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MIL-S-81771A(AS)
AMENDMENT 1
30 APRIL 1991

MILITARY SPECIFICATION
SEAT SYSTEM; AIRCREW, CRASH RESISTANT;
GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-S-81771A(AS), dated 30 April 1975, and 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.

The attached insertable replacement pages listed below are replacements for stipulated pages. When the new pages have been entered in the document, insert the amendment as the cover sheet to the specification.

Replacement Page	Page Replaced
3	3
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PAGE 1

Title: Delete "Seats; Aircrew, Adjustable, Aircraft;" and insert "Seat System; Aircrew, Crash Resistant;" instead.

Paragraph 1.1: Delete "two types of" and insert "crash resistant," Delete "adjustable" in the second line. Delete "adjustable" in the third line and insert "crash resistant."

Paragraph 2.1: Under Specifications, Federal, Delete: QQ-Z-325 Zinc Coating Electrodeposited, Requirements For

Page 2

Paragraph 2.1: Under Specifications, Military, Delete the following:

MIL-C-6021	Casting, Classification and Inspection of
MIL-W-8604	Welding of Aluminum Alloys, Process for
MIL-W-45205	Welding Alloys, Readily Weldable for Structures, Excluding Armor.

PAGE 9

Paragraph 3.8e: Delete.

Paragraph 3.8: Delete "The specified loads and tests specified in Section 4." and substitute "Normal flight or crash impact loads."

Paragraph 3.8.1: In the third line, delete "3rd through 98th percentile" and insert "as specified in paragraph 3.7" between "aircrewmember" and "while."

Paragraph 3.8.1c: Delete "back type parachute or."

Paragraph 3.8.1.1: Delete "(if applicable)." Delete "3rd through 98th percentile" and insert "as specified in paragraph 3.7" between "aircrewmembers" and "wearing."

Paragraph 3.8.1.1: Delete "Section 4" and substitute "Table I (a)".

PAGE 10

Figure 1: Delete "or parachute" in Note 1 and in the drawing. Delete "by 98th percentile in the drawing.

PAGE 11

Paragraph 3.8.1.3: Delete "or parachute" in the first line, "either" and "or back type parachute" in the second line and all after the second line. Add "as specified in paragraph 3.8.4.2" after "cushion" in the second line.

Paragraph 3.8.1.4.3: Delete "98th percentile" and add "as specified in paragraph 3.7." after "crewmember."

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Paragraph 3.8.1.4.4: Add "The force required to operate the levers shall not exceed 30 pounds.", at the end of the paragraph.

Paragraph 3.8.1.4.6: Delete "preferably."

Paragraph 3.8.1.4.8: Delete "When subjected to the operational cycle and functional tests as specified in Section 4,". Delete "The specific load" and insert "A load not to exceed 30 pounds."

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TABLE III: Add a 2/ in the "Sample Size" and "Acceptance Criteria", and a note 2/ after the Table "2/ The Inspection Levels and Acceptance Criteria are as defined in MIL-STD-105."

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

Preparing Activity:
NAVY-AS
(Project No. 1680-N585)

STANDARDS

Federal

FED-STD-191	Textile Test Methods
FED-STD-595	Color

Military

MIL-STD-22	Welded - Joint Designs
MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
* MIL-STD-210	Climatic Information to Determine Design and Test Requirements for Military Systems and Equipment
* MIL-STD-372	Welding Gas Metal-ARC, and Gas Tungsten-ARC, Aluminum Alloys, Readily Weldable for Structures, Excluding Armor
* MIL-STD-470	Maintainability Program for Systems and Equipment
MIL-STD-471	Maintainability Demonstration
* MIL-STD-756	Reliability Modeling and Prediction
MIL-STD-758	Reliability Program for Systems and Equipment Development and Production
MIL-STD-810	Environmental Test Methods
MIL-STD-838	Lubrication of Military Equipment
MIL-STD-889	Dissimilar Metals
* MIL-STD-970	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-1186	Cushioning, Anchoring, Bracing, Blocking, and Waterproofing, with Appropriate Test Methods
MIL-STD-1261	Welding Procedures for Constructional Steels
MIL-STD-1333	Aircrew Station Geometry for Military Aircraft

* MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
* MIL-STD-1629	Procedures for Performing a Failure Mode Effects and Criticality Analysis
* MIL-STD-2175	Castings, Classification and Inspection of
* MIL-STD-2219	Fusion Welding for Aerospace Applications

Military Handbook

MIL-HDBK-5	Metallic Materials and Elements for Aerospace Vehicle Structures

Code of Federal Regulations

* 14 CFR Parts 23.785, 25.785, and 25.835	Federal Aviation Regulations - Compartment Interiors

(When requesting any of the applicable documents, refer to both title and number. All requests should be made via the cognizant Government quality assurance representative. Copies of this specification and other unclassified specifications, standards and drawings required by contractors in connection with specific procurement functions should be obtained upon application to the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, Pennsylvania 19111-5094. All other documents should be obtained from the procuring activity or as directed by the contracting officer.)

* 2.2 Non-Government Publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues to documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
ASTM B 633 - Zinc Coating Electrodeposited, Requirements for

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187).

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)
J-211 - Instrumentation for Impact Test, Recommended Practice

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096)

Supersedes page 4 of MIL-S-81771A(AS) of 30 April 1975

* 2.3 Order of Precedence. In the event of a conflict between the text of this document and the references cited herein, 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 First Article. Unless otherwise specified (see 6.2), the seat furnished under this specification shall be a product which has been inspected and has passed the first article inspection in 4.3 through 4.3.2.

* 3.1.2 Subclassifications. In addition to the Type I and II classifications of paragraph 1.2, subclassifications as specified in 3.1.2.1, 3.1.2.2 and 3.1.2.3 shall also apply.

* 3.1.2.1 Class A: Rotary wing and other Vertical Take-Off and Landing (VTOL) Aircraft. Class A seats shall be in accordance with the requirements of this specification.

* 3.1.2.2 Class B: Fixed wing, lightweight aircraft. Class B seats shall be in accordance with this specification, except for paragraphs 3.8.2.1, 3.9.3.2 and 4.5.4.2 which deal with dynamic loads, and paragraphs 3.8.3.1 through 3.8.3.5, 3.9.3.1 and 4.5.4.1 which address static loads. In place of these requirements, the requirements of 14 CFR 23.785 shall be used, except that occupant weights used for static and dynamic testing shall remain as specified herein.

* 3.1.2.3 Class C: Fixed wing, transport category aircraft: Class C seats shall be in accordance with this specification, except for the paragraphs listed in paragraph 3.1.2.2. In place of those paragraphs, the requirements of 14 CFR 25.785 shall be used, except that occupant weights used for static and dynamic testing shall remain as specified herein.

* 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-978.

3.3 Selection of materials and standard parts. The selection of materials, standard parts, processes, corrosion protection, and design features significant in adequate corrosion behavior shall be in conformance with the requirements of the aircraft detail design specification.

3.3.1 Materials. Materials shall conform to applicable specifications and shall be as specified herein and on applicable drawings. Materials which are not covered by government specifications, or which are not specifically described herein, shall be of the best quality, of the lightest practicable weight, and suitable for the purpose intended, and shall be approved by the procuring activity. Particular care shall be given to close fitting parts in the choice of both materials and corrosion practices.

