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NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION
PATUXENT RIVER, MARYLAND

TECHNICAL REPORT

REPORT NO: NAWCADPAX/TR-2002/94

TESTING CONDUCTED ON WALL-HANGING TROOP SEATS

by

Rachael Testerman

12 September 2002

20021129 099

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DEPARTMENT OF THE NAVY
NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION
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RELEASED BY:

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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1. REPORT DATE 12 September 2002	2. REPORT TYPE Technical Report	3. DATES COVERED
4. TITLE AND SUBTITLE Testing Conducted on Wall-Hanging Troop Seats		5a. CONTRACT NUMBER 5b. GRANT NUMBER 5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) Rachael Testerman		5d. PROJECT NUMBER 5e. TASK NUMBER 5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Air Warfare Center Aircraft Division 22347 Cedar Point Road, Unit #6 Patuxent River, Maryland 20670-1161		8. PERFORMING ORGANIZATION REPORT NUMBER NAWCADPAX/TR-2002/94
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Air Systems Command 47123 Buse Road Unit IPT Patuxent River, Maryland 20670-1547		10. SPONSOR/MONITOR'S ACRONYM(S) 11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This report presents the data collected during testing conducted at NAWCAD Patuxent River, Maryland. The tests conducted were static load tests and were conducted on wall-hanging troop seats. Four seats were tested, all of them being of the three-man configuration. Tests were conducted for the Defense Logistics Agency and the Air Force. All photographs and data collected from the testing are contained herein.

15. SUBJECT TERMS

Wall-Hanging Troop Seats

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Rachael Testerman
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER (include area code)
Unclassified	Unclassified	Unclassified	SAR	58	(301) 342-8436

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39-18

SUMMARY

The purpose of testing the three-man wall-hanging troop seat was to verify that the seat met the current standards, which are outlined in Military Standard 5804C. Tests were conducted at NAWCAD Patuxent River, Maryland, using the Static Test Fixture. Data were collected using an *Industro*Logic, Inc. Portable Data Acquisition System (PDAS) at the rate of 50 data points per second. Data were saved on a laptop in ASCII format and were then converted to Excel format. Three tests were conducted, with each test being conducted on a separate seat. The first test was a back test, during which the seat had to withstand a proof load of 1,200 lb and an ultimate load of 1,800 lb. The next test was a bottom and side load test. The seat had to withstand a proof load of 4,410 lb for the bottom load and a proof load of 450 lb for the side load. The seat also had to withstand an ultimate load of 6,220 lb, with a side ultimate load of 675 lb. The legs of the seat had to withstand a load of 1,000 lb in tension. This load was applied perpendicular and away from the floor plate. The three-man seat did not continue to have load-bearing capabilities during the seat bottom and side test; because of this, the seat was considered to fail that portion of the testing. It was determined that the three-man seat does not meet the standards established in Military Standard 5804C and, therefore, should be redesigned or replaced.

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INTRODUCTION

BACKGROUND

Defense Logistics Agency (DLA) of Richmond, Virginia, and the U.S. Air Force, Brooks Air Force Base, San Antonio, Texas, asked the Crashworthiness Engineers at NAWCAD Patuxent River, Maryland, to static load test wall-hanging troop seats. These troop seats were the three-man version of the wall-hanging troop seats. It was found in the fleet that these seats were not holding up in crashes, though it was unclear if they had failed prior to meeting the required static loading. The required static loading is listed in Military Standard 5804C.

METHODS

Static testing was conducted on four wall-hanging troop seats manufactured by Newgard, Inc., of Monroe, North Carolina. The seats were under the P/N 3WC1032R and S/N 1680-00-616-4604. The seat back on two seats was tested, the right and left legs were tested on a third seat, and the seat bottom and side of the fourth seat were tested on the fourth seat. The testing was conducted in two parts. During the first part, the seat back and legs were tested. The second part consisted of the second back test and the seat bottom and back test. LT Tim Skaar, from Brooks, along with engineers from DLA, had contracted NAWCAD Patuxent River, Crashworthiness and Escape Systems Branch, Code 4.6.2.2, to test the three-man seat. LT Skaar witnessed the second part of this testing.

The tests were conducted at Patuxent River where the Crashworthiness and Escape Systems Branch, Code 4.6.2.2, was tasked to complete the testing. The testing was conducted using a Static Test Fixture acquired from the Air Force. The Static Test Fixture is located in Building 2187 Room 1B16 at Patuxent River. A detailed description of the test fixture and hydraulic equipment is given below.

STATIC TEST FIXTURE AND EQUIPMENT

The design of the Static Test Fixture was a result of interior surveys of the C-130, C-141, and KC-135 aircraft. The fixture was designed to simulate the seat attachment points for the aircraft and provide a stable framework from which the desired testing loads could be consistently applied. The structure was designed to measure loads from the seat bottom or back as well as the side loads. The design of the Static Test Fixture also allowed for tensile strength of legs to be tested. A front and side view of the structure is shown in figure 1. The position of the hydraulic cylinder during a back test is shown in figure 2. Figure 3 shows the three-man pressure foot used during the back testing. This pressure foot was also used for the bottom and side testing.

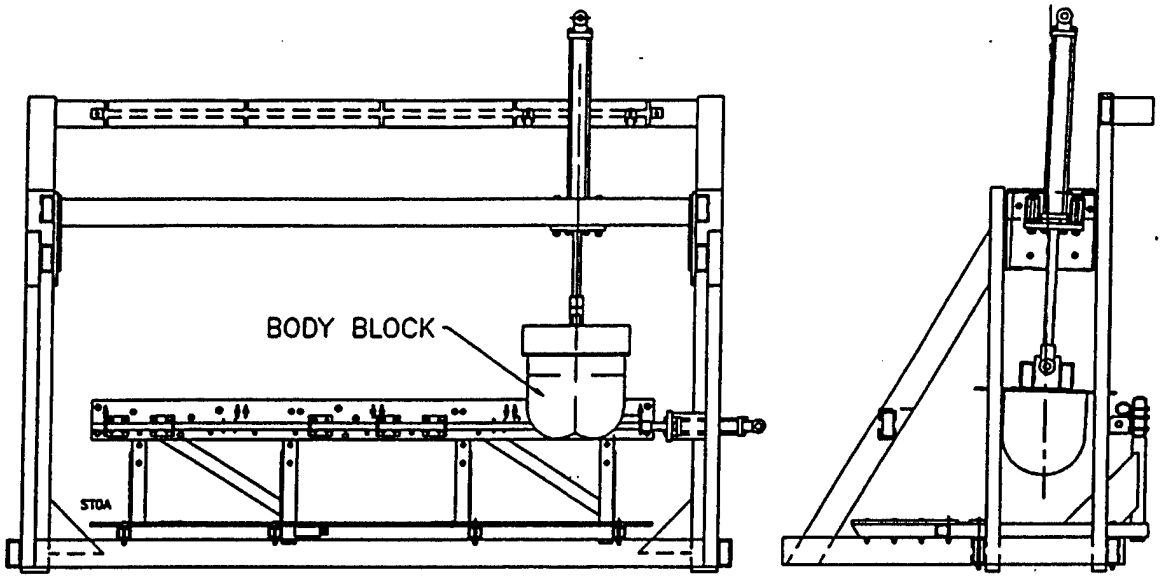

Figure 1: Front and side views of static tester. Configuration shown is for testing a one-man seat with a body block. Body block was not used for this testing.

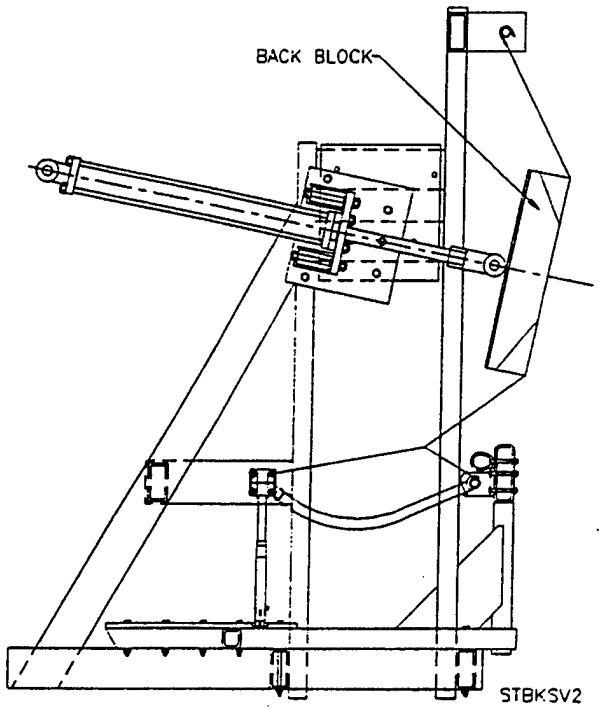

Figure 2: Position of Pressure Foot during Back Load Test

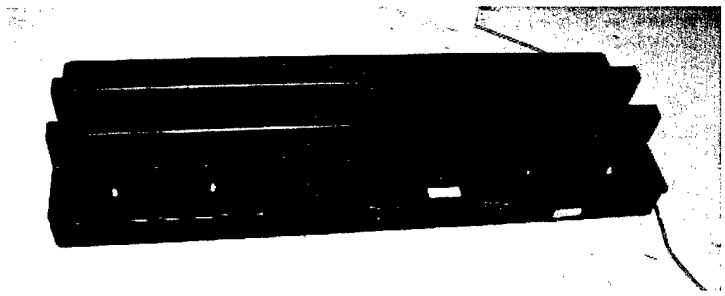

Figure 3: Three-man pressure foot used during back testing.
Pressure foot will also be used during bottom and side testing.

The pressure foot, which is driven by a hydraulic cylinder, applies the test loading. The pressure foot is designed according to MIL-SPEC-58095 and SAE AS8049 guidelines and is interchangeable. One-, two-, and three-man seat configurations can be tested with body and back blocks provided for each. The dimensions for the three-man pressure foot can be found in table 1. The upper structure rotates for application of loads to either the seat bottom or the seat back. A second hydraulic cylinder is then implemented for side loads on the front tube of the seat.

Table 1: Dimensions and Weight of Three-Man Pressure Foot

Block Type	Thickness (in.)	Width (in.)	Height (in.)	Weight (lb)
Three-man	4	58.25	20.31	290

Hydraulic pumps drive the cylinders. The pumps were ordered through Bearings and Drives, Inc., Asheville, North Carolina, and were manufactured by Gibson Machines. The pumps use Parker Hydraulic Valves for controlling the amount of pressure and direction of the load. The hydraulic cylinders are loaded by the pumps at a maximum rate of 20 lb/sec. The Parker Hydraulic Valves are controlled by hand. Figure 4 shows the hydraulic pump used for the static testing.

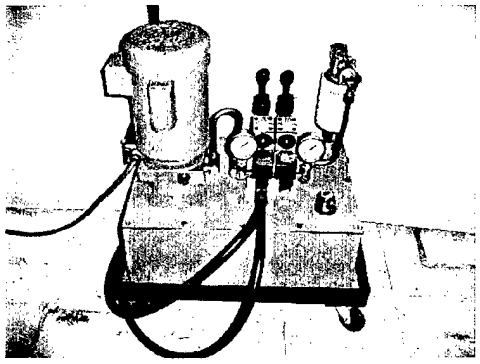

Figure 4: Front view of pump which controls the hydraulic cylinder that applies bottom and back force, as well as leg test. Pump that applies side load looks the same.

Two Sensotec load cells are used to measure the amount of pressure applied by the pressure foot. The load cell used for applying the side load is shown below in figure 5. The load cell used for measuring the bottom and back loads as well as the leg test measure up to 10,000 lb. The load cell used for the side loads measures 5,000 lb. For both load cells, compression is considered positive and tensile is considered negative. Both load cells are calibrated prior to each test to assure that all data obtained is accurate. The load cells are connected to two strain gauge amplifier/display units, which are connected to a Portable Data Acquisition System (PDAS)-3. The PDAS and Sensotec load cells were purchased from *Industro*Logic, Inc. in St. Charles, Montana. Data are collected at the rate of 50 samples per second. The PDAS is connected to a laptop, which downloads the data after the test is complete. Data are saved in an ASCII format, which is converted into Excel files. These Excel files can be used for data analysis.

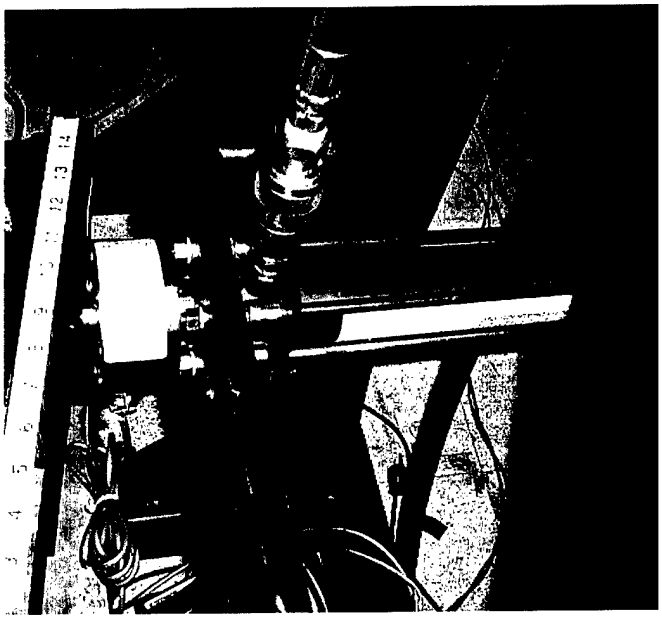

Figure 5: Sensotec Load Cell on Side Hydraulic Cylinder

TEST PROCEDURES

The seats were tested according to the Test Plan written by Mr. Jerry Hill, NAWCAD Patuxent River, for NAVAIRSYSCOM in July 2000, and was provided to DLA. The Test Plan appears in appendix A. One change to the Test Plan was that DLA, as stated by Mr. David White, Aviation Quality Assessment Specialist at DLA, requested that the seat be loaded to the ultimate load, unless a catastrophic failure occurred (i.e., ripping of fabric, failure of spreader bars and legs). Checklists were used during the testing to assure that all steps were completed and that all tests were conducted in exactly the same manner. Copies of all checklists used during this testing are available in appendix B, along with all pretest and posttest photographs. A brief overview of the test procedures is listed below.

Prior to attaching the seats to the test fixture, the seats, or legs, are weighed and all manufacturer information is recorded. Once a seat is attached to the fixture, still photographs are taken and the load cells are calibrated. The proof load is applied and held for 60 sec. Any deformation in the seat or leg is noted. Then the ultimate load is applied and held for 60 sec unless a failure occurs, at which time the testing is halted. Again, any deformations of the seat are measured and recorded. After testing, stills photographs are taken again and the data are downloaded.

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RESULTS AND DISCUSSION

The first test conducted was a back test. Prior to attaching the seat to the Static Test Fixture, the weight of the seat was exactly 5 lb. This test used the three-man pressure foot. The proof load of 1,200 lb was first applied for 60 sec. Prior to reaching the proof load, at approximately 914 lb, the right leg of the seat came free from the bottom plate. Since there was no ripping or failure of the legs or spreader bar, the test continued. Other than the leg coming free, there was no deformation of the seat and no failure. Next, the ultimate load of 1,800 lb was applied. Prior to reaching the ultimate load, at 1,754 lb, the fabric from under the front tube on the left side came free. The fabric did not rip, and the screws did not come loose. The left most tiedown hook came free from the upper attachment, but did not deform or fail. Photographs of the failure are shown in figures 6 through 9. The graph created from the downloaded data is shown below in figure 10. All still photographs that were taken are shown in appendix B.

