MILITARY SPECIFICATION

BAR, REPEATABLE RELEASE HOLDBACK, AIRCRAFT LAUNCHING, GENERAL DESIGN REQUIREMENTS FOR

This specification has been approved by the Naval Air Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the requirements for the design, construction, performance, and test of the repeatable release holdback bar (RRHB) for use on carrier-type aircraft.

2. APPLICABLE DOCUMENTS

2.1 Government documents normally furnished. 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

MILITARY

DOD-D-1000	Drawings, Engineering and Associated Lists

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93) Naval Air Engineering Center, Lakehurst, N.J. 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 1720

SPECIFICATIONS (Continued)

MILITARY (Continued)

MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-C-6021	Casting, Classification and Inspection of
MIL-H-6088	Heat Treatment, Aluminum Alloys
MIL-H-6875	Heat Treatment of Steels (Aircraft Practice), Process for
MIL-F-7179	Finishes and Coatings, General Specification for Protection of Aerospace Weapons, Structures and Parts
MIL-F-7190	Forgings, Steel, for Aircraft and Special Ordnance Applications
MIL-S-8516	Sealing Compound, Polysulfide Rubber, Electric Connectors and Electric Systems, Chemically Cured
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-C-8837	Coating, Cadmium (Vacuum Deposited)
MIL-A-8863	Airplane Strength and Rigidity - Ground Loads for Navy Procured Airplanes
MIL-T-10727	Tin Plating, Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals
MIL-P-15024	Plates, Tags and Bands for Identification of Equipment
MIL-F-18264	Finishes, Organic, Weapons System, Application and Control of
MIL-A-21180	Aluminum Alloy Castings, High Strength

SPECIFICATIONS (Continued)

MILITARY (Continued)

MIL-A-22771	Aluminum Alloy Forgings, Heat Treated
MIL-D-23003	Deck Covering Compound, Nonslip, Lightweight
MIL-S-23586	Sealing Compound, Electrical, Silicone Rubber, Accelerator Required
MIL-D-23890	Decalcomanias, Process for Application of
MIL-M-24041	Molding and Potting Compound, Chemically Cured, Polyurethane
MIL-C-26074	Coating, Electroless Nickel, Requirements for
MIL-M-43719	Marking Materials and Markers, Adhesive, Elastomeric, Pigmented, General Specification for
MIL-H-46855	Human Engineering Requirements for Military Systems, Equipment and Facilities
MIL-H-81200	Heat Treatment of Titanium and Titanium Alloys

FEDERAL

QQ-C-320	Chromium Plating (Electrodeposited)
QQ-N-290	Nickel Plating (Electrodeposited)
QQ-P-416	Plating, Cadmium (Electrodeposited)
QQ-S-365	Silver Plating (Electrodeposited), General Requirements for
QQ-Z-325	Zinc Coating, Electrodeposited, Requirements for

STANDARDS

FEDERAL

FED-STD-595	Colors

MILITARY

MIL-STD-100	Engineering Drawing Practices

STANDARDS (Continued)

MILITARY (Continued)

MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-143	Specifications and Standards, Order of Precedence for the Selection of
MIL-STD-810	Environmental Test Methods
MIL-STD-838	Lubrication of Military Equipment
MIL-STD-889	Dissimilar Metals
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities

PUBLICATIONS

DEPARTMENT OF DEFENSE

MIL-HDBK-5	Metallic Materials and Elements for Aerospace Vehicle Structures
MIL-HDBK-132	Protective Finishes
MIL-HDBK-694	Aluminum and Aluminum Alloys

BULLETINS

MILITARY

MIL-BULL-147	Specifications and Standards for Non-Government Organizations Released for Flight Vehicle Construction

NAVAL AIR SYSTEMS COMMAND

SD-24	General Specification for Design and Construction of Aircraft Weapons Systems.
AD-1350	Engineering Drawings and Associated Data

INSTRUCTIONS

OFFICE, CHIEF OF NAVAL OPERATIONS

OPNAVINST 4790.2A The Naval Aviation Maintenance Program (NAMP)

NAVPERS 18068 Manual of Qualifications for Advancement in Rating

DRAWINGS

NAVAL AIR ENGINEERING CENTER (NAEC)

607770 Design Requirements, Catapulting Arrangement, Nose Gear Type Launch

(Copies of documents, other than specifications and standards, required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Specifications and standards are available from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.)

3. REQUIREMENTS

3.1 Selection of materials and standard parts. The selection of materials, standard parts, processes and corrosion protection shall be in accordance with the requirements of Naval Air Systems Command Design Specification SD-24.

3.1.1 Materials. Materials shall conform to applicable specifications and shall be as specified herein and on applicable drawings. Design shall make maximum use of standard (MS, AN, MIL-STD, etc.) parts, materials and processes, rather than special or peculiar items. Materials which are not covered by government specifications, or which are not specifically described herein, shall be of the best quality, suitable for the purpose intended, and shall be approved by the procuring activity. Particular care shall be given to close fitting parts in the choice of both materials and corrosion prevention method.

3.1.1.1 Metal parts. All metal parts shall be of the corrosion-resistant type or treated in a manner to render them resistant to corrosion. Unless suitably protected against electrolytic corrosion, dissimilar metals, as defined in MIL-STD-889, shall not be used in contact with each other. General design information governing usage of metals is furnished in MIL-HDBK-5. General design information for aluminum and aluminum alloys is provided in MIL-HDBK-694. Metals which are not covered by government specifications or which are not specifically described herein, shall be of the best quality, suitable for the purpose intended, and shall be approved by the procuring activity.

3.1.1.1.1 Heat treatment. Heat treatment of aluminum parts and steel parts shall be in accordance with MIL-H-6088 and MIL-H-6875, respectively. Heat treatment of titanium and titanium alloy parts shall be in accordance with MIL-H-81200.

3.1.1.1.2 Castings. Castings shall conform with the requirements of MIL-C-6021. In addition, aluminum alloy castings shall conform to the requirements of MIL-A-21180.

3.1.1.1.3 Forgings. Steel forgings shall conform to the requirements of MIL-F-7190. Critical steel forgings shall meet the requirements for MIL-F-7190 Grade A forgings. Aluminum forgings shall conform to the requirements of MIL-A-22771.

