INCH POUND

MIL-A-18717C(AS)
20 September 1993
SUPERSEDING
MIL-A-18717B(AS)
10 September 1979

MILITARY SPECIFICATION

ARRESTING HOOK INSTALLATION, 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 arresting hook installations in aircraft for which detail specifications or pertinent contractual documents require that arresting hooks be fitted.

2. APPLICABLE DOCUMENTS

2.1 Government documents

2.1.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those 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-S-5002	Surface Treatments and Inorganic Coatings for Metal Surfaces of Weapon Systems
MIL-L-6730	Lighting Equipment, Exterior, Aircraft (General Requirements For)
MIL-D-8708	Demonstration: Aircraft Weapon Systems, General Specification For
MIL-A-8860	Airplane Strength and Rigidity, General Specification For

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 Warfare Center Aircraft Division Lakehurst, Systems Requirements Department, Code SR3, Lakehurst, NJ 08733-5100, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 1710

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

MIL-B-8906	Bolt, Alloy Steel, Shear and Tensile (132 KSI Min FSU and 220 KSI Min FTU), 450 Deg. F, Spline Drive
MIL-N-8922	Nut, Self-Locking, Assembled Washer, Alloy Steel, 220 KSI Ftu, 450 Deg. F, (12-Spline Wrenching Element)

STANDARDS

MILITARY

MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-203	Aircrew Station Controls and Displays: Location, Arrangement and Actuation of, for Fixed Wing Aircraft
MIL-STD-970	Standards and Specifications, Order of Precedence for the Selection of

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from DODSSP - Customer Service, Standardization Documents Ordering Desk, Bldg. 4D, 700 Robbins Ave, Philadelphia, PA 19111-5094.)

PUBLICATIONS

Naval Air Systems Command

AD-1350 - Engineering Drawings and Associated Data

SD-8706 - Data and Test, Engineering; Contract Requirements for Aircraft Weapon Systems

Form 4200/25 - Drawings, Lists and Specifications Required

(Copies may be obtained from, Commander, Naval Air Systems Command (AIR-51122E), Washington, D.C. 20361-5110).

Naval Air Warfare Center Aircraft Division Lakehurst

Materials Process Requirements (MPR's)
MPR 1067 - Flame Sprayed Data Pads

(Copies may be obtained from Commanding Officer, Naval Air Warfare Center Aircraft Division Lakehurst, Materials Section, Code SR46, Lakehurst, NJ 08733-5092).

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets, or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Materials. Materials shall conform to applicable specifications and shall be as specified herein and on applicable drawings.

3.1.1 Protective treatment. Materials shall be protected against deterioration from environmental conditions. 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.

3.2.1 Standard parts. MS and AN standard parts shall be used where appropriate. They shall be identified on drawings by their Part or Identifying Number (PIN), (see 6.5).

3.3 Design information. Design information and suggested methods of determining the characteristics of arresting hook installations are presented in Appendix A of this specification.

3.4 Nomenclature. The nomenclature of arresting hook installation parts shall be indicated on the figures and in the appendices of this specification.

3.5 Arresting hook installation. The type, location, arrangement, and detail design of the arresting hook installation for each model of aircraft shall be selected consistent with satisfactory performance under all design conditions and with all applicable arresting gear.

3.5.1 Location. The arresting hook shall be so located that the aircraft is maintained at an attitude which ensures clearance of all non-contact parts of the aircraft and external stores over six inch obstructions when the aircraft is subjected to the forces applied during an arrested landing. General arrangements and details of a typical carrier flight deck and its obstructions are shown on figures 1 and 2. Recommendations for determining deck clearance are presented in Appendix A.

3.5.2 Damage from deck pendant. The arresting hook shall be so located, or guards or supporting structure shall be provided on the aircraft where necessary to prevent the deck pendant from damaging the aircraft or from engaging parts of the aircraft other than those designed for such engagement during an arrested landing. The dynamics of the deck pendant shall be investigated to ensure that this requirement is met. Table 1 shows a sampling of cable bounce height as a result of rollover from aircraft tires. Table 1 is not all inclusive and may not be representative of new aircraft/arresting hook designs with new/existing arresting gear configurations.

3.5.3 Deck pendant displacement. The arresting hook shall be the designed and located with respect to the landing gear to ensure engagement of deck pendant by the hook after displacement by the nose wheel, main wheels or tail bumper of the aircraft passing over it.

3.5.4. Nose wheel load. The influence of the arresting hook location on the magnitude of the wheel loads shall be investigated. The design loads for the nose gear shall include those resulting from the envelope of arrested landings defined in MIL-A-8860, as modified by the detail specification. Recommendations for determining nose wheel loads are presented in Appendix A (see 30.5.3.3).

3.5.5 Lateral movement. The arresting hook shall be free to move laterally, not less than 20 degrees to each side of the center position, to permit it to align with the applied arresting forces in an "off-center" or "skid" landing, unless the hook is designed as a laterally rigid structure to carry the specified design side load.

3.5.5.1 Centering device. A centering device shall be provided to keep the hook laterally centered against aerodynamic loads and against those lateral loads which may occur during the approach and just prior to the hook contacting the deck or a crossdeck pendant. In addition, when the hook is laterally displaced upon contact with the deck or a deck protrusion, the centering device shall return the arresting hook to an "arrestment-ready" position.

3.5.6 Upward swing. The aircraft structure shall be protected from the upward swing of the arresting hook shank assembly during arrestment and retraction.

3.5.7 Shock absorber. A shock absorber shall be provided to control hook bounce.

3.5.8 Installation strength. Strength of the installation shall be as specified by MIL-A-8860.

3.6 Arresting hook design.

3.6.1 Hook trail angle. The arresting hook installation shall be designed to allow the arresting hook to trail aft at an angle such that, when the aircraft is at the angle of attack corresponding to the maximum lift coefficient with zero sink speed, the arresting hook will not contact the deck in a direction that will cause damaging compression loads to be developed in the hook shank and in the aircraft structure (see Appendix A, 50.3).

3.6.2 Hook length. The arresting hook assembly shall have sufficient length to engage the deck pendant at all aircraft attitudes expected during carrier or field landing operations and aborted take-offs, including the most critical attitude defined on figure 3, except that the arresting hook length may be determined by rational analysis subject to approval by the Naval Air Systems Command (NAVAIR).

> NOTE: The shorter the arresting hook shank (resulting in smaller angle between the vertical and a line drawn through the shank centerline), the greater the tendency for the aircraft to pole vault on the arresting hook system when the aircraft is moving rearward after arrestment.

3.6.3 Wear areas. The arresting hook shall be smoothly faced and made of wear-resistant material to minimize arresting hook and deck pendant wear. The area of the shank and hookpoint which the pendant can contact shall contain no surface irregularities or sharp corners, and shall be coated with a wear-resistant material. A hookpoint drawing shall be provided by the contractor which defines the maximum allowable wear and the inspection and rejection criteria. This drawing shall be submitted with drawings required by 3.10.2 (see 6.3).

3.6.3.1 Wear indicators. In accordance with the contractors drawing defining maximum allowable wear and inspection/rejection criteria, the hookpoint itself shall incorporate wear indicators that provide both visual and tactile information for the go/no go wear limits of the hookpoint. The hookpoint wear indicators shall provide for simple, quick inspection by aircraft squadron personnel without the use of gauges or measuring instruments. The hookpoint shall have a detachable backface wear plate that can be replaced when plate wear has reached a maximum limit. The hookpoint design shall be such that the entire backface wear will be experienced by the backface plate and none by the hookpoint itself.

3.6.4 Second pendant pick-up. The arresting hook shall be designed to prevent the possibility of picking up a second pendant after one has been engaged unless analysis of the arresting geometry shows no need.

3.6.5 Detachable hookpoint. The arresting hook installation shall have a detachable hookpoint.

3.6.6 Hookpoint/shank design. The design of the hookpoint/shank shall be:

(a) To preclude incorrect assembly.

(b) To withstand large impact loads that act through the aft side of the hookpoint (i.e. in the opposite direction as a normal arrestment load), that may occur as a result of initial impact with the flight deck and during aircraft rollback in which the arresting hook may jam against flight deck obstructions.

(c) To withstand large loads acting on the hookpoint during normal arrestments.

(d) To withstand any possible side loads.

(e) Such that any loads acting on the hookpoint shall not be transmitted to the hookpoint/shank attaching hardware.

3.6.7 Hookpoint to shank attachment hardware. Hookpoint to shank attachment hardware shall conform to the following:

a. Bolt(s) used to attach the aircraft arresting hookpoint to the hook shank shall be in accordance with MIL-B-8906.

b. Nut(s) used in conjunction with the above bolt(s) shall be in accordance with MIL-N-8922.

c. If a washer or other metallic material is required between the nut and shank or between the bolt head and shank, then this washer or metallic material shall have a minimum heat treat of 180,000 psi.

d. Surface treatments for the bolts, nuts, washers or other metallic material shall be in accordance with MIL-S-5002.

e. Hookpoint attachment hardware shall be solely for attaching the hookpoint to the hook shank. Its use for collateral purposes, such as attaching bumpers or up-locks, or as shank assembly hardware, is not acceptable.

3.7 Arresting hook control. Provision shall be made for lowering or raising the arresting hook by a control mechanism. The control shall be either manually or power operated.

3.7.1 Arresting hook control location. The arresting hook control shall be located in the cockpit as specified in MIL-STD-203. It shall be easily operable by the pilot regardless of the position of adjustment of the pilot's seat or pilot's shoulder harness.

3.7.2 Arresting hook control design. The control shall have a unique design to be readily distinguishable from adjacent cockpit controls, both by day and night in order that the pilot need not divert his attention to locate and check the control.

3.7.3 Actuator. An actuator shall be provided to raise and lower the arresting hook.

3.7.3.1 Times for hook positioning. The arresting hook system shall be designed to raise the hook to the stowed position within 4 seconds and to be fully extended to the arrestment-ready position within 2 seconds after the cockpit control has been actuated.

3.7.4 System failure. The arresting hook control shall be designed to allow the pilot to lower the hook, and the arresting hook itself shall remain down in the event of a failure of the power system or control system.

