

INCH-POUND

MIL-L-22589D(AS)

10 September 1991

SUPERSEDING

MIL-L-22589C(AS)

8 August 1979

MILITARY SPECIFICATION

LAUNCHING SYSTEM, NOSE GEAR TYPE, AIRCRAFT

This specification is approved for use 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 covers the design, development, construction, analysis, test and documentation requirements for aircraft nose gear launching systems on carrier-type aircraft for which detail specifications or other pertinent contractual documents require nose gear launching systems on aircraft.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

Military

MIL-D-8708 Demonstration Requirements for Airplanes

MIL-A-8860 Airplane Strength and Rigidity; General Specification for

<p>Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Systems Engineering and Standardization Department (SESD), Code 53, Lakehurst, NJ 08733-5100, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.</p>
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AMSC N/A

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

FSC 1720

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SPECIFICATIONS (Cont'd)

Military

MIL-A-8863	Airplane Strength and Rigidity Ground Loads for Navy Acquired Airplanes
MIL-P-15024	Plates, Tags and Bands for Identification of Equipment
MIL-T-81259	Tie-down, Airframe Design, Requirements for
MIL-B-85110	Bar, Repeatable Release Holdback, Aircraft Launching General Design Requirements for

STANDARDS

Military

MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-203	Aircrew Station Controls and Displays; Assignment, Location and Actuation of, for Fixed Wing Aircraft
MIL-STD-411	Aircrew Station Signals
MIL-STD-889	Dissimilar Metals
MIL-STD-970	Standards and Specifications, Order of Precedence for the Selection of

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

2.1.2 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 are those cited in the solicitation.

DRAWINGS

Naval Air Engineering Center (NAVAIRENGCEN)

504633	Catapulting Arrangement Drawing Requirements for
607770	Design Requirements, Catapulting Arrangements, Nose Gear Type Launch

(Copies are available from the Naval Air Technical Services Facility (NATSF) (Code 312), 700 Robbins Avenue, Philadelphia, PA 19111-5097.)

REPORTS

Naval Air Engineering Center (NAVAIRENGCEN)

NAEC-ENG-7481	Numerical Index (Drawing List) for Mk 2 Nose Gear Launch Equipment
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PUBLICATIONS

Naval Air Systems Command

AD-1350

Engineering Drawings and Associated Data

(Copies are available from the Standardization Section, (Code 51122E), Washington, DC 20361-5110.)

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

* **2.3 Order of precedence.** In the event of a conflict between the text of this document and the references cited herein (except for related associated details specifications), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

* **2.4 Streamlining.** This document has been streamlined. Appendix A to MIL-L-22589(AS) lists those documents required for acquisition and is a mandatory part of MIL-L-22589(AS). All other documents, referenced through tiering, may be used as guidance and information to supplement MIL-L-22589(AS).

3. REQUIREMENTS

3.1 Materials. Materials shall conform to applicable specifications and shall be as specified herein and on applicable drawings. Materials which are not covered by specifications, or which are not specifically described herein, shall be of the best quality, of the lightest practicable weight, and suitable for the purpose intended.

* **3.1.1 Protective treatment.** Materials exposed to environmental conditions during service use shall be protected against deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. Unless suitably protected against electrolytic corrosion, dissimilar materials, as defined in MIL-STD-889, shall not be used in contact with each other. The protective system shall be in accordance with the aircraft detail specification.

* **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-970 or as specified in the detail specification. Parts which are not covered by specifications or military standards, or which are not specifically described herein, shall be completely described on manufacturer's drawings submitted for approval (see 3.4).

3.2.1 Standard parts. MS and AN standard parts shall be used where they suit the purpose. They shall be identified on the drawings by their part numbers.

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3.3 Design, construction and installation. The design, construction and installation of the launching system shall permit satisfactory operation of the aircraft with all specified stores with the catapults specified in the detail specification for the aircraft. No deviation from any part of the requirements of this specification and applicable drawings shall be permitted unless specifically authorized in writing by NAVAIR.

3.3.1 Launching system. The aircraft nose gear launch system shall meet the requirements of this specification and any amendments thereto specified in the detail specification for the aircraft. The launching system shall consist of a launch bar installation, cockpit controls and components, and a holdback and release installation. The aircraft launch system shall conform to the design requirements of NAVAIRENGCEN Drawing 607770 while loads and strengths must meet the requirements of MIL-A-8860 and MIL-A-8863.

3.3.1.1 Mk 2 compatibility. The aircraft nose gear launch system shall be compatible with the Mk 2 Nose Gear Launch System as shown on the drawings listed in the report NAEC-ENG-7481.

3.3.1.2 Hookup operation. The launching system shall be designed to preclude the need for manual assistance by the deck crew during tracking, hookup, tensioning, suspend, and abort operations.