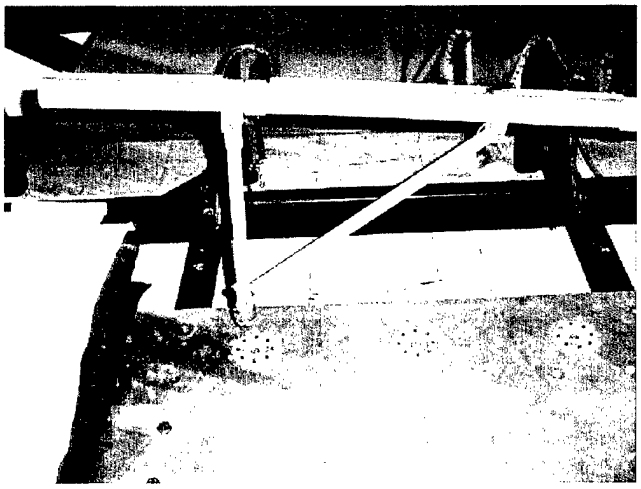

Figure 6: Right Leg and Distance from Floor Plate

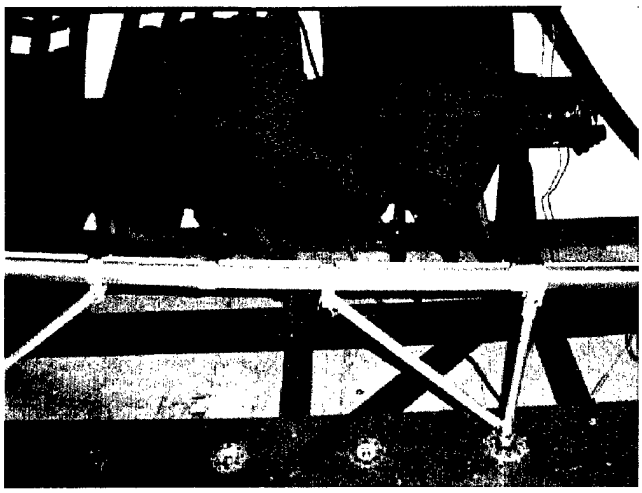

Figure 7: Front of Seat, Showing Fabric Separation from Front Bar

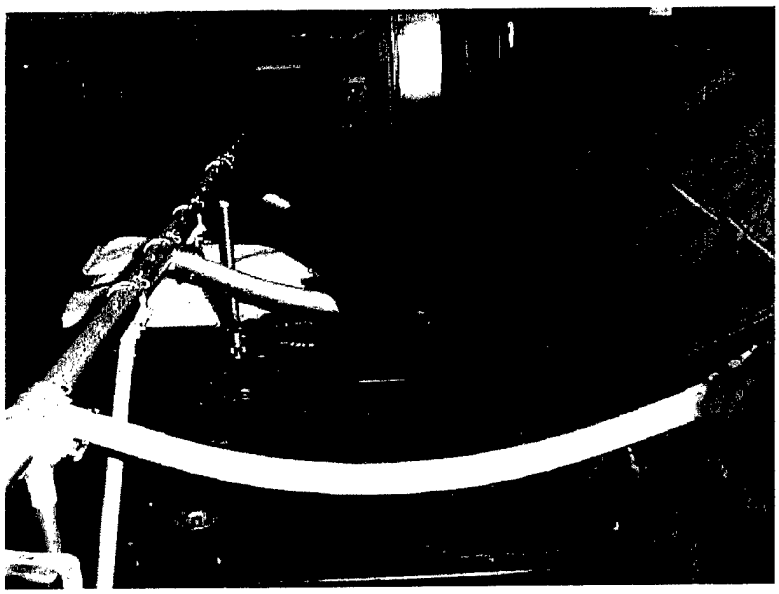

Figure 8: Side of Seat, Showing Fabric Separation from Front Bar

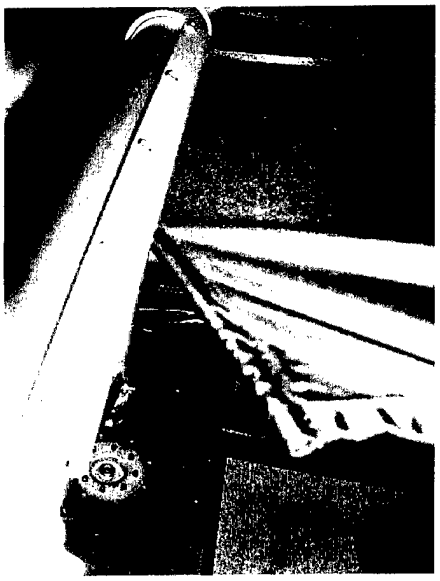

Figure 9: Close View of Fabric Separation

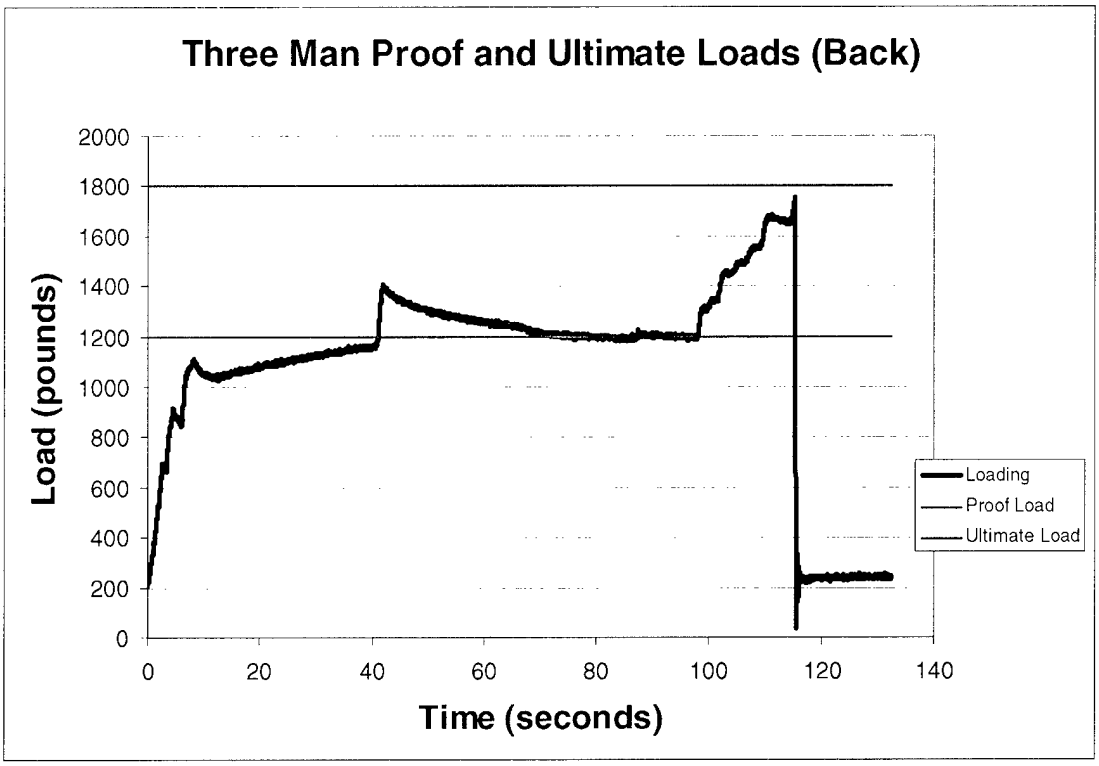

Figure 10: Data Collected during Back Loading Test

After examination of the right leg of the first seat tested, no damage was found on the bottom plate or on the locking mechanism of the leg. It was decided to test the legs next to ascertain that the legs could withstand the proof and ultimate loads and to see if the legs would pull apart from the bottom plate again. This involved removing both legs from the Newgard seat. The legs each weighed 0.75 lb. The left leg was tested first. The proof load of 600 lb was first applied and held for 60 sec. No deformation of the leg was seen. The ultimate load of 1,000 lb was then applied and held for 60 sec. Again, no deformation of the leg was seen. After testing, the leg was removed and measured. No elongation of the leg had occurred during testing, and all locking devices at the bottom of the leg were undamaged. The graph created from the downloaded data is shown below in figure 11. The still photographs taken are available in appendix B. The right leg was tested next. The procedure followed for the left leg was followed for the right leg. The right leg did not deform or fail. The graph created from the downloaded data is shown in figure 12, and all still photographs are available in appendix B.

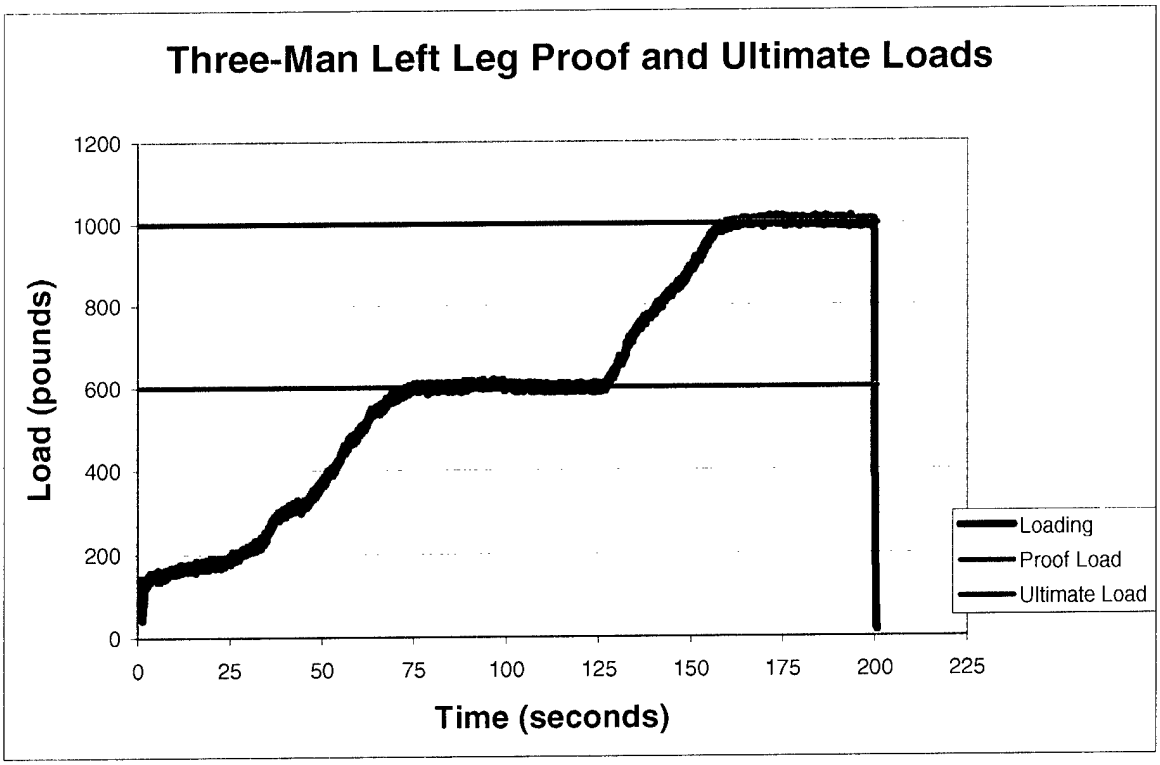

Figure 11: Data Collected during Testing of Left Leg

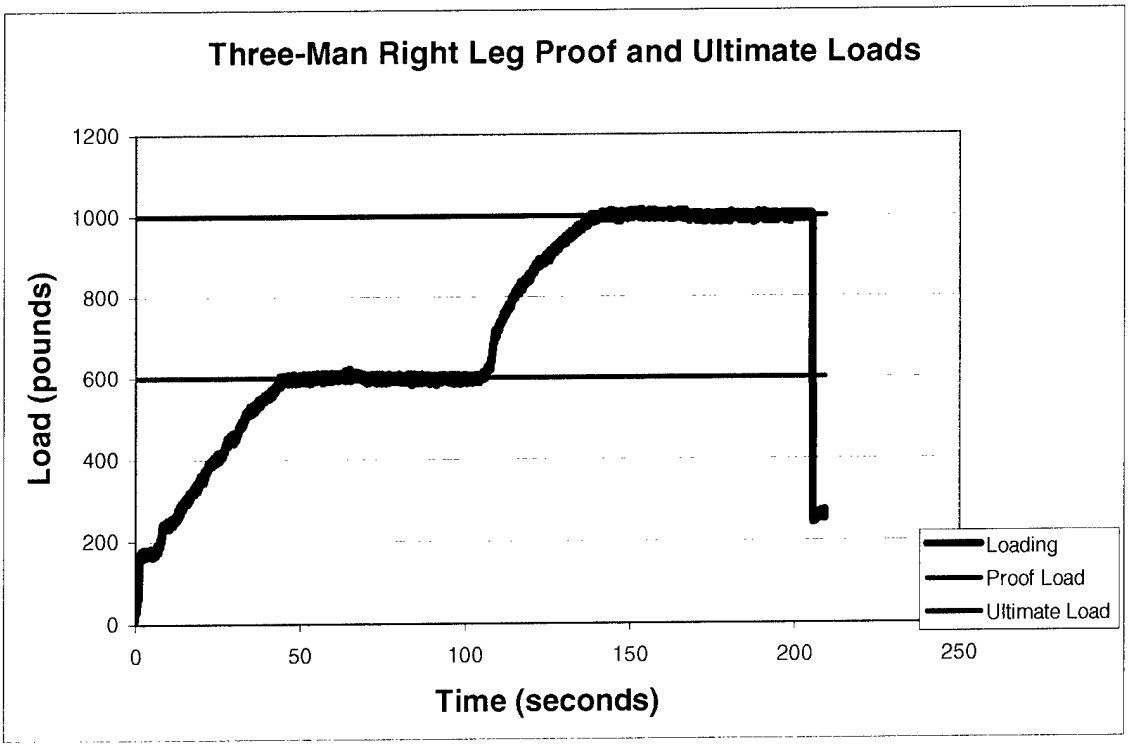

Figure 12: Data Collected during Testing of Right Leg

The second back test was conducted using a new seat. LT Tim Skaar was in attendance. Prior to attaching the seat to the Static Test Fixture, the seat was weighed and the weight was measured to be 8 lb. This seat was 3 lb heavier than the first seat that was back-tested. This test again used the three-man pressure foot. The proof load of 1,200 lb was first applied for 60 sec. Then the ultimate load of 1,800 lb was applied. There were no failures during this test. The graph created from the downloaded data is shown below in figure 13. All still photographs taken are available in appendix B.

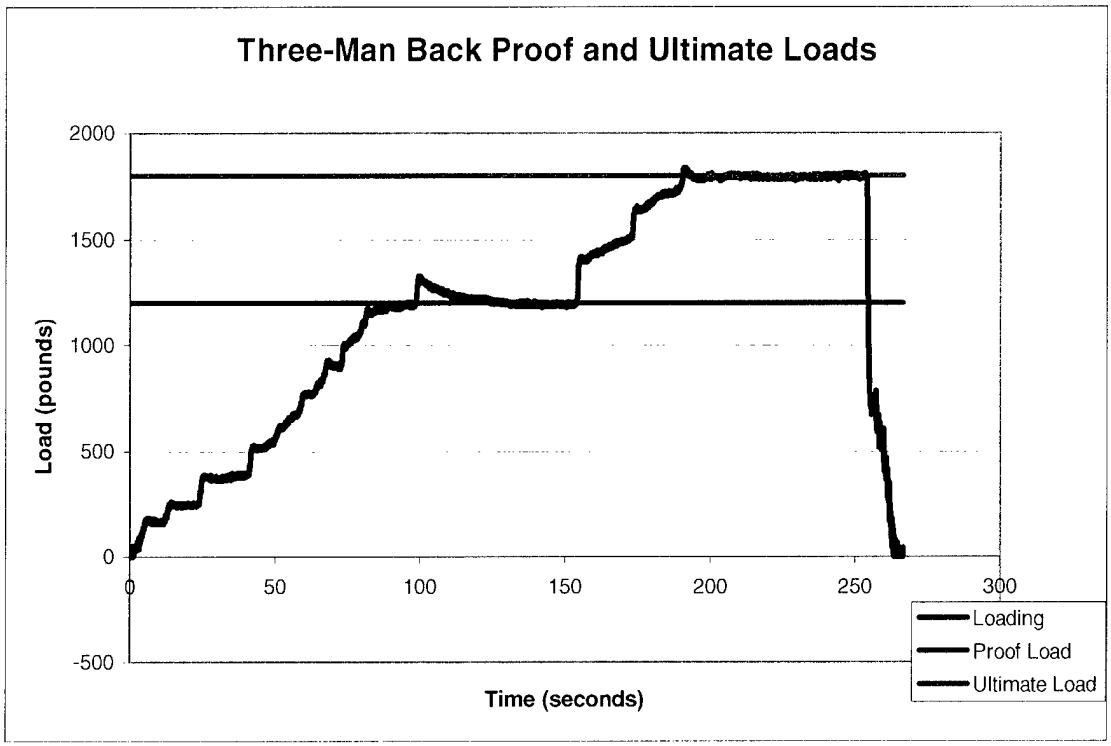

Figure 13: Data Collected during Testing of Seat Back

The bottom and side test was the last test conducted. LT Tim Skaar was on hand to witness this test. The seat was weighed prior to testing and weighed 8 lb. The Test Plan called for a proof load for the bottom to be 4,410 lb. The loading was reduced to 4,030 lb to account for the weight of the pressure foot and the weight of the sandbags. This is because the seat would see the total weight of 4,410 lb, while the digital readout would only show 4,030 lb. The bottom load was first applied to the seat and held for 60 sec. After 60 sec, the displacement of the front tubing was measured and the side proof load was calculated to be 450 lb. This load was applied and, when reached, the right spreader bar came loose from the rear bar where it was attached. After consulting with LT Skaar, this was not deemed a failure and the testing continued. After holding the side proof load for 60 sec, the bottom load was increased so that the ultimate load of 6,220 lb could be reached. Prior to reaching the ultimate load at 5,420 lb, the legs of the seat buckled and the left spreader bar came loose from the rear bar where it was attached. It was

determined that the seat no longer had load-bearing capability and the test was stopped. Photographs of the failures are shown below in figures 14 through 19. The graph created from the downloaded data is shown below in figure 20. All still photographs taken are available in appendix B.