* 3.3.1.1 Metal parts. All metal parts shall be of the corrosion-resistant type or treated in a manner to render them resistant to corrosion. Unless suitably protected against electrolytic corrosion, dissimilar metals, as defined in MIL-STD-889, shall not be used in contact with each other. Riveted joints shall be designed in accordance with MIL-HDBK-5. Quality welding shall be in accordance with MIL-W-6873, MIL-STD-22, MIL-STD-372, MIL-STD-1261 and MIL-STD-2219.

3.3.1.1.1 Heat Treatment. Heat treatment of aluminum parts and steel parts shall be in conformance with MIL-H-6088 and MIL-H-6875, respectively.

* 3.3.1.1.2 Castings. Castings used in the seat system shall conform with the requirements of MIL-STD-2175.

3.3.1.2 Non-metallic components. Non-metallic components shall be designed to minimize deterioration caused by abrasion and/or exposure to sunlight, microorganisms, moisture, heat, fuel, hydraulic and lubricating oil and grease, and salt spray. Protection shall be provided for those non-metallic components, particularly nylon lines, for which strength degradation is associated.

* 3.3.1.3 Lubrication. Lubricants and lubrication practices shall conform to the requirements of MIL-STD-838. Lubricants shall function satisfactorily throughout the temperature range from -65 F to +200 F. Choice of lubricants shall (a) reduce the hazards to non-metallic escape system components, (b) reduce damage to finishes adjacent to location of lubricant application, and (c) eliminate the need for frequent relubrication by field maintenance activities. If relubrication is required, choice of lubricants and practices should be such that relubrication need be accomplished only during Scheduled Depot Level Maintenance (SDLM).

* 3.3.1.4 Hydraulic fluids. Hydraulic fluids used in the seats or seat system components shall function satisfactorily throughout the temperature range from -65 F to +200 F and shall be nonflammable, noncorrosive, nontoxic, and inorganic in nature and shall be approved by the procuring activity.

3.3.1.5 Fungus-proof materials. To the greatest extent practicable, the materials used in the seat system shall not be nutrients for fungi. If materials that are nutrients for fungi must be utilized, such materials shall be treated with a fungicidal agent approved by the Naval Air Systems Command.

3.3.2 Corrosion protection. Corrosion protective practices employed in the manufacture of the seats and seat components shall be in conformance with the MIL-F-7179 requirements for exterior surfaces.

3.3.2.1 Finishes. Protective coatings and finishes shall not crack, chip, or scale during normal service life, or in the herein specified extremes of atmospheric conditions. Surface treatments, coatings and finishes shall conform

to MIL-S-5002, except that all aluminum and aluminum alloy parts shall be anodized.

3.3.2.2 Anodizing. All aluminum and aluminum alloy parts, except those subject to wear, shall be anodized in accordance with MIL-A-8625, Type II anodic coating. Anodic coatings for all aluminum and aluminum alloy parts subject to wear shall conform to MIL-A-8625, Type III, except for parts which are expensive and would normally be reworked during overhaul. For these parts, chromium plating in accordance with QQ-C-320 shall be used.

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

* 3.3.2.3 Plating. Steel parts in contact with aluminum or aluminum alloys shall be cadmium plated in accordance with QQ-P-416, Type II, Class 1, or zinc plated in accordance with ASTM B633.

3.3.3 Flammability and toxicity.

* 3.3.3.1 Flammability. Materials in their finished condition shall satisfy FAR Part 25.853.

* 3.3.3.2 Toxic fumes. Materials which when burned or exposed to high temperatures, give off toxic fumes shall not be used.

* 3.4 Environmental requirements. The seat shall be designed to operate during and following exposure to the environmental conditions specified below:

a. Temperature: The seat energy absorbers shall function within the normal operating limits when the temperature is between -25 F and +200 F. They shall be capable of normal operation after cold soaking to -65 F and warming to -25 F.
b. Solar radiation: in accordance with MIL-STD-210 for the naval surface environment (unsheltered).
c. Altitude: in accordance with the aircraft detail specification.
d. Rain: in accordance with MIL-STD-210 for the naval surface environment, one hour averaging time.
e. Relative humidity: zero percent to 100 percent.
f. Fungus: as encountered in tropical climates.
g. Salt fog and flue gases: as encountered in the naval unsheltered environment (e.g., exposed on the flight deck to a stream of stack gases).
h. Sand and dust: in accordance with MIL-STD-210 for the ground environment.
i. Acceleration, shock, and vibration: as derived from the aircraft detail specification and the aircraft environmental analysis for specific locations within the aircraft.

* 3.5 Maintainability Program. The contractor shall establish a maintainability program in accordance with MIL-STD-470 which is designed to meet the maintainability requirements specified by the procuring activity (see 6.2).

* 3.5.1 Maintainability Requirements. Access to seat components shall conform to MIL-STD-1472. The cushions and restraint shall be replaceable without removal of the seat from the aircraft. Cushion replacement shall not require tools. Joints requiring disassembly, for installation and removal of the seat from the aircraft, or disassembly of the component parts, shall be attached with fasteners which are easily removed using common tools. The maintainability program to achieve, and demonstrate seat system maintainability shall be in accordance with MIL-STD-471.

* 3.6 Reliability Program. A system reliability program plan shall be established in accordance with MIL-STD-785. The program shall be maintained during the design, development and production of the seat.

* 3.6.1 Seat System Reliability. The seat system shall achieve the reliability levels specified for the following operational modes:

a. Emergency crash reliability, expressed as the probability that the set shall perform as required in paragraph 4.5.4, shall be at least 0.98 at a lower confidence level of 0.90.

b. Normal flight (mission) reliability, expressed as the probability that the seat system will achieve the aircraft mission reliability requirements allocated, shall be as required in the aircraft detail specification.

* 3.6.2 Reliability Design. Design of critical sub-systems and components shall be controlled in accordance with Task 208 of MIL-STD-785.

* 3.7 Human factors general design considerations. Human factors design considerations shall be in accordance with MIL-STD-1472, MIL-STD-1333 and the following:

a. Crewmember accommodation. Seating systems shall accommodate disproportionate (multivariate) anthropometry of both the Navy male and female aircrew population, including the effects of all clothing, personal flight gear and survival equipment configurations. The applicable anthropometry requirements shall be obtained from the contract or detailed specification.

b. Cockpit compatibility. Seat design shall be compatible with the aircrew station in which the seat shall be installed. Fully equipped aircrewmembers within the specified anthropometry population range shall be able to reach and actuate all normal aircraft and equipment controls within the crewstation when the seat is adjusted to place the occupant's eye at the design eye location. Each aircrewmember shall be able to reach and fully actuate all emergency aircraft controls through the full range

of seat adjustments while fully restrained in the full-back position by the restraint subsystem. Design of the seat profile shall be compatible with its location, enabling ready ingress to, and egress from the seat by aircrewmembers. The seat shall not hinder emergency escape from the aircraft by aircrewmembers wearing all configurations of clothing, personal flight gear and survival equipment.