3.1.1.1.4 Magnesium and magnesium alloys. Magnesium and magnesium alloy parts shall not be used.

3.1.1.2 Non-metallic components. Non-metallic components shall be designed to minimize deterioration caused by abrasion and/or exposure to sunlight, microorganism, fungi, moisture, heat, fuel, hydraulic and lubricating oil and grease, and salt spray. Protection shall be provided for those non-metallic components for which strength degradation associated with abrasion or exposure-induced deterioration can endanger the system user. All cover materials shall be flame resistant and shall not produce toxic gases when subjected to high temperature or flame. Materials that are nutrients for fungi shall be treated with a fungicidal agent approved by the Government procuring activity. Under no circumstances shall polyester elastomers be used in fabricating molded components or potting or sealing applications without specific approval. Flexible epoxy resins and adhesives and other flexible materials having ester linkages shall be tested for hydrolytic stability.

3.1.1.3 Lubrication. Lubricants and lubrication practices shall conform to the requirements of MIL-STD-838. Any lubricants not meeting the requirements of MIL-STD-838 shall require approval from the procuring activity for their use. Lubricants shall function satisfactorily throughout the temperature range as specified in 3.4.5.1. Choice of lubricants shall: (a) reduce the hazards to non-metallic system components, (b) reduce damage to finishes adjacent to location of lubricant application, and (c) eliminate the need for frequent relubrication by field maintenance activities. If relubrication is required, choice of lubricants and practices should be such that relubrication need be accomplished only during inspection, calibration or overhaul periods.

3.1.1.4 Decalcomanias. Decalcomanias shall conform to the requirements of MIL-M-43719. General guidance for the application of decalcomanias is provided in MIL-D-23890.

3.1.1.5 Potting compounds. Potting compounds shall be selected from those listed on the Qualified Products List for MIL-S-8516, MIL-S-23586, and MIL-M-24041 and which have completed tests to the Government procuring activity's satisfaction to demonstrate their hydrolytic stability.

3.1.1.6 Fungus-proof materials. To the greatest extent practicable, the materials used in the RRHB shall be non-nutrients for fungi. If materials that are nutrients for fungi must be utilized, such materials shall be approved by the procuring activity.

3.1.2 Corrosion protection. Protective coatings and finishes shall be in accordance with MIL-F-7179 unless otherwise specified in the RRHB detail specification.

3.1.2.1 Finishes. General guidance in the application and control of organic finishes is provided in MIL-F-18264 and MIL-HDBK-132.

3.1.2.2 Anodizing. All aluminum and aluminum alloy parts, except those subject to wear, shall be anodized in accordance with MIL-A-8625, Type II anodic coating. Anodic coatings for all aluminum and aluminum alloy parts subject to wear shall conform to MIL-A-8625, Type III. Fatigue critical aluminum and aluminum alloy parts shall utilize MIL-A-8625, Type I anodic coating or aluminum (99.5% pure) coating.

3.1.2.2.1 Chemical surface treatment. For aluminum and aluminum alloy parts not subject to wear, abrasion or erosion, chemical conversion surface treatment in accordance with MIL-C-5541 may be used in lieu of anodizing if the parts are to be painted.

3.1.2.3 Metal coatings. The metals used in the RRHB shall possess adequate corrosion-resistant characteristics or shall be suitably protected by the use of coatings equivalent to those listed in Table I to resist corrosion which may result from such conditions as, but not limited to, dissimilar metal combinations, moisture, salt spray, and high temperature deterioration. Where not indicated, class or type is at the option of the manufacturer, subject to approval by the procuring activity. Dissimilar metals are defined in MIL-STD-889. Unless otherwise specified herein, physical properties of all metals shall meet the minimum requirements of MIL-HDBK-5.

TABLE I

METAL COATINGS

Coating	Specification
Cadmium plating	QQ-P-416, type II, class 2 (note 1)
Cadmium plating	MIL-C-8837, type II class 1 (note 2)
Zinc plating	QQ-Z-325, type II, class 2
Chromium plating	QQ-C-320
Nickel plating	QQ-N-290
Silver plating	QQ-S-365
Tin plating	MIL-T-10727, type I
Electroless nickel	MIL-C-26074

NOTES:

(1) For steels heat treated up to 180,000 psi

(2) For steels heat treated above 180,000 psi

3.2. Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143. A partial listing of approved (MIL-STD-143 Group II) non-government organization specifications and standards is furnished in MIL-BULL-147.

3.3 Drawings. Drawing requirements shall be specified by the procuring activity in accordance with MIL-STD-100 and AD-1350 instructions. Generally all categories of drawings established in DOD-D-1000 will be required. Unless otherwise directed by the Government procuring activity, all drawings shall conform to the requirements established in DOD-D-1000 for Level 2 Drawings.

3.4 Design and construction. The RRHB shall be designed and constructed to meet the requirements of this specification and the applicable drawings.

3.4.1 Dimensions. The RRHB shall be designed with the deck end configurations and dimensions as shown in NAEC Drawing 607770.

3.4.2 Weight. The weight of the RRHB shall be kept to a minimum. The contractor shall conduct a weight control program during the design phase to insure a design of minimum weight.

3.4.3 Operating characteristics. The RRHB shall meet the following functional requirements.

(a) The RRHB shall not depend upon failure type elements for operation.

(b) The RRHB shall permit rapid and easy attachment to the aircraft, and be firmly held after installation.

(c) The RRHB shall be designed to operate satisfactorily when it is rotated 180° about its longitudinal axis during installation.

(d) The installed RRHB shall not be free to rotate about its longitudinal axis and thus prevent proper engagement with the buffer slider.

(e) The RRHB shall carry any load up to its required release load without releasing prematurely.

(f) The RRHB shall release repeatedly within the load ranges specified in MIL-A-8863 throughout the entire operating conditions specified in 3.4.4 and 3.4.5.

(g) The RRHB shall operate satisfactorily and be insensitive to catapult loading rates up to 800,000 pounds/second.

(h) The installed RRHB shall be capable of being tracked into the buffer of the nose gear launch deck hardware at a maximum speed, which shall be the smaller of:

(1) Four knots, or

(2) That speed which will cause a maximum load in the holdback bar, during buffing, equal to the minimum release load as specified in MIL-A-8863.

(i) The RRHB shall be incapable of being installed on an aircraft other than that for which it was designed.

(j) The RRHB shall be capable of absorbing internally any strain energy stored in the unit through a self-contained snubber.

(k) The RRHB shall incorporate a mechanical override feature to permit manual release up to load P. The manual release load, P in pounds, in the RRHB is:

$$P = \frac{T + .2W}{\cos \theta}$$

where:

T = idle thrust on 59°F day

W = airplane maximum gross weight

θ = angle between holdback axis and the deck

(l) The RRHB shall automatically reset itself for subsequent reuse after final release from the aircraft holdback fitting within twenty seconds.

