

MIL-C-0082662A(OS)

22 January 1981

USED IN LIEU OF

MIL-C-82662

20 September 1977 and
Amendment 3

16 May 1980

MILITARY SPECIFICATION

CATAPULT, AIRCRAFT EJECTION SEAT
CKU-2/A AND CKU-5/A ASSEMBLY

This limited coordination military specification has been prepared by the Naval Sea Systems Command, Department of the Navy, based upon currently available technical information but it has not been approved for promulgation as a coordinated revision of MIL-C-82662. It is subject to modification. However, pending its promulgation as a coordinated military specification, it may be used in procurement.

1. SCOPE

1.1 Scope. This specification covers the minimum requirements for the procurement of the Rocket Catapult CKU-2/A and CKU-5/A loaded assembly.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-P-116
MIL-I-6866
MIL-I-6868Preservation-Packaging, Methods of
Inspection, Penetrant Method of
Inspection Process, Magnetic Particle

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 Ordnance Station, Standardization/Documentation Division (501), Indian Head, MD by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 1377

MIL-S-9479

Seat System, Upward Ejection, Aircraft,
General Specification for

MIL-P-82663

Propellant, Solid, Composite

* MIL-P-82680

Propellant, Solid, Composite (CKU-7/A and
CKU-2/A Rocket Catapults)

* MIL-S-82714

Sleeve and Grain Assembly (CKU-2/A Rocket Catapult)

STANDARDS

MILITARY

MIL-STD-105

Sampling Procedures and Tables for Inspection
by Attributes

MIL-STD-129

Marking for Shipping and Storage

MIL-STD-414

Sampling Procedures for Inspection by Variables

MIL-STD-453

Inspection, Radiographic

MIL-STD-810

Environmental Test Methods

* MIL-STD-1168

Ammunition Lot Numbering

MS 17983

Compass-Magnetic, Pilots Standby

PUBLICATIONS

NAVAL SEA SYSTEMS COMMAND (Code Ident 10001)

WR-43

Preparation of Quality Assurance Provisions

* DRAWINGS

NAVAL AIR SYSTEMS COMMAND (Code Ident 30003)

736AS159

Shear Pin

NAVAL SEA SYSTEMS COMMAND (Code Ident 53711)

5184311

Shipping Container For Rocket Catapult

5184312

Shipping Container, Inner Packing For Rocket Catapults

NAVAL ORDNANCE STATION, INDIAN HEAD (Code Ident 14083)

10551685

Tube, Motor

11726650

Tube, Motor

11726655

Tube, Launcher

11726656

Tube, Booster

11740598

Tube, Booster

11743866

Catapult, Aircraft Ejection Seat CKU-2/A Assembly

11743869

Breech

11743871

Tube, Launcher

DL11743975

List of Drawings, Catapult, Aircraft Ejection Seat,
CKU-5/A Assembly

11743975

Catapult, Aircraft Ejection Seat CKU-5/A Assembly

11743980

Breech Assembly

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(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of invitation for bids or request for proposal shall apply.

CODE OF FEDERAL REGULATIONS

49 CFR 100-199

Transportation

(The Code of Federal Regulations is available from the Superintendent of Documents, US Government Printing Office, Washington, DC 20402. Orders should specify "49 CFR 100-199 (latest revision)").

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT
National Motor Freight Classification

(Application for copies should be addressed to American Trucking Associations, Attn: Tariff Order Section, 1616 P Street, Washington, DC 20036.

UNIFORM CLASSIFICATION COMMITTEE, AGENT
Uniform Freight Classification

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

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3.1 First article. Unless otherwise specified in the contract (see 6.2), first article samples of the catapult assemblies are required and shall be manufactured using the methods and procedures proposed for production. The samples shall be tested as specified in Section 4 for the purposes of determining, prior to starting production, that the contractor's production methods are capable of producing catapult assemblies that comply with the technical requirements of the contract (see 4.4). No production changes shall be made subsequent to approval of the first article without prior approval of the procuring activity.

3.1.1 Pressure transducers. All first article sample catapult assemblies shall be adapted for pressure transducers as specified in the contract or order (see 6.2).

3.2 Materials. All materials, parts and assemblies shall be in accordance with the applicable drawings, this specification and the documents referenced herein.

3.3 Age.

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* 3.3.1 Explosive components. All explosive components, including but not limited to ignition powders and igniters, shall be manufactured within the 12 months prior to the contract scheduled delivery date for the catapult assemblies lot. Primers shall be manufactured or requalified within the 12 months prior to the contract delivery date for the assembly lot.

3.3.2 Propellant. The propellant shall be manufactured within the 150 days prior to the contract scheduled delivery date for the catapult assemblies lot.

3.4 Performance and product characteristics. The rocket catapults shall meet the following performance and product characteristics when test fired at -65°F, +70°F and +165°F using an ejected weight of 375 pounds.