3.8 Specific_design_considerations. The seat system shall include the following components, as applicable to the specific aircraft in which the system is utilized.

a. Seat bucket
b. Supporting energy attenuating structure and connections to aircraft.
c. Restraint system

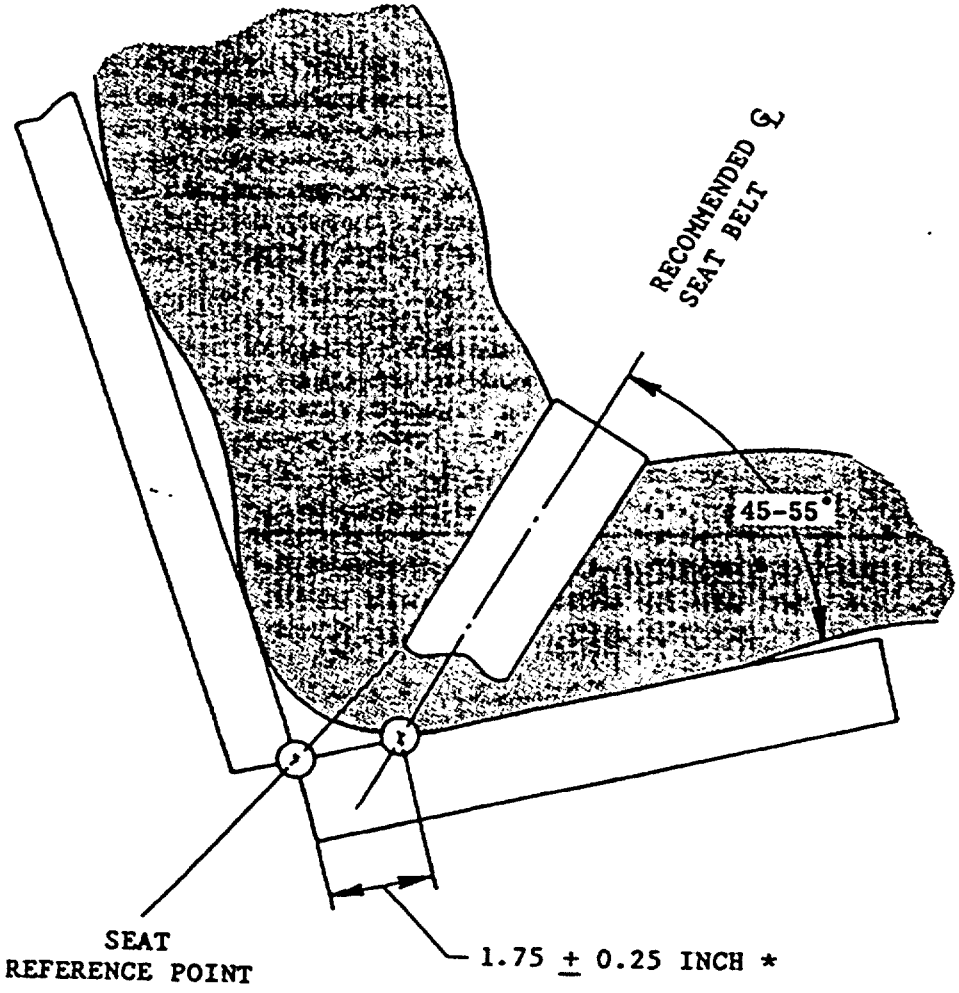

FIGURE 2. Lap belt anchorage geometry

Supersedes page 13 of MIL-S-81771A(AS) of 30 April 1975

* 3.8.2.1 Supporting E/A Subsystem. The seat bucket shall be attached to a supporting E/A subsystem which will form the interface between the bucket and airframe. The E/A subsystem shall attenuate vertical crash forces transmitted to seat occupants by inducing downward displacement (stroke) of the seat bucket at a controlled non-injurious load level. Motion during the vertical stroke shall be downward only, parallel to the seat back tangent line to within ±10 degrees. A vertical stroking distance of not less than 12 inches shall be provided below the seat when adjusted to the full down seated position. The E/A shall include a variable load feature which manually or automatically adjusts the stroking load to compensate for the range of occupant weights. As a result of the variable load feature, the stroking distance required to dissipate impact energy shall not vary more than 1.0 inch across the range of occupant weights for any given crash pulse. The adjustment shall be either continuously variable, or provide minimum of 5 discrete settings to span the occupant weight range specified by paragraph 3.7.

* 3.8.3 Restraint Subsystem. The restraint subsystem shall be comfortable, lightweight and easily put on or removed in the dark. It shall be attached to the stroking portion of the seat and be readily adjustable to accommodate crewmembers as specified in paragraph 3.7. The restraint harness shall consist of a lap belt, two shoulder straps, a single point attachment/release fitting and a tiedown strap.

* 3.8.3.1 Restraint Webbing. The restraint webbing shall conform to MIL-W-25361, Type III, except as specified in Table I.

TABLE I. Restraint System Webbing Requirements

Component	Width		Thickness		Ultimate Strength	
	Cm	In	Cm	In	Lbs	N
Lap Belt	5.375±0.375	2.125±0.125	0.140±0.025	0.055±0.010	6,000	26,690
Shoulder Strap	5.000±0.250	2.000±0.100	0.140±0.025	0.055±0.010	6,000	26,690
Inertia Reel Strap	4.450±0.250	1.750±0.100	0.165±0.025	0.065±0.010	8,000	33,585
Tie Down Strap	4.762+0.375	1.875+0.125	0.140±0.025	0.055±0.010	6,000	26,690

* 3.8.3.3 Lap Belt. The lap belt geometry shall be as shown in Figure 2. The adjustment hardware shall be easily accessible and adjustable with either hand and shall not cause discomfort by being located over skeletal protuberances of the seated crewmember. The pull force necessary to adjust the webbing shall not exceed 30 lbs. End to end elongation shall be less than 7% when a 4,000 lbs. tensile load is applied to the lap belt assembly.

* 3.8.3.4 Shoulder Strap. Shoulder straps shall pass over the shoulders and down the occupant's chest in a plane approximately parallel to the seat back as shown in Figure 3. The inside edges of the straps shall not bear against the occupants neck. Manual strap tightening shall require a downward force no greater than 30 lbs. Strap elongation in excess of 8% when a tensile load of 4,000 lbs. or structural failure at or below 5,000 lbs. shall be unacceptable.

* 3.8.3.5 Tiedown Strap . The tiedown strap shall be permanently attached to the single point attachment and release mechanism. Its other end shall be located on the seat pan centerline between 14 to 15 inches forward of the seat reference point. Strap length adjustment shall be provided. Elongation of the strap shall not exceed 10% of its length under a tension load of 3,000 lbs.

* 3.8.3.6 Single point attachment and release mechanism. The mechanism shall provide firm connection for the shoulder strap and lap belt fittings. When the release mechanism is actuated, it shall simultaneously release all four fittings. The release mechanism shall minimize the possibility of inadvertent release. It shall be easily opened with either hand. The mechanism shall have no protrusions, sharp edges, or features which would tent to entangle or catch on clothing or equipment. The mechanism shall maintain its lock on the restraint system components under vibrational operational loads and impact loading described in paragraphs 4.5.5.8 and 4.5.4.2. The single-point mechanism shall be equipped with a pad attached to its underside to provide a soft interface and to permit distribution of loads to the torso. The force required to open the release mechanism shall be 15 to 25 pounds.

* 3.8.3.7 Attachments of belts and straps. Belts and straps shall be attached to the seat structure in a manner which shall preclude premature failure due to stress concentration caused by misalignment of components resulting from seat deflection or body orientation during the crash sequence. Fittings shall permit angular movement of 45 degrees between mating components, in any direction, without imposing loads on the components.