3.7.5 Connection to angle of attack approach lights. The arresting hook control shall be interconnected with the angle of attack approach lights as specified in MIL-L-6730.

3.8 Shock absorber design.

3.8.1 Shock from round down. The arresting hook installation or structure shall be designed to absorb the shock loads caused by sudden extension of the arresting hook, when the aircraft passes over the forward round down of the carrier angled deck after missing a deck pendant engagement. The hook shall be assumed to extend from the "full-up" position.

3.8.2 Hold down. The shock absorber shall include a hold down feature to minimize the bounce of the arresting hook when it strikes the deck protrusion during a carrier landing. Typical flight deck protrusions are shown on Figures 1 and 2.

3.8.2.1 Hook bounce. The hold down feature shall return the arresting hook rapidly to the deck following initial hook bounce. The first bounce shall not be more than 20 feet long and 4 inches high. Any succeeding bounces shall be low enough to allow the hook to engage a deck pendant.

3.8.3 Flight speeds. The shock absorber shall be designed so that the arresting hook can be released and lowered at all flight speeds up to 2.5 times the power approach speed at maximum arrested landing weight. The arresting hook shall also be capable of remaining in the full-down position at all flight speeds up to 2 times the power approach speed at maximum arrested landing weight.

3.8.4 Limit load design. The shock absorber and its supporting structure shall be designed for limit loads equal to the loads imposed on it when the design ultimate vertical bending moment is applied to the arresting hook. This requirement will insure the structural integrity of the shock absorber during acceptance tests when the shock absorber loads are varied to determine optimum orifice size.

3.9 Ground lock. Provisions for attachment of an arresting hook ground lock shall be provided, unless otherwise specified in the detail specification. The ground lock shall prevent release of the arresting hook in the event that cockpit control is actuated. Design of the ground lock shall prohibit removal if the control is actuated.

3.10 Drawings and reports. Three drawings (see 3.10.1 through 3.10.4), are required to establish the complete operational characteristics and interface requirements of the arresting hook installation. The data to be furnished shall be listed on DD Form 1423 "Contractor Data Requirements List," which shall be attached to and made a part of the contract or order. NAVAIR Form 4200/25, "Drawings, Lists, and Specifications Required," shall be attached where applicable (see 6.3).

3.10.1 Preliminary layout. A preliminary study or layout of the hook arrangement and location shall be made during the early stages of design and forwarded to the Naval Air Systems Command (NAVAIR) for advance comment with information copies to Naval Air Warfare Center Aircraft Division Lakehurst (NAVAIRWARCENACDIVLKE) and the Naval Air Warefare Center Aircraft Division Patuxent River (NAVAIRWARCENACDIVPAX) (see 6.3). Addresses for these activities are given in 6.4.

3.10.2 Installation. Arresting hook installation drawings showing the arrangement and details of hook installation, controls, shock absorber, holddown device, etc., and indicating or accompanied by pertinent data relating to the operating characteristics of the arresting hook installation, shall be submitted to NAVAIR for release with copies to NAVAIRWARCENACDIVLKE and NAVAIRWARCENACDIVPAX in accordance with SD-8706 (see 6.3).

3.10.3 Scale arrested landing arrangement drawing. A 1/20 scale drawing similar to Figure 3, as applicable, shall be included with the drawings required by 3.10.2. The drawing must show clearances and other critical areas during arrested landing roll out and roll back (see 6.3).

3.10.4 Drawing update. All drawings must be kept up to date during the design and construction of the aircraft. The contractor shall submit drawings of all new design and construction revisions, as they occur, to NAVAIR for approval with copies to NAVAIRWARCENACDIVLKE and NAVAIRWARCENACDIVPAX (see 6.3).

3.11 Identification data pad. Each arresting hook shank shall bear a flame sprayed data pad on which a serial number (see 6.4) and a part number are electro or vibro etched. The data pad shall provide sufficient blank surface to permit the stamping of symbols by inspection or overhaul activities to record the number of inspection and overhaul cycles as required. In addition, serial numbers must be permanently affixed to, or marked on, the above components in non-critical areas. Refer to MPR 1067 for background information on application of flame sprayed data pads.

3.12 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.

3.13 Identification of parts. All parts used in the arresting hook installation shall be marked with the manufacturer's code number in accordance with MIL-STD-130.

3.14 Workmanship. The arresting hook installation shall be uniform in quality and shall be free from irregularities or defects which could affect performance, reliability, durability, or maintainability.

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 (see 6.3).

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 inspection requirements of the arresting hook installation are classified as follows:

(a) Prototype inspection

(b) Quality conformance inspection

4.2.1 Prototype inspection. Prototype inspection shall consist of the following:

(a) Examination (4.3.1)

(b) Development tests (4.3.4)

(c) Structural tests (4.3.5)

(d) Dynamic tests (4.3.6)

4.2.2 Quality conformance inspection. The quality conformance inspection shall consist of the Naval Acceptance Tests (4.3.7).

4.3 Inspection methods.

4.3.1 Examination. The arresting hook installation shall be thoroughly examined by the contractor to determine conformance with this specification and applicable drawings with respect to all the requirements not covered by tests.

4.3.2 Arresting hook installation descriptive narrative. An arresting hook installation descriptive narrative shall be prepared by the contractor and submitted to NAVAIRSYSCOM (AIR-551) for approval no later than 30 days after completion of design. The arresting hook installation narrative shall be a written description, illustrated as necessary, and containing, but not limited to, the following components and functions:

(a) Mechanical, electrical and hydraulic/pneumatic systems and components

(b) Normal extend

(c) Retract

(d) Damping

(e) Centering

(f) Cockpit controls

(g) Redundancy/fail safe features

4.3.3 Failure mode, effects and criticality analysis (FMECA) report. A failure mode, effects and criticality analysis report shall be submitted on the complete aircraft arresting hook installation system described herein. The analysis shall cover the entire cycle of operation from release of the hook to retraction. Operation of the hook system, both airborne and on the ground (deck), shall be included where different. Both normal and emergency modes of operation shall be covered. The FMECA report shall be prepared by the contractor and submitted to NAVAIR (AIR-551) for approval no later than 30 days after completion of design (see 6.3).

4.3.4 Development tests. The contractor shall conduct such tests as are necessary to develop suitable aircraft arresting features and aircraft arresting hook installation. This requirement shall be construed to encompass the design and construction of deadloads and modification of an aircraft to produce a suitable test vehicle if necessary. A report shall be prepared by the contractor and submitted to NAVAIR (AIR-551) for approval no later than 30 days after completion of development tests (see 6.3).

4.3.4.1 Navy facilities. Development tests may be conducted at Navy facilities made available upon request. The arresting hook installation may be tested during arresting tests conducted with a full scale dynamic deadload.

4.3.5 Structural tests. The contractor shall conduct structural tests on the aircraft arresting hook installation and associated arresting hook components in accordance with the requirements of MIL-A-8860.

4.3.6 Dynamic tests. The dynamic characteristics and the structural integrity of the aircraft and its arresting hook installation shall be tested in various arresting gear and in various landing attitudes and configurations during acceptance trials. These trials will include the requirements of MIL-D-8708.

4.3.6.1 Spares. One spare arresting hook and shock absorber assembly shall be provided with the prototype aircraft.

4.3.7 Naval acceptance test. The aircraft arresting hook installation shall be tested during acceptance trials in accordance with current Board of Inspection and Survey directives.

4.3.8 Hardwood model. A full scale hardwood model of the hookpoint and shank shall be provided to the NAVAIRWARCENACDIVLKE, Code IS32. The model shall be capable of being assembled and disassembled similar to the actual assembly. The total length of the model assembly shall not be more than 18 inches including the hook end. The model shall be that of the final Naval acceptance test of paragraph 4.3.7.

5. PACKAGING

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. This specification is intended for use by aircraft contractors in the design of aircraft for the US Navy to assure an arresting hook installation that is suitable for use with carrier, field and expeditionary airfield (EAF) type arresting gear.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number and date of this specification.

b. Applicable aircraft detail specification.

c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).

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 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.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
3.6.3	DI-DRPR-81000	Product Drawings and Associated Lists	
3.10.1	DI-DRPR-81003	Commercial Drawings and Associated Lists	
3.10.2	DI-DRPR-81000	Product Drawings and Associated Lists	
3.10.3	DI-DRPR-81002	Developmental Design Drawings and Associated Lists	
3.10.4	DI-DRPR-81000	Product Drawings and Associated Lists	

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
4.3.2	DI-MISC-80711	Scientific and Technical Reports	
4.3.3	DI-R-7085A	Failure Mode, Effects, and Criticality Analysis Report	
4.1 4.3.4	DI-NDTI-80809A	Test/Inspection Reports	

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

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 requirement Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Serial numbers. Serial numbers required by 3.11 shall be obtained from the Naval Air Warfare Center Aircraft Division Lakehurst (NAVAIRWARCENACDIVLKE), Materials Section, Code SR46, Lakehurst, NJ 08733-5092.

6.5 NAVAIR, NAVAIRWARCENACDIVLKE, and NAVAIRWARCENACDIVPAX. Where reference is made in the specification to provide correspondence to NAVAIR, NAVAIRWARCENACDIVLKE, NAVAIRWARCENACDIVPAX, the following respective addresses shall be used:

NAVAIR: Commander
Naval Air Systems Command
Code AIR-551
Ship and Shore Installation Division
Washington, D.C. 20361-5510

NAVAIRWARCENACDIVLKE: Commanding Officer
Naval Air Warfare Center
Code IS32 and Code PV12
Lakehurst, NJ 08733-5091

(Code IS32 - In Service Engineering Directorate)
(Code PV12 - Product Verification Department)

NAVAIRWARCENACDIVPAX:
Commander
Naval Air Warfare Center Aircraft Div. Patuxent River
Flight Test Engineering Group (FTEG)
Strike Aircraft Test Directorate
Code SA 70, Carrier Suitability
Patuxent River, MD 20670-5304

6.6 Definitions.

a. Arresting hook - A steel device used to arrest an aircraft onboard the flight deck of an aircraft carrier, during landing by "scooping up" a deck pendant. This device has 2 configuration types:

(i) Stinger - A steel beam shaped like a hook at one end and attachaed to the aircraft at the other end.