(m) The RRHB shall provide a visual indication of having reset itself.

(n) The RRHB shall provide a visual indication of correct installation to the airplane catapult holdback fitting.

(o) The RRHB shall be free of any external adjustments that could permit inadvertent or unauthorized variation in release load. An adjustment feature shall be provided which will permit periodic calibration of the release load as required.

(p) The RRHB shall incorporate a counter to record automatically the number of cycles of operation for the purpose of determining remaining service life.

(q) The RRHB shall be capable of being installed on or removed from an aircraft by one crewman.

(r) An overload control section shall be provided either on the aircraft holdback fitting or on the aircraft end of the RRHB, as dictated by the aircraft design and approved by the procuring activity. The design of the overload control section shall be such that failure at this point shall not impair normal functions of the nose landing gear, or otherwise cause damage to the aircraft.

(s) The RRHB shall be designed so that any internal failure will cause the indicator device(s) to show an unsafe condition, and prevent subsequent application of initial tension loading.

3.4.4 Loads. Strength is required for the catapulting, ground handling, release, and fatigue loads as specified in 3.4.4.1 thru 3.4.4.4.

3.4.4.1 Ultimate. The RRHB shall have ultimate load limits that will not damage or change the operating characteristics when the ultimate load test conditions of (a) and (b) are performed (4.3.3.1). Ultimate load test conditions are:

(a) Maximum tensile load of the RRHB shall be (1.50) times (1.06) times the "R" value as defined in MIL-A-8863.

(b) RRHB rigidly supported at both ends and a 400-pound static load applied in any direction at the midpoint normal to the longitudinal axis.

3.4.4.2 Endurance. The components must withstand the entire fatigue spectrum of Figure 1 for catapulting loads, including a scatter factor of 2.0 both by analysis and the Endurance tests of 4.3.3.5.

3.4.4.3 Release. Release loads shall be those as specified in MIL-A-8863.

3.4.4.4 Overload. The overload control section shall be designed in such a manner that the aircraft will never be loaded greater than 1.60R (see 3.4.3 (r) and 3.4.4.1(a)) due to the bar malfunctioning.

3.4.5 Environmental. The RRHB shall operate satisfactorily with no malfunctions under any of the following environmental conditions (3.4.5.1 thru 3.4.5.7) or combinations of these conditions as specified herein.

3.4.5.1 Temperature. The RRHB shall operate satisfactorily with no malfunctions when subjected to the ambient temperature ranges and conditions of (a) and (b) and the high and low temperature tests of 4.3.2.2 and 4.3.2.3.

(a) Storage - Minus 70°F to plus 160°F for extended period of time.

(b) Operating - Air, 0°F to 123°F at sea level.

3.4.5.2 Low pressure. The RRHB shall operate satisfactorily with no malfunctions when subjected to the low pressure atmosphere and the low pressure tests of 4.3.2.1.

3.4.5.3 Dust. The RRHB shall operate satisfactorily with no malfunctions when:

(a) Exposed to the dust and grit particles in combination with hydraulic fluid, jet exhaust residue and other oily films common to an aircraft carrier deck during flight operations.

(b) Subjected to the dust tests as specified in 4.3.2.4.

3.4.5.4 Humidity. The RRHB shall operate satisfactorily with no malfunctions when:

(a) Exposed to humidities up to 100 percent, including conditions where condensation, including frost, takes place in or on the RRHB.

(b) Subjected to the humidity tests of 4.3.2.5.

3.4.5.5 Salt fog. The RRHB shall operate satisfactorily with no malfunctions when exposed to the operational salt-sea atmosphere and the salt fog test of 4.3.2.6.

3.4.5.6 Vibration. The RRHB shall be designed to meet the performance requirements of this specification when subjected to the vibration tests of 4.3.2.7.

3.4.5.7 Rough usage. The RRHB shall be designated to withstand the type of usage that will be encountered on an aircraft carrier, including being thrown and dragged on carborundum coated steel decks.

3.4.6 Reliability. Equipment reliability shall be considered in every phase of the design process. Techniques used to determine and evaluate the detailed design include analyses, part selection, derating, and appropriate application of design guidelines. The procuring activity shall specify the MCBF (Mean Cycles Between Failures) for each procurement. In meeting this requirement, the scheduled preventive maintenance recommended by the contractor for service usage and approved by the procuring activity will be permitted. Successful completion of the testing herein shall not relieve the contractor of the responsibility for compliance of production units with the specified reliability and performance requirements during any subsequent testing or service usage within the limitations specified.

3.4.7 Maintainability. The RRHB shall be designed in accordance with the quantitative and qualitative maintainability requirements as specified in 3.4.7.1 and 3.4.7.2. The RRHB shall be maintained at the Intermediate level of maintenance as specified in OPNAVINST 4790.2A and 3.4.7.1.3.

3.4.7.1 Quantitative.

3.4.7.1.1 Minimum cycles between overhaul. The equipment shall be designed such that it is capable of a minimum of (to be specified by NAVAIR) cycles between overhauls. A cycle is defined by Figure 1. Replacement of critical parts subject to wear/deformation is permitted after each (to be specified by NAVAIR) cycles.

3.4.7.1.2 Organizational level. Organizational level maintenance generally shall be unnecessary.

3.4.7.1.2.1 Scheduled. There shall be no scheduled maintenance other than a calibration check every (to be specified by NAVAIR) cycles.

3.4.7.1.3 Intermediate level. All intermediate level repairs of the RRHB shall not exceed a mean time of 2.0 manhours. The manhours shall include, but not be limited to, the following:

(a) Connect and disconnect any test equipment.

(b) Bench check

(c) Disassembly and assembly

(d) Adjustments

(e) Calibrations if required

(f) Functional checkout for repair verification

Ninety percent (90%) of all repair actions shall be completed within 2.83 manhours. The mean time to completely disassemble and reassemble the RRHB shall not exceed 3.0 manhours.

3.4.7.1.4 Depot level. There shall be no depot level maintenance.

3.4.7.1.5 Support equipment. Requirements for additional equipment shall be held to a minimum. In particular, requirements for Peculiar Ground Support Equipment (PGSE) and special tools shall be justified, documented and submitted to the procuring activity for approval.

3.4.7.2 Qualitative.

3.4.7.2.1 Preventive maintenance. The RRHB shall be designed to eliminate requirements for scheduled maintenance. In the event that this requirement cannot be achieved, proposed requirements shall be justified by the contractor and will be subject to NAVAIR approval. Scheduled replacement will not be allowed for any parts unless the contractor has established that such parts have a wearout or fatigue characteristics which results in a determinable life span with nonrandom life distribution. Wearout of parts caused by mechanical operation is a typical example which may justify a scheduled maintenance action. Where parts replacement is considered necessary to preclude failure, service or wear tolerances for affected parts shall be included on the contractor's drawings.