* 3.3.1.3 Engagement speed. The launching system shall be designed to permit hookup with the nose gear launch deck hardware at a maximum speed, which shall be the smaller of:

(a) Four knots, or

(b) That speed which will cause a maximum load in the holdback bar, during buffing, equal to the minimum release load specified in MIL-A-8863. Buffer load vs displacement curves for Mk 2 the system can be obtained from Naval Air Engineering Center (NAEC)

* 3.3.1.4 Launching criteria. The launching system shall be such that the aircraft will be capable of being launched satisfactorily from any applicable catapult, through the full range of launching weights and critical center of gravity positions specified in MIL-A-8860 under the following conditions or as specified in the aircraft detail specification:

(a) The main gear off-center location at the time of holdback release shall be the lesser of (also see Figure 1).

(1) 24 inches from either side of the centerline of the catapult or,

(2) The final main gear location that results when the aircraft initially enters the wye-section of the catapult at a maximum angle of 15° (Between Aircraft and Catapult Centerline) with the Launch Bar aligned with the longitudinal axis of the aircraft.

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3.3.1.5 Clearance

* 3.3.1.5.1 Minimum clearance. The aircraft and its specified external stores shall be designed to clear the catapult tow fitting shuttle spreader, catapult deck hardware, and the holdback bar from the beginning of tracking at the entry wye to the end of the launching run for the following conditions simultaneously:

- (a) The most critical tire and strut flat: the remaining struts and tires in accordance with MIL-A-8863 and under the most critical dynamic load.
- (b) The aircraft and store deflection corresponding to (a) above.

Note: For clearance purposes, it will be assumed that the holdback bar (see 3.3.4.2.1) has no recoil and will come to rest on top of the nose gear launch deck hardware (see 3.3.1.1) after release.

* 3.3.1.5.2 Launch bar clearance. The launch bar may contact the deck, the catapult deck hardware and the catapult shuttle spreader as required during normal tracking, hookup, tensioning, release, power run, suspend or abort procedures (see 3.3.2.1, 3.3.2.2.1 through 3.3.2.2.4). The launch bar shall not strike the flight deck after it has moved out of the catapult tow fitting at the end of the power run. The launch bar installation design shall not restrict 360° nose gear swiveling with the launch bar in the up or retracted position for deck handling with a minimum clearance of 1 inch between the launch bar and all aircraft structure, stores, and attached ground handling equipment for all strut and tire conditions.

* 3.3.1.5.3 Nose wheel tires and structure. The nose gear tires shall clear the catapult deck hardware and the catapult tow fitting in the maximum flat tire condition. There shall be a minimum of 1/8 inch clearance between the aircraft nose gear structure and catapult deck hardware and the catapult shuttle spreader in the maximum flat tire condition during all phases of catapult operations.

3.3.1.5.4 Holdback bar. Sufficient clearance shall be provided to permit the holdback bar to be attached readily to the aircraft holdback fitting with the most critical store loading.

3.3.1.6 Dynamic analysis. A dynamic analysis shall be made to show the interaction of the launch bar and the catapult tow fitting for the condition specified in 3.3.1.4. The analysis shall show the following for critical conditions of launch bar loadings as approved by the procuring activity:

- (a) Resisting moments and side reactions developed at the catapult tow fitting to react launch bar torsional and bending loads.
- (b) Attitude of the aircraft.
- (c) Launch bar axial load.
- (d) Maximum misalignment between the launch bar and the catapult shuttle spreader slot.

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* **3.3.2 Launch bar installation.** The launch bar installation consists of the launch bar; launch bar extension, holddown and retraction device; launch bar uplock; launch bar control circuit and such auxiliary equipment as is necessary to functionally integrate it into the launching system. Nose wheel centering and nose wheel steering must be inoperative when entering, tracking and hooking up to the catapult shuttle spreader except that the design logic shall permit the pilot to select nose wheel steering upon command.

* **3.3.2.1 Launch bar.** The launch bar shall provide the means of steering the nose gear during tracking and shall couple the aircraft to the catapult during the power run. The design of the launch bar shall conform to the requirements of NAEC Drawing 607770 or as approved by NAVAIRENGCEN. NAVAIRENGCEN personnel should be contacted to ascertain a proper design for optimum interface of launch bar and spreader.

3.3.2.2 Launch bar holddown and retraction device

* **3.3.2.2.1 Holddown.** The holddown device shall provide and maintain a positive downward force on the launch bar to keep the launch bar in contact with the guide track during tracking and buffing. The force shall be maintained until the tensioning operation is completed. The effect of this force plus gravity shall result in a vertical deck contact load of 30 to 50 pounds at the end of the launch bar. Application of intermediate or maximum takeoff power shall not cause mispositioning or disengagement of the launch bar from the catapult shuttle spreader.

* **3.3.2.2.2 Automatic retraction.** When the end of the power run has been reached and the launch bar has been moved out of the catapult shuttle spreader, the launch bar shall automatically retract rapidly without striking the flight deck and shall effect locking in the up position. This shall not be dependent on landing gear retraction. The stowed position of the launch bar when the nose gear is fully retracted need not be the same as the up or retracted position.

* **3.3.2.2.3 Emergency retraction.** Independent means, separate from the automatic retraction system, shall be provided for emergency retraction and locking of the launch bar in the up position should the automatic retraction system fail. The emergency retraction system shall be automatic.