* 3.4.1 Ballistic. The rocket catapult CKU-2/A shall meet the ballistic performance parameters specified in Table I. The rocket catapult CKU-5/A shall meet the performance parameters specified in Table II.

3.4.1.1 Other requirements. In addition to meeting the ballistic requirements, none of the following shall occur during test firing of the rocket catapults:

a. No unit component, including but not limited to cartridge components, O-rings, springs or pieces of propellant shall be ejected.

b. No component subject to loading shall fail.

c. No excessive erosion, hot spots or burn through shall occur.

* Table I. CKU-2/A ballistic performance requirements - 375 pound ejected weight.

	PARAMETER	-65°F		70°F		165°F	
		MIN	MAX	MIN	MAX	MIN	MAX
Catapult	Dynamic Response Index (DRI)#	-	-	-	18.0	-	22.0
	Separation Velocity (ft/s)	35	-	40	-	45	-
	Ignition Delay (ms)	-	30	-	30	-	30
Rocket Motor							
	Resultant Impulse (lb _f -sec)	1150	-	1150	-	1150	-
	Ignition Delay (ms)	-	50	-	50	-	50
	Action Time (ms)	-	511	-	511	-	511
	Resultant Thrust (lb _f)	-	7359	-	7359	-	7359
	Thrust Angle (reference)	58°*		58°*		58°*	

*Record for information only

#DRI is defined in MIL-S-9479 (see 6.4.7)

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* Table II. CKU-5/A ballistic performance requirements - 375 pound ejected weight

	PARAMETER	-65°F		70°F		165°F		AQL
		MIN	MAX	MIN	MAX	MIN	MAX	
Catapult	Dynamic Response Index (DRI)#	-	-	-	18.0	-	22.0	.65
	Separation Velocity (ft/s)	35	-	40	-	45	-	1.0
	Ignition Delay (ms)	-	30	-	30	-	30	.65
	Axial Thrust (lbf)	-	7000	-	7000	-	70000	1.0
Rocket Motor	Resultant Impulse (lbf-sec)	950	-	950	-	950	-	1.0
	Ignition Delay (ms)	-	30	-	30	-	30	1.0
	Action Time (ms)##	-	500	-	450	-	400	1.0
	Resultant Thrust (lbf)	-	5000	-	5000	-	5000	.65
	Thrust Angle (reference)	54°*		54°*		54°*		

*Record for information only

#DRI is defined in MIL-S-9479 (see 6.4.7)

##Nominal rocket motor action time at 70°F in 350 ms.

3.4.2 Initiation. All rocket catapults shall be capable of firing with any actuating gas pressure up to 10,000 psia.

3.5 Hydrostatic pressure. The components listed in Table III shall be capable of withstanding the applicable internal hydrostatic pressure specified in Table III for 15 seconds (s) minimum when tested in accordance with 4.5.6.2.

Table III. Hydrostatic pressure requirements.

COMPONENT	DRAWING	HYDROSTATIC PRESSURE (PSI)
Motor Tube	11726650	5,000
Launcher Tube	11726655	12,000
Booster Tube	11726656	12,000
Breech Assembly	11743980	12,000

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- * 3.6 Shear pin strength. Each lot of shear pins (drawing 736AS159-1 for CKU-2/A or drawing 736AS159-2 for CKU-5/A) shall be tested in accordance with 4.5.7. Shear pins shall shear (double shear) when subjected to a load of 58-63 lbs applied at the rate of 0.125 inches per minute.
- 3.7 Radiographic requirements. Each loaded rocket catapult shall conform to the radiographic requirements of MIL-STD-453; radiographic quality level 1.
- 3.8 Torque. The booster tube and breech assembly, when seated with a torque of 400 + 50, -0 inch-pounds, shall not be loosened or deformed when subjected to a breakaway torque of 200 inch-pounds.
- 3.9 Protective finish. Protective finish shall be in accordance with the applicable specifications and drawings and shall apply to all surfaces of the component regardless of contour configuration.
- 3.10 Residual magnetism. The rocket catapult assembly, when passed 6 inches in front of the compass along the entire length of the catapult (see FIGURE 1), shall not cause the indicator of a compass in accordance with MS 17983 to deflect more than 5° in either direction.
- 3.11 Environmental requirements. The rocket catapult assemblies shall show no evidence of disintegration of propellant or derangement of components and shall be capable of meeting the performance and product characteristics requirements of 3.4 when test fired in accordance with 4.4.3 after exposure to the following environmental conditions.
 - 3.11.1 Vibration. The rocket catapult shall be capable of withstanding the vibration test of 4.4.2.1.
 - 3.11.2 Temperature-shock. The rocket catapult shall be capable of withstanding the temperature-shock test of 4.4.2.2.
 - * 3.11.3 High temperature. The rocket catapult shall be capable of withstanding the high temperature test of 4.4.2.3.
 - * 3.11.4 Thirty (30) days storage test. The rocket catapult shall be capable of withstanding the thirty (30) days storage test of 4.4.2.4.
- 3.12 Propellant. The propellant in the CKU-2/A shall be in accordance with MIL-P-82660, Class II. The propellant in the CKU-5/A shall be in accordance with MIL-P-82663.
- * 3.13 Identification marking. Each rocket catapult CKU-2/A shall be marked in accordance with drawing 11743866 and each CKU-5/A shall be marked in accordance with drawing 11743975 each with an identification label, a warning label, and an installation label.