3.4.7.3 Personnel skill level. Organizational and intermediate level of maintenance personnel shall not exceed a skill level E-6 as defined in NAVPERS 18068, Occupational field 5 for at least 95% of the maintenance tasks. A man of lower skill may assist in disassembly or assembly.

3.4.8 Storage life. The RRHB shall have a storage life of not less than 36 months when stored in an unheated warehouse using Level A packing condition as specified in the contract. Storage life is the period for which the equipment may be kept in storage before installation and still have the specified operational service life after installation without component or part replacement, adjustment, or maintenance action.

3.4.9 Human engineering. In addition to complying with the human engineering requirements of MIL-STD-1472 and MIL-H-46855, the RRHB design shall include, but not be limited to, the following:

(a) The RRHB shall provide for installation and removal by no more than one crewman.

(b) No degradation of crewman performance shall be allowed while installing and removing the RRHB due to personnel wearing essential clothing required of the operating environment.

(c) The RRHB shall incorporate physical measures to preclude interchange of units or components of same or similar form that are not in fact functionally interchangeable.

(d) The RRHB shall incorporate physical measures to preclude improper mounting of units or components.

3.5 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of AD-1350 shall govern the manufacturer's part numbers and changes thereto.

3.6 Marking. Each RRHB shall be marked for identification in accordance with MIL-STD-130.

3.6.1 Identification plates. Each RRHB shall bear a metal plate in accordance with MIL-P-15024, Type A, G or H on which a serial number, part number, contract number, and manufacturer's code are stamped. The plate shall provide sufficient blank surface to permit the stamping of symbols to record the number of inspection and overhaul cycles and accessory changes incorporated.

3.7 Workmanship. The workmanship displayed in fabrication and assembly of the RRHB shall be such as to assure ability of the RRHB to meet its performance requirements under all applicable environmental conditions. Unauthorized repair, welding, loose rivets, heavy burrs, indiscriminate placement of fasteners, and parts assembled by introduction of high stresses not prescribed in design, are typical signs of inferior workmanship. The standards of workmanship exhibited in any approved sample, subject to any qualification stated in the Government's notice of approval, shall be determinative of the requirements of the contract relative to workmanship insofar as not specifically covered by applicable specifications.

4. TESTS AND TEST METHODS

4.1 Responsibility for tests. Unless otherwise specified in the contract or purchase order, the supplier is responsible for

the performance of all tests as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or other facilities suitable for the performance of the tests specified herein, unless disapproved by the Government. The procuring activity reserves the right to perform any of the tests set forth herein where such tests are deemed necessary to assure supplies and services conform to prescribed requirements. See Table II for the complete listing of all specified tests.

4.2 Number of test samples. A minimum of two (2) samples shall be provided for the qualification tests of paragraph 4.3. Four (4) additional samples shall be provided for demonstration of paragraph 4.6.

4.3 Qualification tests. The following qualification tests shall be conducted in accordance with the respective tests and sequence shown in Table III.

4.3.1 Examination. The RRHB shall be carefully examined for conformance with the applicable drawings and the requirements of this specification not covered by tests.

4.3.2 Environmental tests. The environmental testing of the RRHB shall be conducted on the sample designated and sequences shown in Table III.

4.3.2.1 Low pressure test. The low pressure test shall be performed in accordance with MIL-STD-810, Method 500.1, Procedure I, except that the steps shall be as follows:

Step 1 - The RRHB shall be examined per 4.3.1 and subjected to the actuation (4.3.4.1) and manual release (4.3.4.2) tests under the standard ambient conditions specified in 3.1 of MIL-STD-810. A record of specific pretest data shall be made to determine that the RRHB is within the requirements of 4.3.1, 4.3.4.1, and 4.3.4.2.

Step 2 - Place the test item in the chamber in a manner to simulate shipment by air. Decrease the chamber pressure to 144.1 mm of Hg (5.56 inches of Hg or 40,000 feet above sea level) at a rate not to exceed 2000 fpm. Maintain this pressure for not less than one (1) hour.

Step 3 Return the chamber to standard ambient conditions at a rate not to exceed 2000 fpm.

TABLE II

SPECIFIED TESTS

Test	Reference Paragraph
Qualification	4.3
Examination	4.3.1
Environmental	4.3.2
Low pressure	4.3.2.1
High temperature	4.3.2.2
Low temperature	4.3.2.3
Dust	4.3.2.4
Humidity	4.3.2.5
Salt fog	4.3.2.6
Vibration	4.3.2.7
Structural	4.3.3
Tensile	4.3.3.1
Bending	4.3.3.2
Overload	4.3.3.3
Loading rate	4.3.3.4
Endurance	4.3.3.5
Operating	4.3.4
Actuation	4.3.4.1
Manual release	4.3.4.2
Maintenance	4.4
Human Factors	4.5
Demonstration on aircraft	4.6
Additional tests	4.7

TABLE III
QUALIFICATION TEST SEQUENCE

Test	Reference Paragraph	MIL-STD-810		Test Sample	
		Method	Procedure	A	B
Examination	4.3.1			X	X
Environmental	4.3.2			X	
Low pressure	4.3.2.1	500.1	I	X	
High temperature	4.3.2.2	501.1	II	X	
Low temperature	4.3.2.3	502.1	I	X	
Dust	4.3.2.4	510.1	I	X	
Humidity	4.3.2.5	507.1	IV	X	
Salt fog	4.3.2.6	509.1	I	X	
Vibration	4.3.2.7	514.2	Category b.1 & b.2	X	
Structural	4.3.3				
Tensile	4.3.3.1			X	
Bending	4.3.3.2			X	
Overload	4.3.3.3			X	
Loading rate	4.3.3.4				X
Endurance	4.3.3.5				X
Operating	4.3.4			X	X
Actuation	4.3.4.1			X	X
Manual release	4.3.4.2			X	X

Step 4 - Remove the items from the test chamber and perform the examination (4.3.1), actuation (4.3.4.1), and manual release (4.3.4.2) tests on the test samples and obtain results in accordance with 3.2 of MIL-STD-810.