3.3.2.2.4 Suspend or abort retraction. The retraction device shall allow retraction of the launch bar by the pilot from its on-the-deck position to the up position to permit taxiing or removal of the aircraft from the launching area without damage to the launch system and without deck crewman assistance. In the up position, the bar shall clear deck obstructions up to 8 inches in height. Compliance with this requirement shall not require a change in aircraft power or any specific power setting and shall not result in damage to the aircraft launching system or to the deck hardware.

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3.3.2.2.5 Damage. If retraction is initiated while the launch bar is still restrained by the nose gear launch deck hardware, no damage shall result to either aircraft or catapult components.

3.3.2.3 Launch bar uplock. The uplock shall retain the launch bar in the up position. The uplock shall prevent accidental extension of the launch bar as a result of forces imposed on it by flight loads and during taxiing, arrested landings, impact of the nose gear with flight deck obstructions, and sudden extension of the nose gear as it passes over flight deck round-downs. When the uplock is released, the launch bar shall position readily to the deck. The uplock shall be releasable from the cockpit by the pilot and at the uplock by a deck crewman.

3.3.3 Cockpit controls and components

* 3.3.3.1 Controls. Controls for the actuation by the pilot of the aircraft launch bar extension, holddown and retraction device and the aircraft launch bar uplock shall be provided in the cockpit of the aircraft. Launch bar position shall be controlled independently of aircraft attitude, aircraft engine throttle position, aircraft engine thrust or any pivoting of the nose gear strut at anytime prior to catapult launch. Location and actuation of these controls shall be in accordance with MIL-STD-203. An advisory/warning light shall be provided which shall glow green during deck or ground operations when the launch bar is not locked in the up position except the light shall be extinguished when the aircraft is in the final tension condition. The light shall glow red when the airplane is airborne, the landing gear is extended, and the launch bar is not locked in the up position. The advisory/warning lights shall incorporate a test feature. Advisory/warning light locations shall conform to MIL-STD-411.

* 3.3.3.1.1 Launch bar retraction control system. Launch bar control system design logic shall permit the pilot to extend or to retract the launch bar within a ± 45 degree angle relative to the longitudinal axis of the aircraft. In addition the launch bar control system design logic shall not permit extension of the launch bar at angles greater than ± 45 degrees relative to the longitudinal axis of the aircraft.

3.3.3.2 Components

3.3.3.2.1 Headrest. Padding suitable for protection of the head and neck against launching acceleration shall be provided for all forward facing crew members and passengers.

3.3.3.2.2 Catapult throttle grip. A suitable device shall be placed in the cockpit to enable the pilot to hold the throttle in the intermediate thrust position and alternatively in the maximum thrust position (if the aircraft has thrust augmentation) to prevent inadvertent movement of the throttle during launching. When not in use, the device shall not obstruct throttle operation, other manual operations, or instrument viewing.

3.3.3.2.3 Handgrip. Suitable handgrips or supports shall be provided to permit each aircraft crew member and passenger, except the pilot, to brace himself against the acceleration resulting from the launch.

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* **3.3.4 Holdback and aircraft holdback fitting.** The holdback and aircraft holdback fitting shall have two axes of movement - one in a horizontal and one in a vertical plane - to insure proper tracking of the holdback bar. The holdback and aircraft holdback fitting shall be capable of being displaced a minimum of 15 degrees on either side of its centered position. Lateral centering force shall be provided to recenter the holdback and aircraft holdback fitting if it is displaced. The design shall permit the holdback bar to operate satisfactorily when it is rotated 180 degrees about its longitudinal axis during installation. The installed holdback bar shall not be free to rotate about its longitudinal axis and thus prevent proper engagement with the buffer slider. An over-load control section shall be provided either on the aircraft holdback fitting or on the aircraft end of the holdback bar as dictated by the aircraft design and approved by the procuring activity.

* **3.3.4.1 Aircraft holdback fitting.** An aircraft holdback fitting shall be provided that will mate with the holdback bar. The aircraft holdback fitting shall be readily accessible and shall permit rapid and easy attachment of the holdback bar, preferably outside the periphery of the nose gear tires. The aircraft fitting shall be damped by a shock absorbing device to preclude large accelerations in the vertical plane. Consideration shall be given to use of the holdback fitting as the attachment point for the full power engine runup holdback restraint required by MIL-T-81259.

3.3.4.1.1 Design. The aircraft holdback fitting shall be designed to exclude any holdback bar other than the one designed or approved for use with it.

3.3.4.1.2 Indicator device. The aircraft holdback fitting and/or the holdback bar shall incorporate suitable exterior indicator device(s) which will show that the holdback bar is properly installed.

3.3.4.1.3 Design load. The design load for the aircraft holdback fitting shall be as specified in MIL-A-8863.

3.3.4.2 Holdback bar. The holdback bar shall restrain the aircraft against aircraft engine thrust, catapult tensioning force and ship motion.