* 3.8.3.8 Inertia reel. Both shoulder straps shall be jointly served by a single inertia reel in accordance with MIL-R-8236 and as specified below. The reel shall lock automatically in a crash by detecting the acceleration of strap extraction from the reel and inertial acceleration of the reel housing itself. Automatic locking shall occur when either or both of the two locking modes experience an acceleration which exceeds thresholds associated with normal or combat flight. However, in no case shall the reel inadvertently lock due to aircraft flight dynamics and occupant motion in the seat during normal flight,

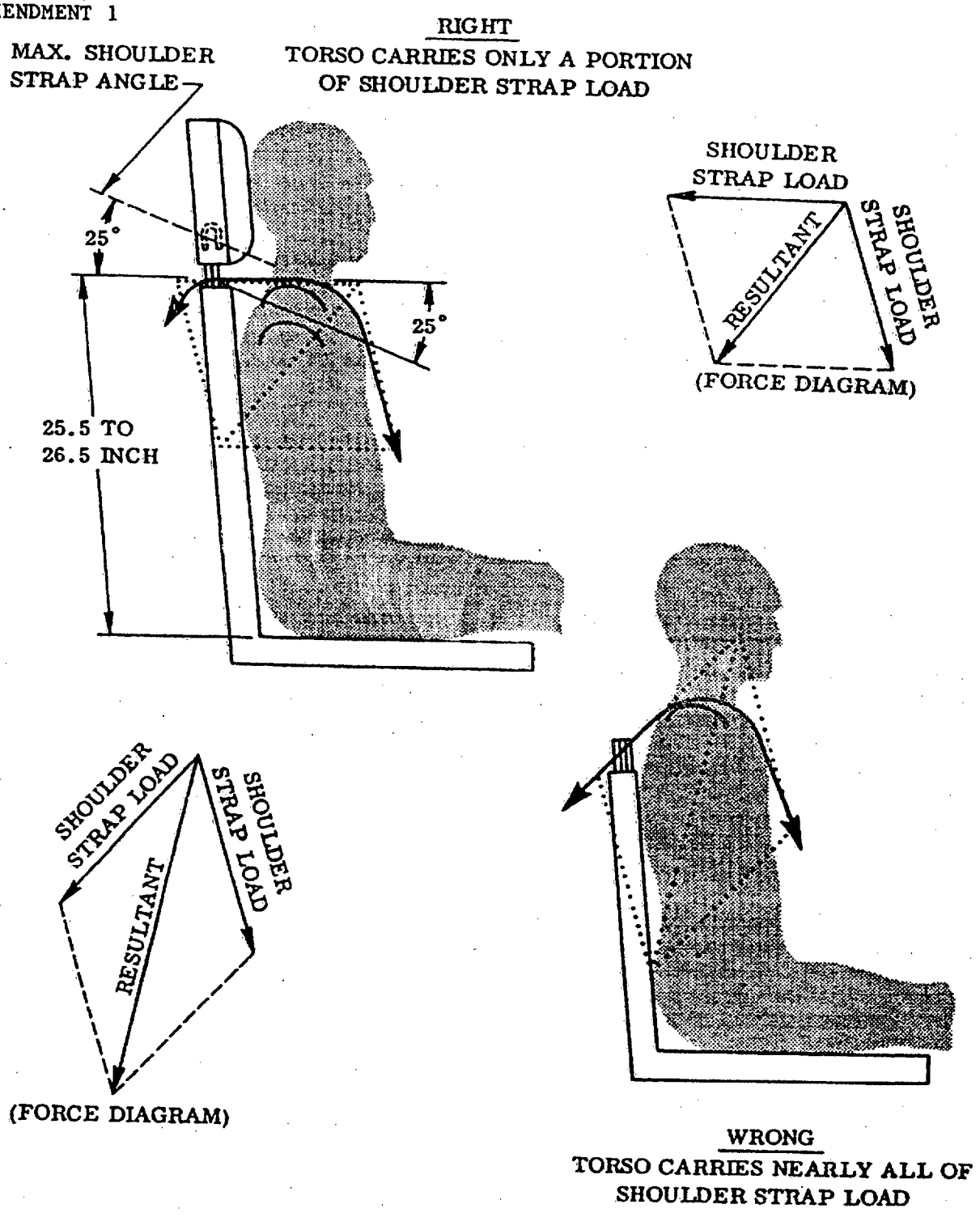

FIGURE 3. Shoulder harness achorage geometry

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or combat flight maneuvers with weapon firing. The reel shall be mounted to the seat back as close to the occupant as possible, and the inertia reel lock/unlock control lever shall be located on the left side of the seat.

* 3.8.4 Seat cushions. The seat bottom and back cushions shall not induce "dynamic overshoot," shall be designed for comfort and durability, and not as a device to absorb energy. The cushions shall be retained such that aircraft maneuvers, crashes, or occupant motion shall not cause displacement or separation. Cushions shall be easily removed for maintenance purposes.

* 3.8.4.1 Seat bucket cushion. The bottom cushion shall be contoured to comfortably support the buttock area of the crewmember as specified in paragraph 3.7. Thickness of the cushion at the lowest point of the buttocks shall be between 0.75 and 0.50 inches when compressed under the weight of the crewmembers as specified in paragraph 2.7 at 1.0G.

* 3.8.4.2 Seat back cushion. The back cushion shall comfortably accommodate the occupant's back and shall include a contoured adjustable lumbar support pad. Cushion weight shall be supported solely by the seat structure, and not by the occupant's back or shoulders.

3.9 Construction.

3.9.1 Bolting, riveting, and welding. Riveting and welding may be used for assembling the component parts fabricated of metals which are suitable for this type of construction. Fittings and joints requiring disassembly for installation and removal of the seat from the aircraft or disassembly of the component parts of the seat shall be bolted. Bolt shear and tension allowables shall be in accordance with tables 8.1.2(a) and 8.1.2(b) of MIL-HDBK-5 respectively.

* 3.9.2 Projections. The inside surface of the bucket shall be free from projections which could snag or damage by abrasion, cutting, or tearing, the clothing of the occupant. The exterior surfaces of the bucket shall be free from sharp edges or any other projections.

3.9.3 Strength requirements.

* 3.9.3.1 Static design loads. The seat system shall be designed with sufficient strength to support the loads shown in Table I(a). Structural members shall not fail and the neutral seat reference point deflection shall not exceed the limits of Table I(a) when tested in accordance with paragraph 4.5.4.1.

* 3.9.3.2 Dynamic crash loads. The seat system, including restraint and airframe interface structure, shall be capable of withstanding, without failure, loads developed as the result of testing to the conditions of Figure 4. Any failure of a restraint system component or of a primary load-carrying structural member of the seat shall be unacceptable. A primary load-carrying structural member is defined as a nonredundant member whose failure would allow uncontrolled motion of the seat and/or potentially injurious impact of the occupant with

TABLE I(a) Seat static load design and test requirements

Test ref. no.	Loading Direction with respect to fuselage floor	Minimum Load Factor (a)	Body weight used in load determination (lbs)	Seat Weight used in load determination	Deflection limits(d) (in)
1	Forward	35G	264	Full	2
2	Afterward	12G	264	Full	2
3	Lateral (c)	20G	264	Full	4
4	Downward (bottomed)	25G	215(f)	Full	No Reqmt
5	Upward	8G	264	Full	2
6	Combined (b) Forward Lateral (c) Downward (Stroking)	 25G 9G (e)	 264 264 215(f)	 Full Full Stroking Part	 Full Stroke
7	Headrest Aftward	400 lbs	N/A	N/A	(g)
8	Armrests Lateral (c)	100 lbs	N/A	N/A	(g)
9	Armrests Downward	264 lbs	N/A	N/A	(g)

Notes

a. The aircraft floor or bulkhead shall be deformed, as shown in Figure 4b, prior to the conduct of static tests and kept deformed throughout load application.
b. The forward and lateral loads shall be applied prior to downward loading.
c. The lateral loads shall be applied in the most critical direction.
d. Measured at neutral seat reference point during loading.
e. Static load factor as necessary to meet dynamic test criteria, Figure 4.
f. Accounts for that portion of 264 pound occupant loading which is relieved from the seat bucket due to leg contact on the floor during vertical impact.
g. No permanent deformation.

cockpit components. Permanent deformations of the structure which do not present a hazard to the occupant are acceptable.