4.3.2.2 High temperature. The high temperature test shall be performed in accordance with MIL-STD-810, Method 501.1, Procedure II, except that the steps shall be as follows:

Step 1 - The RRHB shall be examined per 4.3.1 and subjected to the actuation (4.3.4.1) and manual release (4.3.4.2) tests under the standard ambient conditions specified in 3.1 of MIL-STD-810. A record of specific pretest data shall be made to determine that the RRHB is within the requirements of 4.3.1, 4.3.4.1 and 4.3.4.2.

Step 2 - Raise the internal chamber temperature to 49°C (120°F)

Step 3 - Maintain internal chamber temperature for 6 hours at 49°C (120°F).

Step 4 - Raise the internal chamber temperature to 71°C (160°F) within a time period of 1 hour and then maintain at that temperature for 4 additional hours.

Step 5 - Lower the internal chamber temperature to 49°C (120°F) within a time period of 1 hour.

Step 6 - Repeat steps 3, 4, and 5 two additional times (making a total of three 12-hour cycles).

Step 7 - Adjust the internal chamber temperature to 50.5°C (123°F) and maintain until temperature stabilization of the test item is reached.

Step 8 - Remove RRHB from chamber and install on test fixture within five (5) minute time period. Perform the actuation (4.3.4.1) and manual release (4.3.4.2) tests, after which examine the test item per 4.3.1.

Step 9 - Return the RRHB to standard ambient conditions and stabilize.

Step 10 - Remove the RRHB from the test chamber and perform the examination (4.3.1), actuation (4.3.4.1), and manual release (4.3.4.2) tests on the test samples and obtain results in accordance with 3.2 of MIL-STD-810.

NOTE: The rate of temperature change (steps 2, 4 and 6) may be the maximum attainable by the chamber, but shall not exceed 10°C (18°F) per minute.

4.3.2.3 Low temperature. The low temperature test shall be performed in accordance with MIL-STD-810, Method 502.1, Procedure I, except that the steps shall be as follows:

Step 1 - The RRHB shall be examined per 4.3.1 and subjected to the actuation (4.3.4.1) and manual release (4.3.4.2) tests under the standard ambient conditions specified in 3.1 of MIL-STD-810. A record of specific pretest data shall be made to determine that the RRHB is within the requirements of 4.3.1, 4.3.4.1, and 4.3.4.2.

Step 2 - Lower the internal chamber temperature to the storage temperature -57°C (-70°F) and maintain for a period of 24 hours after stabilization.

Step 3 - Increase temperature to -18°C (0°F) and stabilize RRHB temperature. Remove RRHB from chamber and install on test fixture within five (5) minute time period, and perform the actuation (4.3.4.1) and manual release (4.3.4.2) tests, after which examine the test item per 4.3.1.

4.3.2.4 Dust. The material used in testing shall contain a mixture of 50% - 50% by weight of deck compound per MIL-D-23003 and MIL-STD-810 dust. The dust test shall be performed in accordance with MIL-STD-810, Method 510.1, Procedure I, except that the steps shall be as follows:

Step 1 - The RRHB shall be examined per 4.3.1 and subjected to the actuation (4.3.4.1) and manual release (4.3.4.2) tests under the standard ambient conditions specified in 3.1 of MIL-STD-810. A record of specific pretest data shall be made to determine that the RRHB is within the requirements of 4.3.1, 4.3.4.1 and 4.3.4.2.

Step 2 - Set the chamber controls to maintain an internal chamber temperature of 23°C (73°F) and a relative humidity of less than 22 percent. Adjust the air velocity to 1,750 ± 250 feet per minute. Adjust the dust feeder to control the dust concentration at 0.3 ± 0.2 grams per cubic foot. With the test item nonoperating, maintain these conditions for 6 hours.

Step 3 - Stop the dust feed and reduce the air velocity to 300 ± 200 feet per minute. Raise the internal chamber air temperature to 63°C (145°F). Hold these conditions 16 hours.

Step 4 - While holding chamber temperature at 63°C (145°F) adjust the air velocity to 1,750 ±250 fpm. Adjust the dust feeder to control the dust concentra-tion at 0.3 ±0.2 grams per cubic foot. Unless otherwise specified, with the test item nonoperating, maintain these conditions for 6 hours.

Step 5 - Turn off all chamber controls and allow the test item to return to standard ambient conditions. Remove accumulated dust from the test item by brushing, wiping, or shaking, care being taken to avoid introduction of additional dust into the test item. Dust shall not be removed by either air blast or vacuum cleaning.

Step 6 - Remove RRHB from chamber and install on test fixture. Perform the actuation (4.3.4.1) and manual release (4.3.4.2) tests, after which examine the test item per 4.3.1. When inspecting per 4.3.1, test items containing bearings, grease

seals, lubricants, etc., shall be carefully examined for the presence of dust deposits.

4.3.2.5 Humidity. The humidity test shall be performed in accordance with MIL-STD-810, Method 507.1, Procedure IV, except that the steps shall be as follows:

Step 1 - The RRHB shall be examined per 4.3.1 and subjected to the actuation (4.3.4.1) and manual release (4.3.4.2) tests under the standard ambient conditions specified in 3.1 of MIL-STD-810. A record of specific pretest data shall be made to determine that the RRHB is within the requirements of 4.3.1, 4.3.4.1, and 4.3.4.2.

Step 2 - Dry the test item at a temperature of not less than 40°C (104°F) nor more than 50°C (122°F) for not less than 2 hours.

Step 3 - Condition the test item at 25° ±5°C (77° ± 9°F) and 50 percent relative humidity for 24 hours.

Step 4 - Subject the test item to five 24-hour cycles in accordance with Figure 507.1-3 of MIL-STD-810. Do not make the performance measurements at the times indicated on Figure 507.1-3. A 24-hour cycle consists of 16 hours at 60° ±5°C (140° ±9°F) and approximately 8 hours at 30° ±5°C (86° ±9°F) (includes transition times). The relative humidity shall be maintained at 95 percent, or greater, at both temperatures. Each transition time between 30° ±5°C (86° ±9°F) and 60° ±5°C (140° ±9°F) shall be not greater than 1-1/2 hours. The relative humidity during each transition need not be controlled. Approximately 2 hours after stabilization during the high temperature and low temperature portions of the first or second cycle, a sampling of the atmosphere in the chamber shall be made to determine that the conditions of temperature and relative humidity are uniform throughout the chamber. The RRHB shall be removed from the chamber during the third cycle at 60° ±5°C (140° ±9°F)

immediately prior to decreasing to 30° ±5°C (86° ±9°F) and installed on the test fixture within a 10-minute time period. Perform the actuation (4.3.4.1) and manual release (4.3.4.2) tests, after which examine the RRHB per 4.3.1. If the RRHB passes these inspections it shall be replaced in the chamber and subjected to the remaining 24-hour cycles in accordance with Figure 507.1-3.

