

25 February 1969

**MILITARY SPECIFICATION
CATAPULT, AIRCRAFT EJECTION SEAT: XM37 ASSEMBLY**

1. SCOPE

1.1 This specification covers Catapult, Aircraft Ejection Seat: XM37 Assembly for use in conjunction with other propellant actuated devices in aircrew emergency escape systems.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS**Military**

MIL-A-2550

- Ammunition and Special Weapons, General Specification for

STANDARDS**Military**

MIL-STD-105

- Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-109

- Quality Assurance Terms and Definitions

MS-28741

- Hose Assembly-Detachable End Fitting, Medium Pressure

DRAWINGS**Munitions Command**

F10551840

- Catapult, Aircraft Ejection Seat, XM37, Assembly
- Container, Ammunition, Fiber, M424 for Catapult, M9

C8826679

C8826680

- Box, Packing, Ammunition, for Catapult, M9 in Fiber Container, M424

IEL-10551840

- Inspection Equipment List for Catapult, Aircraft Ejection Seat, XM37 Assembly

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

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3. REQUIREMENTS

3.1 General.- Materials, parts and assemblies shall comply with the requirements specified on the applicable drawings, referenced specifications and the following:

3.2 Torque.- Torque shall be as specified in Table I. No loosening or deformation shall occur upon application of the breakaway torque.

Table I

<u>Components</u>	<u>Seating or Bottoming (Inch-Pounds)</u>	<u>Breakaway (Inch-Pounds) (Minimum)</u>
Breech, Launcher and Tube, Launcher	500 + 50	400
Trunnion and Tube, Launcher	400 + 50	200
	(Applied between trunnion and motor tube head)	

3.3 Residual magnetism.- The assembled catapult shall not deflect the indicator of the compass more than 3 degrees in either direction when passed in front of the compass at a distance of 6 inches.

3.4 Functional.

3.4.1 Ballistics.- The catapult, loaded with acceptable explosive components, shall function without mechanical failure (see 6.2).

3.4.1.1 Booster section.- The booster section shall propel a 350 pound mass and shall comply with the requirements of Table II.

3.4.1.2 Rocket section.- The rocket section shall comply with the requirements of Table III.

3.4.1.3 Initiation.- The catapult shall be fired by a source delivering an output equal to that of an M3A1 Initiator at the end of 10 feet of aircraft hose, size no. 4, MS 28741, at $70^{\circ} \pm 5^{\circ}\text{F}$.

Table IIBooster Section

<u>Temperature</u>	<u>Acceleration Max.</u>	<u>Rate of Change of Acceleration Max. (see 6.4)</u>	<u>Launch Time Max. (see 6.5)</u>	<u>Acceleration- Time Integral Min. (see 6.6)</u>	<u>Catapult Ignition Delay Max. (see 6.3)</u>
-65° to -70°F	20.0g	300 g/sec	240 millisecond.	0.8 g.sec	60 millisecond.
65° to 75°F	20.0g	350 g/sec	190 millisecond.	1.0 g.sec	60 millisecond.
160° to 165°F	20.0g	450 g/sec	170 millisecond.	1.2 g.sec	60 millisecond.

Table IIIRocket Section

<u>Temperature</u>	<u>Pressure Max. (psi)</u>	<u>Action Time Max. (see 6.8)</u>	<u>Pressure-Time Integral, Min. (see 6.9)</u>	<u>Rocket Ignition Delay Max. (see 6.7)</u>
-65° to -70°F	4600	475 millisecond.	550 psi.sec.	50 millisecond.
65° to 75°F	4600	400 millisecond.	550 psi.sec.	12 millisecond.
160° to 165°F	4600	350 millisecond.	550 psi.sec.	12 millisecond.

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3.5 Workmanship.- The requirements for workmanship are as specified on the applicable drawings, referenced specifications and the following:

3.5.1 Metal defects.- All components shall be free from cracks, splits, cold shuts, inclusions, porosity or any similar defect.

3.5.2 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.

3.5.3 Foreign matter.- No part or assembly shall contain chips, dirt, grease, rust, corrosion or other foreign matter.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.- Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Quality assurance terms and definitions.- Reference shall be made to MIL-STD-109 to define quality assurance terms used.

4.1.2 Inspection.- Inspection shall be in accordance with MIL-A-2550 except as specified herein.

4.2 Inspection provisions.

4.2.1 Lot.

4.2.1.1 Submittal of product.- The product shall be submitted in accordance with MIL-STD-105.

4.2.1.2 Size of lot.- A lot shall consist of an identifiable group of assembled units containing metal parts assemblies produced by a homogeneous process and loaded with accepted cartridges.