(ii) Hookpoint - A detachable solid steel device shaped like the curved portion of a hook. It attaches to a steel beam (called a shank) which connects to the aircraft.

b. Deck pendant - A wire rope cable stretched across the landing area and connected to an energy absorber which applies a retarding force, through the arresting hook, to an aircraft during an arrested landing.

c. MIL-A-8860 - This refers to a series of specifications which will include MIL-A-8860 through MIL-A-8870, Aircraft Strength and Ridigity.

d. Part or Identifying Number (PIN) - An alpha-numeric designator which identifies parts, items or materials that are covered by a specification. The term "PIN" replaces the term "part number" previously used.

Example:

For associated detail specifications or specification sheets, the PIN shall be as follows:

M or MS 23648/ 11 - 1 Example of PIN: M23648/11-1 or MS23648-1

- 1: Dash numbers consisting of numbers, letters, or combinations thereof. Codes may be assigned to variable characteristics of the item and used in the makeup of the dash number (for example, tolerances, materials, temperature ratings, finishes, reliability, etc.)
- -: An alpha code may replace the dash.
- 11: Associated detail specification or specification sheet number. Does not include the revision letter or activity symbol. Does not apply to MS part number.
- 23648/: General Specification number.
- M or MS: M prefix - An item defined by a military specification.

  MS prefix - An item covered by an existing MS sheet form standard.

6.7 Subject term (key word) listing.

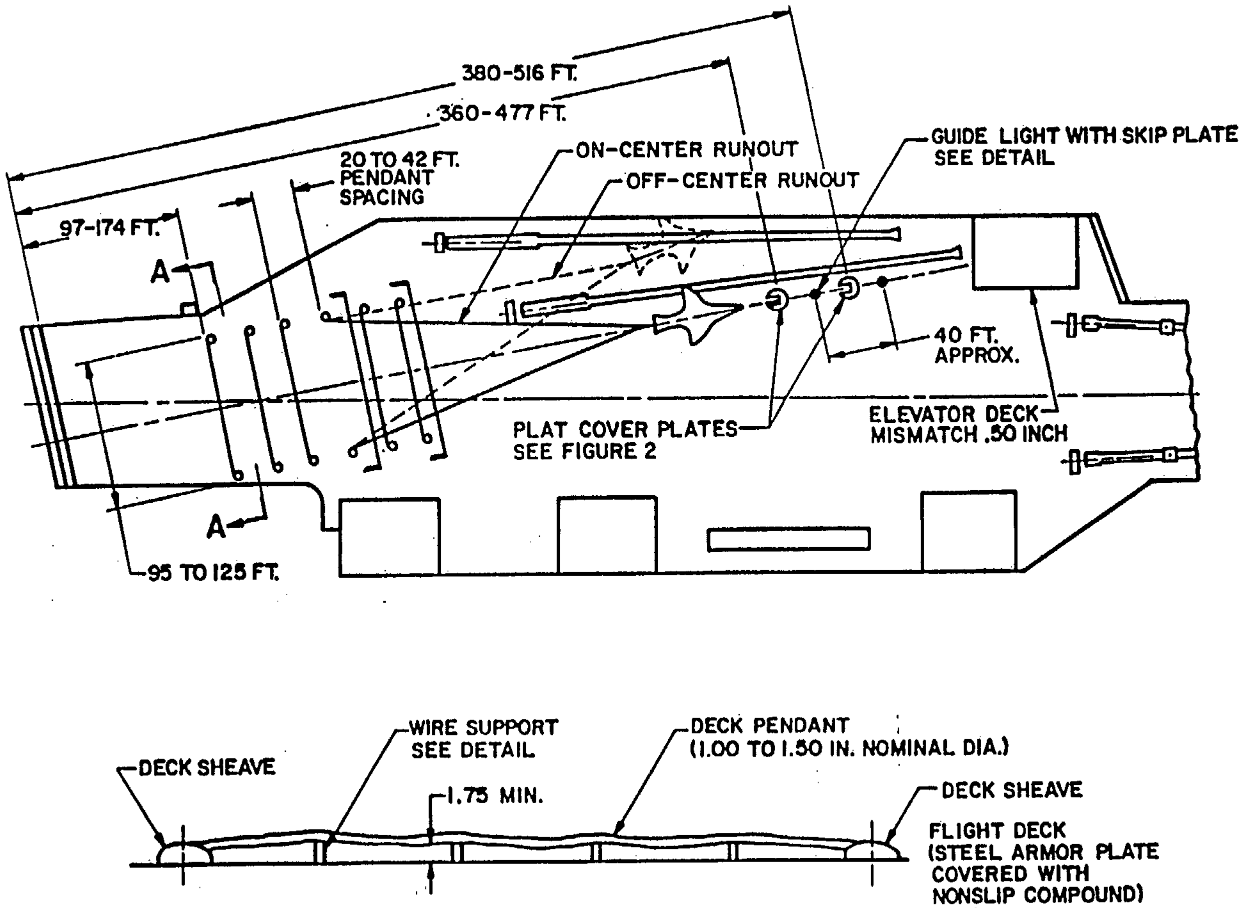
arrestments
carrier decks
deck plates
flight decks
hookpoints
landings
runways
shipboard

6.8 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Preparing Activity:
Navy - AS
(Project 1710-N050)

Table I. Aircraft rollover test conditions.

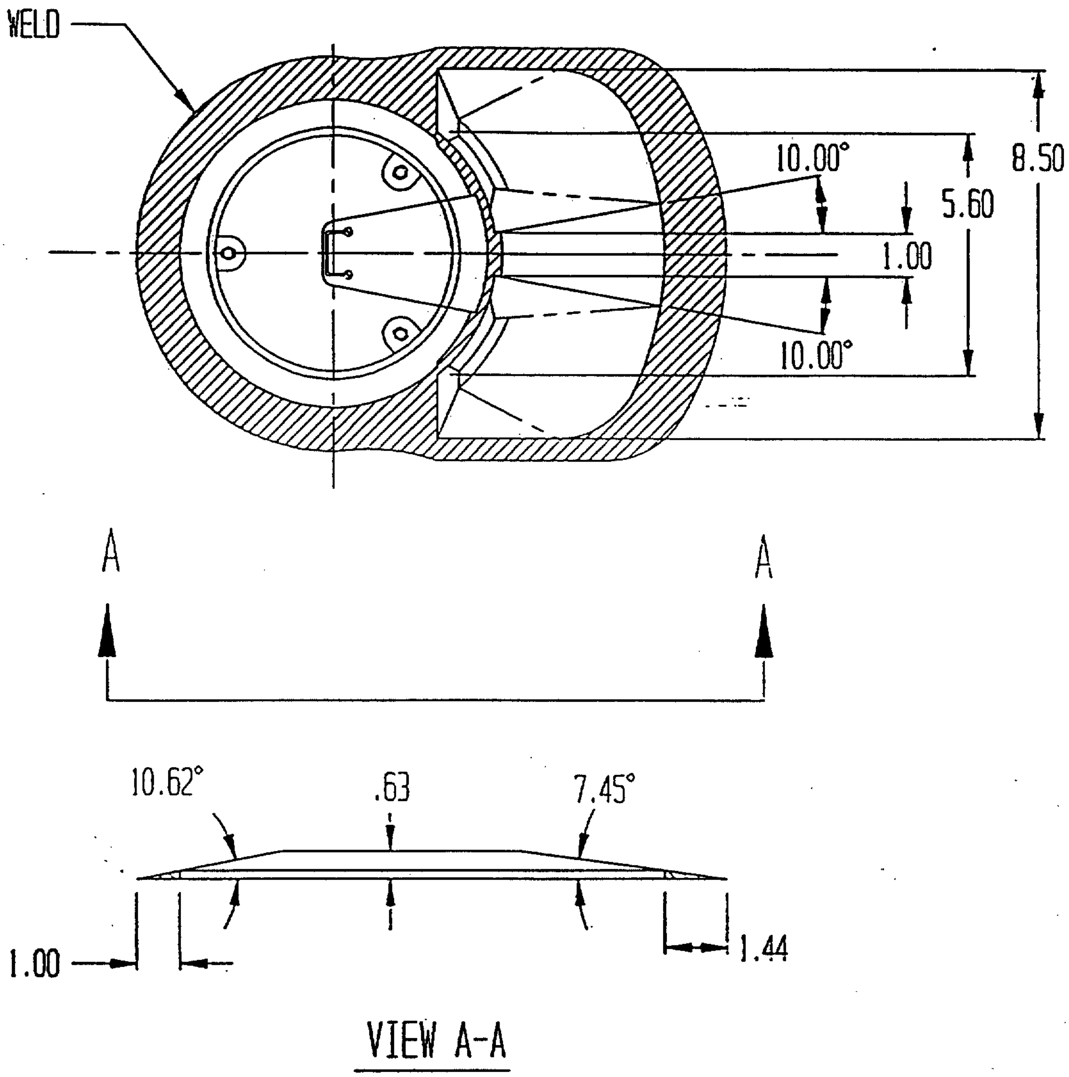
ARRESTING GEAR	AIRCRAFT	AIRCRAFT WEIGHT (RANGE) POUNDS	AIRCRAFT SPEED (RANGE) KNOTS	PENDANT TENSION (POUNDS)	PENDANT WIRE SUPPORT	PENDANT BOUNCE HEIGHT (MAX) INCHES
MK 7 MOD 3	A-7	NOT AVAIL	104-135	3,000	4	6.5
MK 7 MOD 3	F/A-18	NOT AVAIL	91-125	3,000	4	6.5
E-28	F-4B	30,900 to 38,000	TAXI-157	0-2360	Aircraft Tire Section Plastic Rails Rubber Donuts	22.5 15.0 8.5



SECTION A-A

PLAN OF TYPICAL ANGLED DECK CARRIER

FIGURE 1. Typical arrangement and details of arrested landing deck area on CV type flight deck.



GUIDE LIGHT WITH SKIP PLATE (NEW CONFIGURATION)

FIGURE 1. Typical arrangement and details of arrested landing deck area on CV type flight deck. - Continued.