The stroking load of the E/A and stroking distance of the bucket shall be optimized for crash force attenuation. The E/A mechanism and bucket available stroke shall be a minimum of 12 inches between the seat and the aircraft floor when the seat starts from the full down position.

3.10 Weight. The complete seat system shall have a weight which meets the requirements of the aircraft detail design specification.

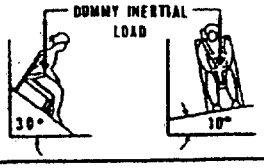
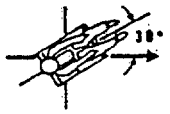
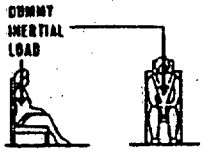
* 3.11 Color. Unless otherwise specified by the procuring activity, the color of the seat shall be non-specular gray, conforming to 36321 per FED-STD-595.

3.12 Interchangeability and replaceability. Parts and assemblies for the seat shall be interchangeable or replaceable in conformance with MIL-I-8500.

* 3.13 Identification of product. Identification marking shall be in conformance with MIL-STD-130. Nameplates shall contain the following information:

SEAT SYSTEM; AIRCREW, CRASH RESISTANT, ENERGY ABSORBING; AIRCRAFT
Specification MIL-S-81771A(AS)
Federal Stock No.
Manufacturer's Part No.
Manufacturer's Serial No.
Contract or Order No.
Manufacturer's Name or Trade Mark

3.14 Workmanship. Workmanship shall be of the highest quality to assure optimum performance, reliability, and service life. Particular attention shall be given to freedom from defects, burrs, and sharp edges; accuracy of dimensions, radii, fillets, and markings of parts and assemblies; thoroughness of welding, brazing, painting, and riveting; alignment of parts and tightness of assembly screws and bolts.

IMPACT CONDITION		PARAMETER	LIMITS
A		t_1 SEC t_2 SEC G MIN G MAX Δ V MIN. FT/SEC (M/SEC)	0.043 0.061 46 51 50 (15.2)
B		t_1 SEC t_2 SEC G MIN G MAX Δ V MIN. FT/SEC (M/SEC)	0.066 0.100 28 33 50 (15.2)
C		t_1 SEC t_2 SEC G MIN G MAX Δ V MIN. FT/SEC (M/SEC)	0.036 0.051 46 51 42 (12.8)

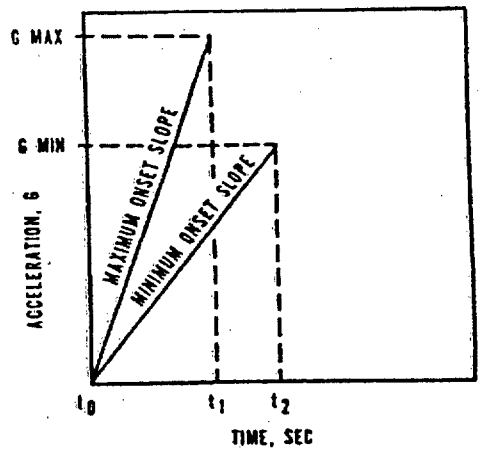


FIGURE 4. Dynamic test impact conditions.

Test Configuration				Seat Preconditioning		
Test No.	Impact Condition	Seat Height Position	Dummy Percentile	Environmental Seat Assy	E/A Subassy	Operational Cycle
1	A	Up	5th (1)		X	
2	A	Mid	95th	X	X	X
3	A	Down	95th			
4	B	Up	95th	X	X	X
5	C	Up	5th (1)			
6	C	Mid	50th		X	
7	C	Down	95th	X	X	

(1) Female. All other percentiles refer to male anthropometry.

FIGURE 4a. Dynamic test requirements.

Supersedes page 20 of MIL-S-81771A(AS) of 30 April 1975

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 using facilities approved by the procuring activity. 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 examination and testing of the seat assembly shall be performed as classified below:

a. Service Release Test. The Service Release Test (SRT) is a qualification test for the frozen design article which is intended for production. Successful completion of the SRT qualifies the design and the first article inspection qualifies the production process and product.

b. First article inspection. First article inspection consists of examinations and tests performed on samples which are representative of the production item after the award of a contract to determine that the production item conforms to the requirements of this specification (see 4.3).

c. Quality conformance inspection. Quality conformance inspection consists of examinations and tests performed on individual products or lots to determine conformance of the products or lots with the requirements set forth in this specification (see 4.4).

* 4.2.1 Quality Assurance Data Collection and Usage. Data acquired from quality inspections of critical component parts, subsystems and systems shall be collected, maintained and monitored in control chart or equivalent trend-identifying formats. Data in this format shall be used to enhance early detection of, and control of, adverse trends among those characteristics and parameters. The contractor, employing reliability and safety analyses of the seat system, shall develop a list of recommended candidate critical characteristics and parameters to be monitored, citing for each the effect(s) likely to occur should these exceed the design and tolerancing limits, and submit it to the Government procuring activity for review and concurrence. The contractor's Quality Assurance Program Plan shall include a section addressing the types of data to be collected and monitored, their grouping(s), the display format(s), and the bounds or constraints imposed on each type of data by the design and tolerancing. Upon request the contractor shall make available for

inspection all records which reflect the use/non-use of these data in detecting and controlling/constraining thesetrends to reduce the likelihood of manufacture, delivery, acceptance, and/or delivery of "out of tolerance" component parts, subsystems, and systems.

4.3 First article inspection. The first article inspection of the seat assembly shall consist of the examinations and tests specified in Table II.

TABLE II. Service release testing and first article examinations and tests

INSPECTION	METHOD PARAGRAPH
Visual examination	4.5.1
Seat system operation tests	4.5.2
Restraint system tests	4.5.3
Strength	4.5.4
Static design loads	4.5.4.1
Dynamic tests	4.5.4.2
Environmental tests	4.5.5
Maintainability test	4.5.6
Reliability test	4.5.7

* 4.3.1 First article samples. Unless otherwise specified, as soon as practicable after award of the contract or order, the manufacturer, shall submit first article samples to support the testing described herein. The samples shall be representative of the construction, workmanship, components and materials to be used during production. When a manufacturer is in continuous production of these seat assemblies from contract to contract, submission of further first article samples may be waived at the discretion of the procuring activity (see 6.2). Approval of the first article inspection samples or the waiving of first article inspection does not preclude the requirements for performing the quality conformance inspection. The first article inspection samples shall be furnished to the Government as directed by the contracting officer (see 6.2).

* 4.3.2 Disposition of data and hardware. Upon completion of the first article inspection, all the applicable inspection reports and when applicable, recommendations and comments pertinent for use in monitoring production shall be forwarded to the cognizant Government activity. The seats provided for the first article inspection shall not be considered as part of the quantity to be delivered under contract.