4.2.2 Examination.- One hundred percent examination shall be performed for all critical defects. Examination for major and minor defects shall be performed on a defect basis in accordance with the classification of defects contained herein, using the sampling plan and associated criteria in Table IV. The total number of allowable defects per class for either the major or minor classification shall not exceed the acceptance number of Table IV. All non-conforming material shall be rejected. Four power (4X) magnification may be used in performing visual examination for such defects as burr and foreign matter.

Table IV

<u>Lot Size</u>	<u>Sample Size</u>	<u>Major</u>		<u>Minor</u>	
		<u>Accept</u>	<u>Reject</u>	<u>Accept</u>	<u>Reject</u>
1 - 300	100% Examination				
301 - 800	50	0	1	1	2
801 - 1800	90	1	2	2	3
1801 - 10000	200	2	3	3	4

4.2.2.1 Igniter, Primary Assembly, Dwg. F10524201, covering a detail of Dwg. F10551840.

<u>Defect</u>	<u>Method of Inspection</u>
CRITICAL	
1. Metal defective	Visual
2. Primer missing	Visual
3. Mixed lots of igniters	Visual
4. Marking missing, incorrect or illegible	Visual

MAJOR

101. Primer pocket not sealed	Visual
102. Burr	Visual
103. Foreign matter	Visual

MINOR

None defined

4.2.2.2 Igniter, Auxiliary Assembly, Dwg. D8596874, covering a detail of Dwg. F10551840.

CRITICAL

1. Igniter composition missing or loose	Manual & Visual
2. Mixed lots of auxiliary igniters	Visual
3. Marking missing, incorrect or illegible	Visual
4. Metal defective	Visual

MAJOR

101. Burr	Visual
102. Foreign matter	Visual

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4.2.2.2 (Cont'd)

DefectMethod of Inspection

MINOR

201. Varnish missing or inadequate	Visual
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4.2.2.3 Holder, Strip, Loaded, Assembly, Dwg. F8596873, covering a detail of Dwg. F10551840.

CRITICAL

1. Propellant missing or loose	Manual & Visual
2. Cable, ball missing or improperly assembled	Visual

MAJOR

101. Burr	Visual
102. Foreign matter	Visual

MINOR

None defined

4.2.2.4 Grain, Propellant Inhibited, Dwg. F8597595, covering a detail of Dwg. F10551840.

CRITICAL

1. End inhibitors missing or loose	Visual
2. Inhibited grain damaged	Visual
3. Wrapping loose	Visual
4. Voids in wrapping	Visual

MAJOR

101. Foreign matter	Visual
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MINOR

None defined

4.2.2.5 Assembly, Dwg. F10551840, less all Dwgs. except F8596873, F8596902 and Standards MS-16997-30, MS-29513-19, and MS-35337-42.

<u>Defect</u>	<u>Method of Inspection</u>
CRITICAL	
1. Improper assembly	Visual
2. Any part missing	Visual
MAJOR	
101. Piston slider valve not attached to holder strip on same side as propellant	Visual
102. Burr	Visual
103. Foreign matter	Visual
MINOR	
201. Sealing compound missing from thread	Visual

4.2.2.6 Assembly, Dwg. F10551840 less all Dwgs. except F8596873, D8596874, F8596893, F8596901, F8596902, C8596903, B8596908, D8596916, C8597664, A8597934, F10524201 and Standards MS-16631-1150, MS-16997-30, MS-29513-19, MS29513-228 and MS-35337-42.

CRITICAL	
1. Improper assembly	Visual
2. Any part missing	Visual
MAJOR	
101. Length from face of cylinder to face of grain collar	Measure
102. Burr	Visual
103. Foreign matter	Visual
MINOR	
None defined	

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4.2.2.7 Assembly, Dwg. F10551840, less all Dwgs. except F10551837 and Standards MS-29513-228 and MS-29513-230.