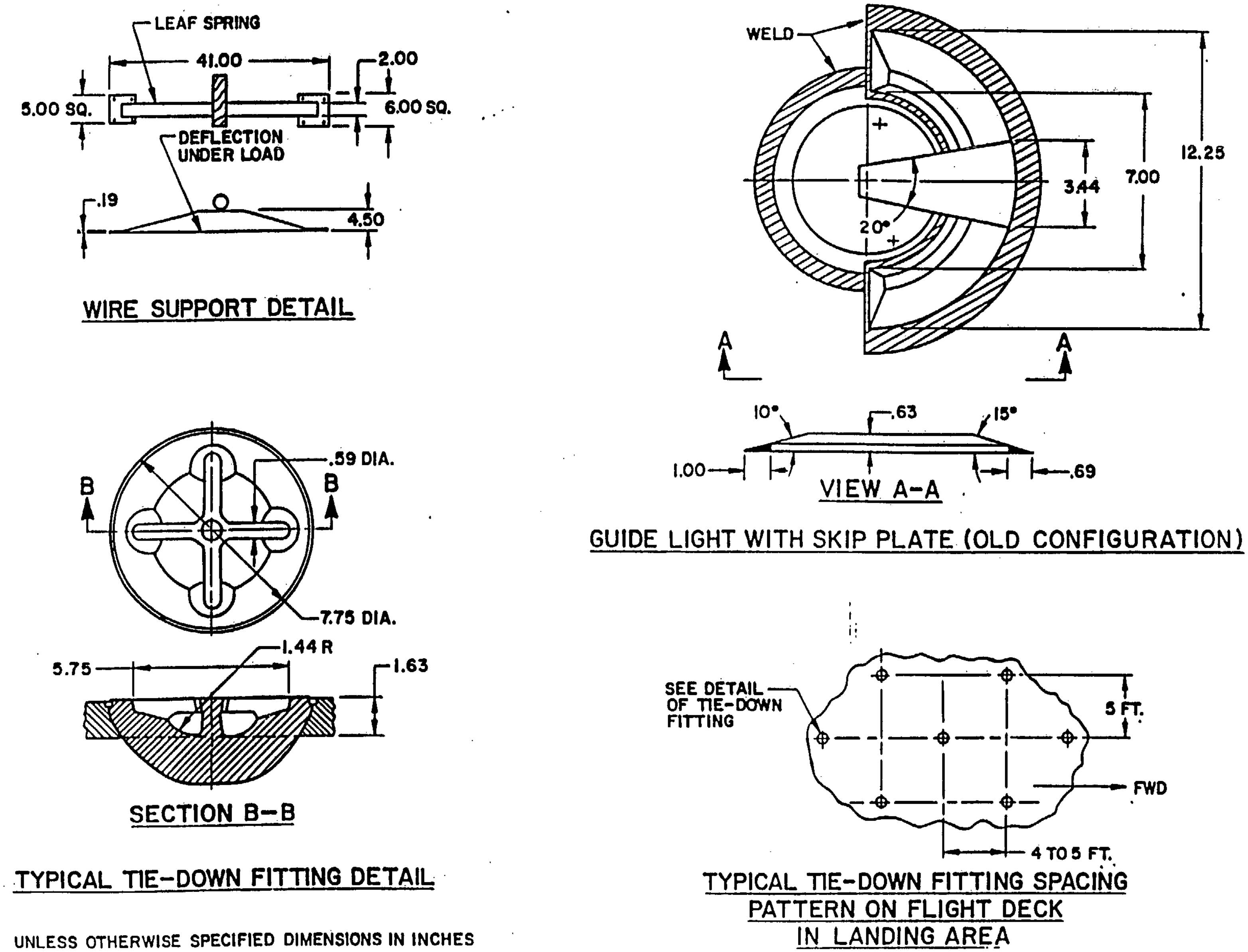
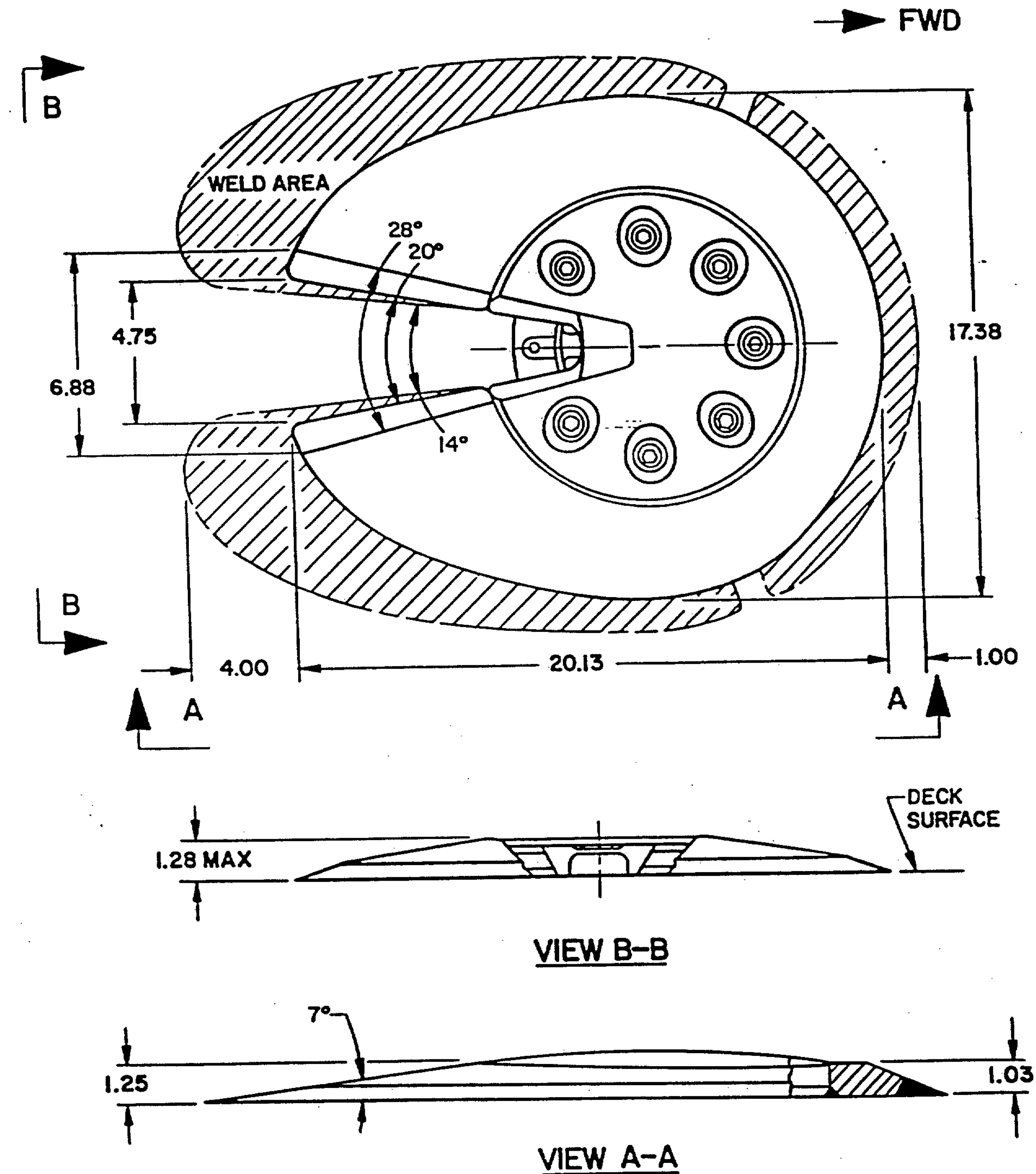
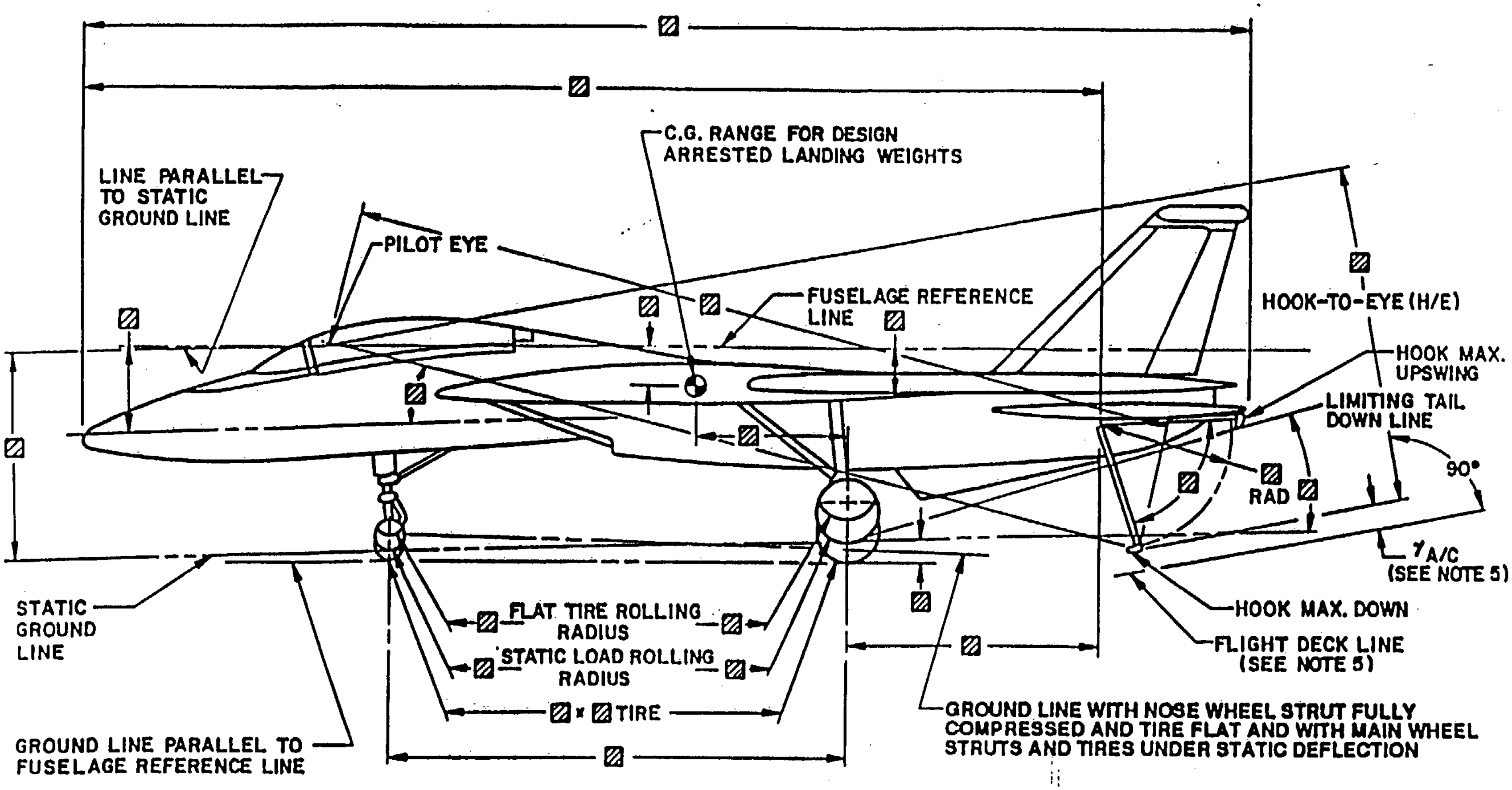


FIGURE 1. Typical arrangement and details of arrested landing deck area on CV type flight deck. -- Continued



NOTES:
1. DIMENSIONS IN INCHES.
2. FEATHER WELD TO BLEND WITH CONICAL SHAPE OF SHEAR RING.