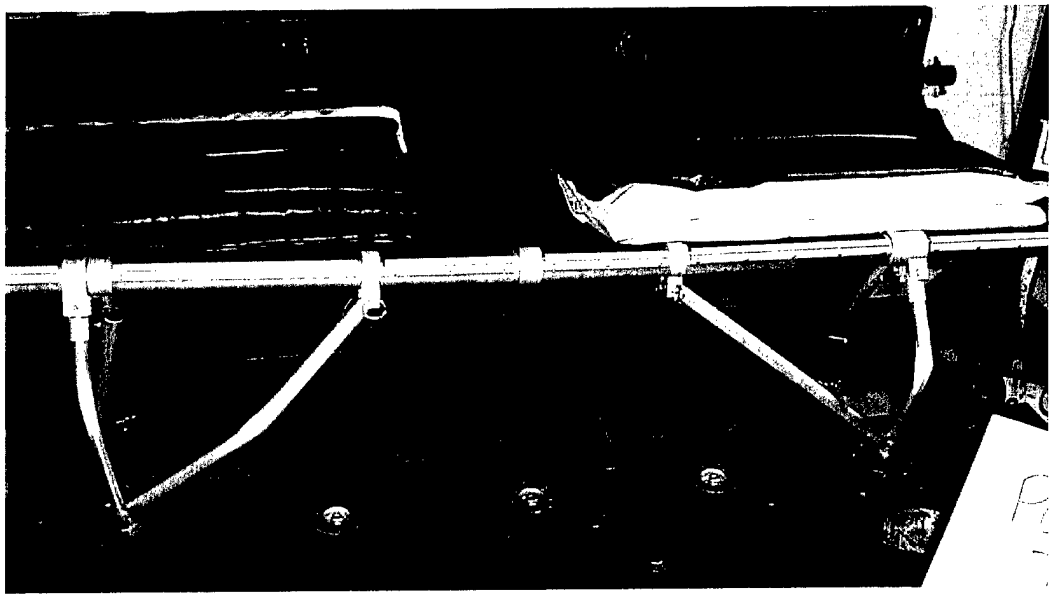

Figure 14: Front View of Failure of Legs

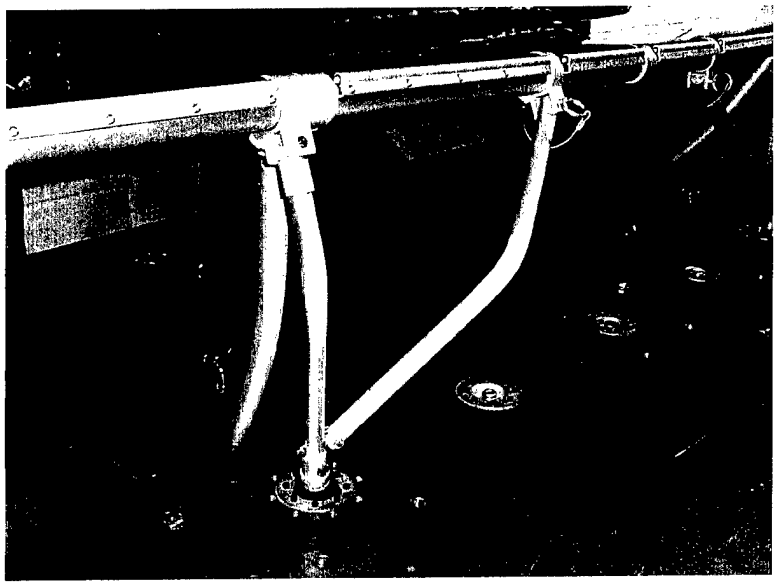

Figure 15: Closeup of Failure of Right Leg

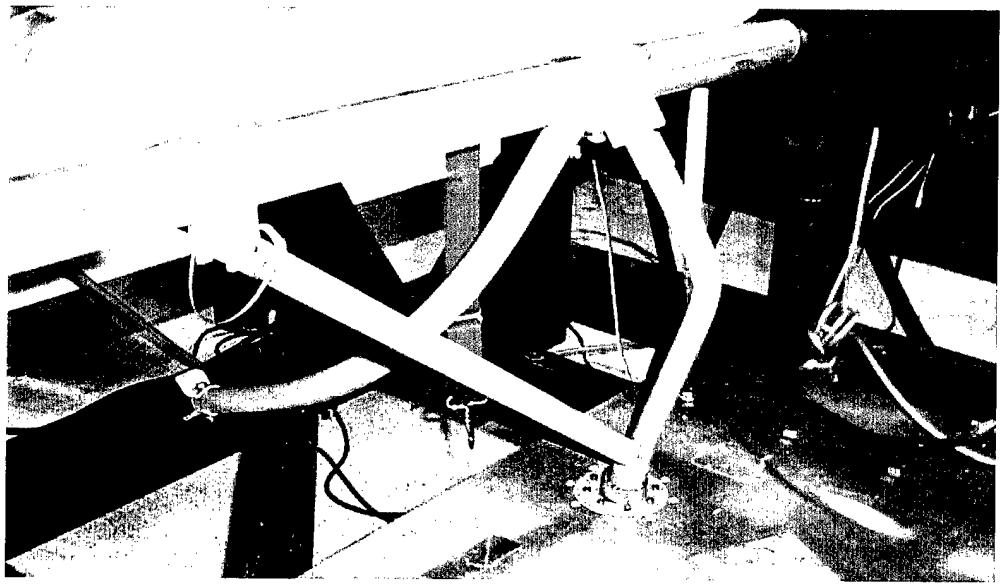

Figure 16: Closeup of Failure of Left Leg

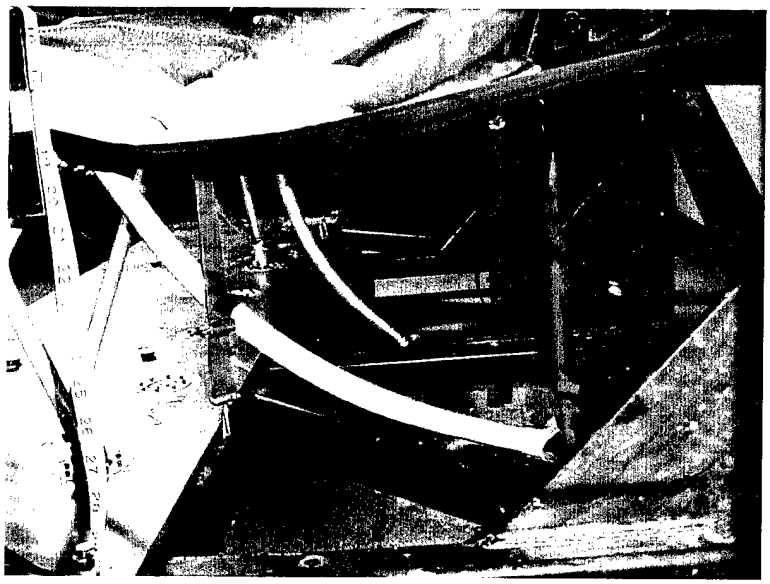

Figure 17: Spreader Bars from Side

Figure 18: Closeup of Failure of Left Spreader Bar

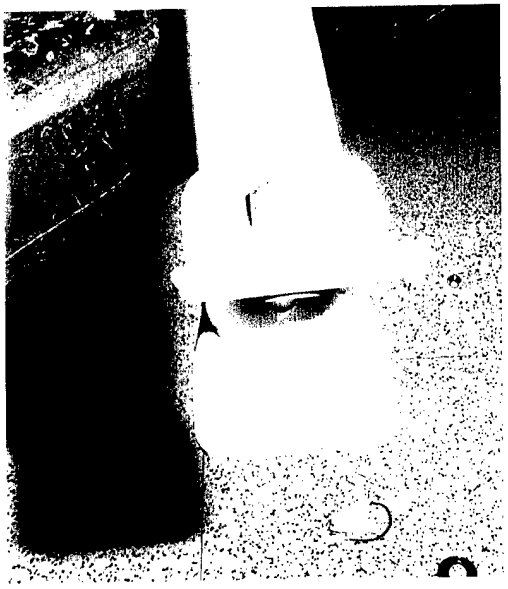

Figure 19: Closeup of Failure of Right Spreader Bar

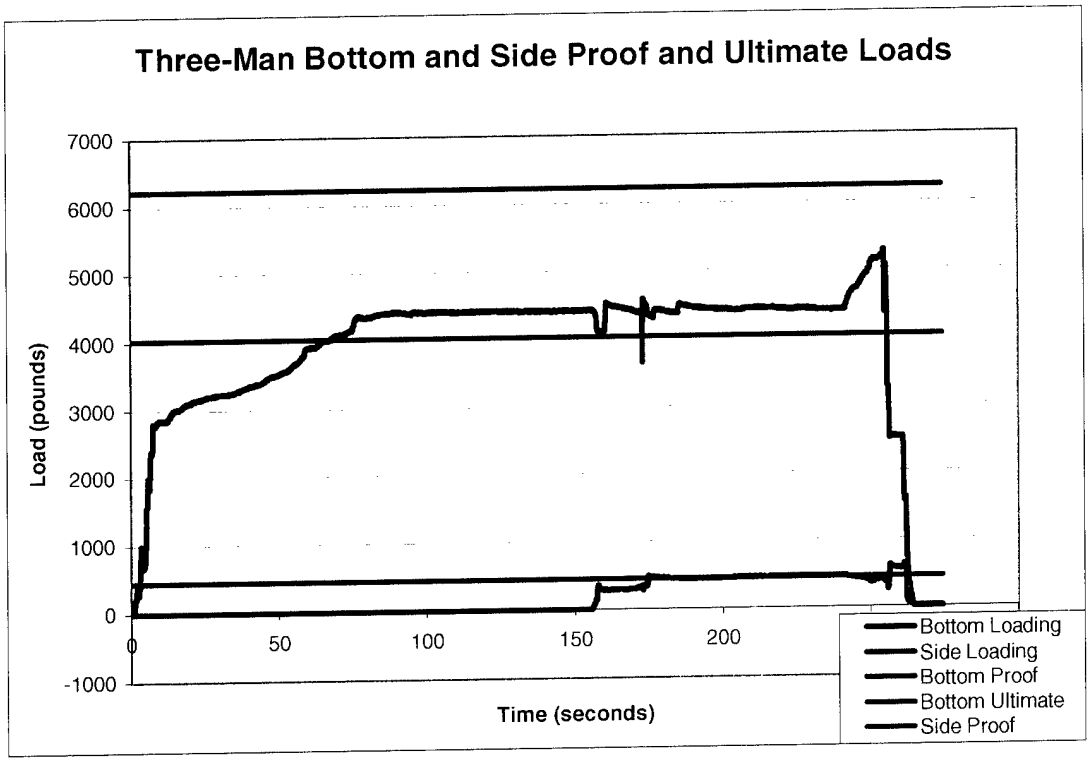

Figure 20: Data Collected during Testing of Seat Bottom and Side

CONCLUSIONS AND RECOMMENDATIONS

The three-man wall-hanging troop seat does not meet the standards established in Military Standard 5804C. Because they do not meet this standard, they do not give adequate protection to the troops that have to sit in them. Therefore, it is recommended that the seat be redesigned or that a replacement for the seat be found.

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APPENDIX A
STANDARD TROOP SEAT QUALIFICATION TESTING PROCEDURES

Prepared by:

Jerry Hill for NAVAIR 4.6.2.2

July 2000

1.1 Introduction

1.1.1 Test Fixture Design

The design of the Static Test Fixture was a result of interior surveys of the C-130, C-141, and KC-135 aircraft. The fixture was designed to simulate the seat attachment points of the aircraft and provide a stable framework from which the desired testing loads could be consistently applied. The structure was designed to measure loads from the seat bottom or back as well as side loads.

1.1.2 Test Fixture Function

The test loading is accomplished by a pressure foot driven by a hydraulic cylinder. The pressure foot is designed according to MIL-S-58095 and SAE AS8049 guidelines and is interchangeable. One-, two-, and three-man seat configurations can be tested with body and back blocks provided for each. The dimensions for the blocks can be found in table 1.1. The upper structure rotates for application of loads to either the seat bottom or seat back. A second hydraulic cylinder is then implemented for side loads on the front tube of the seat. The hydraulic cylinders are loaded at the rate of 20 lb/sec or 1,200 lb/min. Proof and ultimate loading forces are held for a minimum of 1 min before releasing.

Table 1.1: Dimensions of the Pressure Feet and Body Block

Block	Thickness (in.)	Width (in.)	Height (in.)	Weight (lb)
One-man	4	16.5	20.31	90
Two-man	4	38.5	20.31	190
Three-man	4	58.25	20.31	297
Body	12	15	12.5	10

1.1.3 Fixture Inspection

To ensure proper collection of data and the safety of testing personnel, the inspection of the test fixture and setup are an important part of test procedures.

The Static Test Fixture was previously used for Developmental Static Testing and the bed portion was used for Developmental Dynamic Testing. After the fixture was shipped from NAWCAD Warminster, it was reassembled, inspected, and then used in testing of the redesigned Leg Assembly at the next location in Asheville, North Carolina. The life cycle of the Stud Fitting Assembly was also tested. The fixture was then disassembled and shipped to NAVAIR. There it was reassembled and the materials reinspected. There were no discrepancies noted.

In Asheville, the test fixture was inspected before and after each test series to ensure the stability and safety of the test bed. Inspections include a retorque of all bolts, measurement of significant distances, checking of all welds, and a leak check of the

hydraulic cylinders. The stud fitting floor attachments are to be inspected after each test and replaced upon any sign of damage. These inspections are part of the Static Test Checklist, which was part of the test plan sent from USAF and will be implemented at NAVAIR. These lists include inspections for both Proof Loads and Ultimate Loads and can be found in Attachment 1 entitled, "Static Testing Procedure Checklist."

2.1 Static Testing Procedure

The procedures for the loading of the seats will involve the procedures that were included in the USAF test plan. The USAF test plan was written to test seats in accordance with MIL-S-27174B and MIL-S-5804C. This test series only calls for seats to be tested to MIL-S-5804C. The seats are to be attached to the stud fittings on the fixture and a pretest inspection is to be completed. After the inspection, photographs are to be taken of the attached seats.

2.1.1 Loading

For loading, the hydraulic power unit is to be turned on and allowed to build to the desired pressure reading. The pressure is then slowly released to begin loading on the load cells. When the Proof Load is achieved, the side load is determined based on displacement of front tube. The loading is then returned to Proof Load and the side load is applied. The load is released and the power unit is turned off. The video is then turned off. After the equipment is turned off, a post-test inspection is to be completed and photographs are to be taken. The process is then repeated for Ultimate Load testing.

2.1.2 Static Testing Conditions

Conditions for Static Testing are based on the requirements of either MIL-S-27174B or MIL-S-5804C, depending on the military specification in which the seats were built. Loading requirements were assigned to test the strength of the seat bottom, seat back, seat leg, and seat interconnection joint under maximum seat occupant loads. The following test conditions will be used for acceptance testing and first article inspection of seats built in accordance with MIL-S-27174B or MIL-S-5804C.