DefectMethod of Inspection

CRITICAL

- | | |
|---------------------------------|-----------------|
| 1. Improper assembly | Visual |
| 2. "O" ring missing | Visual |
| 3. Nozzle cups missing or loose | Manual & Visual |

MAJOR

- | | |
|---------------------|--------|
| 101. Burr | Visual |
| 102. Foreign matter | Visual |

MINOR

None defined

4.2.2.8 Assembly, Dwg. F10551840, less all Dwgs. except F8596873, D8596874, F10524201, F8596893, F8596901, F8596902, C8596903, F10551837, B8596908, D8596916, F8596917, D8596919, D8597584, F8597595, C8597664, A8597934, F8597935, F8597936 and Standards MS-16631-1150, MS-16997-30, MS-29513-19, MS-29513-228, MS-29513-230, MS-35337-42 and MS-51017-35.

CRITICAL

- | | |
|----------------------|--------|
| 1. Improper assembly | Visual |
| 2. Any part missing | Visual |

MAJOR

- | | |
|--|--------|
| 101. "O" ring damaged | Visual |
| 102. Locking wire damaged, twisted or kinked | Visual |
| 103. Burr | Visual |
| 104. Foreign matter | Visual |

MINOR

None defined

4.2.2.9 Assembly, Dwg. F10551840 less Dwgs. A8593299, D8596909, C8596910, C8596915, D8596918, F8596904, F8597936 and Standards MS-29513-12, MS-29513-18 and AN565C8H3.

<u>Defect</u>	<u>Method of Inspection</u>
CRITICAL	
1. Cable ball not secured in holder on can	Visual
2. Improper assembly	Visual
3. Any part missing	Visual

MAJOR

None defined

MINOR

None defined

4.2.2.10 Assembly, Dwg. F10551840, less all Dwgs. except A8593299, F8596904, D8596909, C8596910, C8596915, F8597936 and Standards MS-29513-12, and MS-29513-18.

CRITICAL

1. Improper assembly	Visual
2. Any part missing	Visual
3. Gas port obstructed	Visual

MAJOR

101. Burr	Visual
102. Foreign matter	Visual

MINOR

201. Shipping plug missing	Visual
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4.2.2.11 Assembly, Dwg. F10551840.

CRITICAL

1. Improper assembly	Visual
2. Labels missing, incorrect or illegible	Visual

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4.2.2.11 (Cont'd)
DefectMethod of Inspection

MAJOR

101. Centerline of lugs not aligned with mounting hole in head	Gage
102. Length from centerline of mounting hole to centerline of lugs	Gage
103. Lead seal and wire assembly missing or improperly assembled	Visual

MINOR

201. Location of labels, incorrect	Visual
202. Varnish missing or inadequate	Visual

4.2.2.12 Container, Ammunition, Fiber, M424 for Catapult, M9, Dwg. C8826679.

CRITICAL

None defined

MAJOR

None defined

MINOR

201. Gap between body and cover, max.	Manual
202. Contents loose	Manual
203. Metal ends loose or distorted	Manual
204. Cut or damaged through all impregnated layers	Visual
205. Marking missing, incorrect or illegible	Visual
206. Tape incomplete or badly wrinkled	Visual
207. Length of tear tab, min.	Visual
208. Color of tape incorrect	Visual

4.2.2.13 Box, Packing, Ammunition, for Catapult, M9 in Fiber Container, M424, Dwg. C8826680.

CRITICAL

None defined

4.2.2.13 (Cont'd)
Defect

Method of Inspection

MAJOR

None defined

MINOR

201. Contents loose	Manual
202. Hardware missing, loose, broken or improperly engaged	Visual & Manual
203. Strapping missing, loose, broken or improperly assembled	Visual & Manual
204. Contents of box exposed	Visual
205. Box damaged	Visual
206. Marking missing, incorrect or illegible	Visual
207. Number of units incorrect	Visual
208. Car seal missing, unsealed or improperly positioned	Visual

4.2.3 Inspection testing.- The following tests shall be performed in accordance with 4.3.

4.2.3.1 Breakaway torque.- A breakaway torque shall be applied to each catapult threaded joint in 3.2. Failure of any catapult to comply with the requirement of 3.2, Table I shall be cause for rejection of the catapult.

4.2.3.2 "O" ring security.- Each sub-assembly consisting of valve shear pins (8596901), slider valve piston (8596902), slider valve cylinder and booster tube assembly (8596893), loaded strip holder assembly (8596873), "O" rings (MS-29513-19), cap screws (MS-16997-30) and washers (MS-35337-42) shall be subjected to the nitrogen gas test to determine that the "O" rings are properly installed and undamaged. Any sub-assembly showing evidence of leakage shall be cause for rejection of the sub-assembly.

4.2.3.3 Residual magnetism.- Each catapult shall be tested for excessive residual magnetism. Failure of any catapult to comply with the requirements of 3.3 shall be cause for rejection of the catapult.