FIGURE 2. Pilot Landing Aid Television (PLAT) installation.



NOTES:

1. REFERENCE SOURCE OF AERODYNAMIC DATA.
2. DIMENSIONS MARKED ▨ TO BE INDICATED ON DRAWING.
3. DRAWING TO BE MADE ACCURATELY TO A SCALE OF 1/20.
4. IF HOOK IS DISPLACED LATERALLY FROM ℄ OF AIRCRAFT, DIMENSION THIS DISPLACEMENT AT THE HOOK HEAD AND AT THE HOOK PIVOT.
5. USE FLIGHT DECK LINE OF FIG. A-1 DEFINED BY $V = V_{PA}$ FOR CARRIER DESIGN ARRESTED LANDING WEIGHT, $V_w = 35$ KNOTS, AND $\gamma_{A/C} = 4°$.
6. SHOW HOOK UPSWING LIMITS VERSUS LATERAL DISPLACEMENT.
7. SHOW COORDINATES RELATIVE TO F.R.L. AND STA. O OF AIRCRAFT FOR NOSE AND MAIN WHEEL AXLES IN THE FULLY COMPRESSED, STATIC, AND FULLY EXTENDED STRUT CONDITIONS.

FIGURE 3. Arrested landing arrangement drawing - nose gear launch type aircraft.

APPENDIX A

PROCEDURES FOR ARRESTING HOOK INSTALLATION ANALYSIS

10. SCOPE

10.1 Scope. This appendix is not a mandatory part of the specification. The information contained herein is intended for guidance only concerning the following:

a. Arresting hook location and installation geometry

b. Arrested landing analysis conditions

c. Recommended analytical procedures

d. Conventional arresting hook installations

e. Arresting hook and arresting hook components design

f. Shock absorber and hold down criteria

20. APPLICABLE DOCUMENTS.

20.1 Government documents.

20.1.1 Specifications, standards and handbooks. The following specifications form a part of this appendix 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-A-8860	Airplane Strength and Rigidity - General Specification For
MIL-D-23003	Deck Covering Compounds, Non-Slip, Lightweight

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the DODSSP - Customer Service Standardization Documents Ordering Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094).

30. ARRESTING HOOK LOCATION

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30.1 Hook location. In determining the location of the arresting hook, the effect of such location on nose wheel loads, propeller or store clearances, and main wheel/deck contact, as applicable to the type of aircraft involved, must be considered. The following paragraphs present general information about various types of arresting gear and general recommendations for determining the adequacy of the hook location.

30.2 Carrier-type arresting gear. US Navy aircraft carriers incorporate a constant runout type of arresting gear. Thus a fixed runout distance, regardless of the weight or engaging speed of the aircraft (within the arresting gear design limit), is characteristic of this type of arresting gear.

30.3 Field-type arresting gear. Carrier based aircraft are required to operate in field arresting gear of various types. These operations include emergency arrestments resulting from runway overrun or aborted takeoff and Expeditionary Airfield (EAF). Deck spans for these gear range from 70 to 330 feet and most of these gear do not provide a constant runout. In general, arresting hook locations suitable for use with carrier-type arresting gear have proved suitable for use with field types.

30.4 Arresting gear time histories. Runout, peak deceleration, representative deceleration and cable tension time histories for the various models of arresting gear can be obtained from NAVAIR, or will be supplied in the airplane detail specification. The forces and accelerations shown in such time histories do not necessarily represent the magnitudes applicable to structural design specified in MIL-A-8860.

30.5 Preliminary arresting hook location. The following paragraphs present criteria for checking the effect of the proposed arresting hook location on the factors of 30.1 in the preliminary design stages of the hook. The acceptability of the final hook location must be verified by a full dynamic analysis of all forces (including aerodynamic forces) acting on the aircraft during runout and by test as required by the basic specification.

30.5.1 Aircraft attitudes. The aircraft may engage the deck pendant in free flight, three point, or two point attitude. For purposes of the preliminary analysis included herein, the following aircraft attitudes should be considered.

30.5.1.1 Static deflection. In general, at the instant that the arresting hook engages the deck pendant, the aircraft may be assumed in contact with the deck, with its main landing gear struts and tires under static deflection. For purposes of analysis, the main landing gear struts and tires may be assumed to remain under static deflection during the entire arrested run.

30.5.1.1.1 Engagement attitudes. Aircraft at engagement, with the weight and engaging speed as specified in 30.5.3 have the following conditions:

a. Tail down position as defined in 3.6.1 with nose clear of deck and $V_{v\ max}$ at touchdown.

b. Pitch attitude corresponding to $V_{v\ max}$ as determined from MIL-A-8860.

c. Pitch attitude corresponding to 3 1/2° glide path relative to the carrier deck.

30.5.2 Other conditions. If necessary, the investigation should be extended to include conditions other than those specified.

30.5.3 Preliminary analysis conditions. A preliminary analysis of the proposed hook location with the aircraft in the attitudes specified in 30.5.1 should be for the following conditions:

a. Aircraft at carrier landing design weight and an engaging speed of 1.1 V_{PA}

b. Aircraft at carrier landing design weight and an engaging speed of 1.1 $(V_{PA} - V_w)$.

Where V_{PA} = Power approach speed for carrier landing.

V_w = Minimum Wind-Over-Deck (WOD) for carrier landing and specified in aircraft detail specification.

For field-type arrestments, the weight should be the maximum field arrested landing weight and the engaging speed equal to V_{PA} + 10 knots.

30.5.3.1 Preliminary analysis procedure. The following analysis is applicable to both nose wheel and tail wheel-type aircraft.

a. Estimate a suitable hook location. Observe tail rise during arrested landings of conventional tail wheel equipped aircraft, indicate the hook location is satisfactory if the hook line of action passes not less than 12 inches below the C.G. when the aircraft attitude is defined by a deck line determined at 90 feet of runout, by a six inch propeller clearance and the main wheel gear in the static position.

b. Assume that the only forces acting on the aircraft during the arrestment are the aircraft weight, main gear reactions, hook load, engine thrust, and the resulting inertia forces. For jet and turbo prop-type aircraft, engine thrust should be equal to the maximum thrust. For propeller aircraft with reciprocating engine(s) the thrust value should be the thrust developed at V_{PA}.

c. Equate the applied moments and the inertia moments of these forces about the main gear axle at the instant of deck pendant engagement. Assure that angular velocity at this instant is zero.

d. Assume an incremental angular change in the reference line of the aircraft ($\Delta\phi$) from the initial engagement attitude.

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e. Compute the angular acceleration (α_t) at the end of the interval. Applied forces and moments about main wheel axle should be based on attitude at midpoint of interval.

f. Compute the average angular acceleration (α avg) over the interval assuming the change in angular velocity (ω) to take place uniformly over the interval.

g. Compute the angular velocity at the end of the interval using α avg.

h. Compute the average angular velocity (ω_{avg}) during the interval.

i. Compute the average angular travel of the reference line during the interval and determine the angle between the reference line and the ground line at the end of the interval.

j. Compare the computed ground angle with that originally assumed in step (d).

k. If the discrepancy between the assumed and computed angle is greater than 0.05 degrees, assume a new ground angle and recompute until the assumed angle and the computed angle agree. To facilitate accurate prediction of a new ground angle, it is suggested that a curve of ϕ versus time be drawn and extrapolated with each computation.

l. Continue this analysis through successive increments of time throughout the arrested run. The increments of time should be sufficiently small so that the changes taking place during the increment may be assumed to occur uniformly.

30.5.3.2 Tail down engagement. For tail down engagement, the analysis need not be carried beyond the point of impact of the nose wheel.

30.5.3.3 Nose wheel load. The nose wheel load during impact can be estimated in the following manner:

a. Assume that the angular velocity at impact is reduced to zero during the angular travel about the main gear axle resulting from compression of the nose wheel strut from the fully extended to the fully compressed position, plus 75 percent of the available deflection of the nose wheel tire. Available deflection of the nose wheel tire shall be the change in radius of the nose wheel tire from the unloaded condition to the radius of the flat tire condition.

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b. Calculate the average angular acceleration during the nose gear stroke and determine the average force (F_{avg}) acting on the nose wheel.

c. Limit load acting on the nose wheel shall be assumed to be 1.43 F_{avg} (assuming a strut-tire efficiency of 70%) unless improved efficiency is to be verified by test.

30.5.4 Selection of new hook location. If the preliminary calculations of 30.5.3 show excessive nose gear loads or insufficient propeller or store clearance, a new hook location should be selected and the preliminary analysis repeated.

40. ARRESTING HOOK INSTALLATION ARRANGEMENTS

40.1 Design stage. The location and arrangement of the hook should be considered at an early stage of the design before the final configuration of the aircraft is set, to insure that the simplest and most reliable installation can be incorporated.