The seat bottom of each type of seat will be tested on the Static Test Fixture to verify that it will withstand the testing loads specified in table 2.1. The loads will be acting downward on and be evenly distributed by the interface over the seat bottom.

Table 2.1a. Test Loads for Seat Bottom in Accordance with MIL-S-27174B, Sec. 4.4.2.1

Seat Type	Ultimate Load (lb)	Proof Load (lb)
I	2,200	1,340
II	4,400	2,670

Table 2.1b. Test Loads for Seat Bottom in Accordance with MIL-S-5804C, Sec. 3.5.3.1

Seat Type	Ultimate Load (lb)	Proof Load (lb)
One-man	2,200	1,470
Two-man	4,400	2,940
Three-man	6,600	4,410

The seat back of each type of seat will be tested on the Static Test Fixture to verify that it will withstand the testing loads specified in table 2.2. The loads will be acting rearward on and be uniformly distributed over the seat back.

Table 2.2a. Test Loads for Seat Back in Accordance with MIL-S-27174B, Sec. 4.4.2.2

Seat Type	Ultimate Load (lb)	Proof Load (lb)
I	600	400
II	1,200	800

Table 2.2b. Test Loads for Seat Back in Accordance with MIL-S-5804C, Sec. 3.5.3.2

Seat Type	Ultimate Load (lb)	Proof Load (lb)
One-man	600	400
Two-man	1,200	800
Three-man	1,800	1,200

The side of each seat will be tested on the Static Test Fixture to verify that it will withstand the side testing loads specified in table 2.3. The side load will act on the centerline of the seat tube that supports the front of the seat bottom.

Table 2.3a. Test Loads for Side of Seat in Accordance with MIL-S-27174B, Sec. 4.4.2.3

Seat Type	Ultimate Load (lb)	Proof Load (lb)
I	225	150
II	450	300

Table 2.3b. Test Loads for Side of Seat in Accordance with MIL-S-5804C, Sec. 3.5.3.3

Seat Type	Ultimate Load (lb)	Proof Load (lb)
One-man	225	150
Two-man	450	300
Three-man	675	450

The seat legs for each of the seats will be tested on the Static Test Fixture to verify that each will withstand the proof and ultimate loads according to the following table. The loads are applied perpendicular to and upward from the plane.

Table 2.4. Test Loads for Seat Leg Locking Mechanism

Seat Type	Ultimate (lb)	Proof (lb)	Reference
MIL-S-27174B	1,000	670	Sec. 4.4.2.4
MIL-S-5804C	1,000	600	Sec. 3.5.3.4

For seats built in accordance with MIL-S-27174B only, the seat interconnection for Type I and Type II seats shall be joined at the seat back, seat bottom, and front support tube. The seat loading procedures for a Type I seat shall be tested in accordance with MIL-S-27174B, Sec. 4.4.2.5. Back and bottom loads will be applied in the normal seating position centered about the vertical plane of the interconnection joints. To test the worst case for interconnection, the seats will be connected with the one-man seat on the left side and the two-man seat on the right side. In this configuration, the shorter bolt is placed with the nylon housing directly under the load.

3.1 Static Test Classification

3.1.1 Failure

When testing the seats, a failure may result from test equipment, test instrumentation, the test fixture, the test article, or improper setup. A failure analysis would include determination of the cause of the failure. A test is classified as a "Failure" if there is failure of the test setup or failure of the test article. A test failure for the USAF Standard Troop Seat is defined as any tested article, which meets the following conditions.

1. Failure of the Seat Bottom fabric resulting in the total loss of load-carrying capability.
2. Failure of the Retaining Plate(s) stitching or fabric or hardware attaching the Seat Bottom fabric to the Front Tube, which results in the total loss of load-carrying capability.
3. Failure of the Stud Fitting Assembly locking lug(s) or related components resulting in separation from the floor stud plate.
4. Failure of the Leg Brace Assembly, which results in the total loss of load-carrying capability due to any of the following:
   a. Column failure of the Leg Brace Tube.
   b. Separation of the Leg Brace Tube from the Upper Fitting.
   c. Separation of the Leg Brace Tube from the Lower Fitting.
   d. Failure of the Leg Brace attachment to the Eyebolt on the Leg Assembly.
   e. Failure of the Leg Brace attachment to the Upper Brace Fitting on the Front Tube.

5. Failure of Leg Assembly or leg attaching hardware, which results in a total loss of load-carrying capability.
6. Failure of the Front Tube, which results in a total loss of load-carrying capability.
7. Failure of the Spreader Bar Front Fitting or Insert, which results in separation of the Spreader Bar from the Front Tube.
8. Failure of the Spreader Bar Rear Fitting, which would allow the Spreader Bar to detach from the aft mounting bar while the Seat Bottom is loaded.

3.1.2 No Test

Failure of test equipment, test instrumentation, or test setup is classified as a "No Test." The test is repeated with replacement of equipment or corrected procedures. A test of the USAF Standard Troop Seat is considered a "No test" if any of the following occur:

1. Failure of the hydraulic system.
2. Failure of the load cell or bad load cell calibration.
3. Failure of either of the digital read outs for the load cells.
4. Failure of any component of the Static Test Fixture.
5. Failure of any two of the video cameras.
6. Failure to produce the stated proof, side, or ultimate loads within a tolerance of $\pm$10%.

3.1.3 Procedures Following a Failure

There will be immediate notification of the USAF in the event of a failure - either of test equipment, test instrumentation, test fixtures, or test articles. In the event of a failure, the following actions will be taken and all inspection observations will be recorded.

1. All further testing will be discontinued until the cause and remedy of the failure is determined. The USAF Program Manager will be notified of the failure within 24 hr.
2. The test setup will be photographed, as necessary, prior to any change in the test setup.
3. The test fixture will be visually inspected and photographed, as necessary, to determine its impact, if any, on the failure.
4. The test article will be visually inspected and photographed while on the test fixture.
5. The test article will be removed from the test fixture, photographed and inspected as an assembly.
6. The test article will be disassembled, as necessary, to determine the specific component or part, which failed.
7. The component or part which failed will be inspected to ascertain the reason for its failure.
8. The inspection data will be analyzed to verify the specific cause of the failure.
9. Testing will resume when all parties are in accord.

STATIC TESTER CHECK LIST

Test Number:	Test Date:	Mil-Spec:
Test Item:		
Part Number:		
Manufacturer:	Date Manufactured:	Serial #

COMPLETE	STATIC TEST PROCEDURE
	Configure test fixture hydraulic cylinder for test article
	Install proper pressure foot
	Install back block or butt-blocks (as needed)
	TEST ARTICLE INFORMATION:
	Weight of test article:
	Serial Number:
	Seat Manufacturer:
	Date of Manufacture:
	Install test on Static Test Fixture
	Turn on all data acquisition equipment
	Verify instrumentation continuity
	Zero all instrumentation
	Photograph test set up with digital camera
	SAFETY: Ensure no Foreign Object Debris (FOD) on test fixture
	SAFETY: Escort witnesses to safe area
	Turn hydraulic pump on
	ACTUAL TEST PROCEDURES:
	Load Back, Bottom or Leg to proof load
	Hold proof load for 60 seconds
	FOR BOTTOM LOAD: determine side load based on front tube aft displacement
	Apply proof side load if bottom/side load test
	Note any failures or damage to test article
	Load Back, Bottom or Leg to ultimate load
	Hold ultimate load for 60 seconds
	FOR BOTTOM LOAD: determine side load based on front tube aft displacement
	Apply ultimate side load if bottom/side load test
	Note any failures or damage to test article
	Release Load
	Stop recording data and begin to download onto computer
	Inspect test article for damage
	Use damage checklist to record all damage
	Verify that there is no apparent failure of the test fixture or test set up
	Take post test photographs with digital camera
	Remove test article from test fixture
	Mark test with test number and date

NO	YES	AREAS OF POSSIBLE DAMAGE
		Inspect floor plates for damage or excess deformation
		Inspect seat fabric and seat structures attaching screws. Verify that fasteners are properly aligned.
		Verify there are no tears in the seat fabric
		Verify there are no punctures in the seat fabric
		Verify there are no excessive abrasions in the seat fabric
		Verify there are isn't any strained or failed stitching in the seat fabric
		Verify there are no failed or deformed Tie-Down Hooks
		Verify there are no strained or deformed zippers
		Inspect leg locking mechanism for any failures or deformations
		Inspect leg tubing and measure and record any deformations
		Inspect leg brace and upper brace fitting for deformations
		Inspect spreader bars for deformation

NOTES:

APPENDIX B
COMPLETED CHECKLIST AND PHOTOGRAPHS

STATIC TESTER CHECKLIST

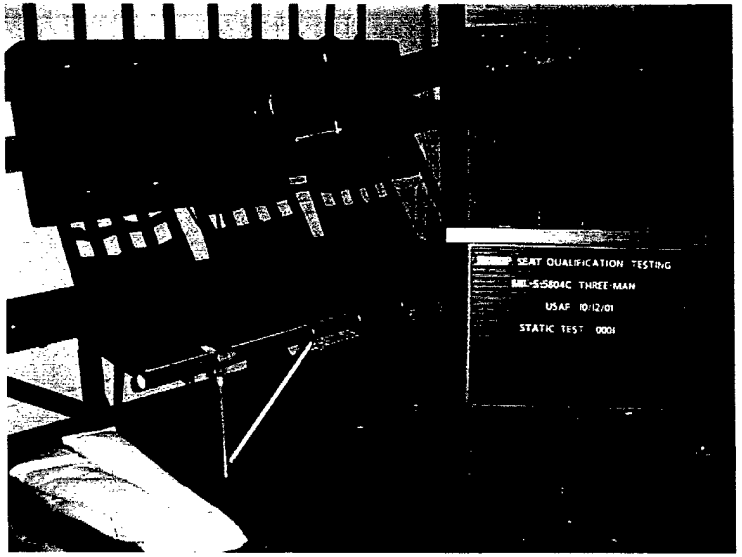
Test Number: 0001	**Test Date:** 10/12/01	**Mil-Spec:** 5804C
Test Item: Three-Man Seat, BACK LOAD		
Part Number: 3WC1032R		
Manufacturer: Newgard	**Date Manufactured:** Unknown	**Serial #:** 1680-00-616-4604

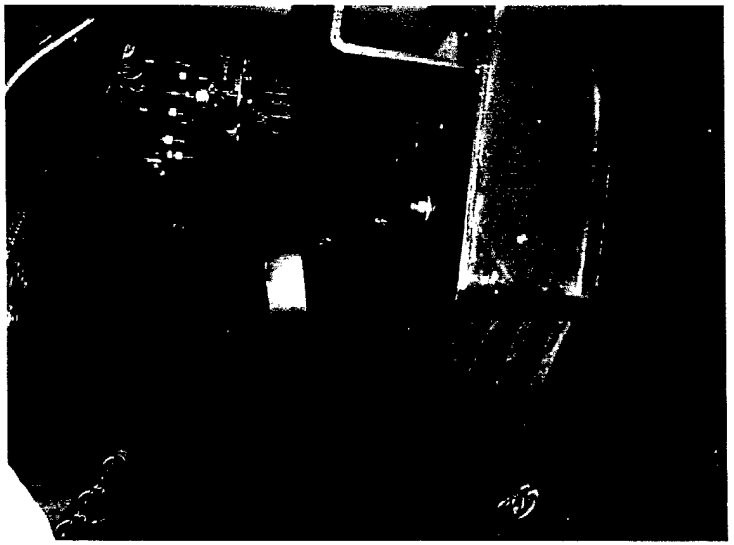
COMPLETE	**STATIC TEST PROCEDURE**
Complete	Configure test fixture hydraulic cylinder for test article
Complete	Install proper pressure foot
Complete	Install back block or butt blocks (as needed)
	TEST ARTICLE INFORMATION:
Complete	*Weight of test article:* 5 lb
Complete	*Serial Number:* 1680-00-616-4604
Complete	*Seat Manufacturer:* Newgard
Complete	*Date of Manufacture:* Unknown
Complete	Install test on Static Test Fixture
Complete	Turn on all data acquisition equipment
Complete	Verify instrumentation continuity
Complete	Zero all instrumentation
Complete	Photograph test setup with digital camera
Complete	**SAFETY:** Ensure no Foreign Object Debris (FOD) on test fixture
Complete	**SAFETY:** Escort witnesses to safe area
Complete	Turn hydraulic pump on
	ACTUAL TEST PROCEDURES:
Complete	Load Back, Bottom, or Leg to proof load
Complete	Hold proof load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply proof side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Load Back, Bottom, or Leg to ultimate load
Complete	Hold ultimate load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply ultimate side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Release load
Complete	Stop recording data and begin to download onto computer
Complete	Inspect test article for damage
Complete	Use damage checklist to record all damage
Complete	Verify that there is no apparent failure of the test fixture or test setup
Complete	Take posttest photographs with digital camera
Complete	Remove test article from test fixture
Complete	Mark test with test number and date

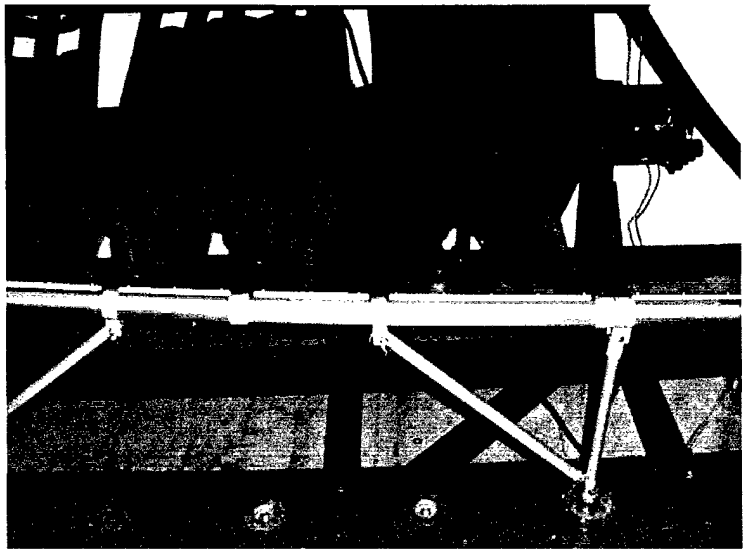
NO	YES	AREAS OF POSSIBLE DAMAGE
NONE		Inspect floor plates for damage or excess deformation.
	YES, See Notes	Inspect seat fabric and seat structures attaching screws. Verify that fasteners are properly aligned.
NONE		Verify there are no tears in the seat fabric.
NONE		Verify there are no punctures in the seat fabric.
NONE		Verify there are no excessive abrasions in the seat fabric.
NONE		Verify there is not any strained or failed stitching in the seat fabric.
NONE		Verify there are no failed or deformed tiedown hooks.
NONE		Verify there are no strained or deformed zippers.
NONE		Inspect leg locking mechanism for any failures or deformations.
NONE		Inspect leg tubing and measure and record any deformations.
NONE		Inspect leg brace and upper brace fitting for deformations.
NONE		Inspect spreader bars for deformation.

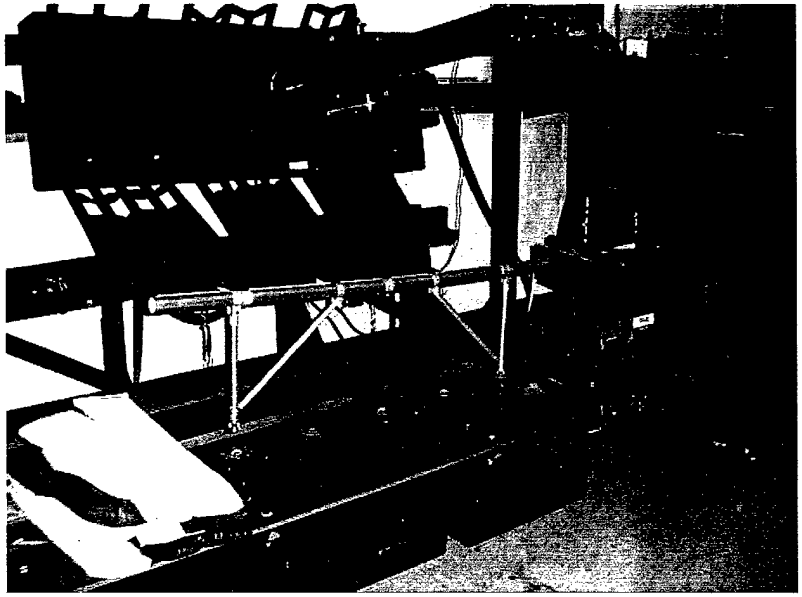
NOTES: At approximately 914 lb, the locking device on the right leg unlocked and allowed the right leg to come out of the fastening point. The leg was 6 in. off the floor plating. At 1,754 lb, the fabric came out from under the seat structure attaching screws. There were no tears or rips anywhere in the fabric. No other damage was done to the seat.

