



2

PERFORMANCE ORIENTED PACKAGING TESTING
OF
MK3 MOD 0 SIGNAL CONTAINER
FOR
PACKING GROUP II
SOLID HAZARDOUS MATERIALS

BY:

KERRY J. LIBBERT
MECHANICAL ENGINEER

Performing Activity:
Crane Division
Naval Surface Warfare Center
Crane, Indiana 47522-5000

MAY 1992

FINAL

DTIC
ELECTE
JUN 29 1992
S B D

DISTRIBUTION STATEMENT A

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.

Sponsoring Organization:
Naval Weapons Station Earle
Program Management Office - Code 50
Coats Neck, New Jersey 07722-5000

92 6 26 032

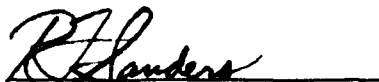
92-16920



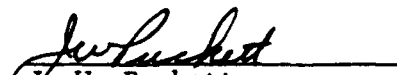
Prepared by:


K. J. Libbert

Reviewed by:


R. F. Sanders

Reviewed by:


J. W. Puckett

Approved by:


D. N. Montgomery

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 5-92	3. REPORT TYPE AND DATES COVERED Final	
4. TITLE AND SUBTITLE Performance Oriented Packaging Testing of the MK 3 MOD 0 Signal Container for Packing Group II Hazardous Materials			5. FUNDING NUMBERS	
6. AUTHOR(S) Kerry J. Libbert				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Crane Division Naval Surface Warfare Center Code 4045 Crane, IN 47522-5040			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Crane Division Naval Surface Warfare Center Code 4027 Crane, IN 47522-5040			10. SPONSORING/MONITORING AGENCY REPORT NUMBER DODPOPHM/USA/DOD/ NADTR 92106	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Unlimited Distribution			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The MK 3 MOD 0 Signal Container (MIL-C-18875) was tested for conformance to Performance Oriented Packaging criteria established by the United Nations Transport of Dangerous Goods and Code of Federal Regulations 49 CFR. The container was tested with a gross weight of 11 pounds (5 kilograms) and met all requirements.				
14. SUBJECT TERMS Performance Oriented Packaging, MK 3 MOD 0 Signal Container			15. NUMBER OF PAGES 7	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unlimited	18. SECURITY CLASSIFICATION OF THIS PAGE Unlimited	19. SECURITY CLASSIFICATION OF ABSTRACT Unlimited	20. LIMITATION OF ABSTRACT UL	

GENERAL INSTRUCTIONS FOR COMPLETING SF 298

The Report Documentation Page (RDP) is used in announcing and cataloging reports. It is important that this information be consistent with the rest of the report, particularly the cover and title page. Instructions for filling in each block of the form follow. It is important to *stay within the lines* to meet optical scanning requirements.

Block 1. Agency Use Only (Leave blank).

Block 2. Report Date. Full publication date including day, month, and year, if available (e.g. 1 Jan 88). Must cite at least the year.

Block 3. Type of Report and Dates Covered. State whether report is interim, final, etc. If applicable, enter inclusive report dates (e.g. 10 Jun 87 - 30 Jun 88).

Block 4. Title and Subtitle. A title is taken from the part of the report that provides the most meaningful and complete information. When a report is prepared in more than one volume, repeat the primary title, add volume number, and include subtitle for the specific volume. On classified documents enter the title classification in parentheses.

Block 5. Funding Numbers. To include contract and grant numbers; may include program element number(s), project number(s), task number(s), and work unit number(s). Use the following labels:

C - Contract	PR - Project
G - Grant	TA - Task
PE - Program Element	WU - Work Unit Accession No.

Block 6. Author(s). Name(s) of person(s) responsible for writing the report, performing the research, or credited with the content of the report. If editor or compiler, this should follow the name(s).

Block 7. Performing Organization Name(s) and Address(es). Self-explanatory.

Block 8. Performing Organization Report Number. Enter the unique alphanumeric report number(s) assigned by the organization performing the report.

Block 9. Sponsoring/Monitoring Agency Name(s) and Address(es). Self-explanatory.

