INCH-POUND
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DETAIL SPECIFICATION

TIE DOWN, TENSIONERS, CARGO, AIRCRAFT

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

1. SCOPE

1.1 Scope. This specification covers two types of aircraft cargo tie down tensioners and excludes cargo chains. The tie down tensioners are considered to be an aircraft Critical Safety Items (CSI). Type I (10,000 lbs) and Type II (25,000 lbs) cargo chains are governed under MIL-DTL-6458 and are procured separately from the tie down tensioners in this specification.

1.2 Classification. Tie down tensioners covered by this specification are one of the following types (see 6.4):

Type I – 10,000 pounds capacity – DELETED
- Style A – MB-1
- Style B – CGU-4/E

Type II – 25, 000 pounds capacity – DELETED
- Style A – MB-2
- Style B – CGU-3/E

Type III – 10,000 lbs capacity, MB-3/E

Type IV – 25,000 lbs capacity, MB-4/E

Comments, suggestions, or questions on this document should be addressed to: WR-ALC/GRVEB, Robins AFB GA 31098-1813. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.daps.dla.mil .

AMSC N/A FSC 1670

1.3 Part or Identifying Number (PIN). PINs to be used for aircraft cargo tie down tensioners acquired to this specification are created as follows:

M 25959- III

- III → Type
- 25959- → Specification number
- M → Prefix

Type	Capacity	Government designation
III	10,000 lbs	MB-3/E
IV	25,000 lbs	MB-4/E

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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 of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

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

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-882	System Safety
MIL-STD-889	Dissimilar Metals

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

SD-6	Provisions Governing Qualification

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes

(Copies of this document are available from www.asq.org or the American Society for Quality, 600 North Plankinton Ave., Milwaukee WI 53203-2914 or www.ansi.org or the American National Standards Institute, 25 West 43rd St., 4th Floor, New York, NY 10036)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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. Tie down tensioners 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 4.1 and 6.5).

3.2 Tie down tensioner description. Tie down tensioners shall be simple one-handle release mechanisms, lightweight, and as compact as possible. The tie down tensioners shall be used in conjunction with the Type I and Type II chains as specified by MIL-DTL-6458 to increase/decrease the tension being applied to the chain. They shall be of rugged construction so that they can withstand the rough handling encountered in installation and service.

3.3 Design and construction. The tie down tensioners shall be designed and constructed so that no parts will work loose in service. They shall be built to withstand the strains, jars, vibrations and other conditions incident to shipping, storage, installation and service. They shall be weatherproof and designed to prevent the intrusion of water and sand into critical operating components. There shall be no sharp corners or other stress risers which would tend to cause cracks with repeated use under normal operating conditions. The tie down tensioners shall be constructed so as not to cause injury to operating personnel.

3.3.1 Materials and protective coatings.

3.3.1.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements and promotes economically advantageous life cycle costs. However, used, rebuilt, or refurbished items shall not be provided.

3.3.1.2 Protective coatings. Materials that deteriorate when exposed to sunlight, weather, or operational conditions normally encountered during the service life (see 3.3.5) of the item shall not be used or shall have means of protection against such deterioration that does not prevent compliance with the performance requirements specified herein. Protective coatings that chip, crack, or scale with age or extremes of climatic conditions or when exposed to heat shall not be used. Fasteners, handles, and fittings used in the assembly of the item shall also be treated with the proper corrosion preventatives.

3.3.1.3 Dissimilar metals. Dissimilar metals, as defined in MIL-STD-889, shall not be in contact with each other. Metal plating or metal spraying of dissimilar base metals to provide electromotively compatible abutting surfaces is acceptable. The use of dissimilar metals only when separated by suitable insulating material is permitted, except in systems where bridging of insulation materials by an electrically conductive fluid can occur. Sealants or gel type gasket materials shall be used between faying surfaces and butt joints.

