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TIEDOWN TESTS FOR AIR TRANSPORT OF THE PERSHING M483 CONTAINER

AIR FORCE SPECIAL WEAPONS CENTER
Air Force Systems Command
Kirtland Air Force Base
New Mexico

TECHNICAL REPORT NO. AFSWC-TR-69-14

August 1969

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Grant W. Gray

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FOREWORD

This research was prepared under Program Element 6.54.04.XX.F, Project 921A-9112-0000-911204. W. F. Speshock, Air Force Weapons Laboratory (WLAW), was the Project Officer. Inclusive dates of research were April 1968 through January 1969. This report was submitted 30 June 1969 by the Air Force Special Weapons Center Test Director, Grant W. Gray (SWTEE).

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This technical report has been reviewed and is approved.

GRANT W. GRAY
Test Director

OSCAR E. HOPKINS, JR.
Chief, Instrumentation Branch

For
DAVID E. CHADWICK, Technical Advisor
Directorate of Test and Engineering

A. G. SWAN, Colonel, USAF
Director of Test and Engineering

ABSTRACT

(Distribution Limitation Statement No. 2)

Aircraft tiedown configurations for transport of the Pershing M483 container in certain current cargo aircraft were designed and tested by the Air Force Special Weapons Center at the request of the Air Force Weapons Laboratory to provide source data for -16 Technical Orders. The developed tiedown configurations, test procedure, test data, and notations of test observations are presented in this report.

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SECTION I

INTRODUCTION

1. PURPOSE

The purpose of this effort was to provide verified tiedown configurations for air transport of the Pershing M483 container in certain current cargo aircraft. The verified tiedown configurations will be used as source data for -16 Technical Orders.

2. SCOPE

The scope of this effort was limited to tiedown for air transport in the cargo aircraft listed in the Test Requirements.

3. AUTHORITY

Authority for this effort is contained in AFSWC Form 35, Work Authorization for Project 9112, entitled "Test Nuclear Weapons Air Transport." This authority was issued by Headquarters, Air Force Special Weapons Center, Kirtland Air Force Base, New Mexico, 23 January 1968.

SECTION II

SUMMARY OF TESTS

1. DESCRIPTION OF TEST ITEM

The Pershing M483 container is a metal cover for the protection of a weapon during handling and storage. It is approximately cylindrical and provided with four skids and four tiedown fittings.

The following specifications on the loaded Pershing M483 container were furnished by the Project Officer:

Total weight: 2726 pounds

Center of gravity:

Vertical: at the lower section flange

Horizontal lengthwise: as marked on the container

Horizontal crosswise: center

Tiedown fittings: 10,000 pounds force

Ship lengthwise only.

2. TEST REQUIREMENTS

The following requirements are stated in the documentation:

Provide centerline tiedown patterns for the container in each aircraft tested to the following g loads:

					Combined	
Aircraft	Fw'd	Aft	Side	Up	Fwd & Up	Fwd & Side
C-130	4.0	1.5	1.5	3.7	---	---
C-133	4.0	1.5	1.5	2.0	3.0 & 1.5	2.0 & 1.5
C-141	4.0	1.5	1.5	3.1	---	---

Determine maximum g load possible in all directions the above patterns will withstand without damaging the container. The maximum forward g load need not exceed 8g. Minimum number of tiedown chains are desired in accordance with applicable -9 T.O.'s.

Shoring, if required, will be specified in layers of 3/4" thick pieces of plywood based on the lowest floor strength for the aircraft, e.g., the between treadway area for the C-141. Footprint dimensions used will also be specified.

3. TEST PROCEDURES

With the use of scale floor plan drawings of the various aircraft and a scale template of the Pershing M483 container, tiedown configurations were designed for all feasible centerline locations in each aircraft listed in the test requirements.

The container was placed in the large static test frame and tied down in the configuration to be tested using MB-1 tiedown devices. A strain link was inserted in each tiedown chain to monitor the restraining force transmitted to the tie points. The strain links were connected to indicators and the force in each tiedown was recorded for each increment of simulated inertial load.

Chains and fixtures were attached to the test item and connected through load cells to hydraulic cylinders mounted on the static test frame to apply simulated inertial loads through the center of gravity of the test item. The load cells were connected to indicators on the hydraulic console to monitor loading. Pairs of lubricated steel plates were placed under each skid on the test item to simulate the reduced friction between the test item and the aircraft deck resulting from vibration.

Figure 1 shows two views of the test item in the test frame and the tiedown devices with strain links inserted, the lubricated steel plates under the skids, and the method of loading application through hydraulic cylinders, load cells, chains, and fixtures.

Simulated inertial loads were calculated using the stated weight of the test item as 1g and applied in increments starting at 50 percent of the required load. The load at each increment was held for at least 30 seconds. A force equal to the stated weight of the test item was added to loads applied in an up direction to overcome gravity.

Bearing area of the skids was measured for calculation of shoring requirements.