3.3.4.2.1 Design. The holdback bar shall be of the repeatable release type and shall be designed in accordance with MIL-B-85110. The configuration of the lower portion (deck end) of the holdback bar shall conform to the requirements of NAEC Drawing 607770. After the release loads and overall length have been determined, NAVAIR shall be contacted to ascertain whether there is an existing equivalent holdback bar that can be approved for use. NAVAIRENGCEN shall be contacted to ascertain noninterchangeability with other existing holdback bars of differing release loads and/or dimensions.

3.3.5 Instrumented launch and holdback bars. An instrumented launch bar and an instrumented holdback bar shall be provided for dynamic tests as required by the contract (see 4.6.6). The contractor shall confer with NAVAIRENGCEN and NATC representatives concerning instrumentation requirements. A calibration shall be conducted by the contractor and the results forwarded to NAVAIRENGCEN and NATC.

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* **3.4 Drawings.** The aircraft nose landing gear installation and detail drawings shall be submitted to NAVAIR for approval and to NAEC (Code 514 and 54) and NATC Code SA-70 for information and review (see 6.3). The drawings shall include complete dimensions, tolerances, constructional details and material and process features. Drawing requirements shall be as specified in AD-1350.

- (a) Aircraft Catapult Arrangement Drawing (see NAEC Drawing 504633).
- (b) Aircraft Nose Landing Gear Installation and Detail Drawing.
- (c) Aircraft Launch Bar Installation Drawing.
- (d) Aircraft Launch Bar and Launch Bar Extension, Holddown, and Retraction System Detail Drawings.
- (e) Aircraft Holdback Fitting Installation and Detail Drawings.
- (f) Repeatable Release Holdback Bar Assembly and Detail Drawings.
- (g) Cockpit Components.
- (h) Control System Schematic.
- (i) Identification plates required by 3.8.1.

3.4.1 Aircraft catapult arrangement drawings. The aircraft catapult arrangement drawing shall be submitted at the earliest possible date (see 6.3). Acceptance of remaining drawings shall be contingent on release of the aircraft catapult arrangement drawing. A separate aircraft catapult arrangement drawing shall be submitted for each version of the basic model and for each different catapulting arrangement proposed for the different versions of the basic model.

3.4.2 Up-dating drawings. It is essential that all drawings be kept up-to-date during the design and construction of the aircraft. The contractor shall submit drawings of all new design and construction provisions including accessories, as they occur, to NAVAIR for approval with copies to NAEC and NATC (see 6.3). Changes in launching provisions or accessory designs shall be resubmitted to NAVAIR for approval with copies to NAEC and NATC.

3.5 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable in accordance with the detail specification.

3.6 Performance. The launching system shall meet the performance requirements specified when subjected to the applicable tests in Section 4.

* **3.7 Environmental conditions.** Unless otherwise specified, all tests shall be conducted at room temperature of 60° to 90° and at atmospheric pressure.

3.8 Marking. Assemblies and parts shall be marked for identification in accordance with MIL-STD-130.

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3.8.1 Identification plates. Each launch bar (3.3.2.1), aircraft holdback fitting (3.3.4.1), and holdback bar (3.3.4.2) shall bear a metal plate in accordance with MIL-P-15024, Type A, G or H on which a serial number (6.3.1) and a part number are stamped. The plate shall provide sufficient blank surface to permit the stamping of symbols by inspection/overhaul activities to record the number of inspection and overhaul cycles as required and space to record accessory changes incorporated. In addition, serial numbers must be permanently affixed to, or marked on, the above components in noncritical areas.

3.9 Workmanship. The workmanship displayed in fabrication and assembly of the launching system shall be such as to assure ability of the launching system 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 specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

* 4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

* 4.2 Classification of inspections. The inspections requirements specified herein are classified as follows:

- (a) First article inspection (see 4.4)
- (b) Quality conformance inspection (see 4.5)

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* 4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 3.7.

* 4.4 First article inspection. First article inspections shall consist of the following inspections:

- (a) Compatibility review (4.6.1)
- (b) Development tests (4.6.4)
- (c) Structural tests (4.6.5)
- (d) Dynamic tests (4.6.6)

4.5 Quality conformance inspection. The quality conformance inspection shall consist of Naval Acceptance Tests (4.6.7).

4.6 Inspection methods

4.6.1 Compatibility review. In order to insure compatibility of the launching system provided under this specification with applicable catapults, the contractor shall submit preliminary documentation to demonstrate compatibility of the proposed launching system with the applicable catapult and deck hardware no later than sixty days after award of contract. The documentation shall be submitted to the addressees of paragraph 6.6. Upon submission of such documentation NAVAIR may, at their option, convene a conference to discuss the proposed launching system and recommend changes if necessary. Subsequent to approval of the preliminary design and thirty days prior to submission of final approval drawings, the contractor shall resubmit the documentation, updated as necessary, to the addressees of paragraph 6.6. A second conference may be required at the option of NAVAIR to review the final design for compatibility with applicable catapults. Any changes required as a result of this conference must be reflected in the final approval drawings.