3.3.2 Markings. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130. The contract number, contract date, date of manufacture, contractor part number, national stock number (NSN), and classification are mandatory. The tie down tensioner shall be marked to indicate the maximum service load rating specified in 3.9.4. These markings shall be permanent.

3.3.3 System safety. The design of the tie down tensioner shall not contain any hazards that can result in a category greater than medium as defined in Table A-IV of MIL-STD-882. The tie down tensioner shall be functional without sharp edges or burrs that might injure operational personnel or prevent the operation of the tie down tensioners in restricted locations. Operation of the tie down tensioner 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 down tensioners. Tie down tensioners shall be capable of being released using only one hand to allow the tie down tensioner to be released in an emergency situation. Normal operation shall not present cutting, pinching, stabbing, nor abrupt impact hazards to personnel or present a tearing hazard to chemical/biological personal protective gear.

3.3.4 Fastening devices. All screws, bolts, nuts, pins, and other fastening devices shall be properly designed, manufactured, and installed with adequate means of preventing loss of torque or adjustment. Cotter pins, lock washers, or nylon patches shall not be used for this purpose, except for the attachment of trim items or as provided in commercial components. The protrusion of a bolt through each nut shall have at least two threads showing and not more than five threads showing from all angles the bolt can be viewed from.

3.3.5 Service life. The tie down tensioner shall be designed for a minimum service life of 30 years.

3.3.5.1 Damage resistance. The tie down tensioner shall be designed such that frequent dropping onto a concrete runway shall not render the tie down tensioner inoperable when tested as specified in 4.6.8.

3.4 Environmental conditions.

3.4.1 Operating temperature range. The tie down tensioner shall be capable of operating in ambient temperatures ranging from -65 ^{o}F to 160 ^{o}F when tested as specified in 4.6.4.1 and 4.6.4.2.

3.4.2 Storage temperature range. The tie down tensioner shall be capable of being stored in ambient temperatures ranging from -65 ^{o}F to 160 ^{o}F when tested as specified in 4.6.4.1 and 4.6.4.2.

3.4.3 Solar radiation. The tie down tensioner shall not be adversely affected by full-time exposure to solar radiation, such as those conditions encountered in desert environments.

3.4.4 Salt fog. The tie down tensioner shall be capable of storage and operation in salt laden, sea coast environments without damage or deterioration of performance when tested as specified in 4.6.4.3.

3.4.5 Sand and dust. The tie down tensioner shall be capable of storage and operation during exposure to wind-blown sand or dust without damage or deterioration of performance when tested as specified in 4.6.4.4.

3.4.6 Vibration. The tie down tensioner shall be capable of withstanding vibrations encountered during use in all cargo transportation aircraft, including all modifications of the C-5, C-17, C-130, KC-10, and all other cargo transporting aircraft when tested as specified in 4.6.4.5.

3.5 Weight and dimensions. The overall weight of the MB-3/E shall not exceed 3.3 lbs and the overall weight of the MB-4/E shall not exceed 5.8 lbs when tested as specified in 4.6.5.1. The dimensions of the tie down tensioners, including the space through which levers and other mechanisms move, shall not exceed envelope sizes as shown in Table I when tested as specified in 4.6.5.2.

TABLE I. Tie down tensioner dimensions.

Tie down	Length	Width	Height
MB-3/E	15 inches	4 inches	3.5 inches
MB-4/E	18 inches	5 inches	4 inches

3.6 Tensioning capabilities.

3.6.1 Tensioning ability. After preliminary adjustment of the tie down tensioner to remove excess slack in the chain, the tensioning assembly shall be operational and shall be capable of applying tension to the chain of not less than 300 lbs with a manually applied torque of not more

than 60 inch-pounds acting on the tensioning adjustment control. Additionally, no component of the tie down tensioner shall fail when torques up to 85 inch-pounds are applied to the tensioning adjustment control, in the tensioning direction while the tie down tensioner is fully retracted, and in the loosening direction, when in the fully extended position when tested as specified in 4.6.6.1. Failure is defined as catastrophic as well as permanent deformation of components. The tensioning adjustment control shall have a minimum height of 1 inch. It shall be of circular design with raised area to aid grip during tensioning and shall have at least eight locking positions per 360° rotation.