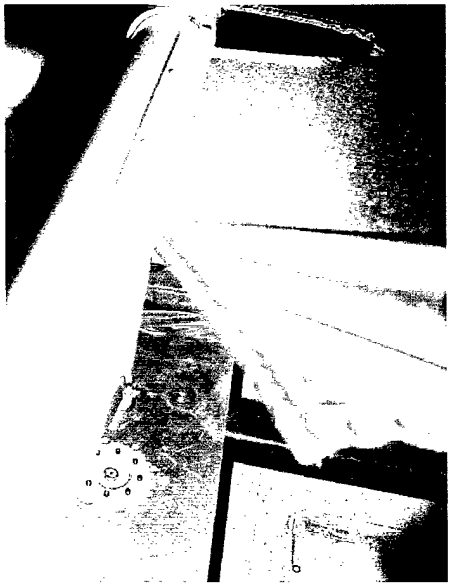
Photographs that were taken prior to the testing and after the testing are on the following pages.

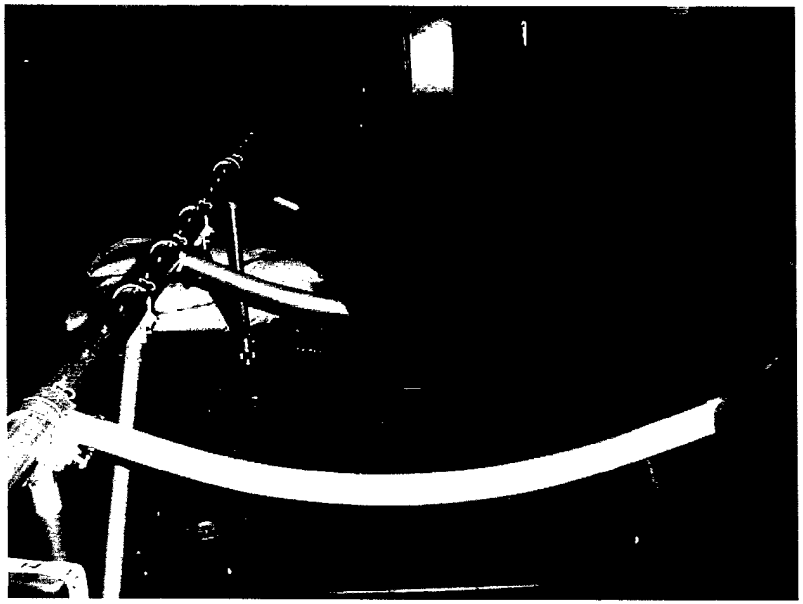

SEAT QUALIFICATION TESTING
MIL-S-58004C THREE-MAN
USAF 10/12/01
STATIC TEST 0001

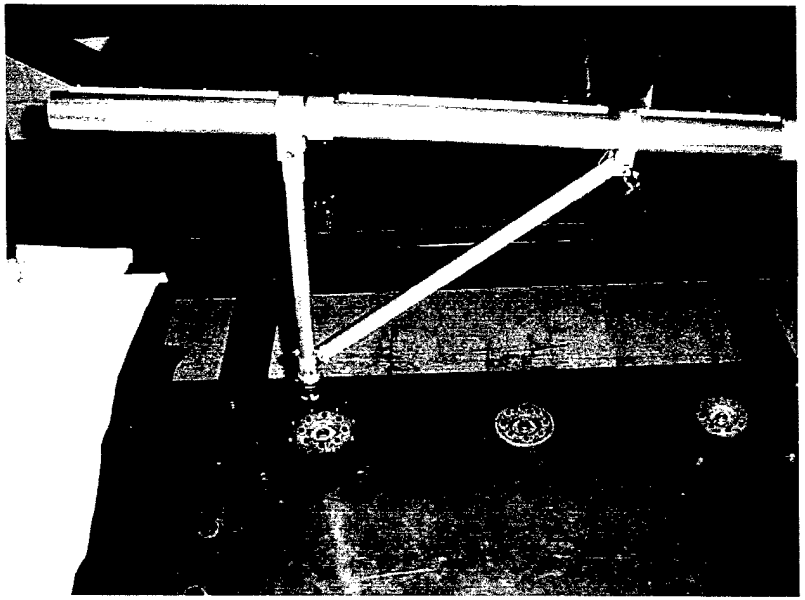












STATIC TESTER CHECKLIST

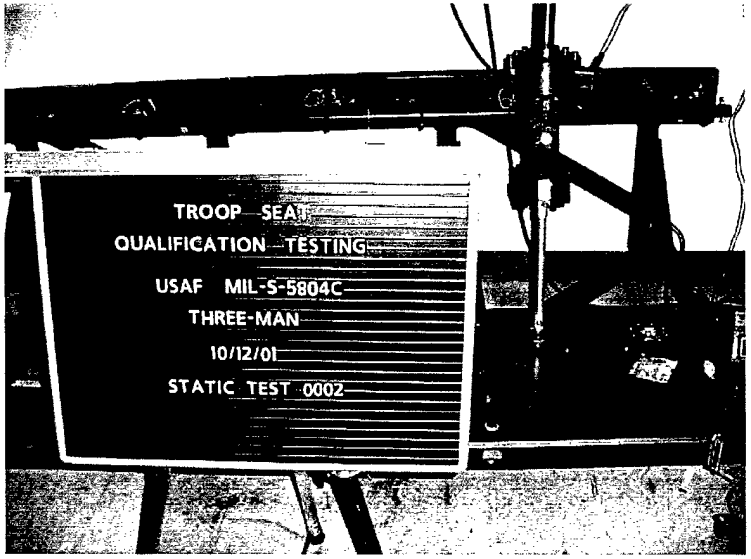
Test Number: 0002	**Test Date:** 10/12/01	**Mil-Spec:** 5804C
Test Item: Three-Man Seat, LEFT LEG LOAD TEST		
Part Number: 3WC1032R		
Manufacturer: Newgard	**Date Manufactured:** Unknown	**Serial #:** 1680-00-616-4604

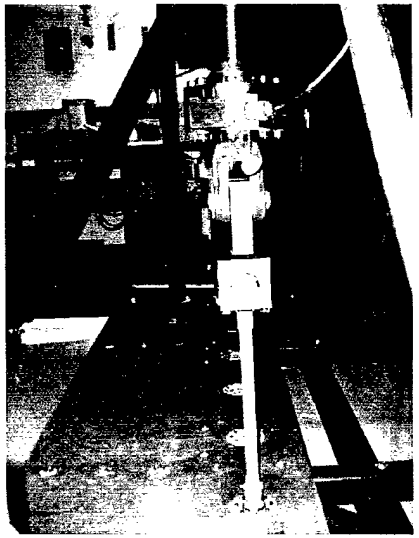
COMPLETE	**STATIC TEST PROCEDURE**
Complete	Configure test fixture hydraulic cylinder for test article
Complete	Install proper pressure foot
Complete	Install back block or butt blocks (as needed)
	TEST ARTICLE INFORMATION:
Complete	*Weight of test article:* 0.75 lb
Complete	*Serial Number:* 1680-00-616-4604
Complete	*Seat Manufacturer:* Newgard
Complete	*Date of Manufacture:* Unknown
Complete	Install test on Static Test Fixture
Complete	Turn on all data acquisition equipment
Complete	Verify instrumentation continuity
Complete	Zero all instrumentation
Complete	Photograph test setup with digital camera
Complete	**SAFETY:** Ensure no FOD on test fixture
Complete	**SAFETY:** Escort witnesses to safe area
Complete	Turn hydraulic pump on
	ACTUAL TEST PROCEDURES:
Complete	Load Back, Bottom, or Leg to proof load
Complete	Hold proof load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply proof side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Load Back, Bottom, or Leg to ultimate load
Complete	Hold ultimate load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply ultimate side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Release load
Complete	Stop recording data and begin to download onto computer
Complete	Inspect test article for damage
Complete	Use damage checklist to record all damage
Complete	Verify that there is no apparent failure of the test fixture or test setup
Complete	Take posttest photographs with digital camera
Complete	Remove test article from test fixture
Complete	Mark test with test number and date

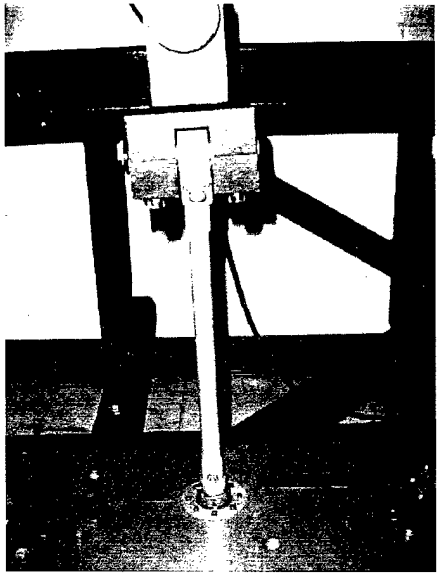
NO	YES	AREAS OF POSSIBLE DAMAGE
NONE		Inspect floor plates for damage or excess deformation.
NA		Inspect seat fabric and seat structures attaching screws. Verify that fasteners are properly aligned.
NA		Verify there are no tears in the seat fabric.
NA		Verify there are no punctures in the seat fabric.
NA		Verify there are no excessive abrasions in the seat fabric.
NA		Verify there is not any strained or failed stitching in the seat fabric.
NA		Verify there are no failed or deformed tiedown hooks.
NA		Verify there are no strained or deformed zippers.
NONE		Inspect leg locking mechanism for any failures or deformations.
NONE		Inspect leg tubing and measure and record any deformations.
NONE		Inspect leg brace and upper brace fitting for deformations.
NA		Inspect spreader bars for deformation.

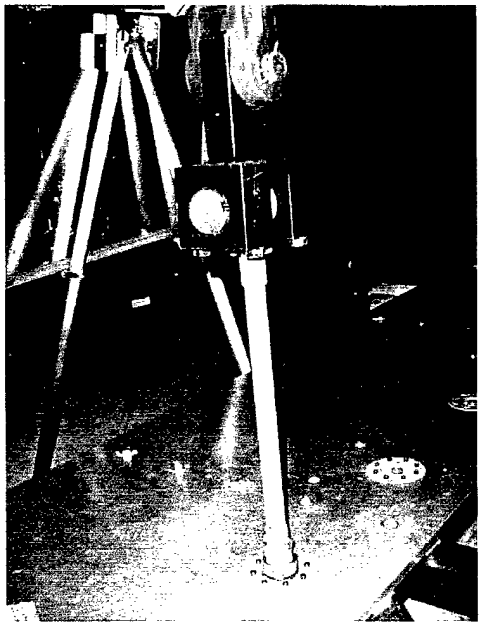
NOTES: This test went smoothly. The leg held the proof and ultimate loads. There was no deformation of the tubing or the locking device. The tube was the same length prior to and after the test. Still photographs show there was no damage to any part of the leg.

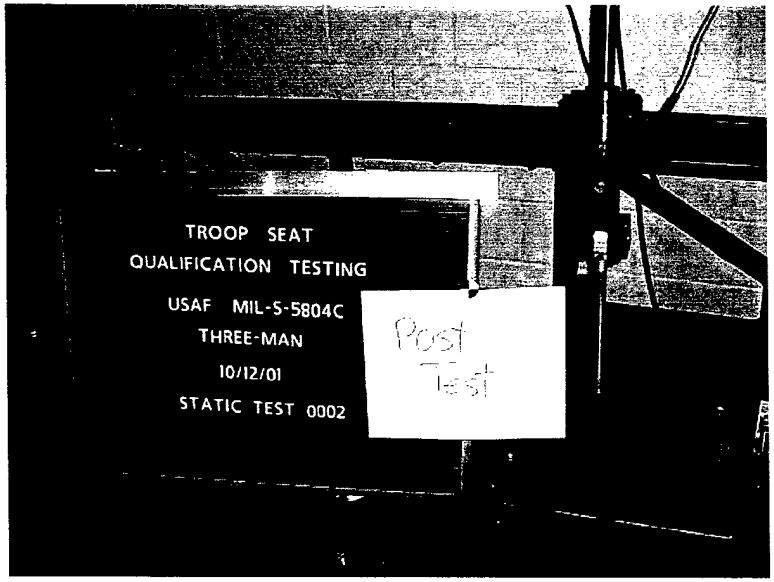
Photographs that were taken prior to the testing and after the testing are on the following pages.

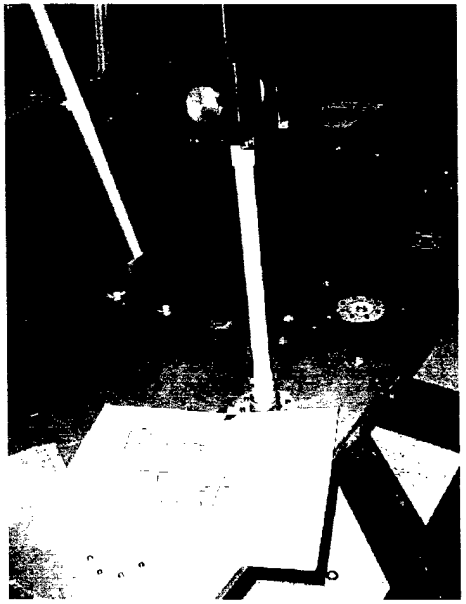

TROOP SEAT
QUALIFICATION TESTING
USAF MIL-S-5804C
THREE-MAN
10/12/01
STATIC TEST 0002

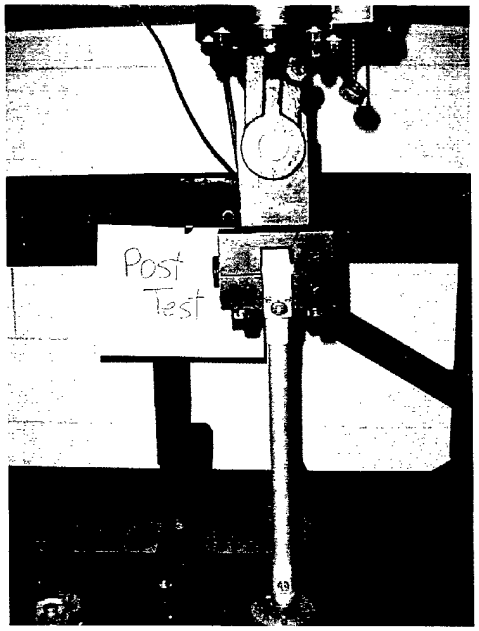







TROOP SEAT
QUALIFICATION TESTING
USAF MIL-S-5804C
THREE-MAN
10/12/01
STATIC TEST 0002
Post
Test

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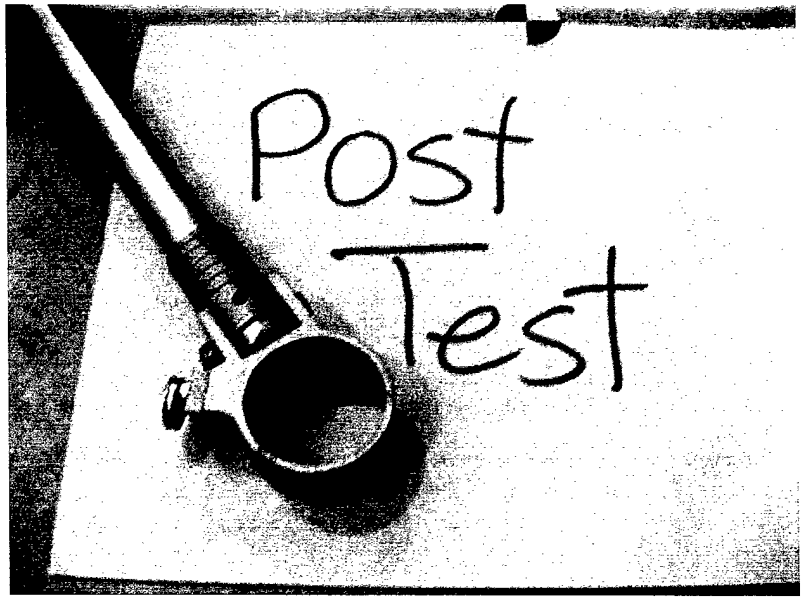
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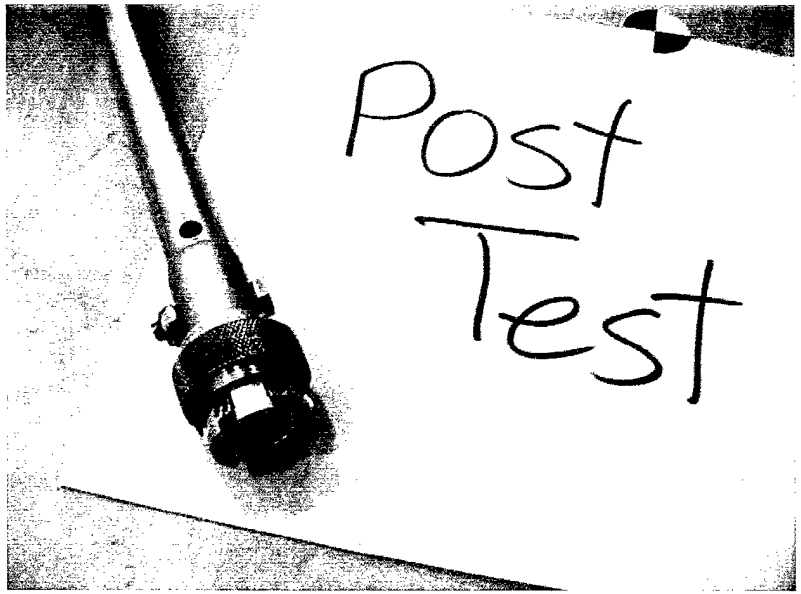