40.2 Proven hook installations. Incorporate a proven hook installation where practicable. Preliminary layouts should be discussed with NAVAIR at an early design stage to determine what proven and standard hook installation components can be incorporated.

50. ARRESTING HOOK DETAIL DESIGN

50.1 Design parameters. The arresting hook is required to have sufficient length, and the hookpoint is to be shaped to permit ready engagement with the deck pendants of any of the arresting gear in which the aircraft is designed to operate, and with the aircraft in any attitude which can reasonably be expected during such arrestment. A discussion of the requirements upon which arresting hook design should be based and pertinent recommended design criteria and considerations are presented in the following paragraphs.

50.2 Arresting hook length.

50.2.1 Prediction. The prediction of the correct length of the arresting hook which will insure a reasonable degree of engagement with the arresting gear is influenced by the following factors:

a. The number, spacing, and height of the deck pendants on the deck.

b. The desirability of maintaining short hook length to reduce weight and minimize hook rotational velocities.

c. Control characteristics of the aircraft near the stall attitude.

d. The usual attitude in which the aircraft makes initial contact with the deck.

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e. The location of the hook with respect to the wheels of the aircraft.

f. The type of landing gear of the aircraft and its effectiveness in preventing nose-up rebound from the deck and resultant "aerodynamic bounce".

g. The effectiveness of the arresting hook shock absorber and hold down device.

50.2.1.1 Arresting gear characteristics. For the purposes of this appendix, the characteristics of the arresting gear pendant spacing, height, etc., may be considered to be fixed as a result of experiment, statistical analysis, and structural considerations in the aircraft carrier. For a typical carrier flight deck arrangement refer to Figure 1 of the basic specification. Field arresting gear layouts generally have only one deck pendant. Deck pendant height is similar to that for carrier-type gear, although deck pendant diameters generally are smaller.

50.2.1.2 Shortest hook. The considerations of weight, hook rate of rotation, and ease of locating and housing the hook dictate the use of the shortest hook which will satisfactorily engage the deck pendant.

50.2.1.3 Airplane control characteristics. In making a carrier approach and landing, a certain margin of speed greater than the stalling speed is required. This is dependent on the control characteristics of the aircraft (when near stall speed), engine acceleration characteristics of the aircraft in the event of a wave-off or a missed wire, and by the aircraft attitude required to ensure pilot's visibility of the landing area. If these characteristics are poor, higher landing speeds will be required which increases the probability of the aircraft bouncing or otherwise being in an attitude in which it is difficult to engage the deck pendant, thus necessitating a longer hook to ensure satisfactory engagement.

50.2.2 Hook length. Arresting hook lengths based on the following formula have proven adequate for aircraft in service.

50.2.2.1 Hookpoint-ground line relationship. With the hook trailing aft, the nose wheel strut fully compressed, the nose wheel tire flat, the main-wheel tires under normal static load, and the main gear struts in a normal static position, the hookpoint should touch or extend below the resulting ground line. For an example of this attitude, refer to Figure 3 of the basic specification.

50.2.2.2 Shorter hook. A shorter hook length than that specified in 50.2.2.1 may be used if the contractor can provide a rational analysis proving the adequacy of the shorter length to engage a deck pendant, which is acceptable to NAVAIR.

50.3 Arresting hook trail angle. The determination of the optimum arresting hook trail angle is influenced by the following factors:

a. The arresting hook must trail aft sufficiently to prevent the aircraft sitting on the hook in a normal "full stall" carrier landing.

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b. In general, hook bounce is reduced when the hook trail angle is increased since the initial rotational acceleration resulting from kinematic bounce is less when the hook is subjected to initial impact at a decreased angle with the deck.

c. An increase in hook trail angle together with the corresponding increase in hook length required, will improve the engaging attitude of the hook head for normal engaging positions of the aircraft. Figure A-2 demonstrates this condition.

d. An increase in hook trail angle is objectionable only from the standpoint that it necessitates the provision of a longer hook to meet the length requirements of 50.2.2. This results in an increase in weight and makes the location and housing of the hook more difficult.

50.3.1 Hook deck angle. Recommended criteria for the hook deck angle and its relationship to the hook trail angle, applicable to conventional designs, are shown in Figure A-1 as a general design guide. Generally, the required hook hold down force increases rapidly as the hook deck angle increases above 65°.

50.4 Arresting hookpoint and hook shank. A typical hookpoint and hook shank design, free from obstructions in the deck pendant contact region, and the angle of trail relationship to the critical deck line is illustrated in Figure A-3.

50.4.1 Arresting hook shank.

50.4.1.1 Hook shank torsional stiffness. One of the major design problems of hook shank design is providing the required torsional stiffness values while minimizing the weight. Previous experience on all arresting hook shank designs has demonstrated that the tubular type members have the greatest torsional stiffness with a history of the fewest failures, minimum number of operational problems and less maintenance.

50.4.2 Arresting hookpoint.

50.4.2.1 Multiple deck pendant engagement. Because the engagement of more than one deck pendant by an arresting hook will probably result in aircraft overload, every consideration should be given to designing a hook which will minimize this possibility. Generally, shortening the hook face and increasing the hook face angle will improve the ability of the hook to shed a second deck pendant. Some compromise in hookpoint design will often be required, however, since the factors which improve the ability of the hook to shed a second deck pendant, decrease somewhat the ability of the hookpoint to pick up a deck pendant after the aircraft's wheels have depressed the pendant.

50.4.2.2 Toe radius. The toe radius is important in determining the ability of the hookpoint to pick up a deck pendant. A small toe radius facilitates pick-up, especially from a depressed condition, but an unduly small toe radius can damage the deck pendant. A minimun toe radius of 0.625 inch shall be required.

50.4.2.3 Transverse curvature. The transverse curvature of the hook face and cable groove should be of a large enough radius to minimize bending stresses in the deck pendant when it wraps around the hookpoint.

50.4.2.4 Tangent radius. The throat radius of the hookpoint should be large enough to accept deck pendants up to 1 1/2 inches nominal (1 5/8 inches maximum) in diameter. The smallest deck pendant in use is 1 inch in diameter.

50.4.2.5 Wear resistance. The wear requirements for arresting hooks are severe. During off-center arrestments the deck pendant tends to slide through the hook throat with rubbing velocities on the order of 40 feet/second. The hookpoint throat must be composed of material which will preclude welding of the deck pendant to the cable groove under the conditions of heat and pressures which exist during off-center engagements. The Colmonoy No. 6, Metco No. 12C or 16C coated cable grooves of the hookpoints have proved suitable for use with both carrier-type and field-type arresting gear cables. The use of Metco No. 12C or equivalent type coating is mandatory for use on hookpoints made of 4330 steel. Portions of the back of the hookpoint and the toe radius are subject to severe abrasion during arrestment on concrete runways and on carrier decks and EAF field landing mats both of which are covered with the anti-skid compound of MIL-D-23003. Field type arrested landings are especially severe since the hookpoint may drag the runway for considerable distances before engagement with the deck pendant. The hookpoint must have a backface wear plate that will be replaced when backface wear has reached a maximum limit. The hookpoint design shall be such that the entire backface wear will be experienced by the backface plate and none by the hookpoint itself.

50.4.2.6 Hookpoint weight. Arresting hookpoint weight influences the hold-down forces required to resist hook bounce. Hookpoint and shank weight should be kept to a minimum.

50.4.2.7 Transverse contours. Consideration should be given to the transverse contours of the toe and the back of the hookpoint to ensure that the point can properly engage the deck pendant with the aircraft in a rolled or yawed handling attitude or with the hookpoint displaced from its centered position. Figure A-4 illustrates poor and better hookpoint design features.

50.4.2.8 Face angle. The optimum face angle is a compromise between deck pendant engagement and retention and shedding characteristics. A sharp face angle will promote pickup of low pendants and retention during the early part of runout, while a shallower face angle will facilitate pendant shedding at the end of runout.

50.5 Arresting hook shock absorber. The determination of the optimum shock absorber and hold down characteristics is dependent upon the following variables:

a. The elastic properties of the arresting hook.

b. The weight and weight distribution of the rotating hook parts.

c. The velocity with which the hook strikes the deck.

d. The angle at which the hook strikes the deck.

e. The elastic properties of the deck surface.

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f. The hook-deck angle (see Figure A-1).

50.5.1 Kinematic bounce. When the aircraft is approaching the deck on a constant glide path, the arresting hook trails at a fixed angle until the hookpoint contacts the deck at which time the hook is forced to rotate about its pivot point (see Figure A-1). Theoretical analysis of the hook motion after it contacts the deck indicates that the angular velocity is

$$\frac{d\beta}{dt} = \frac{-V_{A/C}}{d} \cdot (\sin \gamma_{A/C} \tan \beta).$$

Since the only variable is tan ß, and ß is decreasing with time, the angular velocity subsequent to hook/deck contact must also be reduced if deck contact is to be maintained (zero hook bounce). This requires that the hold-down device impart an angular acceleration to the hook. This angular acceleration is

$$\frac{d^2\beta}{dt^2} = \left|\frac{d\beta}{dt}\right|^2 \tan \beta \cdot$$

The angular velocity and angular acceleration will approach infinity as ß approaches 90°. Obstructions in the way of the hook increase the hold-down force requirements to maintain deck contact of the hookpoint. It should be noted that the foregoing formulas do not take into account the flexibility of the shank and the resiliency of the hookpoint and deck.

60. DETERMINATION OF AIRCRAFT PITCH ATTITUDE

60.1 Methodology. The following is a method for determining the pitch attitude of the aircraft during landing at the instant of hook-deck contact.