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- * 3.13.1 Production lot designation. The production lot number shall follow MIL-STD-1168. The construction of the lot number shall be as follows:

I	H	M	7	5	D	0	0	2	-	0	0	7
a	b	c	d					e				

where:

- a = Manufacturer's Identification Code
- b = The year of manufacture of the oldest batch of propellant in the lot.
- c = The month of manufacture of the oldest batch of propellant in the lot expressed as an alpha code in accordance with 4.1.3 of MIL-STD-1168.

3.14 Workmanship. The requirements for workmanship shall be as specified in the applicable drawings, referenced specifications and the following:

3.14.1 Metal defects. All components shall be free of cracks, splits, cold shots, inclusions, porosity or any similar defect.

3.14.2 Burr. No part shall have a burr which might interfere with the assembly or function of the item or which might be injurious to personnel handling the item.

3.14.3 Foreign matter. No part of the assembly shall contain chips, dirt, grease, rust, corrosion or other foreign material.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection 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 (see 6.2), all inspections shall be performed under the following conditions:

- a. Temperature: CKU-2/A - Room ambient 65 to 90°F
CKU-5/A - Room ambient 65 to 95°F
- b. Pressure: 28 to 32 inches of mercury
- c. Vibration: None
- d. Humidity: CKU-2/A - Room ambient to 90 percent relative, maximum
CKU-5/A - Room ambient to 95 percent relative, maximum

4.4 First article inspection. Unless otherwise specified in the contract (see 6.2), a first article sample of 18 loaded rocket catapult assemblies, manufactured in accordance with 3.1, shall be submitted to the Naval Ordnance Station, Indian Head, Maryland 20640 for first article inspection. The first article samples shall be subjected to the quality conformance inspection of 4.5 with the exception of the test firing of 4.5.5 followed by environmental testing, radiographic examinations and static firing in the sequence specified in Table IV. Acceptance of the first article sample shall be based on no defects in the sample. Any production of the rocket catapult assemblies by the contractor, prior to approval of the first article sample, shall be at the contractors risk. First article samples shall not be included as a part of the quantity specified for delivery in the contract (see 6.2).

* 4.4.1 CKU-2/A failure analysis. Failure of the CKU-2/A first article sample shall require disposition as described in 4.4.1.1.

4.4.1.1 First article sample failure. If a failure, a malfunction, an out-of-tolerance condition, or an inability to obtain results due to loss of data occurs during or after a first article test, a supplier will determine analytically the most probable cause of non-compliance. If the non-compliance is unique to the unit tested, the test may be repeated (in full or in part) with a substitute unit and testing continued on the remainder of the program. If this analytical examination reveals the suppliers production techniques to be inadequate (see 4.4), the production inadequacy must be corrected and all or part of the first article sample testing, as defined in 4.4, repeated as explained in 4.4.1.2 at the discretion of the Government.

4.4.1.2 Retest. At the discretion of the procuring activity, first article sample tests, or any portion thereof, shall be repeated under the following conditions:

- a. The manufacturer has modified his product through a change of raw materials, production procedures, or methods. The supplier shall notify the procuring activity prior to the incorporation of any such changes, and shall

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provide quantitative evidence of the effect of such changes on the performance or characteristics of the product. The requirement for retesting will be based on an evaluation, by the procuring activity, of the evidence supplied.

b. There is evidence that the quality of the product has not been maintained. This evidence may be in the form of accumulated failure reports of the product, of system failures attributable to the product, or failure of the product to pass any of the tests for quality verification that may be conducted by or for the procuring agency.

c. Any change in design or documentation by the procuring activity.

d. Any interruption of production by the contractor.

4.4.2 Environmental tests.

4.4.2.1 Vibration. The rocket catapult assembly shall be subjected to random vibration in accordance with procedure IA of Method 514.2 of MIL-STD-810 for 6 hours with 2 hours on each axis. Before vibration, units shall be temperature conditioned in accordance with Table IV. The input vibratory acceleration shall be in accordance with curve A of Figure 514.2-2A with a W_0 factor of $.1G^2/Hz$. If the rocket catapult must be removed from the environmental conditioning chamber or if the temperature falls outside the specified temperature limits for a period of more than 5 minutes, the testing shall be stopped and the unit shall be reconditioned. A reconditioning time of 2 minutes for every minute the unit is outside the specified temperature envelope shall be required. A continuous temperature history of the unit shall be kept for all conditioning and testing time. Unless otherwise noted, the rocket catapult shall be mounted on a test fixture in a manner that will simulate actual seat/aircraft installation and excited through the attachment fittings. In addition to compliance with the random vibration test of Method 514.2, the rocket catapult shall comply with the gun fire vibration test of Method 519.2 for those applications whereby guns are installed on the aircraft (see 6.2). However, if the maximum test spectrum level of the gunfire configuration is determined to be equal to or less than the vibration test level of Method 514.2, the gun fire vibration test shall not be required.