Step 5 - Condition the RRHB at 25° ±5°C (77° ±9°F) and 50 ±5 percent relative humidity for not less than 12 hours nor more than 24 hours.

Step 6 - Remove the RRHB from the chamber after the conditioning period and install on the test fixture within a 10-minute time period. Perform the actuation (4.3.4.1) and manual release (4.3.4.2) tests, after which examine per 4.3.1 and obtain results in accordance with 3.2 of MIL-STD-810.

4.3.2.6 Salt fog. The salt fog shall be performed in accordance with MIL-STD-810, Method 509.1, Procedure I, except that the Performance test (3.1.6) shall be as follows:

3.1.6 Performance test:

Step 1 - The RRHB shall be examined per 4.3.1 and subjected to the actuation (4.3.4.1) and manual release (4.3.4.2) specified in 3.1 of MIL-STD-810. A record of specific pretest data shall be made to determine that the RRHB is within the requirements of 4.3.1, 4.3.4.1, and 4.3.4.2.

Step 2 - The RRHB shall be placed in the test chamber in accordance with the General Requirements, 3.2.2, of MIL-STD-810 and exposed to the salt fog for a period of 48 hours.

Step 3 - Remove the RRHB and install on test fixture within a 10-minute time period. Perform the actuation (4.3.4.1) and manual release (4.3.4.2) tests, after which examine the test item per 4.3.1. These inspections

shall be compared with those of Step 1 and discrepancies noted.

Step 4 - The RRHB shall then be inspected for corrosion in accordance with General Requirements, 3.2.4, of MIL-STD-810. If necessary to aid in the examination, a gentle wash in running water not warmer than 38°C (100°F) may be used.

Step 5 - Store the RRHB in an ambient atmosphere for 48 hours for drying.

Step 6 - At the end of the drying period the RRHB shall be subjected to the actuation (4.3.4.1) and manual release (4.3.4.2) tests under ambient conditions, after which it shall be examined per 4.3.1. These inspections shall be compared with those of Step 1 and Step 3.

4.3.2.7 Vibration test. The vibration tests shall be performed in accordance with MIL-STD-810, Method 514.2, equipment category b.1 and b.2.

4.3.3 Structural tests. The following structural tests are required.

4.3.3.1 Tensile test. A special test sample RRHB, with the tensile control section omitted, shall be loaded to the maximum tensile load as specified in 3.4.4.1.

4.3.3.2 Bending test. The RRHB shall have a 400-pound static load applied at the midpoint normal to the longitudinal axis with the bar ends rigidly supported for three (3) cycles. Upon completion of the bending load test, the examination (4.3.1), actuation (4.3.4.1), and manual release (4.3.4.2) tests shall be performed on the test samples.

4.3.3.3 Overload test. The RRHB/holdback fitting combination shall be loaded to failure with the RRHB in a locked condition to verify that the overload tensile control section fails within the limits of 3.4.3 (r).

4.3.3.4 Loading rate range. Prior to the start of the endurance test (4.3.3.5) the RRHB shall be tested for three (3) cycles at a loading rate of 125,000 pounds/second and three (3) cycles at a loading rate of 800,000 pounds/second. Release load shall be within the range specified in 3.4.4.3.

4.3.3.5 Endurance test. The RRHB shall be endurance tested for 2000 cycles including a scatter factor of two (2) (or twice the lifetime specified in the applicable airplane detail specification) in accordance with (a), (b), and (c) using the loads of Figure 1.

(a) A cycle shall consist of a manual hook-up, application of loads specified in Figure 1, release, and an impact with a steel deck. The release load shall be monitored throughout the test.

(b) Ten percent (10%) of the endurance test shall be performed at the high ambient of 123°F (51°C) and ten percent at the low ambient of 0°F (-18°C) See Figure 2 and Figure 3 for endurance test setup.

(c) Twenty cycles at 123°F (51°C) shall be performed in rapid succession where the interval between cycles shall not exceed two minutes.

(d) Calibration shall be permitted after each 100 cycles.

4.3.4 Operating tests. The following operating tests are required.

4.3.4.1 Actuation. The RRHB shall be subjected to ten (10) cycles of applied rated load and release. All ten (10) cycles shall operate within the specified range. The unit shall reset itself after each release.

4.3.4.2 Manual release. The RRHB shall be subjected to five (5) manual release cycles at the maximum override release load of 3.4.3(k). The unit shall reset itself after each release.

4.4 Maintainability. The contractor shall conduct maintainability tests in accordance with the maintainability program submitted to and approved by the procuring activity.

4.5 Human factors engineering verification. The contractor shall conduct human factors engineering verification tests in accordance with the program submitted to and approved by the procuring activity. The tests shall be performed to demonstrate compliance with MIL-STD-1472. The effect of degraded inputs and degraded performance shall be determined and reported to the procuring activity.

4.6 Demonstration on aircraft. A test program shall be developed for testing the RRHB using a catapult and launching an aircraft. The program shall monitor and record all parameters of the design and operational requirements as specified herein and on the applicable drawings.

4.7 Additional tests. The contractor shall propose additional qualification and acceptance inspections as necessary for the assurance design adequacy and continued production reliability based upon the peculiarities of the specific design.

5. PREPARATION FOR DELIVERY

Not applicable.

6. NOTES

6.1 Intended use. The requirements of this specification are intended for use by contractors in the design, construction, performance and test of a repeatable release holdback bar (RRHB) for use on carrier-type aircraft.