Block 10. Sponsoring/Monitoring Agency Report Number. (If known)

Block 11. Supplementary Notes. Enter information not included elsewhere such as: Prepared in cooperation with...; Trans. of...; To be published in.... When a report is revised, include a statement whether the new report supersedes or supplements the older report.

Block 12a. Distribution/Availability Statement. Denotes public availability or limitations. Cite any availability to the public. Enter additional limitations or special markings in all capitals (e.g. NOFORN, REL, ITAR).

DOD - See DoDD 5230.24, "Distribution Statements on Technical Documents."

DOE - See authorities.

NASA - See Handbook NHB 2200.2.

NTIS - Leave blank.

Block 12b. Distribution Code.

DOD - Leave blank.

DOE - Enter DOE distribution categories from the Standard Distribution for Unclassified Scientific and Technical Reports.

NASA - Leave blank.

NTIS - Leave blank.

Block 13. Abstract. Include a brief (*Maximum 200 words*) factual summary of the most significant information contained in the report.

Block 14. Subject Terms. Keywords or phrases identifying major subjects in the report.

Block 15. Number of Pages. Enter the total number of pages.

Block 16. Price Code. Enter appropriate price code (*NTIS only*).

Blocks 17. - 19. Security Classifications. Self-explanatory. Enter U.S. Security Classification in accordance with U.S. Security Regulations (i.e., UNCLASSIFIED). If form contains classified information, stamp classification on the top and bottom of the page.

Block 20. Limitation of Abstract. This block must be completed to assign a limitation to the abstract. Enter either UL (unlimited) or SAR (same as report). An entry in this block is necessary if the abstract is to be limited. If blank, the abstract is assumed to be unlimited.

INTRODUCTION

The MK3 Mod 0 Signal Container was tested to ascertain whether the container would meet the requirements of Performance Oriented Packaging (POP) as specified by the United Nations Recommendations on the Transport of Dangerous Goods Document, ST/SG/AC.10/1, Revision 6, Chapters 4 and 9. A base level vibration test was also conducted in accordance with the rulings specified by the Department of Transportation Performance Oriented Packaging Standards, 49 CFR Part 106 et al. Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations. The objectives were to evaluate the adequacy of the container in protecting and retaining the kits when secured with appropriate dunnage.

The MK 3 Mod 0 Signal Container is a sealed aluminum container used primarily for shipment and storage of small signals and signal kits. Figure 1 shows the container open, with the fiberboard liner folded back and a typical load of twelve MK13 signals. The closed container is shown in Figure 2.

TESTS PERFORMED

1. Drop Test

This test was performed in accordance with ST/SG/AC.10/1, Chapter 9, Paragraph 9.7.3. Five containers were used during the test series, one for each drop. The drop height was 1.2 meters and the drop sequence was as follows:

- a. Flat on Bottom
- b. Flat on Top
- c. Flat on Long Side
- d. Flat on Short Side
- e. On a Corner

The test was performed at ambient temperature ($70^{\circ} \pm 20^{\circ}\text{F}$). The contents of the container should be retained within its packaging and exhibit no damage liable to affect safety during transport.

2. Stacking Test

This test was performed in accordance with ST/SG/AC.10/1, Chapter 9, Paragraph 9.7.6. Three different containers were used, each with a stack weight of 325 pounds. This weight represents the load superimposed on the bottom container of a sixteen-foot stack of MK3 containers weighing 11 pounds each. The test was performed for 24 hours. After the allowed time, the weight was removed and the container examined. Any leakage, deterioration, or distortion which could adversely affect transport or reduce its strength or cause instability in stacks of packages is cause for rejection.

Figure 1
MK 1 Mod 0 Signal Container with a
typical load of twelve MK 13 Mod 0
Barbed Smoke and Illumination Signals.