* 4.4.2.2 Temperature shock. The rocket catapult assembly shall be subjected to a temperature shock test in accordance with procedure I of Method 503.1 of MIL-STD-810 except that the duration of each cycle shall be 8 hours and the maximum and minimum temperatures shall be 165°F and -65°F respectively.

* 4.4.2.3 High temperature. The rocket catapult assembly shall be subjected to a high temperature test in accordance with Procedure I of Method 501.1 of MIL-STD-810 with the exception that the test item shall be maintained at 165°F for 50 hours minimum.

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- * 4.4.2.4 Thirty (30) day storage. Three units shall be placed in storage at -65° and three at +165°F for 30 days each. Insuring that the proper temperature is maintained shall be the only attention required outside normal working hours.

4.4.3 Static firing test. Within 30 days after completion of environmental exposure, the rocket catapults shall be static fired at the Naval Ordnance Station, Indian Head, Maryland 20640. The sample shall be temperature conditioned per Table IV for a minimum of 8 hours and test fired within 10 minutes after removal from the conditioning chamber to verify conformance to the requirements of 3.4. Data specified in Table I for the CKU 2/A and Table II for the CKU-5/A, shall be analyzed in accordance with MIL-STD-414. Nonconformance with the Tables I and II or any requirement of 3.4.1, shall be cause for rejection of the first article sample.

4.5 Quality conformance inspection. The quality conformance inspection shall consist of the examinations and tests of 4.5.4 through 4.5.7 conducted on samples selected as specified in 4.5.2. The shear pin test of 4.5.7 shall be performed prior to installation of any shear pins from the lot in question into rocket catapult assemblies. The contractor is responsible for assuring that all rocket catapults offered for acceptance meet all the requirements of the applicable drawings and specifications. Items of inspection shall be serialized and inspection data traceable to a specific serial number.

4.5.1 Test reports. When specified in the contract (see 6.2), the contractor shall furnish test reports to the procuring activity. Test reports shall include the following information:

- a. Propellant description (see 3.12 and 6.3.1)
- b. Static firing performance test results (see 4.5.5 and 6.3.2)
- c. Summary sheet (see 6.3.3)
- d. Ammunition data cards (see 6.3.4)
- e. Propellant/assembly production records (see 6.3.5)
- f. Certification of age of explosive components and propellant (see 3.3)

4.5.2 Sampling for quality conformance inspection.

Table IV. First article evaluation test program. ^{1/}

TEST PARA	TEST	UNIT NUMBER																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
4.5.6.1	Radiographic Inspection	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
4.4.2.3	High Temperature	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b
4.4.2.1	Vibration -65°F							b	b	b	b	b	b	b	b	b	b	b	b
4.4.2.1	Vibration +165°F										b	b	b	b	b	b	b	b	b
4.4.2.4	30 Day Storage -65°F													b	b	b	b	b	b
4.4.2.4	30 Day Storage +165°F																b	b	b
4.5.6.1	Radiographic Inspection	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
4.4.2.2	Temp Shock	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d	d
4.5.6.1	Radiographic Inspection	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e	e
4.4.3	Ballistic Test -65°F	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
4.4.3	Ballistic Test +70°F			f	f	f	f	f	f	f	f	f	f	f	d	d	d	d	d
4.4.3	Ballistic Test +165°F					f	f	f	f	f	f	f	f	f		d	d	d	d

*

^{1/} Letters denote sequence of testing.

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4.5.2.1 Lot. For the purposes of identification, inspection, and shipment, a lot of loaded assemblies shall consist of 360 assemblies, maximum, inclusive of test samples. The homogeneity of inspection lots shall be retained as follows:

- a. Components were produced by homogeneous process
- b. Units are loaded with same lot of rocket motors (see 6.4.10).

4.5.2.2 Sampling for examination. Designation of defects (critical, major, and minor) shall be in accordance with WR-43.

- a. Critical and major defects: Each rocket catapult assembly shall be examined for all critical and major defects.
- b. Minor defects: Samples for examination shall be selected in accordance with inspection level II of MIL-STD-105.

* 4.5.2.3 Sampling for static firing test. A sample of 21 loaded rocket catapult assemblies shall be submitted to the Naval Ordnance Station, Indian Head, Maryland 20640, for static firing in accordance with 4.5.5. Samples shall be chosen by Naval Ordnance Station, Indian Head, Maryland, personnel or by a designated Government representative upon completion of the production lot assembly. Loaded rocket catapult samples shall not be preselected during production. Rocket catapults selected for samples shall not be included as a part of the quantity specified for delivery in the contract or order. Only primary components from a single primary component lot shall be used in a production lot of loaded rocket catapults. One primary component lot may be used in more than one loaded rocket catapult production lot. The ballistic sample size shall be divided as equally as possible among rocket motor batches. From each rocket motor batch not represented in the 21 sample rocket catapult assemblies, one sample rocket motor shall be selected for static firing by the contractor (see 4.5.5.1), so that at least one rocket motor from each rocket motor batch has been static fired.