* 4.4 Quality conformance inspection. The quality conformance inspection shall be consistent of the inspections specified in Table III.

4.4.1 Sampling

* 4.4.1.1 Inspection sample.

* 4.4.1.1.1 Seat assembly. The production lot inspection sample shall be made under essentially the same conditions using the same production procedures and processes and from the same materials and components as the other production units. The sample size shall be in accordance with Table III.

* 4.4.1.1.2 Preparation for delivery. The inspection sample shall be provided in shipping containers, fully prepared for delivery from essentially the same materials and components as the other production units. The sample size shall be in accordance with Table III.

4.4.1.2 Sampling for tests and examinations of the seat assemblies. The sample size, acceptance criteria, and general examinations and tests required for the seat assemblies are listed in Table III.

TABLE V. Classification of defects for preparation for delivery-continued.

ITEM	DEFECTS
Packaging and packing materials	Any nonconforming components; any component missing, damaged, or otherwise defective.
Workmanship	Inadequate application of the components such as incomplete closure of the unit package, intermediate packing, container flaps, or loose strappings, etc.; bulging or distortion of the containers.
Exterior and interior weight or content	Number per container is more or less than required; gross or net weight exceeds the requirements.

* 4.5.2 Seat system operational tests. The requirements of paragraph 3.8.1.4.4 shall be met for all seat system operational tests.

4.5.2.1 Operational cycle tests (as applicable).

* 4.5.2.1.1 Vertical cyclic adjustment. The seat system with a 264 lbs. dummy or test block on it, shall be mounted simulating normal aircraft mounting. The bucket shall then be adjusted upward and downward from its NSRP to each of its adjustment positions until a total of 5,000 adjustments has been completed.

* 4.5.2.1.2 Fore and aft cyclic adjustment. The seat system shall be set up as specified in 4.5.2.1.1. The bucket shall then be adjusted forward and backward from its NSRP to each of its adjustment positions until 5,000 adjustments have been completed.

* 4.5.2.1.3 Combined cyclic adjustment. The seat system shall be set up as specified in 4.5.2.1.1. The bucket shall then be adjusted upward and forward then downward and backward from the NSRP to each of its adjustment positions until 5,000 adjustments have been completed.

* 4.5.2.1.4 Recline cyclic adjustment. The seat system shall be setup as specified in 4.5.2.1.1 and shall be tested for the reclining operation by adjusting it to each of its reclining positions until 1,000 adjustments have been completed.

4.5.2.2 Operational function tests (as applicable).

* 4.5.2.2.1 Vertical functional adjustment. The seat system shall be set up as specified in 4.5.2.1.1 and shall be adjusted upward and downward from its NSRP to each of its adjustment positions for a total of one adjustment per each adjustment position.

* 4.5.2.2.2 Fore and aft functional adjustments. The seat system shall be set up as specified in 4.5.2.1.1 and shall then be adjusted forward and backward from its NSRP to each of its adjustment positions for a total of one adjustment per adjustment position. At each adjustment position, the seat system shall lock positively and smoothly. Release shall be accomplished by a load of not greater than 30 pounds applied to the adjustment control lever.

* 4.5.2.2.3 Combined functional adjustment. The seat system shall be set up as specified in 4.5.2.1.1. The bucket shall then be adjusted upward and forward then downward and backward from the NSRP to each of its adjustment positions for a total of one adjustment per each adjustment position. At each adjustment position, the bucket shall lock positively and smoothly. Release shall be accomplished by a not greater than 30 pound load applied to the adjustment control lever.

* 4.5.2.2.4 Recline functional adjustment. The seat system shall be set up as specified in 4.5.2.1.1 and shall be tested for the reclining operation by adjusting it to each of its reclining position s fur a total of one adjustment per each adjustment position. At each adjustment position, the seat shall lock positively and smoothly. Release shall be accomplished by a load of not greater than 30 pounds applied to the adjustment control lever.

4.5.3 Restraint system test.

* 4.5.3.1 Restraint system. Webbing for the restraint system shall be tested in accordance with FED-STD-191 as specified in MIL-W-25361.

4.5.3.1.1 Restraint hardware. With no load other than the adjustment reaction load, webbing shall be cycled through its adjuster 5000 times. The webbing shall then be tested for abrasion in accordance with the applicable tests of MIL-W-25361. Excessive abrasion of the webbing shall be unacceptable. The test shall be repeated for each dimensionally different webbing/adjuster combination.

* 4.5.3.1.2 Single point release. All restraint system hardware shall be tested as follows:

a. Buckle. The buckle shall be subjected to the following tests:

(1) Release with load. The shoulder straps and lap belts shall be connected to the buckle around 264 pound (120 kg) dummy in the correct position for normal use. The dummy shall be inverted such that his spine is vertical and head down. The buckle shall then be activated and the release force measured. This sequence shall be repeated 50 times. The force required to release shall not exceed 50 pounds (222 newtons) (for a single-point load application).

(2) Release, No Load. Mount the buckle in normal positions on a fixture with all fittings fully engaged but no strap loads applied to them. Manually actuate the buckle's release mechanism and visually inspect that all fittings are released from the buckle's latching mechanism.

Release the mechanism and pull the fittings free from the buckle. This sequence shall be repeated 50 times. Release load shall be at least 5 pounds (22.2 newtons) force.

* 4.5.3.1.3 Adjustment Loads. The forces required to adjust the restraint belts and straps shall be measured for each strap and adjuster combination. The forces shall not exceed the requirement of paragraph 3.8.3.

* 4.5.4 Strength tests. Conformance to strength requirements shall be determined by testing the seat as specified in 4.5.4.1 and 4.5.4.2.

* 4.5.4.1 Static design loads. The seat shall be tested as a complete unit and shall be mounted in a suitable jig or fixture using the actual seat airframe tiedown attachments. The seat shall be placed in the full up adjustment position. The floor or bulkhead shall be subjected to buckling and warping prior to load application as shown on Figure 4b. The test loads shall be applied through a body block which is contoured per Figure 5. The occupant restraint shall fasten the body block to the seat and shall be tested with the rest of the seat during the static tests. The seat shall be subjected to and withstand the tests of Table I(a) without separation of a primary load-carrying member or deflection beyond limits. Total static test loads to be applied, for all directions, shall be determined by multiplying the required load factor specified in the table by the sum of the applicable occupant weight and seat, or seat portion weight. That portion of the static loading that must be withstood by the occupant restraint subsystem shall be applied to the body block and the remainder of the load representing inertial loading of other seat components may be applied separately to the appropriate structure.