4.2.3.4 Functional.- The following tests shall be performed by the Government:

4.2.3.4.1 Ballistics.- Twenty-one units shall be tested to determine compliance with the requirements of 3.4. The units shall be temperature conditioned as provided in Table V and 4.3.4.1.1. Failure of any unit to comply with 3.4 and Tables II and III shall be cause for rejection of the lot.

Table V

<u>Temperature</u>	<u>Sample Size</u>
-65° to -70°F	7
65° to 75°F	7
160° to 165°F	7

4.2.4 Inspection equipment.- The examination and tests shall be made using equipment listed on IEL-10551840.

4.3 Test methods and procedures.

4.3.1 Breakaway torque.- A torque wrench set at the torque requirements specified in 3.2, Table I shall be used to determine the adequacy of the joints. The assembly shall be secured in the fixture prior to application of the torque.

4.3.2 "O" ring security.- The sub-assembly shall be mounted in the device, using the fixture for properly sealing all openings. Nitrogen gas shall be injected to a pressure of 200 psi, minimum, and held for 15 seconds, minimum, to determine security of the "O" ring seals.

4.3.3 Residual magnetism.- The catapult shall be tested for excessive residual magnetism in an area free of local magnetic effects by placing the catapult 6 inches from, and at the same height as the compass in a north-south horizontal position with the compass set in an east-west heading. The catapult shall be moved slowly past the compass in a longitudinal direction for its entire length, rotated 180 degrees in the horizontal position and moved slowly back past the compass.

4.3.4 Functional

4.3.4.1 Ballistics.- The test sample shall be rigidly supported in the fixture. The sample shall be tested within 10 minutes after removal from the temperature conditioning chamber. When this time limit is exceeded, the sample units shall be reconditioned at the original temperatures.

4.3.4.1.1 Temperature conditioning.- Prior to conducting the ballistic test specified in 4.3.4.1, the Catapult samples shall be subjected to the temperature condition specified in Table V. A simulated Catapult loaded with a dummy cartridge containing a temperature sensitive element shall be placed in the temperature conditioning chamber at the same time as the Catapult samples. The conditioning time shall be a minimum of one hour longer than the time necessary to bring the element contained in the dummy cartridge to the required temperature.

4.3.4.2 Method of testing.- The catapult shall be initiated by a M3A1 Initiator or simulated method to determine compliance with 3.4 and Tables II and III. The head of the catapult shall be statically supported and the weight shall be attached to the mounting lugs of the launcher and allowed to move freely. A 30 cps accelerometer shall be mounted on the mass to obtain the performance curve of the booster section. The head shall be fitted with a pressure cell to obtain the performance curve of the rocket section.

5. PREPARATION FOR DELIVERY

5.1 Packing and marking.- Packing and marking shall be in accordance with Drawings C8826679 and C8826680, except that marking requirements shall refer to the Catapult XM37.

5.2 Data cards.- Data card information shall be in accordance with MIL-STD-1167.

6. NOTES

6.1 Ordering data.- Procurement documents should specify the title, number and date of this specification.

6.2 A "mechanical failure" is defined as any deformation or breakage of a part, the occurrence of which is other than a design function.

6.3 "Catapult ignition delay" is defined as the time that elapses between the firing of the catapult primer (t_0) and the beginning of the continuous rise (t_1) on the acceleration time record (see Figure 1).

6.4 "Rate of change of acceleration" is defined as the maximum positive slope of the acceleration-time record measured over any 30 milliseconds between the continuous rise (t_1) and the maximum acceleration on the acceleration-time record (see Figure 1).

6.5 "Launch time" is defined as the time between the beginning of the continuous rise (t_1) and the sudden drop (t_2) on the acceleration-time record (see Figure 1).

6.6 "Acceleration-time integral" is defined as the area under the acceleration-time record bounded by the "launch-time" limits (see Figure 1).

6.7 "Rocket ignition delay" is defined as the time between the sudden drop (t_2) on the acceleration-time record of the booster section and the point at which the pressure-time record of the rocket section reaches 500 psi (t_3) (see Figure 1).

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6.8 "Action time" is defined as the time between the points where the pressure reaches 500 psi (t_3) at the start of burning and the point where the pressure falls below 1000 psi (t_4) at the end of burning on the pressure-time record (see Figure 1).

6.9 "Pressure-time integral" is defined as the area under the pressure-time record bounded by the action time limits (see Figure 1).