4.6.2 Launch system descriptive narrative. A launch system descriptive narrative shall be prepared by the contractor and submitted to AIR-551 for approval no later than 30 days after completion of design. The launch system narrative shall be a written description, illustrated as necessary, containing, but not limited to the following components and functions:

- (a) Launch bar mechanical, electrical and hydraulic/pneumatic systems and components.
- (b) Normal extension and retract.
- (c) Abort/suspend
- (d) Emergency retract
- (e) Cockpit controls and launch bar indicator system
- (f) Holdback and release system
- (g) Redundancy/fail safe features.

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4.6.3 Failure mode and effects analysis (FMEA) report. A failure mode and effects analysis report shall be submitted on the complete aircraft nose gear launching system described herein. The analysis shall cover the entire cycle of operations from holdback bar hookup, launch bar extension, tracking, catapult hookup, tensioning, catapult launch, launch bar retraction, to nose gear retraction. Holdback bar failure, and suspend and abort conditions shall be included. Both normal and emergency modes of operation shall be covered. The FMEA report shall be prepared by the contractor and submitted to AIR-551 for approval no later than 30 days after completion of design.

4.6.4 Development tests. The contractor shall conduct such tests as are necessary to develop aircraft launching features and aircraft launching accessories. Development tests may be conducted at Naval facilities made available upon request. A report shall be prepared by the contractor and submitted to AIR-551 for approval no later than 30 days after completion of development tests.

4.6.5 Structural tests. The contractor shall conduct structural tests on the aircraft and associated launching accessories in order to verify that the nose gear launch system requirements of MIL-A-8860 have been complied with.

4.6.6 Dynamic tests. Satisfactory launching characteristics, including compatibility with specified nose gear launch catapult systems, shall be demonstrated in accordance with the requirements of MIL-D-8708.

4.6.7 Naval acceptance tests. The aircraft launching characteristics, launching structural integrity, launching accessories, and its compatibility with applicable catapults will be tested during acceptance trials in accordance with current Board of Inspection and Survey directives.

4.6.8 Hardwood model. A full scale hardwood model of the launch bar shall be provided to the NAVAIRENGCEN Code 5143. The model shall be that configuration as determined during final Naval acceptance test of paragraph 4.6.7.

5. PREPARATION FOR DELIVERY

5.1 Applicability. This section is not applicable to this specification.

* 6. NOTES

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

6.1 Intended use. The requirements specified herein are intended for use by aircraft manufacturers in the design of aircraft to provide a nose gear launching system.

* 6.2 Acquisition requirements. Acquisition documents must specify the following:

(a) Title, number and date of this specification.

(b) Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1).

* 6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific

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acquisition to ensure that only essential data are requested/ provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
3.4	DI-DRPR-81000	Product drawings and associated lists	--
3.4.1	DI-DRPR-81001	Conceptual design drawings and lists	--
3.4.2	DI-DRPR-81002	Developmental design drawings and associated lists	--
4.6.1	DI-MISC-80711	Scientific and technical reports	--
4.6.2	DI-MISC-80711	Scientific and technical reports	--
4.6.3	DI-R-7085	Failure mode, effects, and critically analysis report	--
4.6.4	DI-NDTI-80809	Test/Inspection reports	--

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.3.1 Serial numbers. Serial numbers required by 3.8.1 shall be obtained from NAVAIRENGCEN.

* 6.4 Streamlining. For MIL-L-22589 acquisition, the required portions of all MIL-L-22589 tier reference documents shall be limited to the portion described in the "Applicability" column of Table I in Appendix A.

* 6.5 Tailoring. When MIL-L-22589(AS) is tailored in an acquisition, Appendix A must be tailored accordingly. In particular, when Appendix A is tailored, specific attention must be given to the chain of referencing. For example, if a first tier reference document in MIL-L-22589 is tailored out, all of the reference documents which are tiered to that first tier reference document must also be tailored out.

* 6.6 NAVAIR, NAVAIRENGCEN, and NATC. Where reference is made in this specification to NAVAIR correspondence, where required, it shall be addressed to:

Commander
Naval Air Systems Command
Code AIR-551
Washington, DC 20361-5510

Where NAVAIRENGCEN is to be contacted the address shall be:

Commanding Officer
Naval Air Engineering Center
Code 514 and 54
Lakehurst, NJ 08733-5100

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Where NATC is to be contacted the address shall be:

Strike Aircraft Test Directorate
Code SA 70
Naval Air Test Center
Patuxent River, MD 20670

6.7 Definitions. The following nomenclature is to be used when referring to shipboard catapult installations, the aircraft's launching provisions, and launching accessories.

6.7.1 Holdback load. The load applied to the aircraft holdback fitting. The load results from the buffing force during deceleration of the aircraft from taxi-in velocity, or from the simultaneous application of catapult tensioning force, aircraft full takeoff power, and ship motion before firing the catapult, or from the application of release load. For design purposes, the holdback load "H" shall be as specified in MIL-A-8863.

6.7.2 Release load. The maximum load applied to the aircraft holdback fitting by application of the catapult firing force in addition to the existing holdback load. The release load of predetermined magnitude disengages a repeatable release holdback bar, thereby allowing the aircraft to be released. For design purposes, the release load "R" shall be as specified in MIL-A-8863.

6.7.3 Tracking. The movement of the aircraft under its own power from entry into the aft section approach ramp, to the hookup condition.