6.2 Ordering data.

6.2.1 Procurement requirements. Procurement documents should specify the following:

a. Title, number, and date of this specification

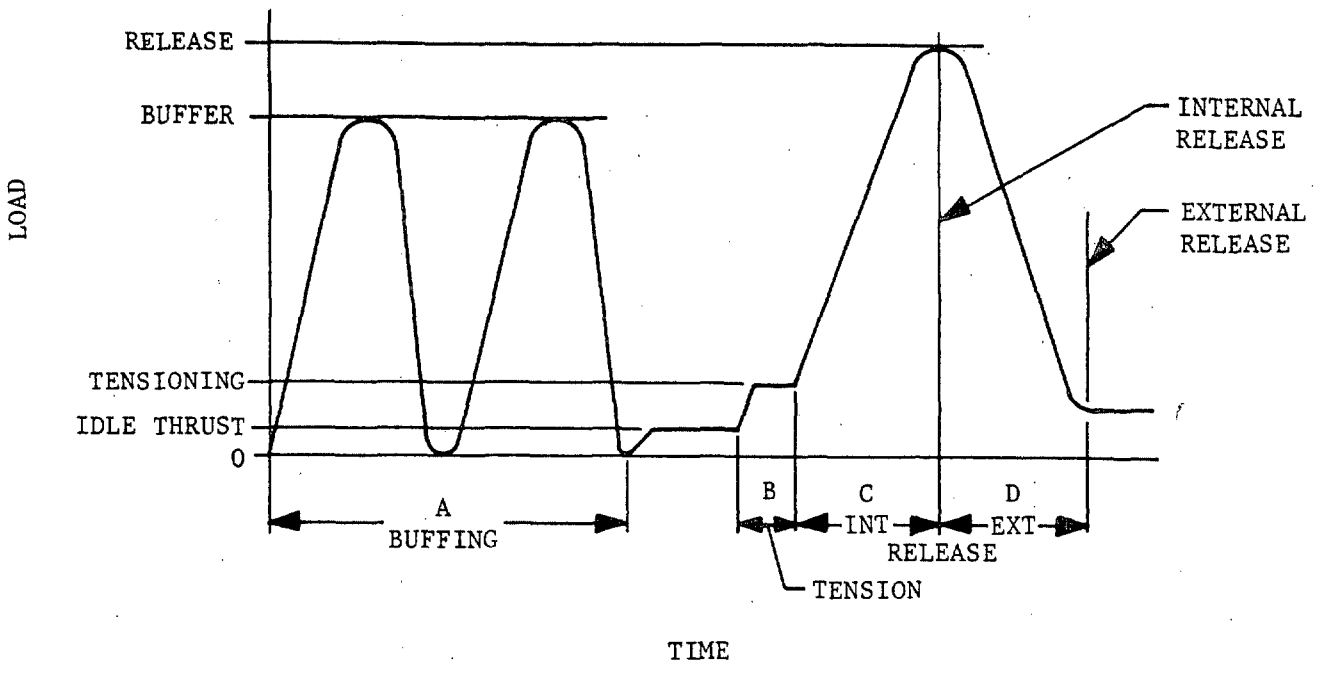
b. Applicable aircraft detail specification

6.2.2 Contract data requirements. When the specification is used in a procurement which incorporates a DD Form 1423 and invokes the provisions of 7-104.9(n) of the Armed Services Procurement Regulations, the data requirements identified below will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of ASPR-7-104.9(n) are not invoked, the data specified below will be delivered by the contractor in accordance with the contract requirements. Deliverable data required by this specification is cited in the following paragraphs:

Paragraph	Data requirement	Applicable DID
4.4	Maintainability	DI-R-2127
4.5	Human factors engineering verification	DI-H-2104

(Copies of data item descriptions required by the contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

Preparing Activity:
Navy - AS
(Project No. 1720-N009)



TIME A - TWO CYCLES OF BUFFER LOADING. EACH CYCLE IS FROM ZERO TO .8RCOS A (SEE FIGURE 3 FOR ANGLE A) APPLIED AT THE AIRCRAFT HOLDBACK FITTING. LOAD DROPS TO ZERO POUNDS AT END OF EACH BUFFER CYCLE.

TIME B - LOAD REPRESENTING TENSIONING CONDITION. LOADING RATE AND TIME HELD AT THIS LOAD NOT CRITICAL. TENSIONING LOAD IS EQUAL TO CATAPULT TENSIONING OF 5500 POUNDS PLUS 'T' AS SPECIFIED IN MIL-A-8863.

TIME C - LOAD TO INTERNAL RELEASE. A LOAD P IS APPLIED TO CAUSE THE RRHB TO RELEASE AT LOAD OF R AS SPECIFIED IN MIL-A-8863. THE RATE OF LOADING FOR P SHALL BE AS SPECIFIED IN 3.4.3(g).

TIME D - LOAD DROPS TO APPROXIMATELY 1000 POUNDS AT WHICH POINT EXTERNAL RELEASE TAKES PLACE AND RRHB FALLS TO STEEL PLATE (PLATE SIZE SHALL NOT BE LESS THAN 60 INCHES IN LENGTH, 24 INCHES IN WIDTH, AND 1 INCH IN THICKNESS).

NOTE: A TOTAL OF 1000 (OR AS SPECIFIED IN THE APPLICABLE AIRPLANE DETAIL SPECIFICATION) CATAPULT LAUNCHES IS REQUIRED NOT INCLUDING SCATTER FACTOR. ALL OF THESE LAUNCHES FOLLOW THE SCHEDULE ABOVE EXACTLY.

FIGURE 1. SCHEMATIC OF HOLDBACK BAR LOADING DURING LAUNCH CYCLE (SEE FIGURE 3 FOR TEST SET-UP AND GEOMETRY)

