LOGISTICS PACKAGING TESTING EQUIPMENT

FOREWORD

This pamphlet identifies packaging testing equipment available in the Department of Defense (DOD) and lists activities where it is located. The pamphlet is intended to assure optimum use of DOD packaging testing equipment. It applies to materials and processes related to specific end items and other tests specifically excluded from the Joint Logistics Commanders' (JLC) Regulation (AFLC/AFSC-R 71-2/DARCOM-R 700-17/NAVMATINST 4030.8/MCO 4030.34/DLAR 4145.32) on "Lead Activities for Testing Packaging Materials and Processes."

Headquarters US Army Materiel DARCOM-P 700-17 *
Development and Readiness Command
5001 Eisenhower Avenue
Alexandria, VA 22333

Headquarters Naval Material Command NAVMAT-P 4030.1 *
Washington, DC 20360

Headquarters Air Force Logistics Command AFLC-P 71-3 *
Wright-Patterson AFB, OH 45433

Headquarters Air Force Systems Command AFSC-P 71-3 *
Andrews AFB, DC 20334

Headquarters Defense Logistics Agency DLAH 4145.4 *
Cameron Station, Alexandria, VA 22314

30 November 1981

Logistics PACKAGING TESTING EQUIPMENT

Purpose: This pamphlet provides information concerning the availability of Packaging Testing Equipment at DOD activities. It serves as a guide for the testing and evaluation of specific commodities not covered under the Lead Activity Concept of Specialization for Packaging Materials and Processes.

OPR: DARCOM/DRCSM-PST
NMC/MAT 04
AFLC/LO
AFSC/LO
DLA/OW

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1-1. Scope. This information applies to the subordinate commands and activities of the Joint Logistics Commanders (JLC) and the Defense Logistics Agency (DLA) as applicable. These organizations will hereafter be referred to as "DOD activities."

1-2. General.

   a. Lead Activity Concept. The policy regarding lead activity specialization for testing and evaluating packaging materials and processes is established by JLC Regulation (see para 1-5a, this pamphlet). This regulation assigns exclusive responsibilities for the testing of general groups of materials and processes to specific DOD activities. Its objectives are to eliminate duplication of effort, provide testing focal points for governmental agencies and industry, improve skills and productivity, and standardize packaging testing equipment to the optimum extent. The following testing is excluded from the Lead Activity Concept:

      (1) Materials and processes related to specific end items or weapons systems or subsystems.
      (2) Research, development, test, and evaluation of materials or processes funded in program element codes 6.1 and 6.2 of DOD 7045.7H.
      (3) Testing and evaluation of packaging equipment related to specific operational requirements.

   b. Item Responsibility. The DOD activity having item responsibility normally has packaging responsibility. Materiel readiness and resource limitations make it essential that adequate protection be provided in accordance with joint service regulations on packaging (see para 1-5b, this pamphlet). The item is only as good as the protection that has been provided. To assure adequate protection, yet reduce the possibility of costly excessive protection, packaging testing is also an essential function of the overall packaging mission. Since many activities having item responsibility do not have packaging testing facilities or equipment, it is desirable that the availability of existing equipment be known prior to the contracting or purchasing of testing equipment. By arrangement between DOD activities, testing lead time may be compressed and military packaging resources effectively used.

1-3. Responsibilities. Each DOD activity has primary responsibility for compliance with the Lead Activity Concept for testing packaging materials and processes, when applicable. Under the conditions stated in 1-2a(1) and 1-2a(3) above, responsibilities are as follows.

   a. DOD activities assigned item responsibility should perform required testing when the necessary testing equipment and personnel are available.
   b. If adequate packaging testing facilities are not available on site, DOD activities are then responsible for seeking the most advantageous means of accomplishing test requirements. This should be done with respect to total DOD packaging capabilities and interservicing opportunities.

1-4. Application.

   a. General. Information contained in appendixes of this pamphlet pertain specifically to 1-3b above. This information is intended to assure optimum use of DOD Packaging Testing Equipment.
   b. Format. This pamphlet has three appendixes.

      (1) Appendix A, Equipment Locations. This appendix consists of an alphabetized list of available packaging testing equipment. Each listing is
followed by a brief description of its testing related function and the DOD activities at which it is located.

(2) Appendix B, Equipment Descriptions. This provides a list of DOD packaging activities followed by an alphabetized list of equipment found at each activity. In addition to cross-referencing appendix A, it also provides equipment descriptions. The equipment has been grouped into the following functional categories:

(a) Environmental testing.
(b) Physical testing.
(c) Process testing.
(d) Instrumentation/recording.

Due to the diverse nature of "instrumentation/recording equipment" at various activities, equipment falling in this category has been excluded from appendix A.