4.5.2.4 Sampling for non-destructive test. Each rocket catapult assembly shall be subjected to the tests specified in 4.5.6.

4.5.2.5 Sampling for shear pin test. A sample of 50 shear pins from each shear pin lot shall be subjected to the shear pin strength test of 4.5.7.

* 4.5.3 Resubmission of rejected CKU-5/A lot. A sample of 42 rocket catapult CKU-5/A assemblies shall be selected in accordance with 4.5.2.3 and submitted when, with prior approval of the procuring activity, the contractor requests that the rejected CKU-5/A lot be test fired under different conditions or the contractor believes a rejected lot may be reworked to meet the requirements of this specification.

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4.5.4 Examination.

4.5.4.1 Critical and major defects. Each rocket catapult assembly shall be visually examined for critical and major defects specified in 4.5.2.2 and the applicable drawings. Any rocket catapult assembly found to contain a critical or major defect shall be rejected.

4.5.4.2 Minor defects. Sample rocket catapult assemblies selected in accordance with 4.5.2.2.b shall be examined for minor defects in accordance with the applicable drawings, 3.9, 3.13 and 3.14. The acceptable quality level (AQL) shall be 2.5 defects per hundred units.

* 4.5.5 Static firing test. Rocket catapults selected in accordance with 4.5.2.3 shall be static fired at the Naval Ordnance Station, Indian Head, Maryland 20640 within 30 days after submission for acceptance of the rocket catapult lot. The sample catapults shall be divided into 3 equal groups and one group conditioned at each temperature specified in Table I for a minimum of 8 hours and static fired within 10 minutes after removal from the conditioning chamber. Data specified in Table I for the CKU-2/A and Table II for the CKU-5/A shall be analyzed in accordance with MIL-STD-414. Nonconformance with the Tables or any requirement of 3.4.1, shall be cause for rejection of the lot.

4.5.5.1 Contractor static firing test. Sample rocket motors selected by the contractor in accordance with 4.5.2.3 shall be static fired by the contractor as rocket motor batch acceptance tests. An equal number of motors shall be fired at each temperature: -65°F, +70°F and +165°F. Failure of any rocket motor to meet the requirements of 3.4 shall be cause for rejection of the specific batch of rocket motors.

4.5.5.2 Post static firing disassembly. A post firing disassembly of all contractor tested units shall be conducted by the project engineer. Detailed observations on conditions, including marginal conditions, of individual components shall be noted. When specified in the contract (see 6.2), a disassembly findings report shall be submitted to the procuring activity (see 6.3.2).

4.5.6 Non-destructive tests. Each rocket catapult assembly shall be subjected to the following tests. When specified in the contract (see 6.2), the contractor shall furnish test reports detailing the results of all non-destructive tests for each lot of rocket catapults.

4.5.6.1 Radiographic inspection. Rocket catapults shall be radiographically inspected in accordance with MIL-STD-453, radiographic quality level 1. Any deficiency shall be cause for rejection of the unit. Radiographs shall be capable of detecting defects and rocket catapult components 0.03 inch

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in length or width, whichever is smaller. If all components cannot be shown using standard radiographic techniques, neutron radiography shall be employed to show these components. When specified in the contract (see 6.2), all radiographs taken of the rocket catapult assembly or components thereof shall be forwarded to the activity designated by the procuring activity. Otherwise, all radiographs shall be inspected on-site by a designated Government representative. Acceptance of the loaded rocket catapult lot shall be subject to approval of the radiographs by the designated Government activity.

- * 4.5.6.2 Hydrostatic pressure. Each component listed shall be subjected to the respective internal hydrostatic pressure specified in Table III for a minimum of 15 seconds without application of an external load. Any leakage, a permanent deformation, or mechanical failure shall result in rejection of the rocket catapult assembly containing that component. Each hydrostatically tested component shall then be subjected to magnetic particle, penetrant or radiographic inspection as specified, per 4.5.6.3, 4.5.6.4 and 4.5.6.4.1. Defective components may be replaced by acceptable components and the rocket catapult retested for acceptance.

4.5.6.3 Magnetic particle inspection. Each motor tube and booster tube shall be 100 percent magnetic particle inspected in accordance with MIL-I-6868. Any defect shall result in rejection of the defective part.

4.5.6.4 Penetrant inspection. Each launcher tube and breech assembly shall be 100 percent penetrant inspected in accordance with MIL-I-6866. Any defect shall result in rejection of the defective part.