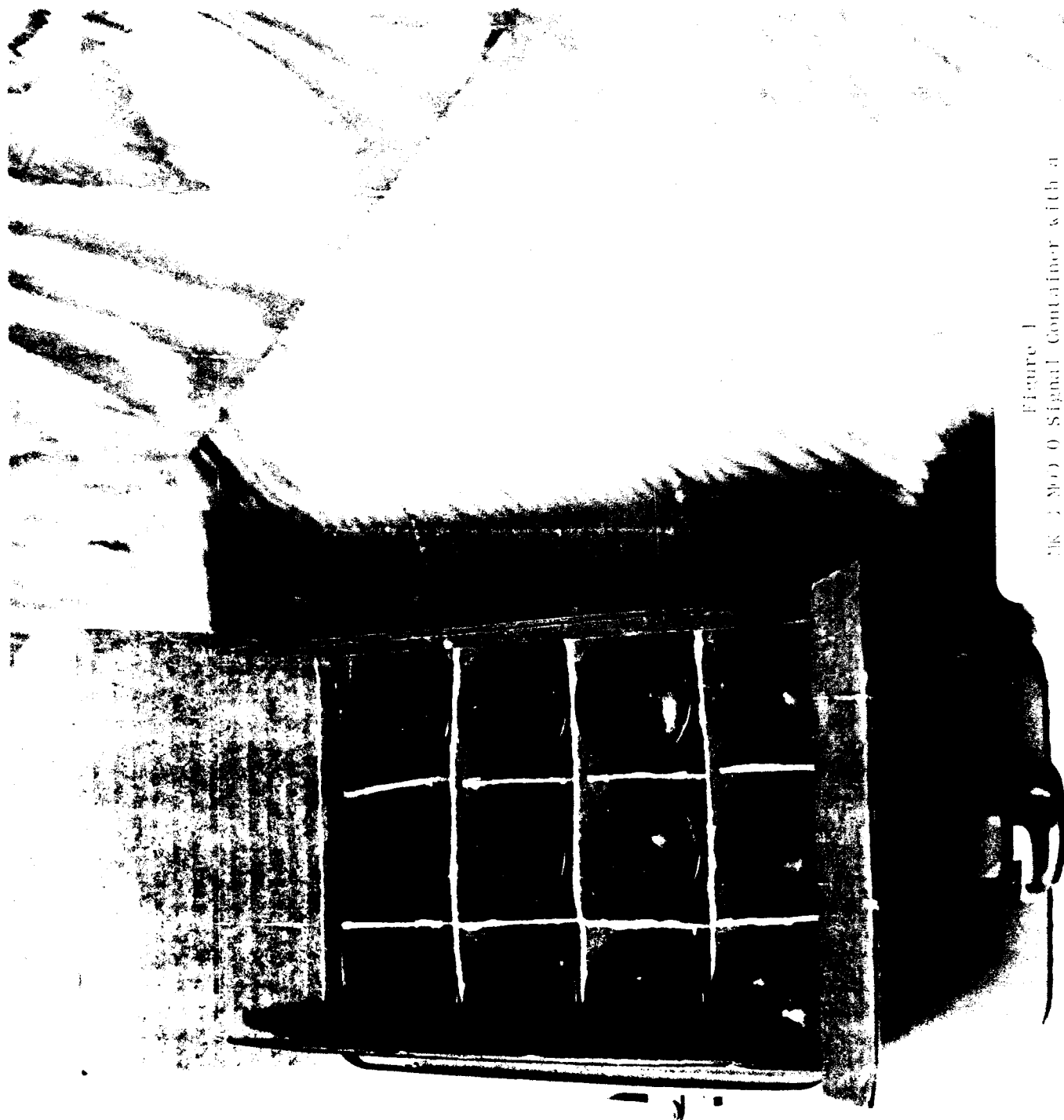




Figure 1
A 3000 signal contour.

3. Base Level Vibration Test

This test was performed in accordance with the Federal Register/Vol 56, No. 245/Friday, December 20, 1991/Rules and Regulations. Three sample containers were loaded with sand and closed as for shipment. Each container was placed on a vibrating platform that had a vertical double-amplitude (peak-to-peak displacement) of one inch. The packages were constrained horizontally to prevent them from falling off the platform, but were free to move vertically, bounce and rotate. The test was performed for one hour at a frequency that caused each point of the container bottom to be raised from the platform to such a degree that a 1.6mm thick metal strip could be passed between the bottom of any package and the platform.