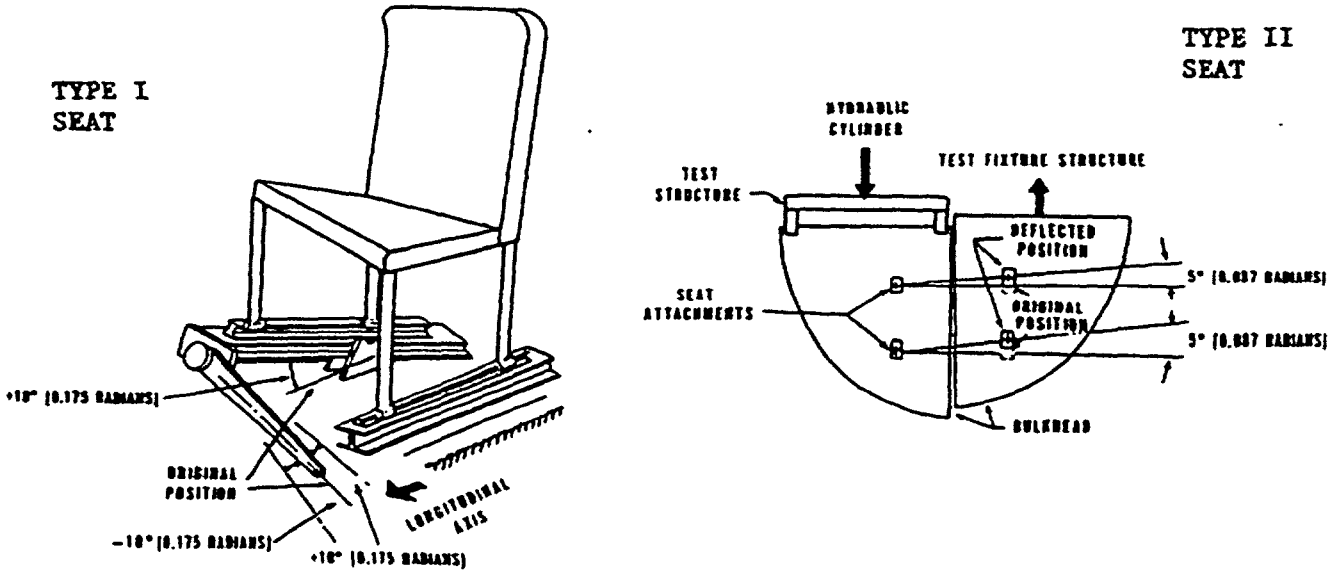


FIGURE 4b. Static loading warpage

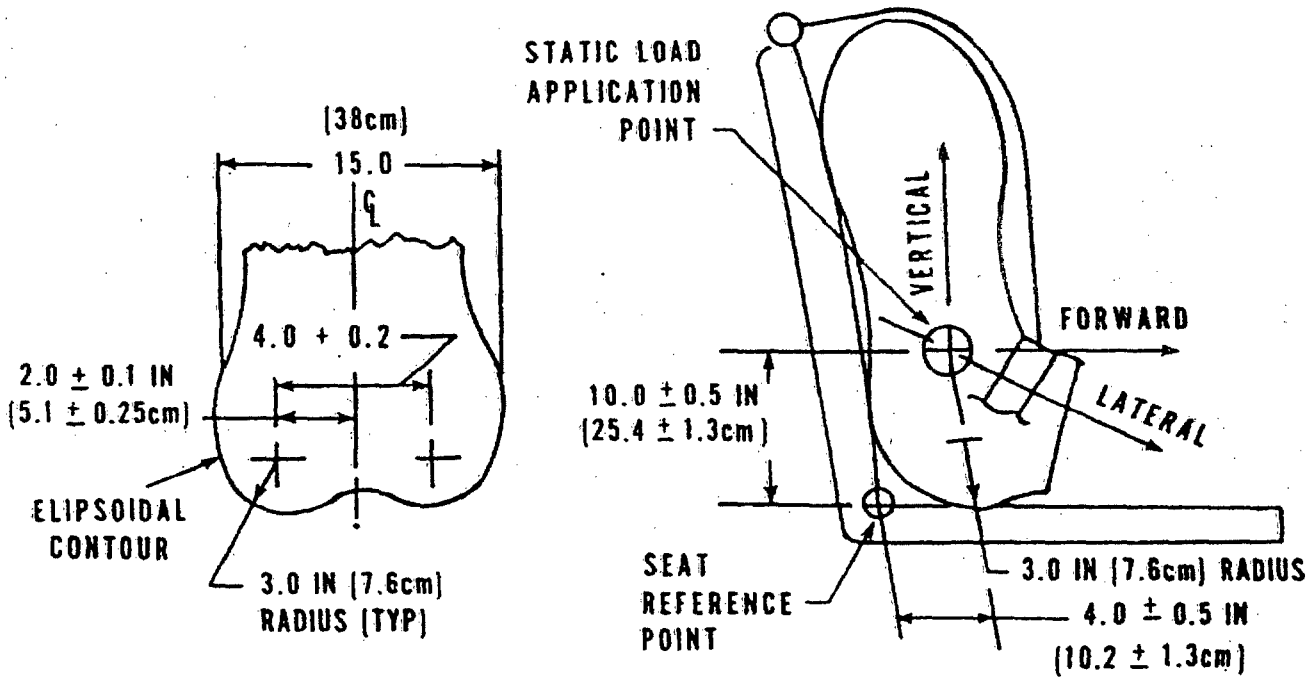


FIGURE 5. Lap and shoulder harness test block

* 4.5.4.2 Dynamic Tests. Seven complete seat systems shall be tested as specified in Figure 4. Anthropomorphic dummies used in the test shall be of the Hybrid III type, and shall be equipped with standard Navy flight clothing and personal equipment. Dummy weights, including clothing, equipment and ballast, shall be 264 pounds for the 98th percentile male dummy, 200 pounds for the 50th percentile male dummy and 129 pounds for the 5th percentile female dummy. The seats shall be preconditioned and configured in accordance with Figure 4a prior to dynamic testing. All tests shall be performed with the inertia reel set in the "auto-lock" mode. Dynamic response of the seat/dummy system shall be measured verses time in accordance with SAE J211 instrumentation requirements. Data shall include seat/dummy accelerations, dummy spinal loads and moments, stroke and load of each energy absorber, seat structural distortion, and floor reaction loads. In test 1-3 and 5-7, the seat shall stroke a minimum of 9.5 inches and the vertical seat pan acceleration shall not exceed 23 G for more than 0.025 seconds. This time duration shall be additive, in a cumulative manner, for all acceleration excursions exceeding 23 G.

* 4.5.5 Environmental Tests. Three complete seats including mounting provisions, shall be subjected to all of the environmental tests specified in paragraphs 4.5.5.1 through 4.5.5.8 in the order listed. Upon completion, they shall be used for the dynamic tests specified in paragraph 4.5.4.2.

* 4.5.5.1 High Temperature. High temperature tests shall be conducted in accordance with method 501.2, procedures I and II, of MIL-STD-810 using hot high temperature cycles provided in table 501.2-I. Proper operation of all adjusters, controls and release mechanisms shall be verified while at the high temperature and after returning to ambient in accordance with paragraph 3.8.1.4.8.

* 4.5.5.2 Low Temperature. Low temperature tests shall be conducted in accordance with method 502.2, procedures I and II, of MIL-STD-810 using the severe cold 10% probability of occurrence for the storage test and -65 F for the operation test. Proper operation of all adjusters, controls and release mechanisms shall be verified while at the low temperature and after returning the test item to ambient temperature in accordance with paragraph 3.8.1.4.8.

* 4.5.5.3 Sunshine. Solar radiation tests shall be conducted in accordance with method 505.2, procedure I, of MIL-STD-810 using the hot-dry cycle. Proper operation of all adjusters, controls and release mechanisms shall be verified while at the high temperature and after return to ambient temperature in accordance with paragraph 3.8.1.4.8.

* 4.5.5.4 Humidity. Humidity tests shall be conducted in accordance with method 507.2, procedure III, of MIL-STD-810, for a minimum of 10 test cycles, with the seat in its operational mode. Proper operation of all adjusters, controls and release mechanisms shall be verified once every five (5) cycles and at conclusion of the test in accordance with paragraph 3.8.1.4.8.