6.7.4 Buffing. The operation, during tracking, which results in the aircraft being decelerated to zero velocity at hookup condition, by the engagement of the holdback bar with the buffer hook of the catapult deck hardware.

6.7.5 Hookup condition. The condition in which the aircraft is spotted on the catapult ready for tensioning.

6.7.6 Initial tension. That operation prior to firing the catapult during which a specified tensioning force is applied to the launch bar by moving the catapult shuttle spreader forward. Power application may occur before, during or after tensioning.

6.7.7 Final tension. That condition in which the tensioning force is acting and full takeoff power is applied to the aircraft.

6.7.8 Suspend. A halt in the launch sequence which results from the need to ascertain whether the launch can be safely accomplished. A suspend condition may occur at any point from the beginning of tracking to just prior to firing the catapult. Aircraft power may be at any level from "idle" to "full take-off" and may or may not be reduced during the suspend. If necessary to evaluate the situation, the catapult is placed in a safe condition by detensioning the catapult to disengage the launch bar from the catapult tow fitting and then moving the tow fitting forward of the raised launch bar. If it is determined that the launch sequence can safely proceed, the catapult tow fitting is again moved aft to battery position and the aircraft returned to the hookup condition for retensioning.

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6.7.9 Abort. That process following suspend by which the aircraft is removed from the catapult area. If in a hookup or suspend condition, (a) aircraft power is reduced, the aircraft is towed aft by the nose gear launch buffer system and the holdback bar is disengaged from the buffer, or alternately (b) aircraft power is reduced and the repeatable release holdback bar abort mechanism is actuated to effect release of the bar from the aircraft.

6.7.10 Release. The point in the launching operation at which the final tensioning process has been completed, the catapult fired and the catapult tow force increased to such a magnitude as to disengage the repeatable release holdback bar and effect release of the aircraft.

6.7.11 Power run. That part of the launching run after release in which the applied catapult towing force is accelerating the aircraft.

6.7.12 Deck run. That part of the launching run from the end of the power run to the end of the carrier deck or the point at which the aircraft leaves the deck.

6.7.13 Launching run. The extent of aircraft travel from release to the end of deck run. It is the sum of the power run and deck run.

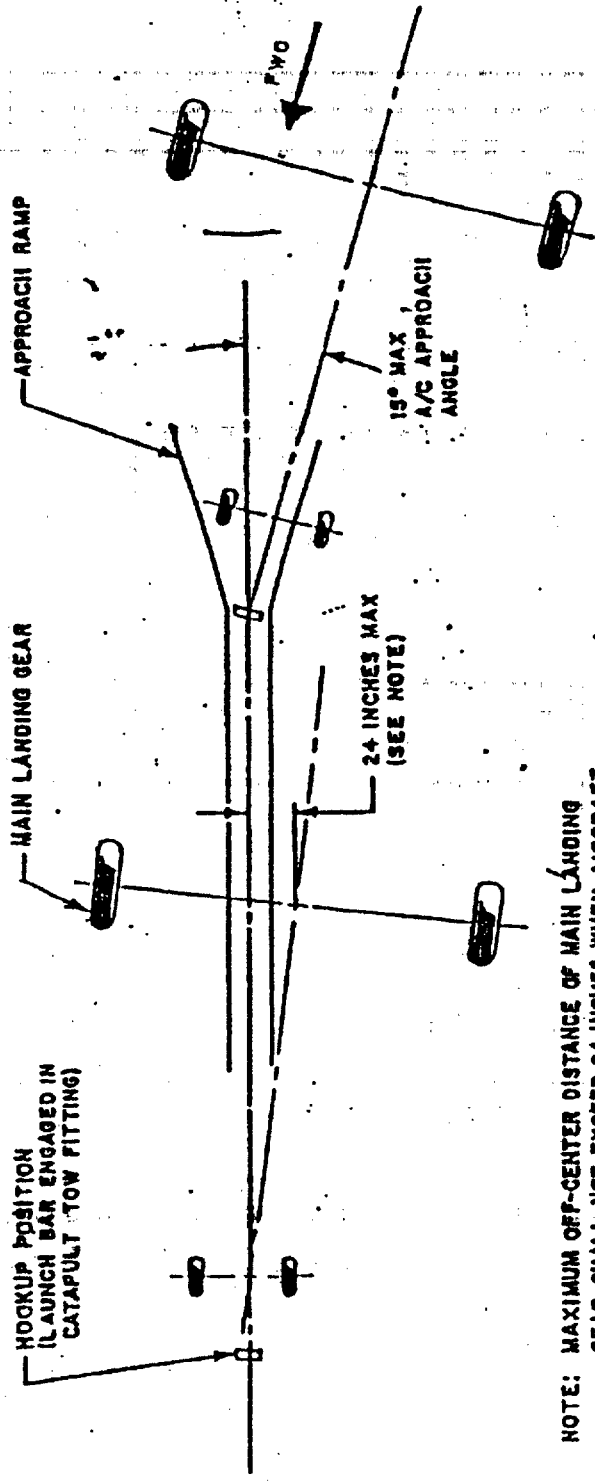
* 6.8 Subject term (keyword) listing.