3.6.2 Tension releasing. The tie down tensioner shall be so designed such that the chain assembly (component attached to the cargo) can be manually released and automatically separated from the tie down tensioner with one hand in a single operation with an applied force not exceeding 50 lbs while restraining loads that apply 5,000 lbs of tension on the chain. It shall also be possible by the application of additional force not to exceed 100 lbs (for both Types III and IV devices) to safely release the chain assembly from the tie down tensioner while restraining loads that apply 10,000 lbs of tension for the MB-3/E device or 25,000 lbs for the MB-4/E device when tested as specified in 4.6.6.2. Any release mechanism which results in any component of the tensioning assembly becoming detached or damaged or does not permit the tie down tensioner to be immediately reapplied shall not be acceptable. The tie down tensioner shall be capable of releasing sufficient tension for the chain to be released in a safe manner solely by using the tension release mechanism. The mechanism shall be designed in such a manner that inadvertent release of the mechanism by personnel moving about the aircraft does not occur. Any design which requires operating personnel to exercise extreme caution in releasing the tie down tensioner under the proof loads cited in this specification shall not be acceptable.

3.7 Components. Installed cargo tie down tensioner assemblies consist of a chain assembly, conforming to MIL-DTL-6458, attached to a tie down tensioner as follows:

a. Type I chain assembly with MB-3/E

b. Type II chain assembly with MB-4/E

3.7.1 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 for the MB-3/E, and 0 to at least 4.5 inches for the MB-4/E tie down tensioner device. Preliminary adjustment of the tie down tensioner length shall be accomplished as specified (see 3.7.1.2). Final adjustment of the tie down tensioner length shall be provided by a take-up in the tensioning assembly itself.

3.7.1.1 Ring attachment hook. One end of the tie down tensioner shall be provided with a flat hook to permit rapid attachment of the tie down tensioner to a ring having a minimum clear open diameter of 1.25 inches for the MB-3/E and a minimum of 2 inches for the MB-4/E tie down devices. The stock cross-sectional diameter shall not be less than 0.875 inch for the MB-3/E and not less than 1 inch for the MB-4/E. The tip of the hook shall be wedge-shaped so that operating personnel can use the tensioning assembly to easily scoop up and attach the hook to tie down rings on the aircraft floor. A spring loaded keeper shall be provided on the hook to prevent inadvertent disengagement when the tie down tensioner is subjected to ultimate proof load. Pressure of the ring against the keeper shall permit the ring to enter the hook. The hook shall

have the capability of swiveling and locking in two positions 180° from each other and perpendicular to the locking release mechanism, so as to replace the MB-1 and CGU-4/E with the MB-3/E device and the MB-2 and CGU-3/E with the MB-4/E device. The hook shall be capable of rotating in both the clockwise and counterclockwise directions, and no tools shall be required to rotate and lock the hook into the new position.

3.7.1.2 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 the 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. A spring loaded chain attachment mechanism or similar positive automatic-acting system shall be provided so that the chain will not become detached from the tensioning assembly during the operations required to apply the tie down when in use. The chain shall not become detached due to any manipulation of the chain including pushing, pulling, and twisting the links of the chain. Any design that requires the chain assembly to thread through the tensioning assembly or requires manipulation of the mechanism to attach the chain assembly shall not be acceptable. Under no conditions shall the chain become detached from the tie down tensioner, unless removed/released by the operator actuating the release handle; this includes pulling, tugging, whipping, etc. of the chain in all directions in which the tie down tensioner and chain assembly can be manipulated at, or moved into by dynamic loads/accelerations that may be experienced on the aircraft. The MB-3/E and MB-4/E chain attachment mechanisms shall be capable of attachment to any chain that falls within the dimensional requirements of MIL-DTL-6458, Types I and II, respectively.