- * 4.5.6.4.1 Radiographic inspection. In lieu of penetrant inspection per 4.5.6.4, the breech may be radiographically inspected in accordance with MIL-STD-453.

4.5.6.5 Torque. After ascertaining that each booster tube and breech assembly has been seated with 400 ± 50 , -0 inch-pounds of torque, a break-away torque of 200 inch-pounds shall be applied. Any evidence of loosening or deformation of the booster tube and breech assembly shall result in rejection of the part.

4.5.6.6 Residual magnetism. Each rocket catapult assembly shall be passed 6 inches in front of an MS 17983 compass along the entire length of the catapult in accordance with Figure 1. If the compass indicator deflects more than 5° in either direction, the rocket catapult assembly shall be rejected.

* 4.5.7 Shear pin test. A load shall be applied at a rate of 0.125 inches per minute to each sample shear pin selected in accordance with 4.5.2.5. If any shear pin fails to shear at 58 - 63 lbs (double shear), the entire lot of shear pins shall be rejected and no pin from that lot shall be used in any catapult assembly.

* 4.6 Measuring and test equipment. The supplier shall provide for the selection, evaluation, approval, maintenance and control of all inspection standards, gages, measuring and test equipment necessary to determine conformance to this specification.

* 4.7 Instrumentation accuracy. Unless otherwise specified, the test instrumentation system shall be such as to yield data of the following accuracy. The percentage figures represent the limits of error expressed in percent of the expected maximum value.

- a. Temperature $\pm 2^{\circ}\text{F}$
- b. Barometric pressure $\pm 5\%$
- c. Pressure $\pm 5\%$
- d. Time $\pm 5\%$ for functional tests

4.8 Packaging inspection. The packaging, packing and marking shall be inspected to verify conformance with the requirements of Section 5.

5. PACKAGING

5.1 Preservation, packaging and packing. Unless otherwise specified in the contract (see 6.2), preservation, packaging, and packing shall be level A.

* 5.1.1 Level A. Preservation, packaging and packing shall be in accordance with drawings 5184311 and 5184312 for the CKU-2/A and drawings listed on DL 1174395 for the CKU-5/A and MIL-P-116. Containers shall conform to Uniform Freight Classification, National Motor Freight Classification, or to rules of other carriers applicable to the mode of transportation.

* 5.2 Marking. In addition to any special markings required by the contract (see 6.2), each container shall be marked in accordance with MIL-STD-129, drawings 5184311 and 5184312 for the CKU-2/A and drawings listed on DL 1174395 for the CKU-5/A, and 49 CFR 171-179 (see 6.8.1).

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6. NOTES

6.1 Intended use. These aircraft ejection seat catapult assemblies are intended to be used to propel an aircraft ejection seat and its occupant safely out and away from a jet aircraft.

6.2 Ordering data. Procurement documents should specify the following:

6.2.1 Procurement requirements.

- a. Title, number and date of this specification
- b. Quantity required (exclusive of first article and static firing test samples) (see 4.4 and 4.5.2.3)
- c. When a first article sample is not required (see 3.1, 4.4 and 6.5)
- d. Instructions for adaption of first article samples for pressure transducers (see 3.1.1 and 6.6)
- e. Assigned activity for first article inspection and static firing tests (see 4.4, 4.5.2.3, 4.5.5 and 6.7)
- f. Whether the gunfire vibration test is required (see 4.4.2.1)
- g. Packaging requirements if other than level A (see 5.1)
- h. Any special markings required (see 5.2 and 6.8.1)
- i. Safety precautions (see 6.8)
- j. Disposition of hardware, scrap propellant and metal parts (see 6.9)
- k. Whether the radiographs are to be retained on file by the contractor (see 4.5.6.1 and 6.10)
- l. Inspection conditions if other than as specified (see 4.3).
- * m. Whether a post firing disassembly findings report is required (see 4.5.5.2)

* 6.2.2 Contract data requirements. The items of deliverable data required by this specification are cited in the following paragraphs:

<u>Paragraph</u>	<u>Data Requirement</u>	<u>Applicable DID *</u>
4.5.1	Test Report	DI-T-5247
4.5.1	Ammunition Data Card	DI-L-1410
4.5.6	Non-destructive Test Report	UDI-T-23729
4.5.6.1	Radiographs	DI-T-2072

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*DID's (Data Item Descriptions/DD Forms 1664) for the above data requirement are documented in the applicable ADL (Authorized Data List). Such data will be delivered as identified on completed (numbered) DID's when specified on DD Forms 1423 (Contract Data Requirements Lists) and incorporated into applicable contracts.

6.3 Description of data. The following paragraphs are a description of data to be included in test reports per 4.5.1 when specified in the contract (see 6.2.2).