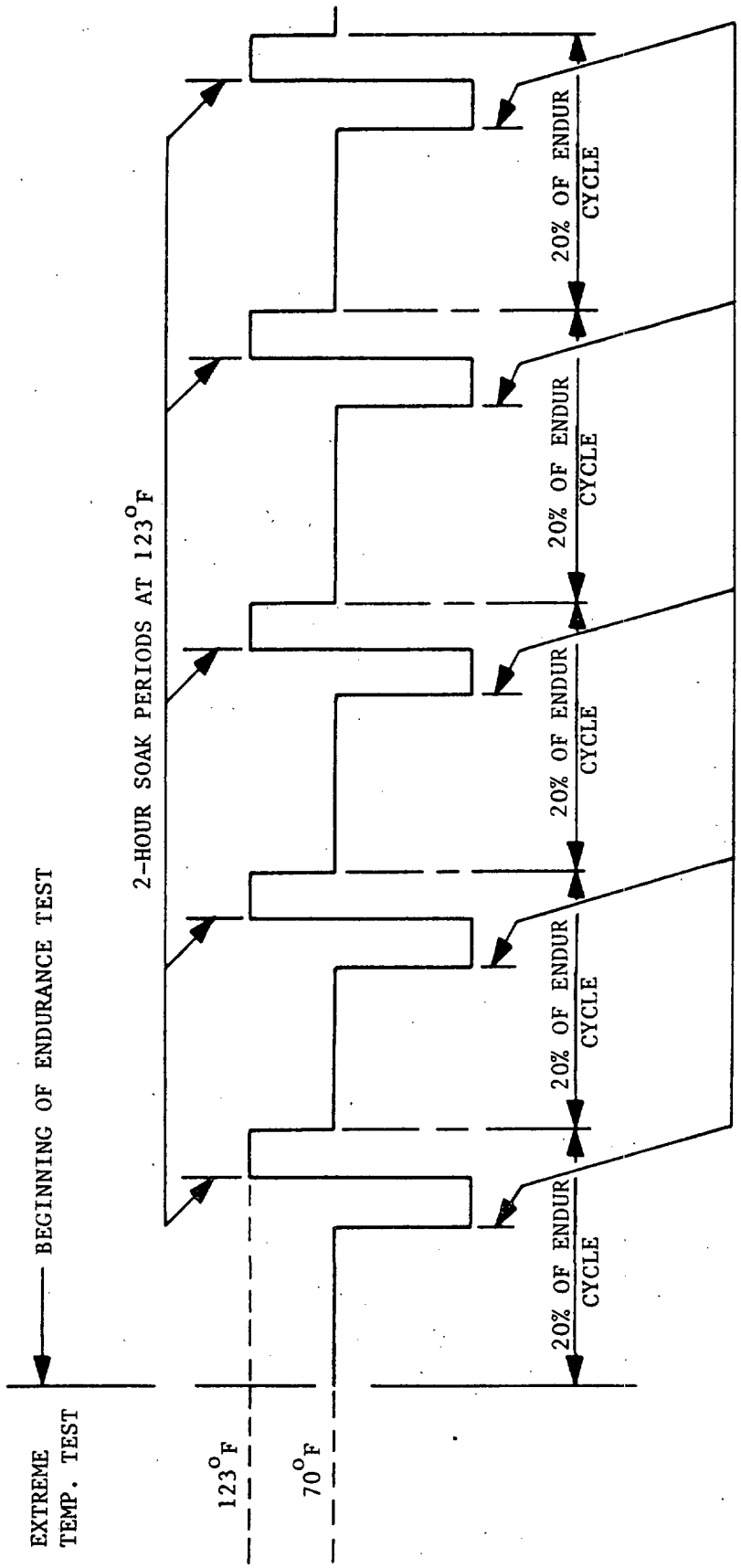


FIGURE 2. ENDURANCE TEST TEMPERATURE CYCLING SCHEMATIC GRAPH

CONDITION	LOAD P	ANGLE A ± 30'
HOOK-UP BUFFING TENSIONED RELEASE	SEE FIGURE 1	VARIABLE TO SUIT DESIGN GEOMETRY

NOTES

1. THE SPRING REPRESENTS NOSE GEAR TIRE/OLEO DEFLECTIONS.

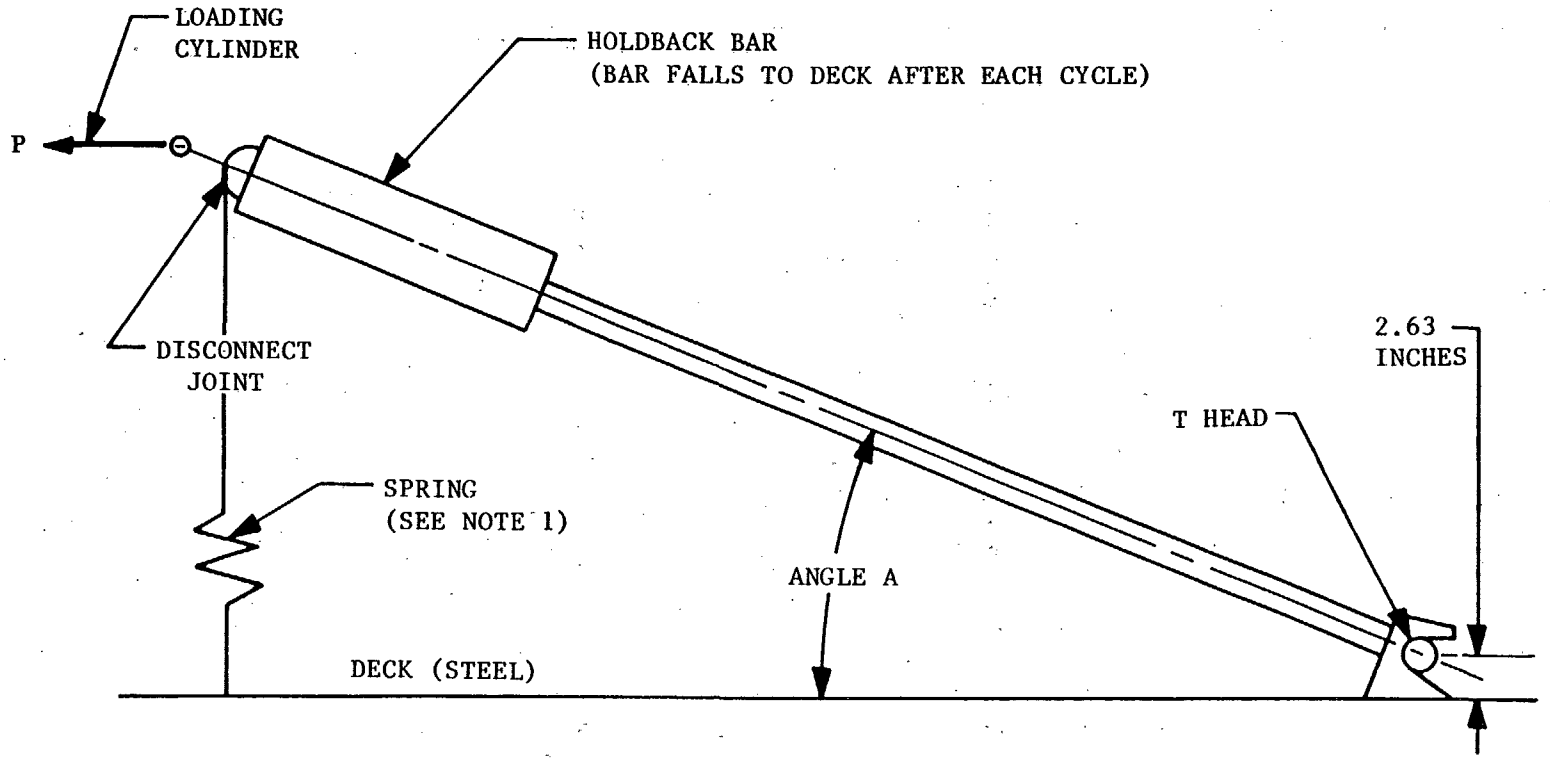


FIGURE 3. HOOKUP FOR ENDURANCE AND FATIGUE CYCLE

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NUMERICAL INDEX (Continued)

NUMERICAL INDEX (Continued)

TABLES

FIGURES

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NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

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