Post
Test

STATIC TESTER CHECKLIST

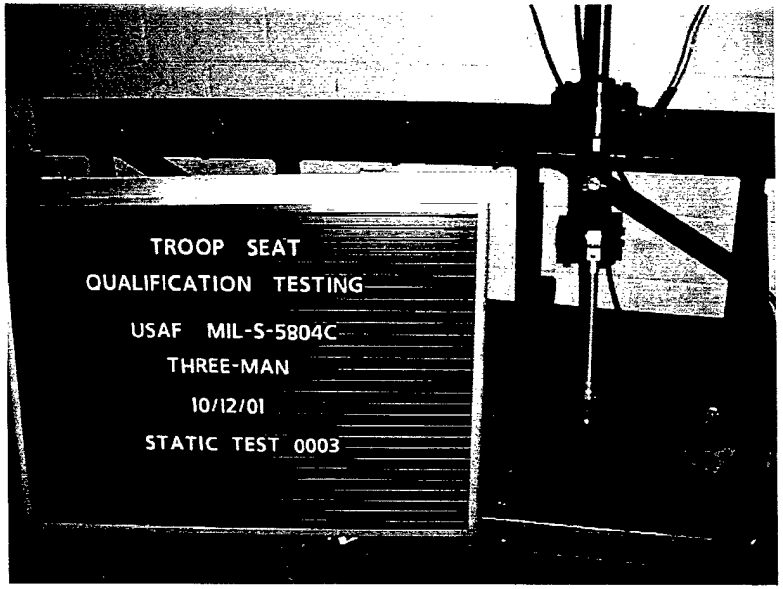
Test Number: 0003 | **Test Date:** 10/12/01 | **Mil-Spec:** 5804C
Test Item: Three-Man Seat, RIGHT LEG LOAD TEST
Part Number: 3WC1032R
Manufacturer: Newgard | **Date Manufactured:** Unknown | **Serial #:** 1680-00-616-4604

COMPLETE	STATIC TEST PROCEDURE
Complete	Configure test fixture hydraulic cylinder for test article
Complete	Install proper pressure foot
Complete	Install back block or butt blocks (as needed)
	TEST ARTICLE INFORMATION:
Complete	*Weight of test article:* 0.75 lb
Complete	*Serial Number:* 1680-00-616-4604
Complete	*Seat Manufacturer:* Newgard
Complete	*Date of Manufacture:* Unknown
Complete	Install test on Static Test Fixture
Complete	Turn on all data acquisition equipment
Complete	Verify instrumentation continuity
Complete	Zero all instrumentation
Complete	Photograph test setup with digital camera
Complete	**SAFETY:** Ensure no FOD on test fixture
Complete	**SAFETY:** Escort witnesses to safe area
Complete	Turn hydraulic pump on
	ACTUAL TEST PROCEDURES:
Complete	Load Back, Bottom, or Leg to proof load
Complete	Hold proof load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply proof side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Load Back, Bottom, or Leg to ultimate load
Complete	Hold ultimate load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply ultimate side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Release load
Complete	Stop recording data and begin to download onto computer
Complete	Inspect test article for damage
Complete	Use damage checklist to record all damage
Complete	Verify that there is no apparent failure of the test fixture or test setup
Complete	Take posttest photographs with digital camera
Complete	Remove test article from test fixture
Complete	Mark test with test number and date

NO	YES	AREAS OF POSSIBLE DAMAGE
NONE		Inspect floor plates for damage or excess deformation.
NA		Inspect seat fabric and seat structures attaching screws. Verify that fasteners are properly aligned.
NA		Verify there are no tears in the seat fabric.
NA		Verify there are no punctures in the seat fabric.
NA		Verify there are no excessive abrasions in the seat fabric.
NA		Verify there is not any strained or failed stitching in the seat fabric.
NA		Verify there are no failed or deformed tiedown hooks.
NA		Verify there are no strained or deformed zippers.
NONE		Inspect leg locking mechanism for any failures or deformations.
NONE		Inspect leg tubing and measure and record any deformations.
NONE		Inspect leg brace and upper brace fitting for deformations.
NA		Inspect spreader bars for deformation.

NOTES: This test went smoothly. The leg held the proof and ultimate loads. There was no deformation of the tubing or the locking device. The tube was the same length prior to and after the test. Still photographs show there was no damage to any part of the leg.

Photographs that were taken prior to the testing and after the testing are on the following pages.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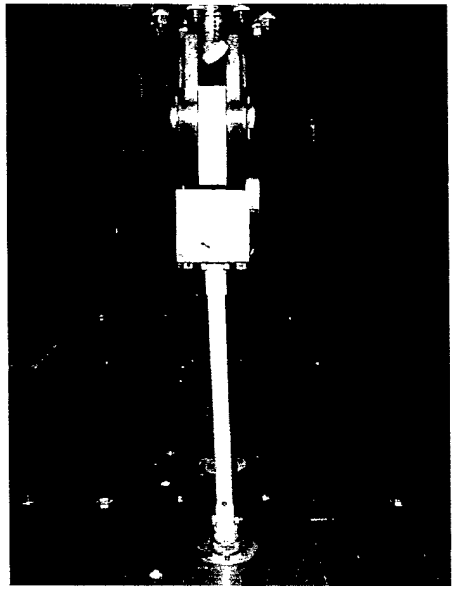
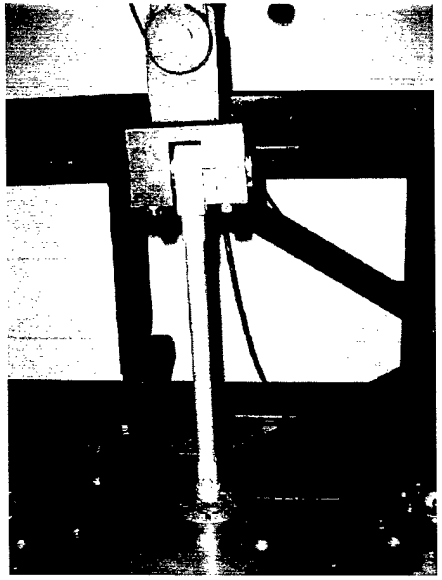
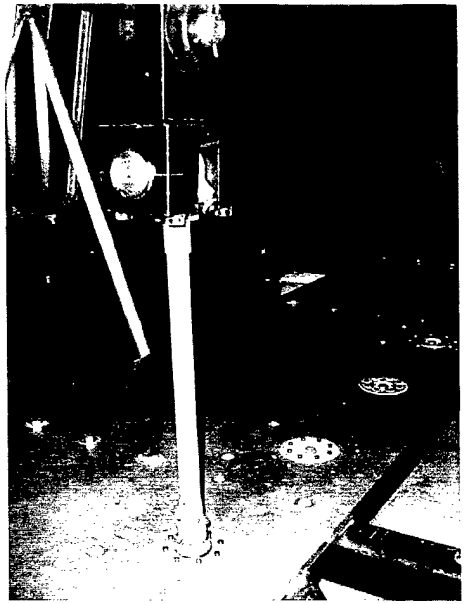
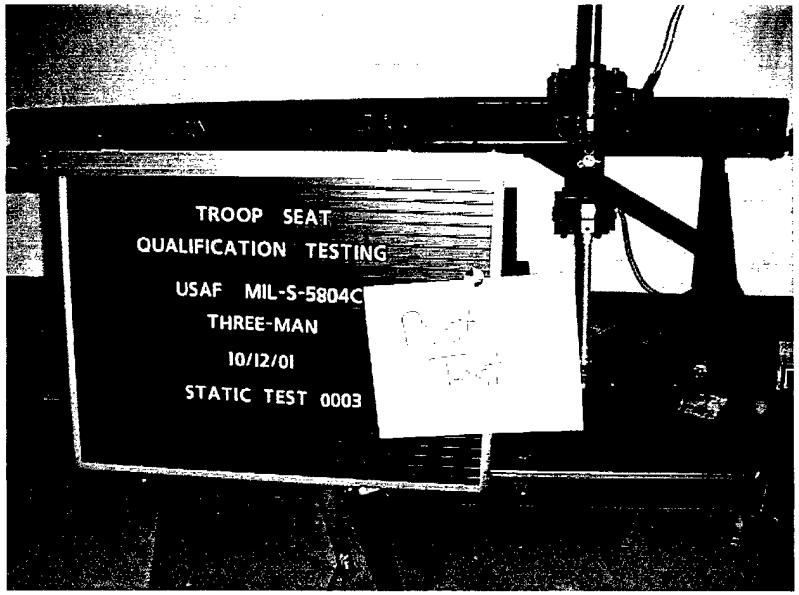
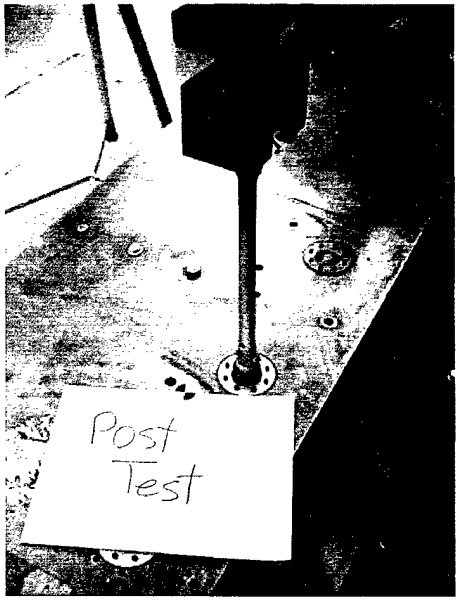
QUALIFICATION TESTING
USAF MIL-S-5804C
THREE-MAN
10/12/01
STATIC TEST 0003

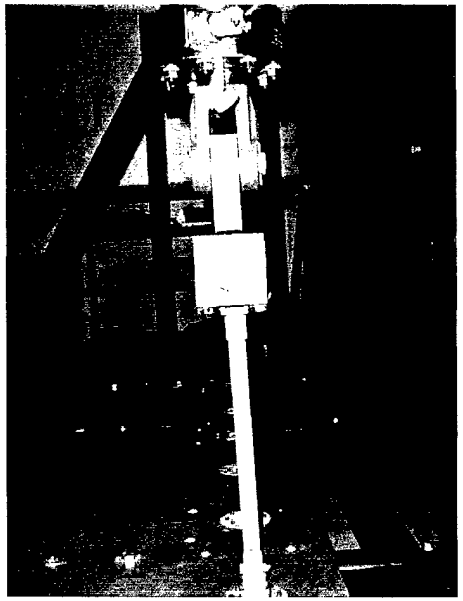







TROOP SEAT
QUALIFICATION TESTING
USAF MIL-S-5804C
THREE-MAN
10/12/01
STATIC TEST 0003


Post
Test



STATIC TESTER CHECKLIST

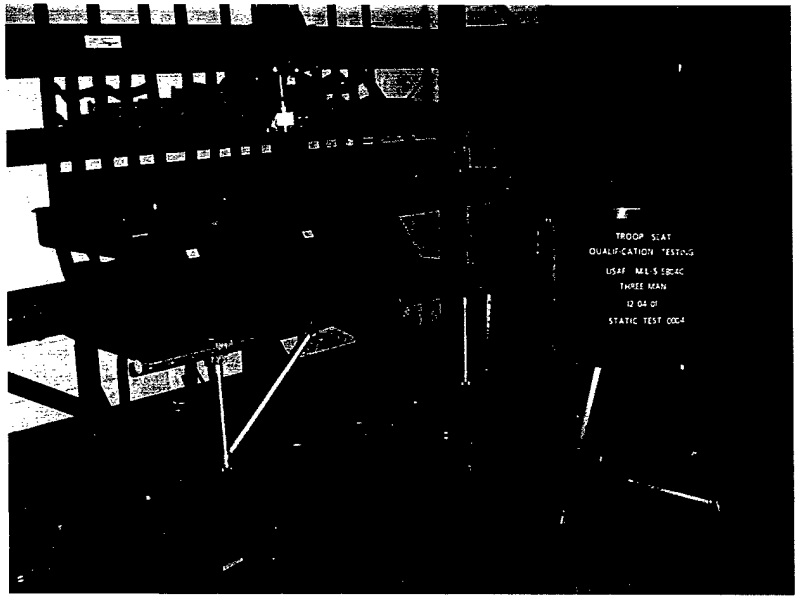
Test Number: 0004	**Test Date:** 12/04/2001	**Mil-Spec:** 5804C
Test Item: Three-Man Troop Seat		
Part Number: 3WC1032R		
Manufacturer: Newgard	**Date Manufactured:** NA	**Serial #:** 1680-00-616-4606

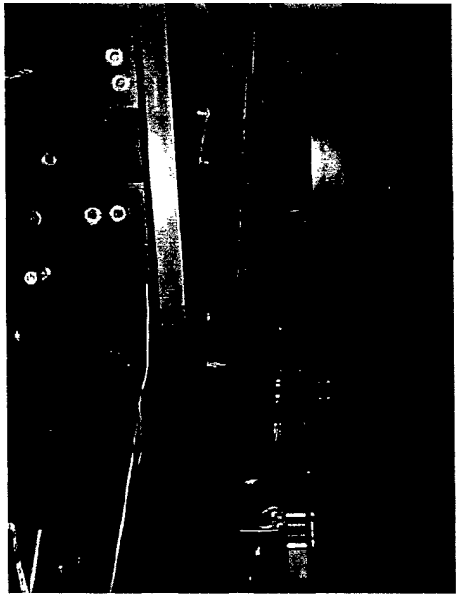
COMPLETE	**STATIC TEST PROCEDURE**
Complete	Configure test fixture hydraulic cylinder for test article
Complete	Install proper pressure foot
Complete	Install back block or butt blocks (as needed)
	TEST ARTICLE INFORMATION:
Complete	*Weight of test article:* 8.0 lb
Complete	*Serial Number:* 1680-00-616-4604
Complete	*Seat Manufacturer:* Newgard
Complete	*Date of Manufacture:* NA
Complete	Install seat on Static Test Fixture
Complete	Turn on all data acquisition equipment
Complete	Verify instrumentation continuity
Complete	Zero all instrumentation
Complete	Photograph test setup with digital camera
Complete	**SAFETY:** Ensure no FOD on test fixture
Complete	**SAFETY:** Escort witnesses to safe area
Complete	Turn hydraulic pump on
	ACTUAL TEST PROCEDURES:
Complete	Load Back, Bottom, or Leg to proof load (Back = 1,200 lb)
Complete	Hold proof load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply proof side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Load Back, Bottom, or Leg to ultimate load (Back = 1,800 lb)
Complete	Hold ultimate load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply ultimate side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Release load
Complete	Stop recording data and begin to download onto computer
Complete	Inspect test article for damage
Complete	Use damage checklist to record all damage
Complete	Verify that there is no apparent failure of the test fixture or test setup
Complete	Take posttest photographs with digital camera
Complete	Remove test article from test fixture
Complete	Mark test with test number and date