* 6.3.1 Propellant description. The following propellant information should be submitted with each production lot. The materials and components of each propellant batch should be listed with the manufacturer, lot number, and date of manufacture. The burning rates at 1000, 2500 and 4000 psi for the CKU-2/A propellant and 500, 1000, and 1500 psi for the CKU-5/A propellant, performed at -65°, 70° and 165°F for each pressure (three samples at each temperature and pressure per mix) should also be included. In addition, include the results of tensile strength and elongation tests at -65°, 70° and 165°F with a pull rate of 2 inches/minute (three samples at each temperature per mix), heat of explosion (3 samples per mix), and differential thermal analysis from -100°F to ignition for the CKU-5/A propellant only, and verification that ingredients were properly weighed and added to each mix (mix sheet(s)).

6.3.2 Static firing performance tests. All computations and data required for ballistics evaluation, generated during quality conformance inspection static firings per 4.5.5 (Government) and 4.5.5.1 (contractor) shall be reported including firing traces. The following information shall also be listed:

- a. Grain designation, manufacturer, lot number, and date of propellant manufacture
- b. Type of test equipment
- c. Deviations from standard testing procedures
- d. Additional comments (malfunctions, unusual occurrences)
- e. Disassembly findings report (see 4.5.5.2).

* 6.3.3 Summary sheet. A summary of the results of the tests for the parameters listed in Table I or Table II as applicable, shall be submitted to the designated Government activity for each inspection lot. The summary shall include the sample size, number and nature of defects found, and the disposition (accepted or rejected).

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6.3.4 Data cards. Data cards (DD form 1650) shall be completed for each loaded rocket catapult lot. Copies shall be provided in accordance with contract requirements and one copy shall be forwarded to the Commanding Officer, Naval Ordnance Station, Indian Head, MD 20640 (Code 5152).

6.3.5 Propellant/assembly production records. The contractor shall prepare and retain for the service life of the unit, propellant production records including batch number, mix designation, rocket motor lot number, rocket motor serial number, cartridge lot number, and cartridge serial number. These shall be cross referenced to the assembled rocket catapult lot number and to specific rocket catapult serial numbers.

6.4 Definitions.

6.4.1 Rocket motor resultant impulse. The rocket motor resultant impulse is obtained by vectorially adding the longitudinal and normal impulse of the rocket motor taken over the action time.

6.4.2 Rocket motor action time. Action time is determined from the normal thrust time curve, and shall be defined as the time interval from the 10 percent of maximum thrust on the initial rise of curve to the corresponding 10 percent of thrust on the declining portion of the curve.

6.4.3 Rocket motor resultant thrust. The rocket motor resultant thrust is obtained by vectorially adding the two maximum components of rocket thrust that occur at one time.

6.4.4 Rocket motor ignition delay time. Rocket motor ignition delay time is the elapsed time from separation (the point on the catapult thrust trace where the trace begins to drop sharply) to 10 percent of maximum thrust, as measured on the rising portion of the normal component rocket thrust trace.

6.4.5 Catapult ignition delay time. Catapult ignition delay time is the elapsed time from the shearing of the firing pin shear pin to first indication of catapult thrust.

* 6.4.6 Catapult separation velocity. Catapult separation velocity is defined as the average velocity of the simulated ejected weight propelled horizontally at catapult separation measured over the interval from separation to 12 inches after separation.

6.4.7 Catapult dynamic response index - (DRI). DRI is representative of the maximum dynamic compression of the vertebral column of the human body, as defined in MIL-S-9479.

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6.4.8 Propellant batch. A propellant batch is a mix in which each ingredient is composed entirely of one homogeneous lot.

6.4.9 Rocket motor batch. A rocket motor batch is a group of rocket motors cast from one propellant batch.

6.4.10 Rocket motor lot. A rocket motor lot is a group of rocket motors composed of one or more rocket motor batches all having the same ingredients lots.

6.4.11 Rocket catapult lot. A rocket catapult lot is a group of units composed of one lot of rocket motors, one lot of metal parts and one lot of catapult cartridges.

6.4.12 Primary components. Primary components are all components containing explosive ingredients. This includes the cartridge percussion primers, the cartridge, the rocket motor, and the rocket motor igniter(s).

6.5 First article sample waiver. First article samples submitted and approved on a recent contract (a contract remaining in production or a contract out of production for less than one year) may be accepted by the procuring activity in lieu of an additional first article inspection. When the first article sample is waived (see 6.2.1(c)), the procurement document should contain a statement specifying that the standards of workmanship exhibited by the previously approved first article sample shall determine the minimum requirements of the current contract.

6.6 Pressure transducers. Instructions for adaption of first article catapult assemblies for pressure transducers should be compatible with instrumentation that has a response of not less than 600 Hz and that is capable of detecting ignition peak pressures and unstable burning rates.

* 6.7 Test facility for first article inspection. The Naval Ordnance Station, Indian Head has been designated as the test facility for the first article inspection and the static firing tests (see 6.2.1(e)).

6.8 Safety precautions. The safety precaution requirements of the "Contractors' Safety Manual for Ammunition, Explosives, and Related Dangerous Material" (DOD 4145.26M) are applicable and should be specified in the contract as required by the Defense Acquisition Regulations (DAR) 1-323.