PASS/FAIL (UN CRITERIA)

The criteria for passing the drop test is outlined in Paragraph 9.7.3.5 of ST/SG/AC.10/1 and states the following: "Where a packaging for solids undergoes a drop test and its upper face strikes the target, the test sample passes the test if the entire contents are retained by an inner packaging or inner receptacle (e.g., a plastic bag), even if the closure is no longer sift-proof".

The criteria for passing the stacking test is outlined in Paragraph 9.7.6.3 of ST/SG/AC.10/1 and states the following: "No test sample should show any deterioration which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages".

PASS/FAIL (FEDERAL REGISTER CRITERIA)

The criteria for passing the Base Level Vibration Test is outlined in the Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations and states the following: "Immediately following the period of vibration, each package shall be removed from the platform, turned on its side and observed for any evidence of leakage. A packaging passes the vibration test if there is no rupture or leakage from any of the packages. No test sample should show any deterioration which could adversely affect transportation safety or any distortion liable to reduce packaging strength."

TEST RESULTS

1. Drop Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Base Level Vibration Test

Satisfactory.



Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

DISCUSSION

1. Drop Test

After each drop the container was inspected for any damage which would be cause for rejection. Final inspection revealed minor damage to the boxes, but no spillage of contents.

2. Stacking Test

Three containers were individually tested. Each container was visibly inspected after the 24-hour period was over. There was no leakage, distortion, or deterioration to the container as a result of this test.

3. Base Level Vibration Test

Immediately following the vibration test, each container was removed from the platform, turned on its side and observed for any evidence of leakage. All latches remained fastened and there was no evidence of leakage of contents.

REFERENCE MATERIAL

United Nation's "Recommendations on the Transport of Dangerous Goods", ST/SG/AC.10/1, Revision 6

Department of Transportation Performance Oriented Packaging Standards, 49 CFR Part 106 et al. Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations

DISTRIBUTION LIST

Commander
Crane Division
Naval Surface Warfare Center
Code 4045 and Code 4027
Crane, IN 47522-5000

Commanding Officer
Naval Weapons Station Earle
Code 50 and Code 50232
Colts Neck, NJ 07722-5000

Defense Technical Information Center (2 copies)
ATTN: DTIC/FDAC (Virginia Guidi)
Bldg. 5, Cameron Station
Alexandria, VA 22304-6145

Commander
U.S. Army Armament, Research, Development and Engineering
Center
SMCAR-ESK
Rock Island, IL 61299-7300

Defense General Supply Center
DDRV-TMPA (Dave Gay)
Richmond, VA 23297-5000

DATA SHEET

CONTAINER:
MK3 Signal Container

POP MARKING:



4B1/Y5/S/**
USA/DOD/NAD

Type: 4B1

UN Code: 1.4G

Specification Number:
MIL-C-18875

Material:
Aluminum

Gross Weight:
5.0 kg
(11.0 pounds)

Dimensions:
.22 m L x .18 m W x .16 m H
(8.7" L x 6.9" W x 6.4" H)

Closure (Method/type):
Latches (4 each)

Tare Weight:
1.3 kg
(2.9 pounds)

Additional Description: MK13 and MK124 signals packed in accordance with Drawing 10001-2128332. Lifeboat Signal Kits packed in accordance with Drawing 53711-6869827. Container has fiberboard liner and chipboard partitions.

PRODUCTS:

Marine Smoke and Illumination Signal
MK13 Mod 0, L275, 1370-00-309-5028
MK124 Mod 0, L283, 1370-01-030-8330
Lifeboat Signal Kit, No NSN assigned

Proper Shipping Name: Signal Devices, Hand

United Nations Number: 0191

United Nations Packing Group: II

Physical State: Solid

Amount Per Container:

Marine Smoke and Illumination Signals: 12
Lifeboat Signal Kit: 1

Net Weight: Varies

TEST PRODUCT:

Name: Sand
Physical State: Solid

Size: N/A

Quantity: N/A

Dunnage: None

Gross Weight: 5.0 kg (11.0 lbs.)