* 4.5.5.5 Fungus. If any of the materials utilized in construction of the seat are susceptible to fungal growth, fungus tests shall be conducted in accordance with method 508.3 of MIL-STD-810.

* 4.5.5.6 Salt Fog. Salt fog tests shall be conducted in accordance with method 509.2 of MIL-STD-810. During the salt fog testing, sulphur dioxide gas shall be injected into the test chamber at six hour intervals for a time duration of 60 minutes and a flow rate of 50 cc/hr/ft of test chamber volume. Proper operation of all adjusters, controls and release mechanisms shall be verified at the conclusion of the test in accordance with paragraph 3.8.1.4.8.

* 4.5.5 7 Sand and Dust. Blowing dust tests shall be conducted in accordance with method 510.2, procedure I of MIL-STD-810. Proper operation of all adjusters, controls and release mechanisms shall be verified at the conclusion of the test in accordance with paragraph 3.8.1.4.8.

* 4.5.5.8 Vibration. Vibration tests shall be conducted in accordance with method 514.3, procedure I, categories 1, 4 and 6 of MIL-STD-810. Vibration tests shall be conducted with a 98th percentile dummy instrumented at its C.G. to determine the transmissibility of the system. The transmissibility shall be less that the limit specified in paragraph 3.8.4.1. All adjusters, controls and release mechanisms shall be operated at the conclusion of the test in accordance with paragraph 3.8.1.4.8.

The seat shall be mounted by its actual attachments to a fixture, which represents the appropriate aircraft structure, which in turn shall be fastened to the vibration exciter. The vibration tests of the seat shall be conducted separately in each of the three (3) orthogonal directions in the full up, intermediate, and full down adjustment positions with a lightly clad 50th percentile human occupant. The vibration test of each axis shall consist of a sinusoidal sweep over the 4 to 50 HZ frequency range during a time period of no less then seven (7) minutes. An input of 0.10G shall be used and shall be constant over the frequency range. The vibration transmissibilities shall be controlled to the extent required by the associated detailed specification.

* 4.5.6 Maintainability Verification. A maintainability demonstration shall be conducted by the contractor in accordance with MIL-STD-471 to assess compliance with the maintainability requirements specified in 3.5.1.

* 4.5.7 Design reliability analysis. Perform a reliability analysis on the seat system design to assess compliance with the requirements of paragraph 3.6.1. The analysis shall include the following tasks:

a. Block diagrams and mathematical models shall be prepared in accordance with MIL-STD-785 and shall be used to develop mathematical equations which will provide assessments of mission reliability.

b. Reliability allocations and predictions shall be made for both the emergency crash and normal flight modes of operation in accordance with

MIL-STD-785 and MIL-STD-756. Allocations and predictions shall be updated by the contractor during the development and production phases to determine attainability of reliability requirements.

c. A failure modes, effects, and criticality analysis shall be conducted for each seat system component and subsystem in accordance with MIL-STD-785 and MIL-STD-1629. The FMECA shall systematically identify the likely modes of failure, possible effects of each failure, and the criticality of each failure with regard to safety, system readiness, mission success and demand for maintenance/logistic support.

* 4.5.7.1 Reliability demonstration. Compliance with reliability requirements shall be demonstrated through the following approaches:

a. Using the system block diagram and math model developed and approved in accordance with paragraph 4.5.7, incorporate the component and subsystem reliabilities (at the 90 percent lower confidence level) determined through tests defined in paragraph 4.5.4.2 and government approved component and subsystem reliability history data. This constructed system reliability shall be equal to or greater than 0.98.

Include the following in the documentation of the systems block diagram constructed reliability.

(1) The achieved constructed system reliability.
(2) Using the block diagram format, the block-by-block comparison of the allocated and demonstrated reliabilities.

b. System tested reliability shall be demonstrated by the successful completion of the dynamic tests specified in paragraph 4.5.4.2.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be Level A or C, as specified (see 6.2).

5.1.1 Level A. Each seat shall be preserved and packaged in accordance with MIL-P-116, Method III, in a weather resistant unit container conforming to PPP-B-636.

5.1.2 Level C. Each seat shall be preserved and packaged in a manner that will afford adequate protection against corrosion, deterioration and physical damage during shipment from supply source to the first receiving activity for immediate use. This level may conform to the supplier's commercial practice, provided the latter meets the requirements of this level.

5.2 Packing. Packing shall be Level A, B or C, as specified (see 6.2).

5.2.1 Level A. Seats preserved and packaged as specified in 5.1.1 shall be packed in overseas type shipping containers conforming to PPP-B-601 or PPP-B-621. As far as practicable, shipping containers shall be of uniform shape and size, or minimum cube and tare consistent with the protection required, and contain identical quantities. The gross weight of each shipping container shall not exceed the weight limitation of the specification and appendix thereto.

5.2.2 Level B. Seats preserved and packaged as specified in 5.1.1 shall not be overboxed for domestic shipments. The unit container, closed and strapped in accordance with the applicable appendix of the container specification, shall be the shipping container.

5.2.3 Level C. Seats shall be packed in a manner that will afford adequate protection at the lowest rate against damage during direct domestic shipment from the supply source to the first receiving activity for immediate use. This level shall conform to applicable carrier rules and regulations and may be the supplier's commercial practice, provided the latter meets the requirements of this level.

5.3 Physical protection. Cushioning, blocking and bracing, shall be in accordance with MIL-STD-1186, except that for domestic shipments, water-proofing requirements for cushioning materials and containers shall be waived when preservation, packaging and packing of the item is for immediate use or when drop tests of MIL-P-116 are applicable.

5.4 Marking.

* 5.4.1 Interior package. Each interior package shall be durably and legibly marked with the following information in such a manner that the markings will not become damaged when the packages are opened:

SEAT SYSTEM; AIRCREW; CRASH RESISTANT
Specification MIL-S-81771A(AS)
Type I or II (as applicable)
Manufacturer's Part No.
Manufacturer's Serial No.
Contract or Order No.
Name of Manufacturer
Name of Contractor (if different from the manufacturer)

5.4.2 Exterior shipping containers. The exterior shipping container shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The specification covers two types of adjustable aircraft seating systems intended for use by pilots, co-pilots, observers, and students in rotary wing or fixed wing aircraft not requiring ejection seats.

Supersedes page 32 of MIL-S-81771A(AS) of 30 April 1975

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number and date of this specification

b. Type of seat (see 1.2)

c. Whether first article inspection is required (see 3.1 and 4.3.1)

d. Name and address of the first article inspection laboratory (see 4.3.1)

e. Specify acceptable level of maintainability (see 3.5)

f. Selection of applicable levels of preservation, packaging and packing required

g. Items of data required (see 6.3).

6.3 Data. For the information of Contractors and Contracting Officers, any of the data specified in applicable documents listed in Section 2 of this specification or referenced lower-tier documents need not be prepared for the Government unless specified in the contract order. The data to be furnished shall be listed on DD Form 1423 (Contractor Data Requirements List), which shall be attached to and made part of the contract or order; NAVWEPS Form 4200/25 (Drawings, Lists, and Specifications Required) shall be attached where applicable.

6.4 Supersession Data. This specification includes the requirements of MIL-S-7832 (AER), dated 19 October 1954 and MIL-S-18619 (AER), dated 4 April 1955.

Preparing Activity:
NAVY-AS
(Project No. 1680-N585)