60.1.1 Notations.

V_V	Sinking speed	ft/sec
V_E	Engaging speed	ft/sec
$V_{A/C}$	Velocity of aircraft with respect to the deck	ft/sec
V_W	Headwind velocity relative to deck	ft/sec
α	Angle of attack	RAD
θ	Pitch attitude	RAD
$\gamma_{A/C}$	Glide path angle of aircraft with respect to the deck	ft/sec
V	Approach air speed of aircraft	ft/sec
W	Aircraft weight	lb

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γ	Aircraft glide path angle	RAD
T	Engine thrust	lb
D	Aerodynamic drag.	lb
L	Aerodynamic lift.	lb
ρ	Air density	lb $\frac{sec^2}{ft^4}$
S	Wing area.	ft^2
$C_{L/0}$	Vertical intercept of C_L vs. α curve .	dimensionless
$\frac{dC_L}{d\alpha}$	Slope of C_L vs. α curve	1/RAD
$C_{D/0}$	Vertical intercept of C_D vs. α curve .	dimensionless
$\frac{dC_D}{d\alpha}$	Slope of C_D vs. α curve	1/RAD

60.2 Analytical procedure for determining aircraft pitch attitude. The analytical schematic of the aircraft arresting hook is shown in Figure A-5. The sinking speed (V_V) and the engaging speed (V_E) are the velocities of the aircraft. The horizontal and vertical velocities can be derived from $V_{A/C}$ and $\gamma_{A/C}$.

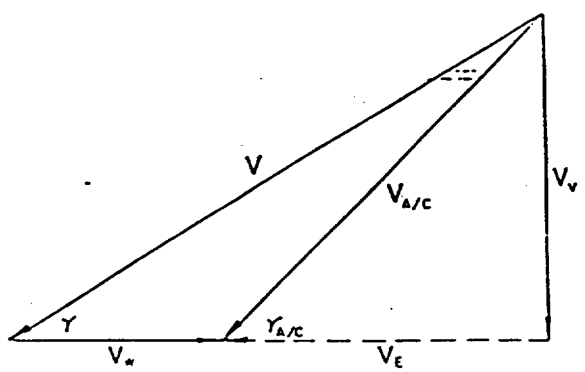

Figure A-5. Aircraft Velocity Diagram.

Using the law of cosines and considering the velocity diagram of Figure A-5, the velocity of the aircraft with respect to the carrier deck is:

$$V_{A/C} = \frac{-2V_W \cos \gamma_{A/C} \pm \sqrt{((2V_W \cos \gamma_{A/C})^2 - 4(V_W^2 - V^2))}}{2}$$

Where: $V = f(w)$ and V_w and $\gamma_{A/C}$ are specified for each landing.

The sinking speed is then determined from

$$V_v = V_{A/C} \sin \gamma_{A/C}$$

and the engaging velocity is given by:

$$V_E = V_{A/C} \cos \gamma_{A/C}.$$

The glide path angle (γ) is then defined by

$$\gamma = \sin^{-1} (V_v/V)$$

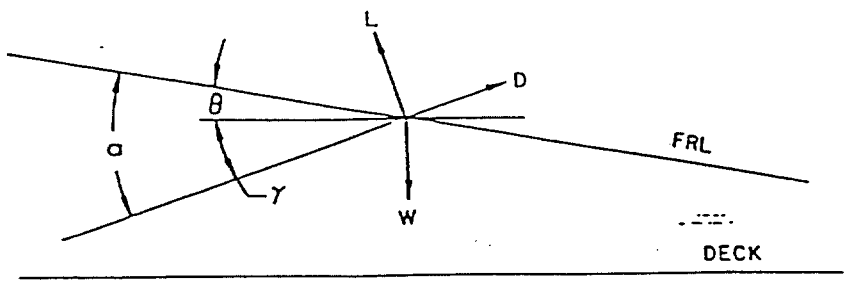

Figure A-6. Aircraft forces diagram.

An aircraft making a steady state approach during an arrested landing possesses a definite angle of attack, thrust, etc., for each particular condition of approach speed (V) and glide path angle (γ). The forces on the aircraft shown in Figure A-6 are defined assuming:

a. The aircraft in the landing configuration out of the ground plane.

b. Constant approach speed.

c. Constant glide path angle.

Since the velocity along and perpendicular to the glide path is constant, the summation of forces along the glide path equals:

$$T(\cos \alpha) - W(\sin \gamma) - D = 0$$

and the summation of forces perpendicular to the glide path equals:

$$L - W(\cos \gamma) + T(\sin \alpha) = 0$$

assuming small angles $\cos \measuredangle = 1$, $\sin \measuredangle = \measuredangle$.

This yields

$$L - W + T\alpha = 0$$
$$T + W\gamma - D = 0 \quad .$$

Eliminating thrust gives

(1) $$L - W + \alpha(D - W\gamma) = 0$$

The untrimmed aerodynamic coefficients are

(2) $$L = (C_{LO} + \frac{dC_L}{d\alpha}\alpha)\tfrac{1}{2}\rho V^2 S$$

(3) $$D = (C_{DO} + \frac{dC_D}{d\alpha}\alpha)\tfrac{1}{2}\rho V^2 S$$

Substituting equations (2) and (3) into (1) gives:

$$(C_{LO} + \frac{dC_L}{d\alpha}\alpha)\tfrac{1}{2}\rho V^2 S - W + \alpha\{(C_{DO} + \frac{dC_D}{d\alpha}\alpha)\tfrac{1}{2}\rho V^2 S - W\gamma\} = 0$$

Where the angle of attack (α) is the only unknown

The pitch attitude (θ) of the aircraft is then defined by

$$\theta = \alpha - \gamma$$

Table I. Aircraft rollover test conditions.

ARRESTING GEAR	AIRCRAFT	AIRCRAFT WEIGHT (RANGE) POUNDS	AIRCRAFT SPEED (RANGE) KNOTS	PENDANT TENSION (POUNDS)	PENDANT WIRE SUPPORT	PENDANT BOUNCE HEIGHT (MAX) INCHES
MK 7 MOD 3	A-7	NOT AVAIL	104-135	3,000	4	6.5
MK 7 MOD 3	F/A-18	NOT AVAIL	91-125	3,000	4	6.5
E-28	F-4B	30,900 to 38,000	TAXI-157	0-2360	Aircraft Tire Section Plastic Rails Rubber Donuts	22.5 15.0 8.5

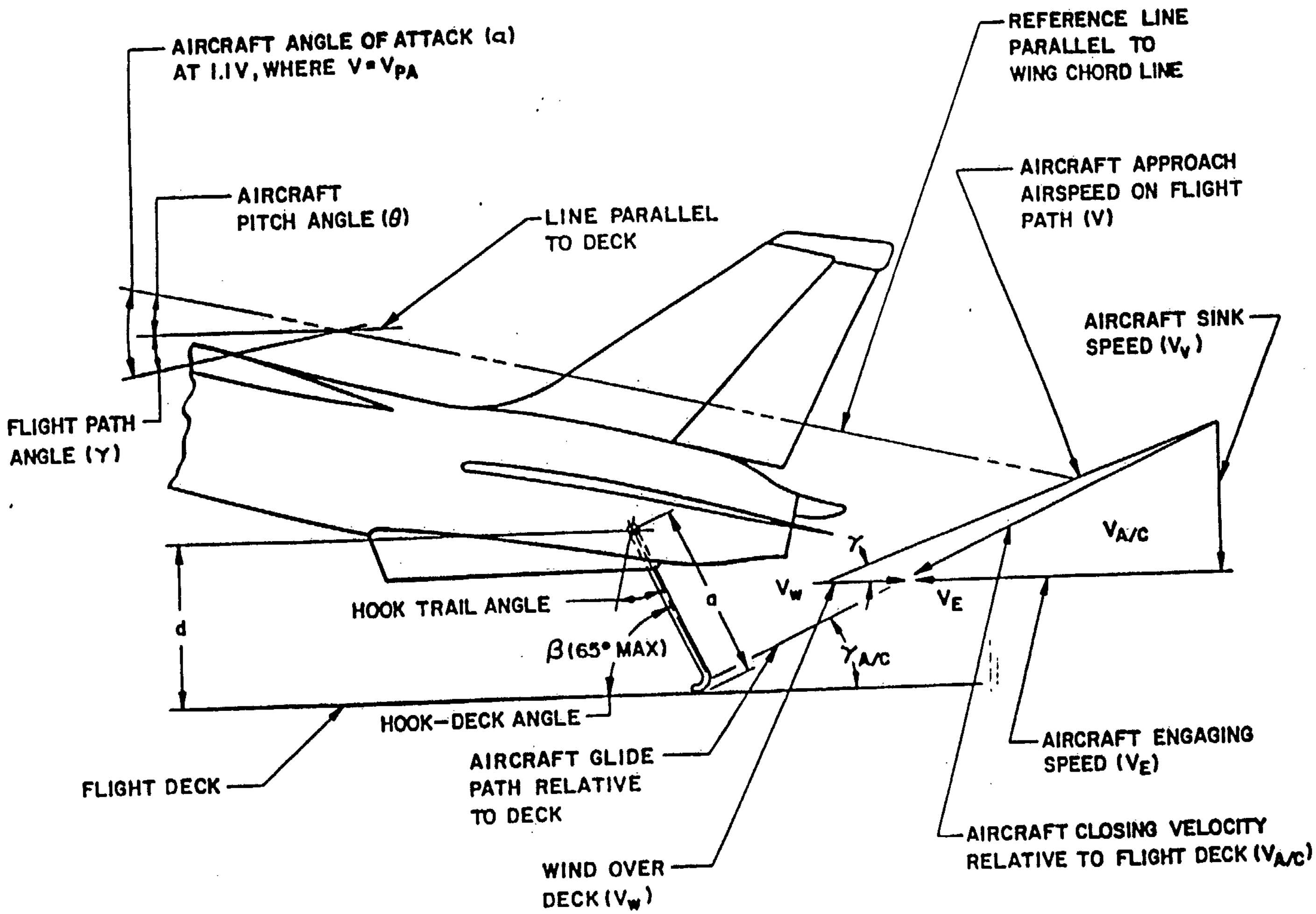

FIGURE A-1. Typical hook deck angle and hook trail angle.