Custodian:

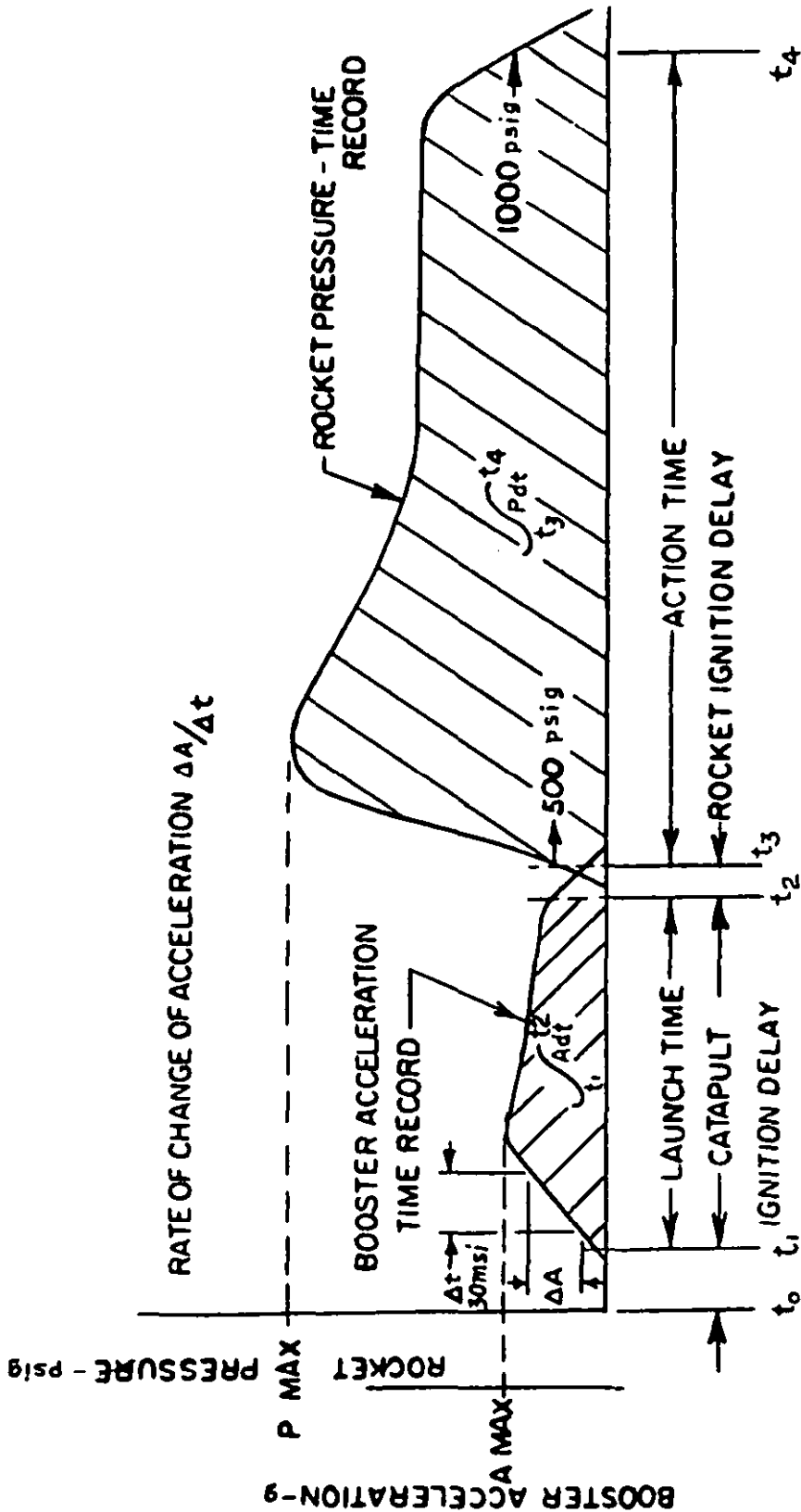
Army - MU

Preparing activity:

Army - MU

Project No. 1377-A332.

TYPICAL ROCKET CATAPULT PERFORMANCE CURVES



TIME - MILLISECONDS

FIGURE 1

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 22-R255

INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

DIRECT GOVERNMENT CONTRACT

SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

YES NO (If "yes", in what way?)

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)

SUBMITTED BY (Printed or typed name and activity - Optional)

DATE

DD FORM 1426
1 JAN 66

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.