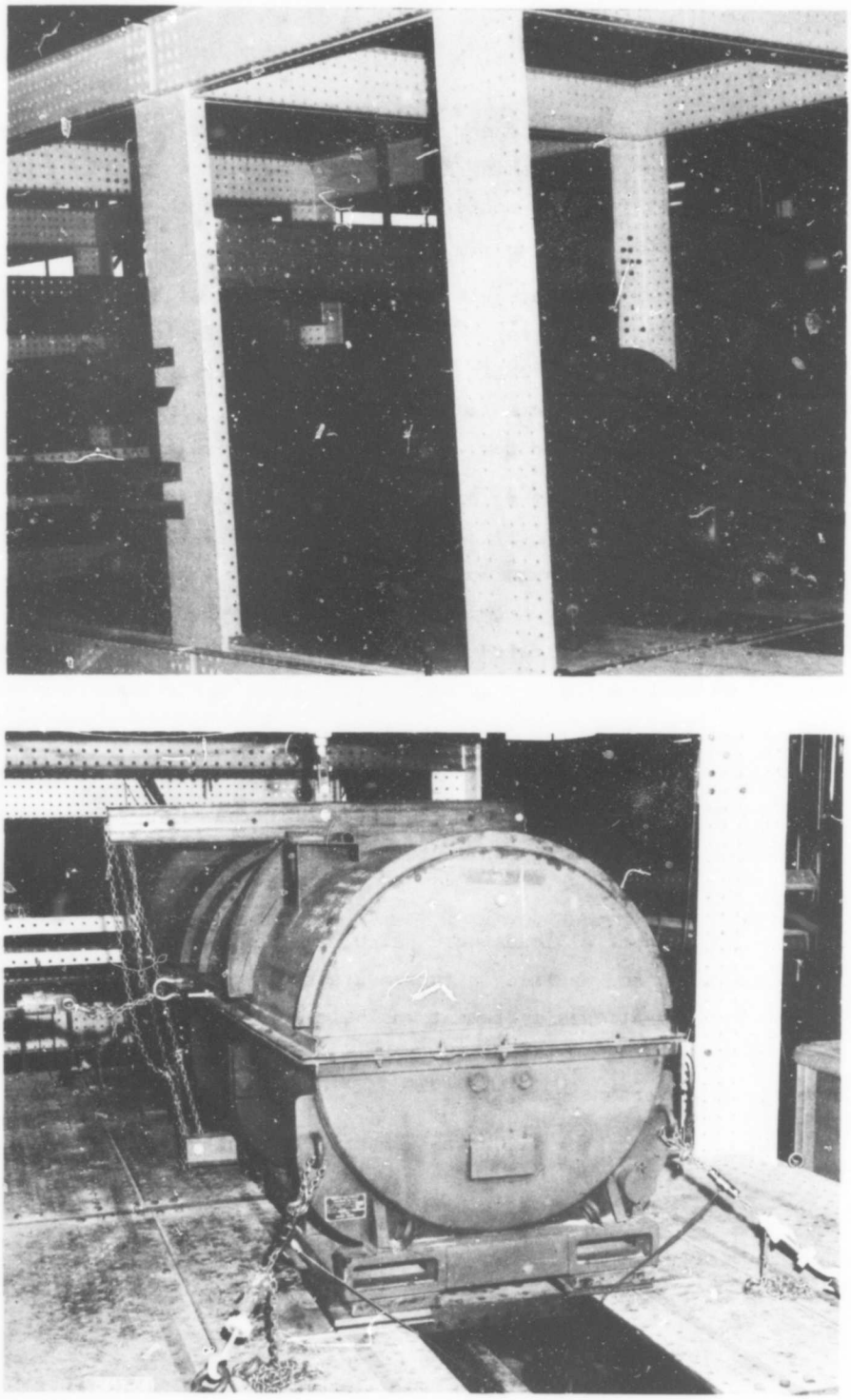


Figure 1. Two Views of Test Item in Static Test Frame

SECTION III

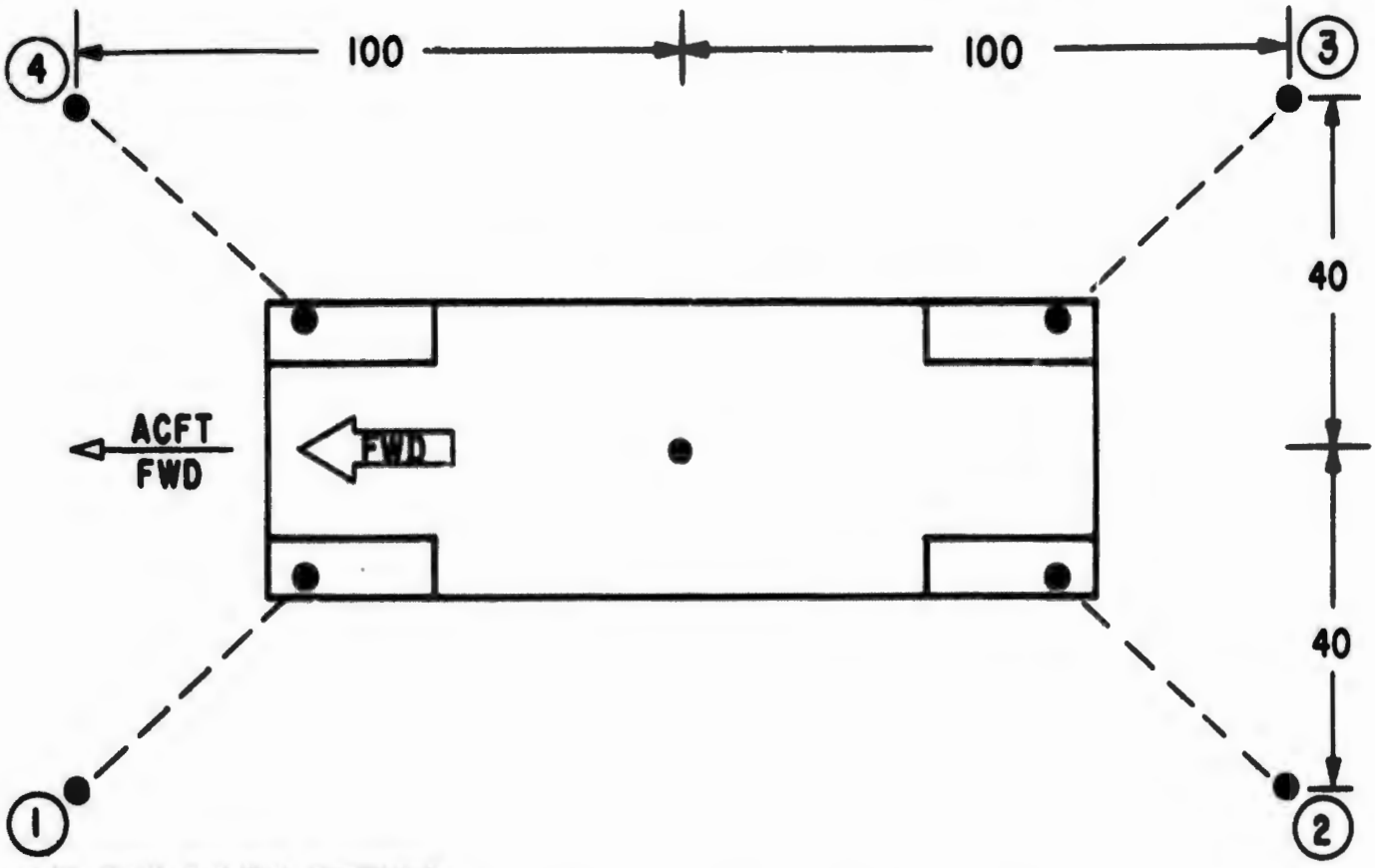
TEST RESULTS

1. TEST OBSERVATIONS

The pattern and spacing of tiedown fittings about the aircraft centerline is the same for the C-130, C-133, and C-141 aircraft; thus only one tiedown configuration was necessary to meet the test requirements. The tiedown configuration shown in Figure 2 was designed and proven satisfactory by test to 100 percent simulated inertial loading as outlined in the test procedure. Because both the container and the tiedown configuration are symmetrical about the container center of gravity, the tiedown is valid if the container is reversed in the aircraft. The 8g forward load in the test requirement was not applied because the restraining forces in the tiedown devices at 4g forward load approached the 10,000-pound rating of both the tiedown devices and the tie points on the test item. Figure 2 includes a tabulation of the restraining forces measured in the tiedown chains at 100 percent simulated inertial loads.

Floor contact area of each skid measured 11 inches by 33 inches which for four skids is a total floor contact area of 1452 square inches. The four skids are symmetrical about the container center of gravity; thus the 2726-pound load distributed