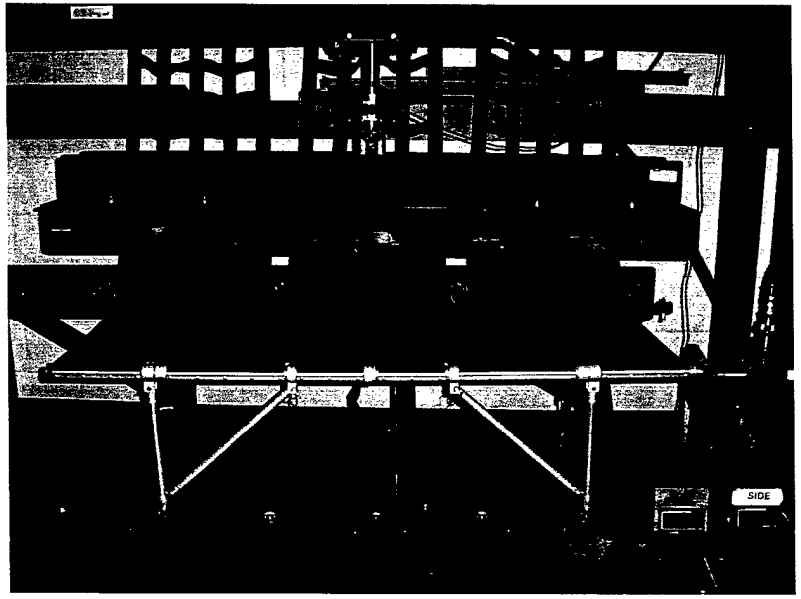
NO	YES	AREAS OF POSSIBLE DAMAGE
NONE		Inspect floor plates for damage or excess deformation.
NONE		Inspect seat fabric and seat structures attaching screws. Verify that fasteners are properly aligned.
NONE		Verify there are no tears in the seat fabric.
NONE		Verify there are no punctures in the seat fabric.
NONE		Verify there are no excessive abrasions in the seat fabric.
NONE		Verify there is not any strained or failed stitching in the seat fabric.
NONE		Verify there are no failed or deformed tiedown hooks.
NONE		Verify there are no strained or deformed zippers.
NONE		Inspect leg locking mechanism for any failures or deformations.
NONE		Inspect leg tubing and measure and record any deformations.
NONE		Inspect leg brace and upper brace fitting for deformations.
NONE		Inspect spreader bars for deformation.

NOTES: LT Skaar was present for this test. There was difficulty releasing the right leg mechanism after the test, though no deformation was found in the mechanism.

Photographs that were taken prior to the testing and after the testing are on the following pages.


TROOP SEAT
QUALIFICATION TESTING
USAF MIL-S-58042C
THREE MAN
12 G4 DI
STATIC TEST 0004

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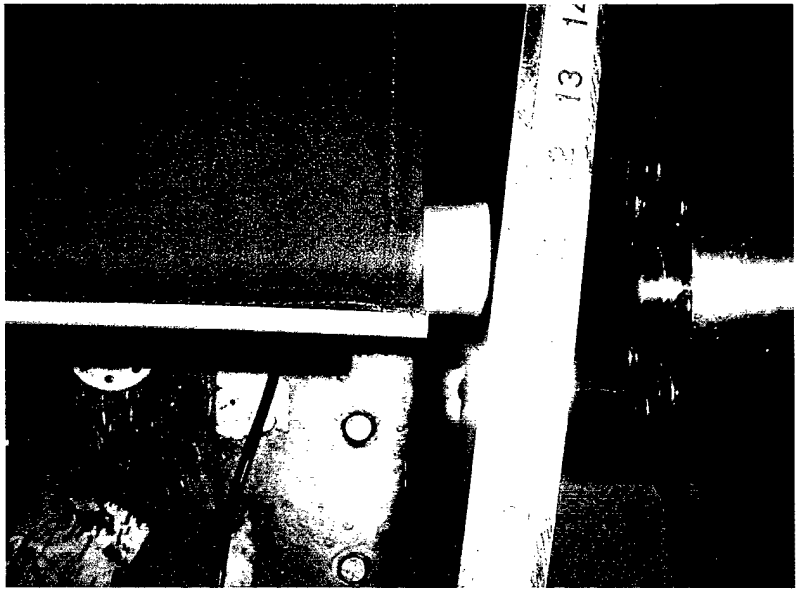
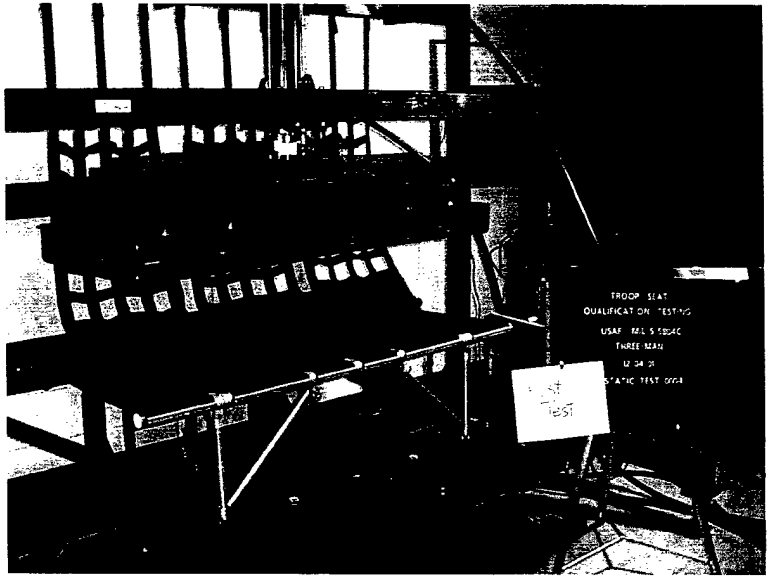
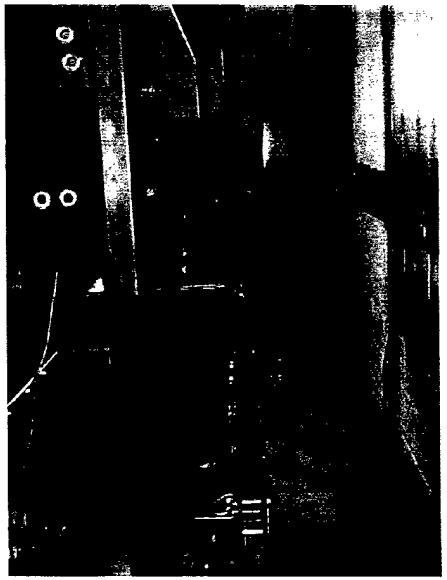
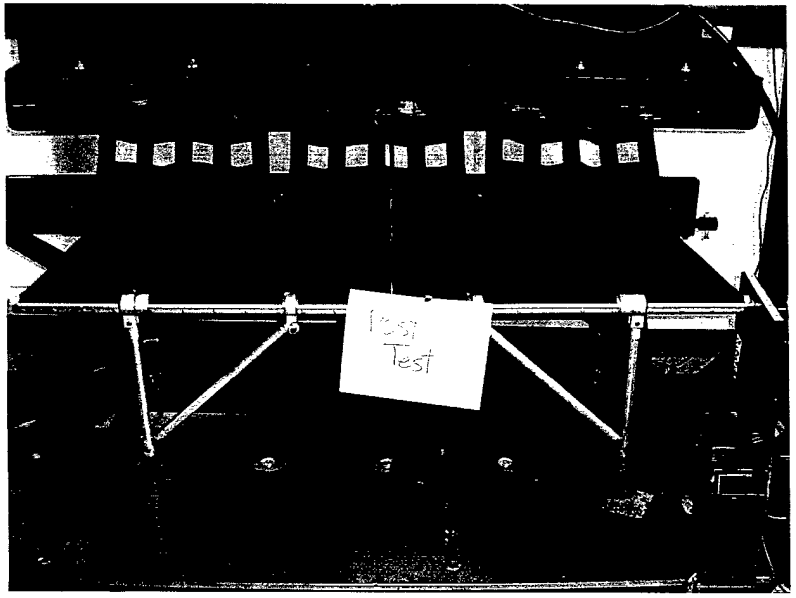
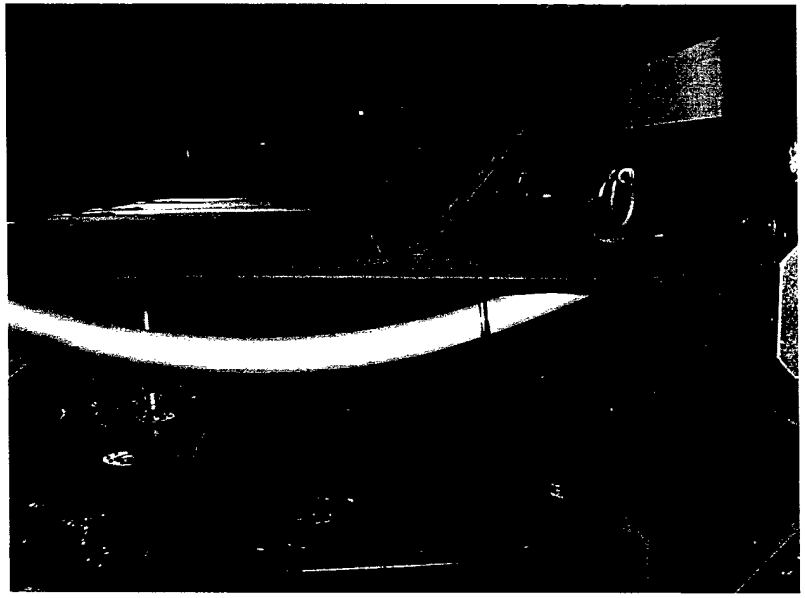



TROOP SEAT
THREE MAN
Test




Test



STATIC TESTER CHECKLIST

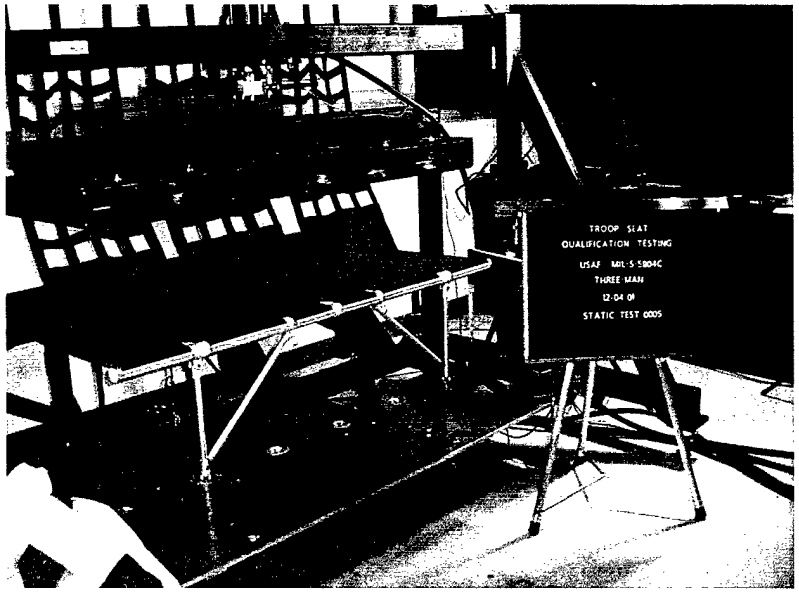
Test Number: 0005	**Test Date:** 12/04/01	**Mil-Spec:** 5804C
Test Item: Three-Man Troop Seat		
Part Number: 3WC1032R		
Manufacturer: Newgard	**Date Manufactured:** NA	**Serial #:** 1680-00-616-4606

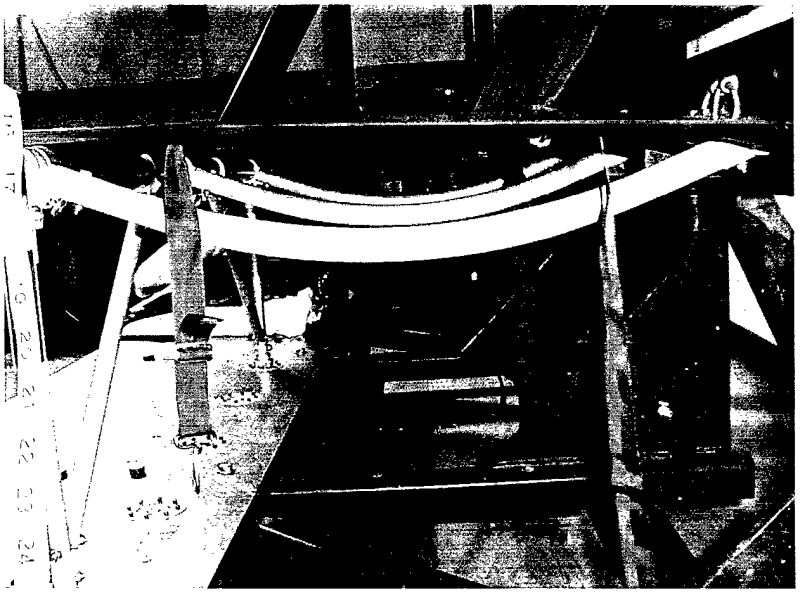
COMPLETE	**STATIC TEST PROCEDURE**
Complete	Configure test fixture hydraulic cylinder for test article
Complete	Install proper pressure foot
Complete	Install back block or butt blocks (as needed)
	TEST ARTICLE INFORMATION:
Complete	*Weight of test article:* 8.0 lb
Complete	*Serial Number:* 1680-00-616-4604
Complete	*Seat Manufacturer:* Newgard
Complete	*Date of Manufacture:* NA
Complete	Install seat on Static Test Fixture
Complete	Turn on all data acquisition equipment
Complete	Verify instrumentation continuity
Complete	Zero all instrumentation
Complete	Photograph test setup with digital camera
Complete	**SAFETY:** Ensure no FOD on test fixture
Complete	**SAFETY:** Escort witnesses to safe area
Complete	Turn hydraulic pump on
	ACTUAL TEST PROCEDURES:
Complete	Load Back, Bottom, or Leg to proof load (Bottom = 4,030 lb)
Complete	Hold proof load for 60 sec
Complete	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
Complete	Apply proof side load if bottom/side load test (Side = 450 lb)
Complete	Note any failures or damage to test article
NA	Load Back, Bottom, or Leg to ultimate load (Bottom = 6,220 lb)
NA	Hold ultimate load for 60 sec
NA	**FOR BOTTOM LOAD:** Determine side load based on front tube aft displacement
NA	Apply ultimate side load if bottom/side load test
Complete	Note any failures or damage to test article
Complete	Release load
Complete	Stop recording data and begin to download onto computer
Complete	Inspect test article for damage
Complete	Use damage checklist to record all damage
Complete	Verify that there is no apparent failure of the test fixture or test setup
Complete	Take posttest photographs with digital camera
Complete	Remove test article from test fixture
Complete	Mark test with test number and date

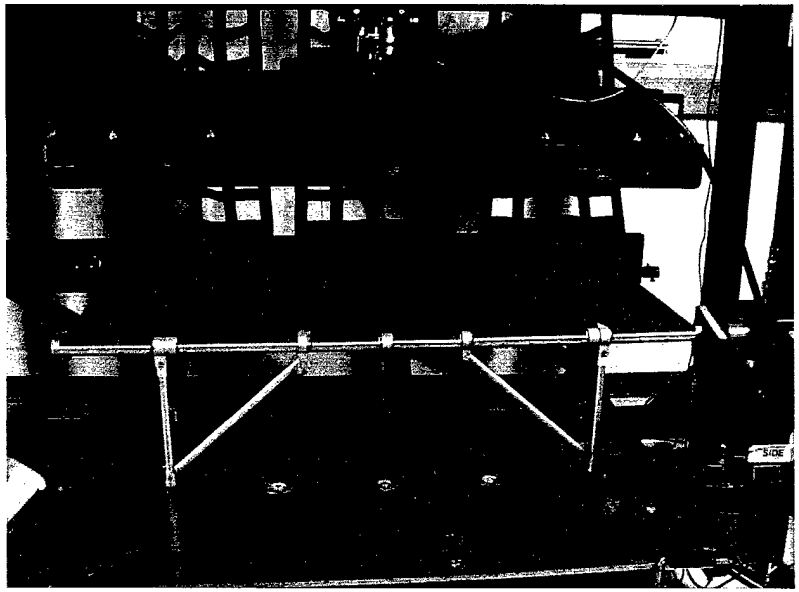
NO	YES	AREAS OF POSSIBLE DAMAGE
	YES	Inspect floor plates for damage or excess deformation.
NONE		Inspect seat fabric and seat structures attaching screws. Verify that fasteners are properly aligned.
NONE		Verify there are no tears in the seat fabric.
NONE		Verify there are no punctures in the seat fabric.
NONE		Verify there are no excessive abrasions in the seat fabric.
NONE		Verify there is not any strained or failed stitching in the seat fabric.
NONE		Verify there are no failed or deformed tiedown hooks.
NONE		Verify there are no strained or deformed zippers.
	YES	Inspect leg locking mechanism for any failures or deformations.
	YES	Inspect leg tubing and measure and record any deformations.
	YES	Inspect leg brace and upper brace fitting for deformations.
	YES	Inspect spreader bars for deformation.