3.7.1.3 Tensioning threads. Threads used for the primary tensioning mechanism where exposed shall be tolerant of damage due to dropping that may impair tensioning ability. Threads shall have a pitch no finer than that of unified coarse thread series (UNC) for the diameter used. Alternative thread profiles may be used.

3.8 Operation. Both types of tie down tensioners listed in this specification shall be capable of being easily operated in worldwide environmental conditions (see 3.4). The tensioner tie downs must function easily, and the release mechanisms shall be designed to allow one-handed operation using a three or four finger grasp. Both functions must be easily performed by personnel wearing aircrew cold weather work gloves (or mittens) or chemical/biological gloves (or mittens). All mechanisms shall be manually operable without 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. It shall be possible to override the positive locking feature to gradually remove tension without releasing and separating the chain. The mechanism shall be capable of one-handed tensioning and release by one crewmember when tested as specified in 4.6.6.4.

3.9 Loads.

3.9.1 Proof loads. Tie down tensioners shall be capable of withstanding a proof load of 12,000 lbs for the MB-3/E and 30,000 lbs for the MB-4/E for 30 seconds without permanent deformation or cracking. Additionally, no component of the tie down tensioner shall be damaged or permanently deformed when torques of 85 inch-pounds are applied to the tensioning

adjustment control, in the tensioning direction while the tie down tensioner is fully retracted, or in the loosening direction when in the fully extended position, when tested as specified in 4.6.7.1.

3.9.2 Axial torque loads. Tie down tensioners shall be capable of withstanding an axial torque load of 2,000 inch-pounds for the MB-3/E and 4,000 inch-pounds for the MB-4/E in either direction for 30 seconds without permanent deformation or damage when tested as specified in 4.6.7.2.

3.9.3 Ultimate loads. Tie down tensioners shall be capable of withstanding a sustained ultimate load of 14,100 lbs for the MB-3/E and 35,250 lbs for the MB-4/E for 30 seconds without failure when tested as specified in 4.6.7.3. During this test, part damage and deformation are allowed, but complete rupture of the hardware or failure to withstand the load shall not be permitted.

3.9.4 Maximum service load rating. The maximum allowable service load or max load rating for safe operation is 10,000 lbs for the MB-3/E and 25,000 lbs for the MB-4/E tie down tensioner.

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

3.11 Maintenance. The tie down tensioner shall not require periodic maintenance or adjustment (other than lubrication every 5 years) to maintain its serviceability.

3.12 Workmanship. The tie down tensioner, including all parts and accessories, shall be constructed and finished in a thorough workmanlike manner. Workmanship objectives shall include freedom from blemishes, defects, burrs and sharp corners and edges; accuracy of dimensions, surface finish, and radii of fillets; thoroughness of welding, painting, and riveting; marking of parts and assemblies; and proper alignment of parts and tightness of assembly fasteners.

3.12.1 Bolted connections. Bolt holes shall be accurately punched or drilled and shall be deburred. Threaded fasteners shall be tight and shall not work loose during testing or service usage. All bolt installations which involve self locking or standard nuts will have at least two complete threads protruding through the nut. These two threads include the chamfered end of the bolt.

3.12.2 Riveted connections. Rivet holes shall be accurately punched or drilled and shall be deburred. Rivets shall be driven with pressure tools and shall completely fill the holes. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the component.

3.12.3 Gear and lever assemblies. Gear and lever assemblies shall be properly aligned and meshed and shall be operable without interference, tight spots, loose spots, or other irregularities. Where required for accurate adjustment, gear assemblies shall be free of excessive backlash.