Bar, catapulting
 Catapult, deck hardware
 Catapult, holdback bar
 Catapulting
 Catapult, tow fitting
 Holdback fittings
 Launch bar, axial load
 Launch hooking
 Landing gear system
 Taxling
 Tow fitting
 Towing
 Shuttle spreader
 Wheel strut system

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

Preparing Activity:
 Navy - AS
 (Project No. 1720-N019)

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NOTE: MAXIMUM OFF-CENTER DISTANCE OF MAIN LANDING GEAR SHALL NOT EXCEED 24 INCHES WHEN AIRCRAFT IS IN HOOKUP POSITION. IF DISTANCE IS LESS THAN 24 INCHES, AIRCRAFT NEED ONLY BE DESIGNED TO LESSER FIGURE.

Fig. 1. Nose and Main Landing Gear Off-Center Distances

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APPENDIX A

STREAMLINING INFORMATION

10. SCOPE

10.1 Scope. This Appendix is a list of documents referenced in MIL-L-22589D(AS) or tiered to documents referenced in MIL-L-22589D(AS). These documents have the same status as those referenced directly in MIL-L-22589D(AS) (first tier documents). This Appendix is a mandatory part of this specification. The information contained herein is intended for compliance.

10.2 Application. This Appendix identifies the applicability of the documents referenced in MIL-L-22589D(AS) or tiered to documents referenced in MIL-L-22589D(AS) through the third tier. Only that portion(s) of a document listed in Table I of this Appendix, and described in the "Appicability" column, is pertinent in the use of MIL-L-22589D(AS). If MIL-L-22589D(AS) is tailored in acquisition, this Appendix must also be tailored.

20. DOCUMENTS

20.1 Documents. The documents listed herein and corresponding applicability data have been identified as required. All other documents referenced through tiering are not considered required and may be used for guidance and information.

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TABLE I. Required documents and corresponding applicability data.

DOCUMENT NUMBER:	DOCUMENT TITLE:	APPLICABILITY:	REFERENCED BY:
<u>First Tier (1 of 16 Documents)</u>			
MIL-D-8708	Demonstration Requirements for Airplanes	Requirements: Locations for tests, equipment demonstration tests, equipment demonstration tests, carrier suitability demonstration tests: General, catapulting, catapult accessories, catapult spotting, controllability, boost or power systems.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to MIL-D-8708, are for guidance and information.			
<u>First Tier (2 of 16 Documents)</u>			
MIL-A-8860	Airplane Strength and Rigidity, General Specification for	Requirements: Deformations, ground tests, flight tests.	MIL-L-22589 (AS)
<u>Second Tier</u>			
MIL-D-8708	Demonstration Requirements for Airplanes	Requirements: Location for tests, structural flight tests.	MIL-A-8860
MIL-A-8867	Airplane Strength and Rigidity Ground Tests	Requirements: Structural flight demonstration planning conference, structural dynamic tests, accessories.	MIL-A-8860
The remaining second tier references, tiered to MIL-A-8860, are for guidance and information.			
<u>Third Tier</u>			
All third tier references, tiered to MIL-A-8860, are for guidance and information.			

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TABLE I. Required documents and corresponding applicability data (continued).

DOCUMENT NUMBER:	DOCUMENT TITLE:	APPLICABILITY:	REFERENCED BY:
<u>First Tier (3 of 16 Documents)</u>			
MIL-A-8863	Airplane Strength and Rigidity - Ground Loads for Navy Procured Airplanes	Requirements: Takeoff, holdback loads, tensioning, release, minimum release load, weight distribution and center of gravity positions, minimum clearance.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to MIL-A-8863, are for guidance and information.			
<u>First Tier (4 of 16 Documents)</u>			
MIL-P-15024	Plates, Tags and Bands for Identification of Equipment	Requirements: Aircraft loading data plate.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to MIL-P-15024, are for guidance and information.			
<u>First Tier (5 of 16 Documents)</u>			
MIL-T-81259	Tiedowns, Airframe Design, Requirements for	Requirements: Engine run-up restraints.	MIL-L-22589 (AS)
<u>Second Tier</u>			
MIL-A-8867	Airplane Strength and Rigidity Ground Tests	Design criteria.	MIL-T-81259
NAVAIR 17-1-537	Aircraft Securing and Handling	Land based and shipboard deck tie-down fitting.	MIL-T-81259

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TABLE I. Required documents and corresponding applicability data (continued).