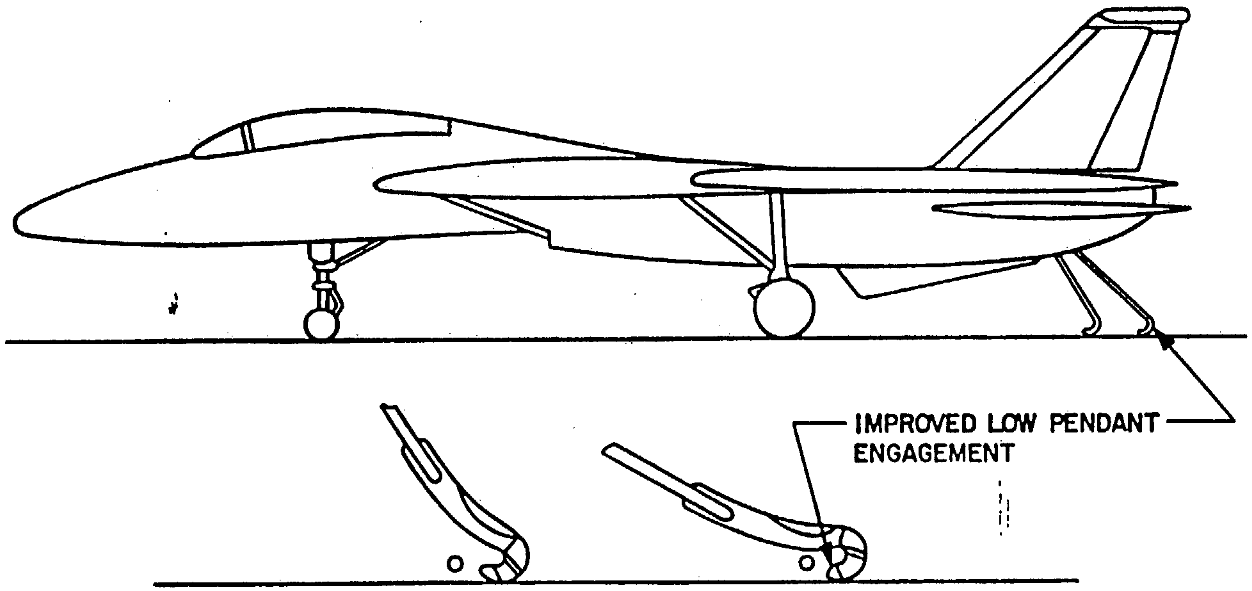

FIGURE A-2. Effect of increased tail angle on low pendant pickup characteristics.

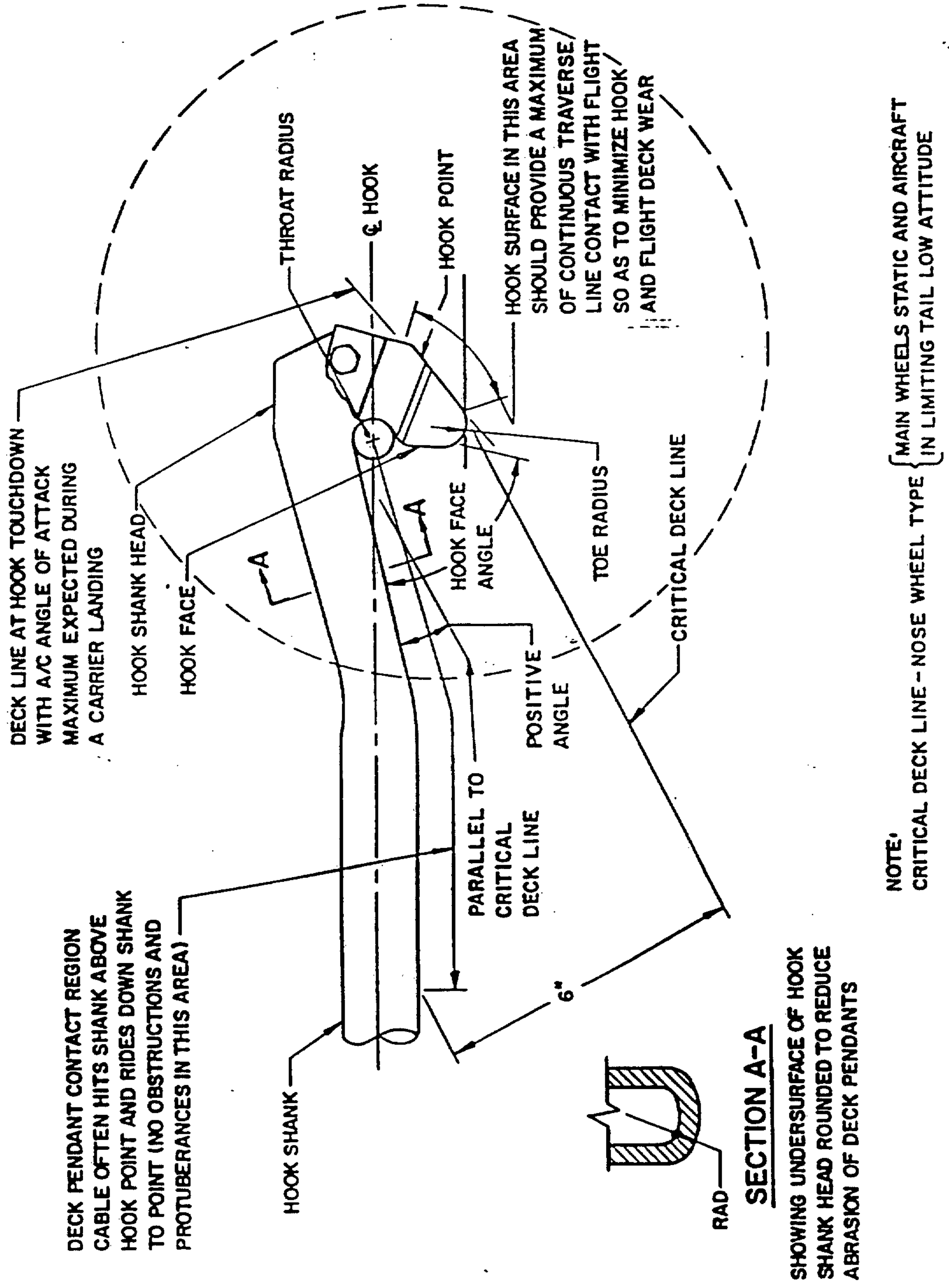

FIGURE A-3. Arresting hook design features.

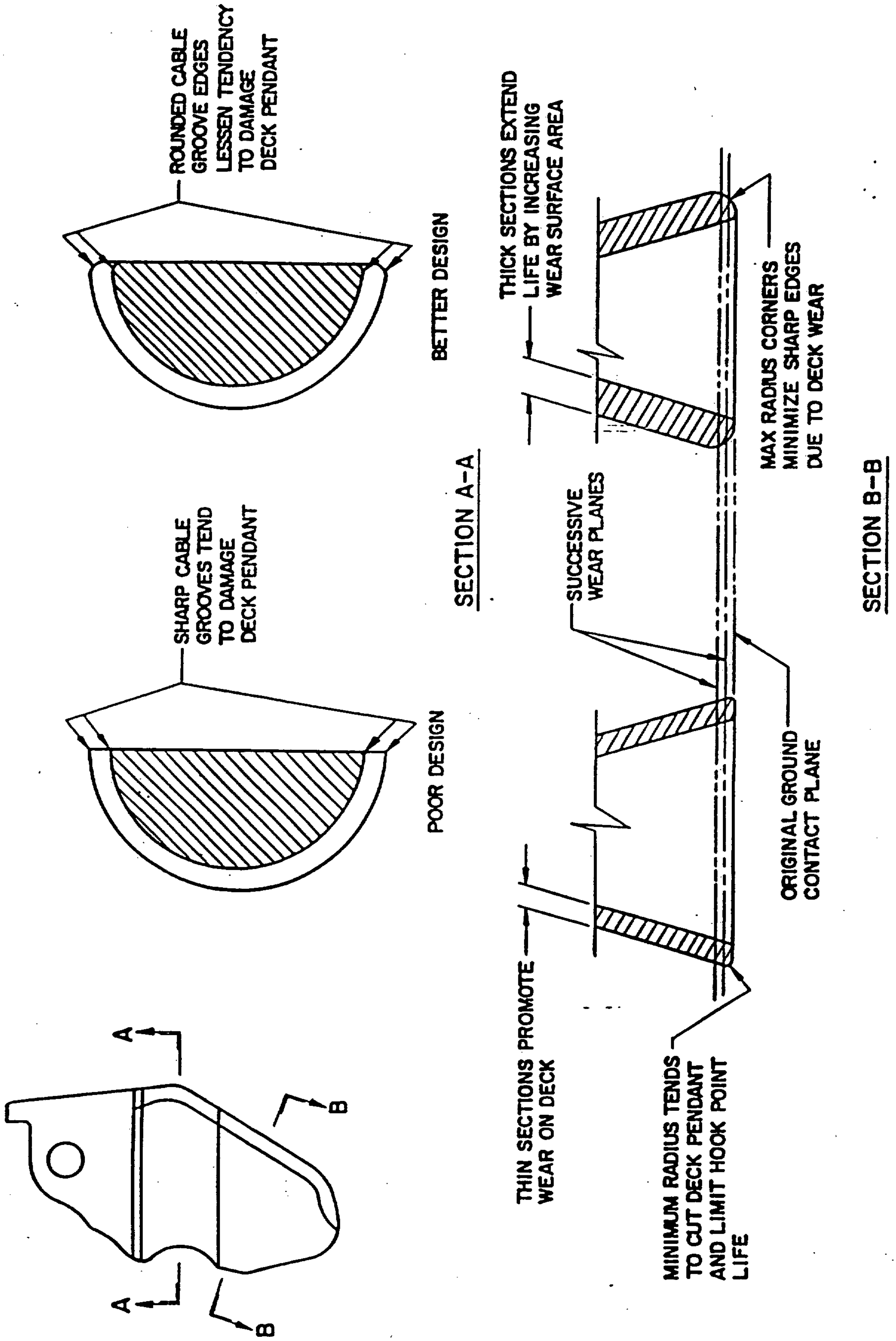

FIGURE A-4. Hook point design features.

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INSTRUCTIONS

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3. DOCUMENT TITLE ARRESTING HOOK INSTALLATION, AIRCRAFT

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

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c. ADDRESS *(Include Zip Code)* AIRCRAFT DIVISION LAKEHURST SRD-CODE SR3 LAKEHURST, NJ 08733-5100	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340