3.12.4 Cleaning. The tie down tensioner shall be thoroughly cleaned. Loose, spattered, or excess solder; welding slag; stray bolts, nuts, and washers; rust; metal particles; pipe compound; and other foreign matter shall be removed during and after final assembly.

4. VERIFICATION

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

a. Qualification inspection (see 4.2).

b. Conformance inspection (see 4.4).

4.1.1 Sampling for inspection. Unless otherwise specified, sampling and associated procedures for formation of lots shall be in accordance with ANSI/ASQ Z1.4, Level I.

TABLE II. Requirement verification matrix.

Requirement	Verification Method	Verification
3.3	Examination (visual)	4.6.1
3.3.1.1	Examination	4.6.1
3.3.1.2	Examination	4.6.1
3.3.1.3	Examination	4.6.1
3.3.2	Examination (visual)	4.6.1
3.3.3	Analysis	4.6.2
3.3.4	Examination (visual)	4.6.1
3.3.5	Analysis	4.6.3
3.3.5.1	Test	4.6.8
3.4.1	Test	4.6.4.1
		4.6.4.2
3.4.2	Test	4.6.4.1
		4.6.4.2
3.4.3	Examination	4.6.1
3.4.4	Test	4.6.4.3
3.4.5	Test	4.6.4.4
3.4.6	Test	4.6.4.5
3.5	Test	4.6.5.1
		4.6.5.2
3.6.1	Test	4.6.6.1
3.6.2	Test	4.6.6.2
		4.6.9
3.7.1	Test	4.6.6.1
		4.6.6.3
3.7.1.1	Examination (visual)	4.6.1
3.7.1.3	Examination (visual)	4.6.1
3.8	Test	4.6.6.4

TABLE II. Requirement verification matrix – Continued.

Requirement	Verification Method	Verification
3.9.1	Test	4.6.7.1
3.9.2	Test	4.6.7.2
3.9.3	Test	4.6.7.3
3.9.4	Examination (visual)	4.6.1
3.10	Examination	4.6.1
3.11	Examination	4.6.1
3.12	Examination (visual)	4.6.1
3.12.1.	Examination (visual)	4.6.1
3.12.2	Examination (visual)	4.6.1
3.12.3	Examination (visual)	4.6.1
3.12.4	Examination (visual)	4.6.1
3.7.1.2	Test	4.6.9

4.2 Qualification inspection. Three qualification tie down tensioners shall be subjected to the analyses, demonstrations, examinations, and tests described in 4.6.1 through 4.6.9. The contractor shall provide or arrange for all test equipment and facilities. The contractor shall submit through the contracting officer a qualification test plan per SD-6 to WR-ALC/GRVE for approval prior to testing and a test report upon completion of testing.

4.3 Qualification matrix. Testing on the three test articles shall adhere to the sequence specified in Table III.

TABLE III. Testing sequences.

Test paragraph	Test article A	Test article B	Test article C
4.6.4.1			2
4.6.4.2			1
4.6.4.3		2	
4.6.4.4		3	
4.6.4.5		4	
4.6.6.1		5	3
4.6.6.2		6	4
4.6.6.3	1		
4.6.6.4	2		
4.6.7.1	3		
4.6.7.2	4		
4.6.7.3	5		
4.6.8			5
4.6.9		1	

4.4 Conformance inspection. For each production lot (2000 units), two sample tie down tensioners shall be subjected to the visual examinations described in 4.6.1, as well as the following tests: 4.6.6.1, 4.6.6.2, 4.6.8, and 4.6.9. Afterwards, the tie down tensioners shall be manually tested for removal of the chain by whipping and pulling the chain from all possible orientations of the tie down tensioner to ensure the chain will not separate from the saddle.

4.5 Inspection requirements.

4.5.1 General inspection requirements. Apparatus used in conjunction with the inspections specified herein shall be laboratory precision type, calibrated at proper intervals to ensure laboratory accuracy.