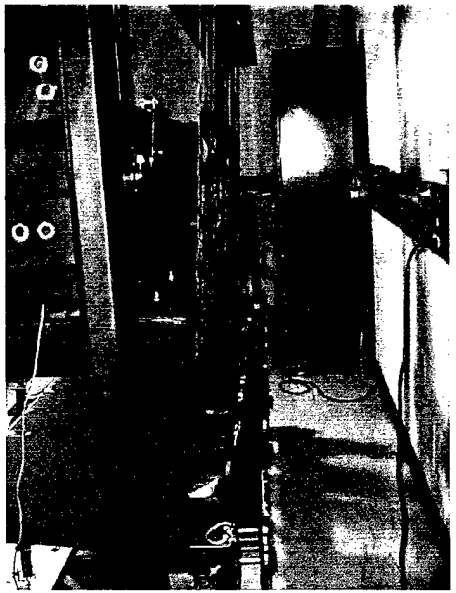
NOTES: LT Skaar was present for this test. After reaching the proof load for the side test, the right spreader bar failed. The seat failed prior to reaching the ultimate load for the seat bottom. The seat failure occurred at 5,240 lb. The floor plates deformed minimally during testing.

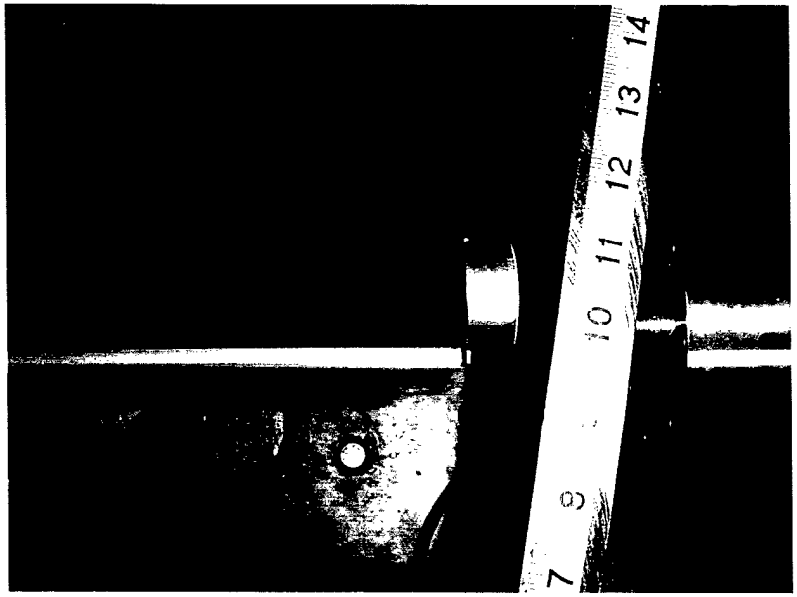
Photographs that were taken prior to the testing and after the testing are on the following pages.


TROOP SEAT
QUALIFICATION TESTING
USAF MIL-S 58042C
THREE MAN
12-04 0F
STATIC TEST 0005





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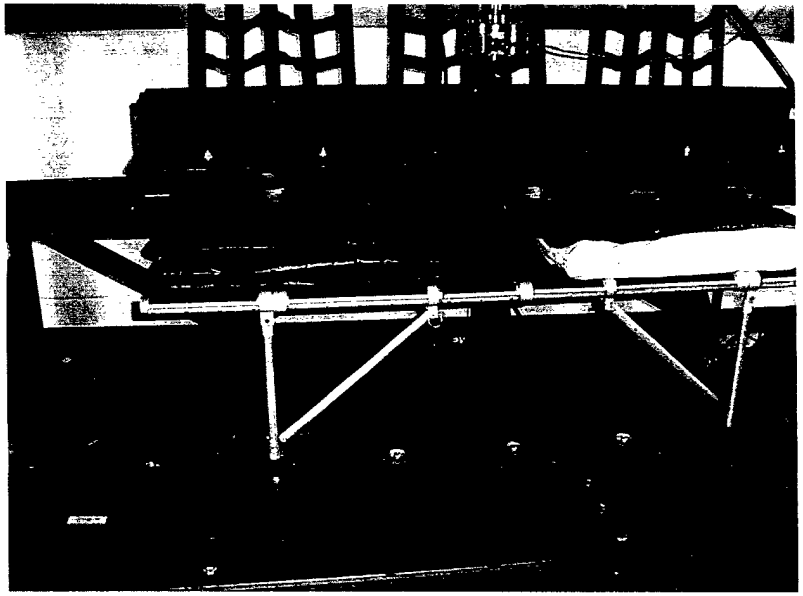
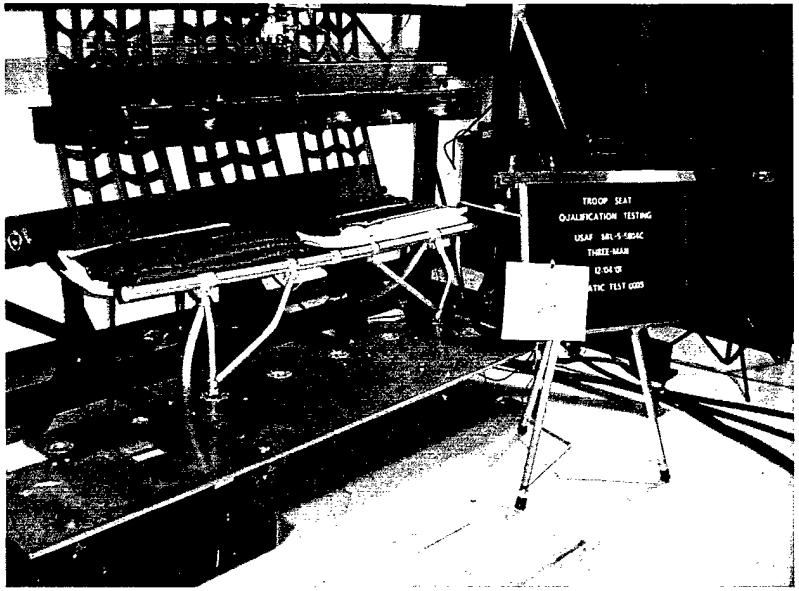
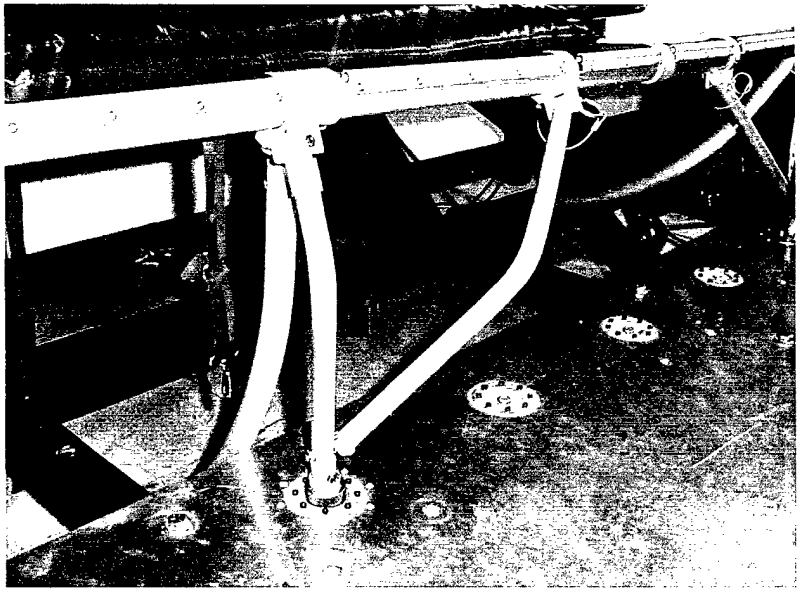
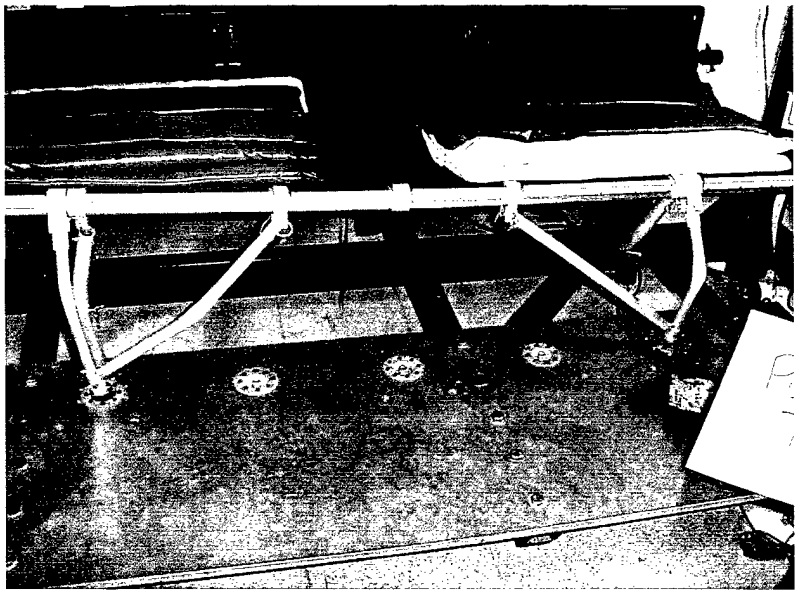
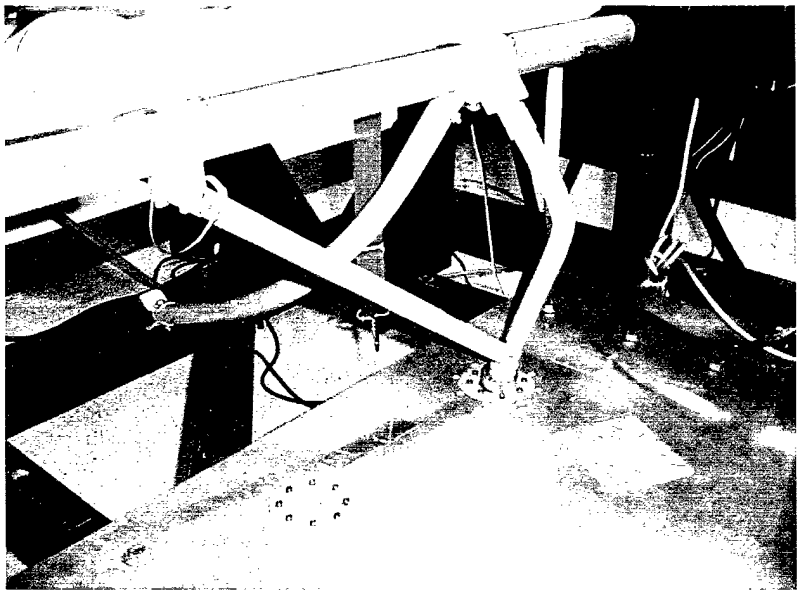
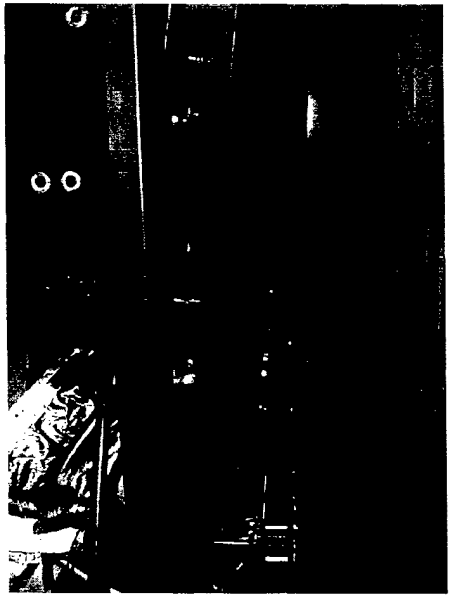


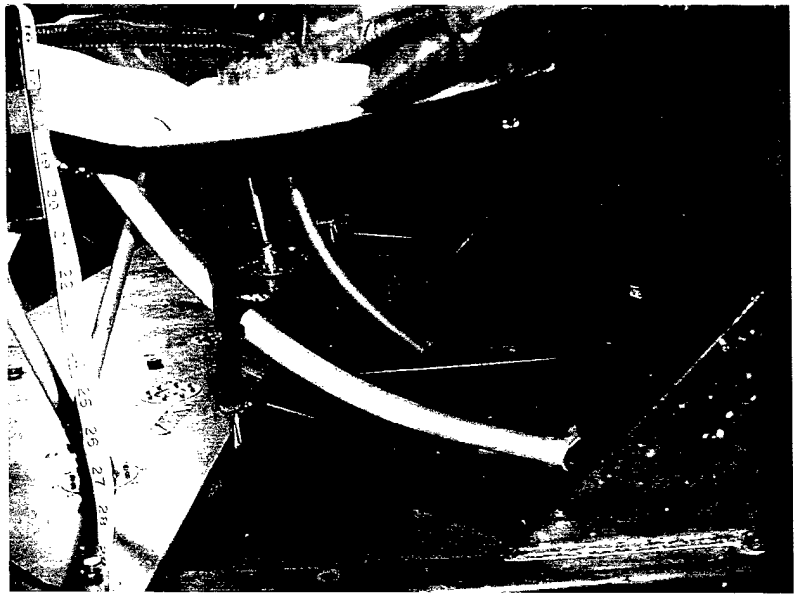

TROOP SEAT
QUALIFICATION TESTING

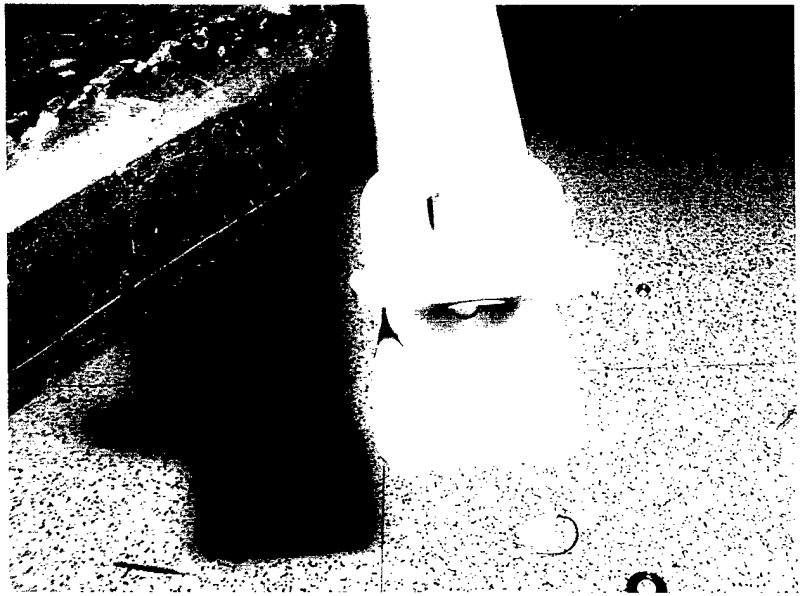












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