(3) Appendix C, Packaging Activity Points of Contact. For each location listed in appendix B, an address, attention symbol, and AUTOVON number have been provided.

c. Procedures. Any activity or command desiring testing in accordance with the conditions established in 1-2a(1) and 1-2a(3) above should informally contact the applicable DOD activity having the required equipment to determine testing feasibility.

CAUTION: These procedures shall in no way alter the packaging testing policy established by the references cited below.

1-5. References.

a. AFLC/AFSC Reg 71-2 Lead Activities for Testing Packaging
DARCOM Reg 700-17 Materials and Processes
NAVMATINST 4030.8
MCO 4030.34
DLAR 4145.32
b. AR 700-15 Packaging of Materiel
NAVSUPINST 4030.28A AFR 71-6 MCO 4030.33A DLAR 4145.7
ENVIRONMENTAL TESTING EQUIPMENT

Altitude Chamber - used to test effects of controlled low pressure on sealed containers, sealed barrier materials, and foamed plastics. DARCOMPSCC, AFPEA, AD

Climatic Long-Term Test Room - tests the effects of any climatic condition known in the world on packages for unlimited time duration. MERADCOM, AFPEA, AD

Cyclic Exposure Cabinet - used for cyclic environmental testing and in determining water vapor transmission rates of packages and packaging materials by cycling temperatures and relative humidity over a 24-hour period. ARRADCOM, DARCOMPSCC, AFPEA

Engine Test Cell - determines the effect of extreme temperature, solar radiation, and humidity on packaged engines. AD

Humidity Chamber - used to test the corrosive effects of various relative humidities on packaged items, and also for pretest conditioning of materials. ARRADCOM, DARCOMPSCC, TACOM, AFPEA, OGDEN ALC

Oven - used for accelerated aging of tapes and barriers, high heat pretest conditioning, and exposure to the effects of the sun and high temperatures. ARRADCOM, DARCOMPSCC, TACOM, AFPEA

Ozonator - tests the effects of ozone on rubber and rubber-like materials. DARCOMPSCC

Rain Room - used to test the effects of rain on packs, palletized loads, and containers. ARRADCOM, DARCOMPSCC, AFPEA

Rain/Salt-Fog/Wind Chamber - tests the effects of rain, salt-fog, and wind on packs and packages. AFPEA

Salt-Fog/Spray Chamber - tests the effects of an excessive salt atmosphere on metals treated with corrosion inhibiting finishes. DARCOMPSCC, TACOM, AFPEA, NWHC

Sand and Dust Chamber - tests the ability of equipment to resist effects of sharpedged dust particles. NWHC

Standard Conditioning Room - for pretest and test conditioning of material characteristics particularly sensitive to temperature/humidity fluctuations, e.g., tensile strength, flexibility, adherence, static charge, propensity, puncture. DARCOMPSCC

Sun and Rain Chamber - tests the effects of solar radiation and rain on packs and packages. ARRADCOM

Sun, Wind, Rain, and Dust Chamber - tests the effects of solar radiation, wind, rain, and sharpedged dust particles on packs and packages. AD

Temperature Chamber - tests the effects of constant or cyclic high and low temperatures on barriers, tapes, preservative films, and other packaging materials. ARRADCOM, DARCOMPSCC, TACOM, AFPEA, AD
Temperature/Humidity Chamber - used for pretest conditioning in testing for water vapor transmission of materials, and in determining the effects of controlled temperature and humidity exposure on packs and packages. ARRADCOM, DARCOMPSCC, AFPEA, NWHC

Temperature/Vibration Chamber - tests the effects of simultaneous temperature cycling and constant vibration on packaged items. ARRADCOM, DARCOMPSCC

Weatherometer - used for accelerated aging of plastic and paper products such as tapes, strapping, films, coatings, laminates, and similar materials susceptible to ultraviolet degradation. ARRADCOM, DARCOMPSCC, MERADCOM, NLABS, AFPEA

PHYSICAL TESTING EQUIPMENT

Abrasion Tester - used to determine the resistance of packaging materials to abrasion. DARCOMPSCC, AFPEA

Burst Tester - used to determine the bursting strength of fiberboard and paperboard. DARCOMPSCC, MERADCOM, AFPEA

Compression/Tensile Tester - used to determine yield load points, ultimate tensile loads, or elongation properties of webbing, strapping, tapes, barriers, adhesive joints, and container fastening materials. Also, this tester determines the compressive or bending properties of materials, members, and assemblies. DARCOMPSCC, NLABS, AFPEA, Oklahoma City ALC, NWHC

Compression Tester - measures the compression strength of wood, plywood, fiberboard containers, crates, and pallets in determining the ability of packs to withstand external compressive loads. DARCOMPSCC, ARRADCOM, MERADOM, NLABS, US Army Defense Ammunition Center and School, AFPEA, NWHC