4.5.2 Data. During all testing specified herein, at least the following data, unless not applicable, shall be recorded at intervals not to exceed 30 minutes. Additional data or shorter intervals shall be provided as appropriate for any specific test.

a. Date.

b. Time started.

c. Time finished.

d. Ambient temperature.

4.5.3 Test rejection criteria. Throughout all tests specified herein, the tie down tensioner shall be closely observed for the following conditions, which shall be cause for rejection.

a. Failure to conform to design or performance requirements specified herein.

b. Structural failure of any component, including permanent deformation or evidence of impending failure.

c. Evidence of excessive wear. If excessive wear is suspected, the original equipment manufacturer's (OEM's) specifications or tolerances shall be utilized for making a determination.

d. Misalignment of components or components missing.

e. Conditions that present a safety hazard to personnel during operation, servicing, or maintenance.

f. Evidence of corrosion or deterioration.

g. Missing, incomplete, incorrect, or illegible markings

h. Failure to conform to the workmanship requirement as specified in 3.12

4.6 Test methods. Unless otherwise specified, the following tests shall be conducted with the tie down tensioner chain assembly working length adjusted to 3 to 6 feet. Unless otherwise specified, all tests shall be performed in accordance with the test conditions specified in MIL-STD-810 for the applicable test.

4.6.1 Examination of product. Each tie down tensioner shall be examined to verify compliance with the requirements specified herein prior to accomplishing any other demonstrations or tests listed in 4.6. A contractor-generated, Government-approved checklist, which shall be submitted with the test plan, shall be used to identify each requirement not verified by an analysis, certification, demonstration, or test, and shall be used to document the examination results. Particular attention shall be given to materials, workmanship, dimensions, surface finishes, protective coatings and sealants and their application, welding, fastening, and markings. Proper operation of each tie down tensioner function shall be verified. Certifications and analyses shall be provided in accordance with Table IV. Each production tie down tensioner shall be visually inspected to a Government-approved reduced version of the contractor-generated checklist. The checklist will entail only the requirements to be verified by visual inspection specified in Table II.

TABLE IV. Certifications and analyses.

Paragraph	Required Certifications and Analyses
3.3.1.1	Contractor certification that recycled, recovered, and/or environmentally preferable materials are used to the maximum extent possible where fit for use for a given application.
3.3.1.2	Contractor certification that all parts are corrosion resistant or properly treated for corrosion resistance such that the tie down tensioners will remain functional over the duration of its service life.
3.3.1.3	Contractor certification that no dissimilar metals, as defined by MIL-STD-889, are in contact with one another.
3.3.3	Contractor system safety hazard analysis (see 4.6.2).
3.3.5	Contractor analysis of the service life requirement (see 4.6.3).
3.4.3	Contractor certification that the tie down tensioner performance is not adversely affected by full time exposure to solar radiation, such as those conditions encountered in desert environments.
3.9.4	Contractor certification that the tie down tensioners can be used in day-to-day operation at the service load rating over the duration of their service life.
3.10	Contractor certification that their parts are functionally and dimensionally interchangeable.
3.11	Contractor certification that the tie down tensioners require only occasional lubrication to maintain their serviceability.

4.6.2 System safety hazard analysis. A system safety hazard analysis of the tie down tensioner shall be conducted in accordance with 4.2 through 4.8 of MIL-STD-882 to demonstrate compliance with the mishap risk requirement of 3.3.3.

4.6.3 Service life analysis. An engineering analysis shall be performed to demonstrate compliance with the service life requirement of 3.3.5.

4.6.4 Environmental testing.

4.6.4.1 High temperature storage and operation test. A qualification tie down tensioner shall be tested in accordance with MIL-STD-810, Method 501.5, Procedures I and II, to demonstrate compliance with the high temperature storage and operating requirements of 3.4.1 and 3.4.2.

4.6.4.2 Low temperature storage and operation test. A qualification tie down tensioner shall be tested in accordance with MIL-STD-810, Method 502.5, Procedures I and II, to demonstrate compliance with the low temperature storage and operating requirements of 3.4.1 and 3.4.2.