NOTE: When this specification is used as part of the description of work to be accomplished by a Government activity, the safety precaution requirements of "Ammunition and Explosives Ashore" (OP 5) should be made applicable.

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6.8.1 Explosive hazard classification. The explosive hazard classification for this rocket catapult has been designated as:

Explosive Hazard Classification - Class 2

Storage Compatibility Group - Group J

Department of Transportation (DOT) Hazard Class - C1 B

DOT Marking - Propellant Explosive

6.8.2 Hazard notice. The rocket catapult described herein is flammable and/or explosive and consequently presents a hazard in manufacture, handling, storage and shipment. The contractor should recognize this hazard and take appropriate measures to guard and protect against fire, explosion, adverse environment, corrosive atmosphere, rough handling and electrically-induced incidence.

6.9 Disposition of hardware, scrap propellant, and metal parts. The contract should specify that all items purchased become the property of the U.S. Government; no hardware, propellant, or metal parts acceptable, scrapped, or tested should be disposed of without authorization of the procuring activity; all items should be made available to the procuring activity upon request; and that the disposal of any tested hardware, propellant, or metal parts without authorization by the procuring activity will result in the test being declared invalid, and a retests will be required.

6.10 Retention of radiographs. The contract should specify that all radiographs of accepted lots of rocket catapults, which are not forwarded to the Government, be retained on file by the contractor for 7 years or 1 year past the service life of the unit, whichever is longer.

6.11 Life. The rocket catapult has a design life of 7 years with an installed service life of 5 years from the date of propellant manufacture.

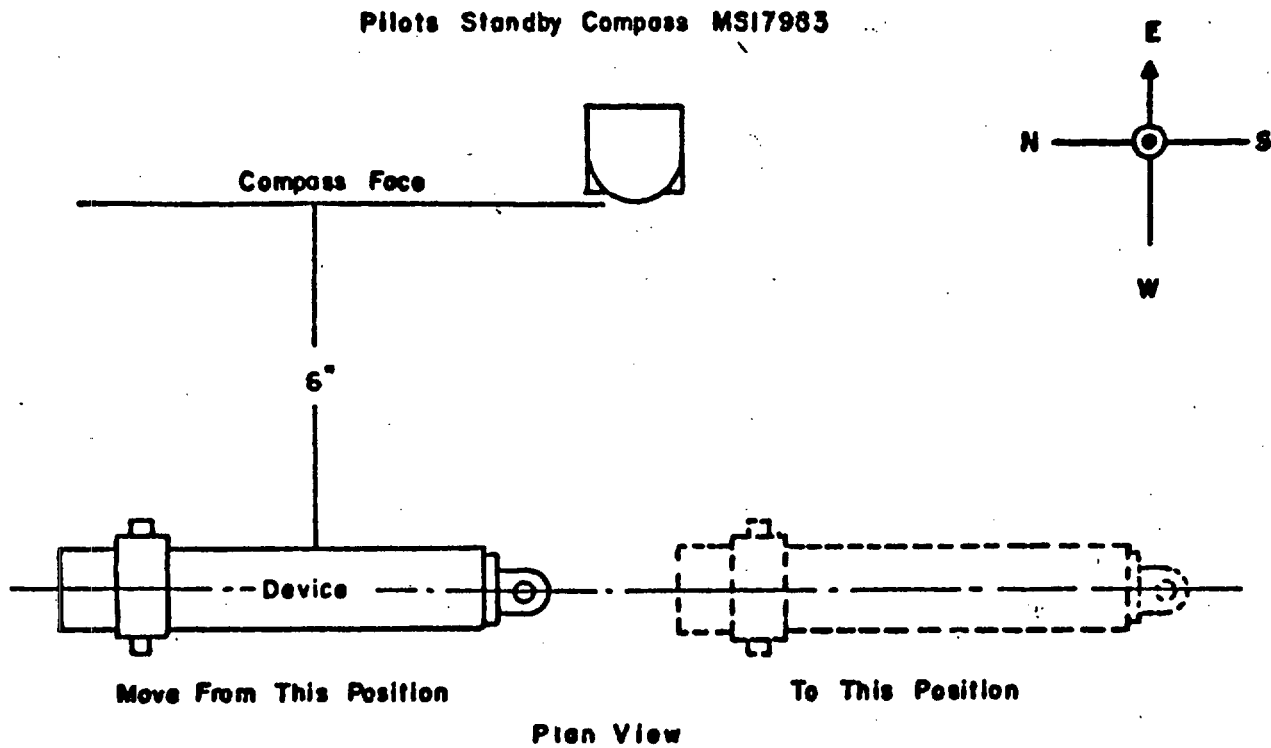
* 6.12 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for 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.

Custodian:
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Project Number:
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Note: Device and Compass Shall Lie in a
Common Horizontal Plane

FIGURE 1. Layout for Determination of Residual Magnetism in Device.