over 1452 square inches of floor area is 1.88 pounds per square inch of floor. The lowest maximum allowable floor loading for the aircraft listed in the test requirement is 25 pounds per square inch of floor; thus no shoring is required.

M483 Container
Aircraft C-130/C-133/C-141
Position Centerline
NOT TO SCALE



● 10,000 POUND FITTING

LOAD	REACTION LOADS - POUNDS AT 100%							MOTION
	1	2	3	4	5	6	7	
4.0g fwd	0	8300	8450	0				1-1/2 in. fwd
1.5g side	50	0	3400	3440				3/4 in. side
3.7g up	4450	4750	4750	4470				1 in. up
1.5g aft	Not tested (symmetrical)							
3.0g fwd & 1.5g up	800	7320	7600	800				3/4 in.fwd 1 in. up
3.0g fwd & 1.5g side	50	5240	9500	2200				1 in. fwd 1 in. side
8.0g fwd	Not tested							

Figure 2. Tiedown Sketch

SECTION IV

CONCLUSIONS AND RECOMMENDATION

1. CONCLUSIONS

The Pershing M483 container is transportable in the C-130, C-133, and C-141 aircraft using the tiedown patterns developed during this series of tests.

No shoring is required for transporting this container in the C-130, C-133, or C-141 aircraft.

2. RECOMMENDATION

No deviations from the tiedown pattern, orientations, number, or types of restraint devices shown in this report should be permitted.

UNCLASSIFIED

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13. ABSTRACT

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