4.6.4.3 Salt fog test. A qualification tie down tensioner shall be tested in accordance with MIL-STD-810, Method 509.5, to demonstrate compliance with 3.4.4. Test duration shall be alternating 24-hour periods of salt fog exposure and drying conditions for 24-hour periods (two wet and two dry).

4.6.4.4 Sand and dust test. A qualification tie down tensioner shall be tested in accordance with MIL-STD-810, Method 510.5, Procedures I (12 hours) and II (90 minutes per side), to demonstrate compliance with 3.4.5.

4.6.4.5 Vibration test. The tie down tensioner shall be assembled between two points that are 3 feet apart and tensioned to 300 lbs. The tie down tensioner shall be subjected to a random vibration test in accordance with MIL-STD-810, Method 514.6, Procedure I - General Vibration. The vibration profiles shall encompass the profiles for jet and propeller cargo aircraft (see 3.4.6) and shall be tested in accordance with MIL-STD-810, Method 514.6, Annex C, Categories 8 and 9.

4.6.5 Weight and dimension tests.

4.6.5.1 Weight measurement. The qualification tie down tensioner device shall be weighed to demonstrate compliance with the weight requirement of 3.5.

4.6.5.2 Dimension measurement. A qualification tie down tensioner shall be measured to demonstrate compliance with the dimensional requirements of 3.5.

4.6.6 Performance.

4.6.6.1 Tensioning test. With the tie down tensioner connected between two fixed points 3 to 9 feet apart, the tensioning mechanism shall be operated and checked for compliance with the requirements specified in 3.6.1 and 3.7.1.

4.6.6.2 Release test. The tie down tensioner chain assembly shall be adjusted to a length of approximately 3 to 6 feet and assembled in a test machine. A load of 5,000 lbs 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 lb load (MB-3/E) or a 25,000 lb load (MB-4/E). The release mechanism shall be as specified (see 3.6.2). The tie down tensioner with chain assembly shall be suspended between two free swiveling rings that are positioned at least 80 inches apart in the same horizontal plane with sufficient slack in the connection to permit at least 5 inches of sag in the assembly. The tie down tensioner shall be rotated slowly through 360°. Under these conditions, the chain shall not become detached from the tensioning assembly.

4.6.6.3 Manual adjustment test. This test consists of performing the tensioning test (see 4.6.6.1) at three incremental lengths specified by the Government.

4.6.6.4 Operations test. The operations test ensures that gloves do not cause interference or otherwise present a safety hazard to the operator during tie down operations. The test shall be performed in conjunction with the tensioning test (see 4.6.6.1) and the release test (see 4.6.6.2). These tests shall be conducted with test personnel wearing cold weather or chemical/biological gloves see (see 3.8).

4.6.7 Load tests.

4.6.7.1 Proof-load test. The tie down tensioners shall be subjected to proof loads of 12,000 lbs for the MB-3/E and 30,000 lbs for the MB-4/E for 30 seconds as specified in 3.9.1. During the test, there shall be no slippage of the chain through the adjustment device. After this test, there shall be no damage or visible deformation and the tie down tensioner must remain fully functional.

4.6.7.2 Axial torque load test. A tie down tensioner for the test shall be adjustable with the hook extended 2 inches from the fully retracted position. The hook of the tie down tensioner shall be inserted into a fixed ring and a 2000 inch-pounds torque load shall be applied to the appropriate size chain, or suitable device that simulates the chain, inserted into the chain attachment mechanism for 30 seconds (see 3.9.2). Alternatively, the chain or chain simulating device may be fixed, and the axial torque load be applied through an adapter connected to the hook that simulates the aircraft tie down attachment ring. For stability the tie down tensioner may rest on fixture hardware, but shall not be clamped in any manner. After the torque load is removed, there shall be no damage or visible deformation and the tie down tensioner must remain fully functional.