DOCUMENT NUMBER:	DOCUMENT TITLE:	APPLICABILITY:	REFERENCED BY:
NAVAIR Dwg. 916AS100	Cancelled w/o replacement	Engine run-up restraints.	MIL-T-81259
NAVSEA Dwg. 805-1916300	Aircraft Securing and Engine Run-Up Fittings	Land-based and shipboard deck tiedown fitting dimensional requirements.	MIL-T-81259
NAVAIR Dwg. 993AS100	Fitting Assembly, Aircraft Run-Up Type XIII Landbased	Land-based and shipboard deck tiedown fitting.	MIL-T-81259
<u>Third Tier</u>			
All third tier references, tiered to MIL-T-81259, are for guidance and information.			
<u>First Tier (6 of 16 Documents)</u>			
MIL-B-85110	Bar, Repeatable Release Holdback, Aircraft Launching	Requirements: Design and construction, environmental, temperature, low pressure, dust, humidity, salt fog, vibration, rough usage, operating characteristics, ultimate. Qualitative: Human engineering.	MIL-L-22589 (AS)
<u>Second Tier</u>			
MIL-A-8863	Airplane Strength and Rigidity - Ground Loads for Navy Procured Airplanes	Requirements: Minimum release load.	MIL-B-85110
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities	General requirements: Human engineering design.	MIL-B-85110

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TABLE I. Required documents and corresponding applicability data (continued).

DOCUMENT NUMBER:	DOCUMENT TITLE:	APPLICABILITY:	REFERENCED BY:
MIL-H-46855	Human Engineering Requirements for Military Systems, Equipment and Facilities	Requirements: Equipment selection, human engineering in equipment detail design.	MIL-B-85110
The remaining second tier references, tiered to MIL-B-85110, are for guidance and information.			
<u>Third Tier</u>			
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities	Information and guidance.	MIL-B-85110
The remaining third tier references, tiered to MIL-B-85110, are for guidance and information.			
<u>First Tier (7 of 16 Documents)</u>			
NAEC Dwg. 607770	Design Requirements Catapulting Arrangement, Nose Gear Type Launch	Configurations, dimensional requirements. Launch bar.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to NAEC Dwg. 607770, are for guidance and information.			
<u>First Tier (8 of 16 Documents)</u>			
MIL-STD-130	Identification Marking of U.S. Military Property	Detail marking requirements parts, marking information.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to MIL-STD-130, are for guidance and information.			
<u>First Tier (9 of 16 Documents)</u>			
MIL-STD-970	Standards and Specifications, Order	General requirements: General of Precedence for the Selection of	MIL-L-22589 (AS) considerations.

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TABLE I. Required documents and corresponding applicability data (continued).

DOCUMENT NUMBER:	DOCUMENT TITLE:	APPLICABILITY:	REFERENCED BY:
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to MIL-STD-970, are for guidance and information.			
<u>First Tier (10 of 16 Documents)</u>			
MIL-STD-203	Aircraft Station Controls and Displays for Fixed Wing Aircraft	General requirements selection of controls and displays, location of controls and displays.	MIL-L-22589 (AS)
<u>Second Tier</u>			
MIL-C-81774	Control Panel, Aircraft, General Requirements for	Panel location(s), crew station panels arrangement, controls, control actuation.	MIL-STD-203
MIL-STD-1333	Air Crew Station Geometry for Military Aircraft	General requirements: Location and actuation of controls.	MIL-STD-203
The remaining second tier references, tiered to MIL-STD-203, are for guidance and information.			
<u>Third Tier</u>			
MIL-STD-250	Aircrew Station Controls and Displays for Rotary Wing Aircraft	General requirements: Location and actuation of controls.	MIL-STD-1333
The remaining third tier references, tiered to MIL-STD-203, are for guidance and information.			
<u>First Tier (11 of 16 Documents)</u>			
MIL-STD-411	Aircrew Station Signals	Detail requirements: Warning lights, advisory lights.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to MIL-STD-411, are for guidance and information.			

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TABLE I. Required documents and corresponding applicability data (continued).

DOCUMENT NUMBER:	DOCUMENT TITLE:	APPLICABILITY:	REFERENCED BY:
<u>First Tier (12 of 16 Documents)</u>			
MIL-STD-889	Dissimilar Metals	Detail requirements: Minimizing dissimilar metal corrosion.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to MIL-STD-889, are for guidance and information.			
<u>First Tier (13 of 16 Documents)</u>			
NAEC Dwg. 504633	Aircraft Catapult Arrangement Drawing	Approval, information and review.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to NAEC Dwg. 504633, are for guidance and information.			
<u>First Tier (14 of 16 Documents)</u>			
NAEC-ENG-7066	Numerical Index (Dwg. List) for MK1 Nose Gear Launch Equipment	Associated detail specification.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All second and third tier references, tiered to NAEC-ENG-7066, are for guidance and information.			
<u>First Tier (15 of 16 Documents)</u>			
NAEC-ENG-7481	Numerical Index (Drawing List) for MK2 Nose Gear Launch Equipment	Associated detail specification.	MIL-L-22589 (AS)
<u>Second and Third Tiers</u>			
All remaining second and third tier references, tiered to NAEC-ENG-7481, are for guidance and information.			

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TABLE I. Required documents and corresponding applicability data (continued).

DOCUMENT NUMBER:	DOCUMENT TITLE:	APPLICABILITY:	REFERENCED BY:
<u>First Tier (16 of 16 Documents)</u>			
AD-1350	Engineering Drawings and Associated Data	Associated detail specification.	MIL-L-22589 (AS)

Second and Third Tiers

All remaining second and third tier references, tiered to AD-1350, are for guidance and information.

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