4.6.7.3 Ultimate load test. Tie down tensioners shall be subjected to torques of 85 inch-pounds applied to the tensioning adjustment control in the tensioning direction while the tie down tensioner is fully retracted, and in the loosening direction while fully extended. Additionally, the tie down tensioners shall be subjected to ultimate loads of 14,100 lbs for the MB-3/E device and 35,250 lbs for the MB-4/E for 30 seconds as specified in 3.9.3. During these tests, part damage and deformation are allowed, but complete rupture of hardware or failure to withstand load or torques shall not be permitted. After these tests the release mechanism must be operational so that the chain can be separated from the tensioning assembly and be immediately reinstalled by hand without the use of tools.

4.6.8 Drop test. One tie down tensioner with at least 2 feet of the appropriate type chain installed in the tie down tensioner shall be dropped at least five times from a height of 16 feet onto a flat concrete surface from five different orientations to demonstrate compliance with 3.3.5.1. The tie down tensioner shall not release the chain when the device is dropped in any orientation to be considered acceptable. At the conclusion of this test, the tie down tensioner shall be operational as specified (see 3.6.1 and 3.6.2) by testing as specified in 4.6.6.1 and 4.6.6.2.

4.6.9 Accelerated handling and inadvertent release test. One tie down tensioner shall be fully extended and suspended by 2 feet of the appropriate chain type inside the tumbler vessel with

one end of the chain attached to the center of an inside surface of the tumbler vessel, and the other end connected to the tie down tensioner's chain attachment device as intended for flight and described in 3.7.1.2. The dimensions of the tumbler vessel and orientation during testing shall result in the tie down tensioner being suspended at least 1 inch above the inside surface opposing the chain to tumbler vessel attachment point when the chain surface is rotated to its highest position above the ground. The tumbler shall be designed, configured, and operated in such a manner that causes the tie down tensioner to, at times, tumble against the inside surface(s), and other times only supported by its chain. The tumbler and installed tie down tensioner shall be operated in this manner at a constant speed for 1 hour. At the conclusion of this test, all tie down tensioner mechanisms shall be inspected to verify the chain was not inadvertently released and then shall be subjected to the salt fog test (see 4.6.4.3). At the conclusion of these tests, the tie down tensioner shall be operational as specified (see 3.6.1 and 3.6.2) by testing as specified (see 4.6.6.1 and 4.6.6.2).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. Tie down tensioners covered in this specification are intended for use in securing cargo for transportation in military aircraft.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Type required (see 1.2).
c. Packaging requirements.

6.3 Subject term (key words) listing.

Ambient temperature
Chain assembly
MB-3/E
MB-4/E
Proof loads

6.4 Classification deletions. Types I and II are obsolete and are no longer available for future procurements. The Type III, MB-3/E, is intended to replace and be interchangeable with both Type I devices: MB-1 and CGU-4/E. The Type IV, MB-4/E, is intended to replace and be interchangeable with both Type II devices: MB-2 and CGU-3/E.

6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List QPL No. 25959 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the appropriate engineer (***WR-ALC***, ***460 Richard Ray Blvd, Ste. 200, Robins AFB, Warner Robins, GA 31098***). An on-line listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.daps.dla.mil.

6.6 International standardization agreement implementation. This specification implements AIR Standardization Coordinating Committee ASCC AIR STD 44/3D, Lashings for Fixed Wing Aircraft. When amendment, revision, or cancellation of this specification is proposed, the preparing activity must coordinate the action with the U.S. National Point of Contact for the international standardization agreement, as indentified in the ASSIST database at https://assist.daps.dla.mil.

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

Custodians:
Navy – AS
Air Force – 84
DLA – GS8

Review Activities:
Air Force – 11

Preparing Activity:
Air Force – 84

Agent:
Air Force – 99

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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.daps.dla.mil.