Container Tilt Test Facility - used for certification testing of International Standards Organization (ISO) containers. US Army Defense Ammunition Center and School

Crush Tester - measures the resistance of fiberboard, cushioning, and plastic foams to crush forces. DARCOMPSCC, AFPEA

Drop Tester - used in performing free-fall, edgewise, and cornerwise drop tests on packaged items from specified heights. DARCOMPSCC, MERADCOM, ARRADCOM, NLABS, TACOM, US Army Defense Ammunition Center and School, AFPEA, Ogden ALC, Oklahoma City ALC, Sacramento ALC, San Antonio ALC, Warner Robins ALC, NWHC

Drop Towers - used in performing free-fall drop tests on inert and live items from extreme heights. ARRADCOM, AD

Drum Testing - used to determine the ability of packs to withstand rough handling and to provide protection to contents. DARCOMPSCC, NLABS, US Army Defense Ammunition Center and School

Flex Tester - used for the flex conditioning of materials prior to determination of water vapor transmission rates. DARCOMPSCC, MERADCOM, AFPEA

Hydraulic Tilt Platform - used in conjunction with incline impact testing and also to determine stability of containers and unit loads when stacking on an incline. NWHC

Impact Wall/Monorail System - determines the ability of large containers/unit loads to withstand sudden shocks and is used in conjunction with pendulum impact testing. MERADCOM, NWHC
Incline Impact Tester - determines ability of containers/unit loads to withstand impacts associated with railroad and truck movement, and to determine the ability of the pack to protect contents. ARRADCOM, DARCOMPSCC, MERADCOM, TACOM, NLABS, US Army Defense Ammunition Center and School Ogden ALC, Oklahoma City ALC, San Antonio ALC

Leak Tester - for determining leaks in containers. APPEA

Pendulum Impact Tester - used in testing the ability of large shipping containers to resist horizontal impacts and to determine the ability of the pack to protect contents. APPEA, AD, Ogden ALC, Warner Robins ALC

Pendulum Tester - used for fracture testing of notched specimens. NLABS

Preservative Testing Facility - for testing and analysis of petroleum-based compounds. MERADCOM Puncture Tester - used to determine the puncture resistance of papers, barriers, and multi-wall fiberboard. DARCOMPSCC, NLABS, APPEA

Railcar Impact Facility - determines the ability of blocking and bracing or internal restraint system to withstand shock encountered during railcar humping and transportation. DARCOMPSCC, US Army Defense Ammunition Center and School, MERADCOM, NWHC

Scuff Tester - used to determine resistance to scuff materials. APPEA

Shock Tester - tests item fragility and dynamic impact response of cushioning materials in determining the ability of packs to withstand expected shock tension. ARRADCOM, DARCOMPSCC, MERADCOM, NLABS, APPEA, San Antonio ALC, NWHC

Tear Tester - used to determine force required to tear barrier and wrapping materials. MERADCOM, APPEA

Tensile Tester - tests the tensile strength of barrier materials and tapes, and the adhesiveness of pressure-sensitive tapes. DARCOMPSCC, MERADCOM, APPEA

Tensile Tower - used in tensile overload testing of very large handling equipment and in drop testing large containers such as MILVAN's. NWHC

Transportability Testing Facilities - used in testing the transportability of truckloads. US Army Defense Ammunition Center and School, MERADCOM, AD

Vibration Tester - used to test the effects of vibrational stresses associated with truck and rail transportation on packs, containers, palletized loads, and cushioning systems. DARCOMPSCC, ARRADCOM, MERADCOM, NLABS, TACOM, US Army Defense Ammunition Center and School, APPEA AD, Ogden ALC, Oklahoma City ALC, Sacramento ALC, San Antonio ALC, Warner Robins ALC, Naval Avionics, NWHC

PROCESS TESTING EQUIPMENT

Automatic Packaging Machine - used to evaluate experimental films for thermoformed packaging. DARCOMPSCC

Bar Code Printer - produces high-density bar code labels for the testing of bar code techniques in materials handling systems. DARCOMPSCC

Foam-In-Place Dispensing Machine - used for testing foamed-in-place chemicals, methods, and test packages. DARCOMPSCC, TACOM, APPEA
Mechanized Materials Handling System - used to evaluate various material handling concepts, including automatic marking and reading systems. DARCOMPS CC

Oven - used in drying excess moisture from various plastics used in the vacuum foaming process. AFPEA, Naval Avionics

Shrink Tunnel/Applicator - used in the design and testing of various shrink-film enclosures. DARCOMPS CC, NLABS, TACOM, Ogden ALC, Sacramento ALC Naval Avionics

Skin Packaging Machine - used in the design and testing of various vacuum-formed packages. Ogden ALC, Naval Avionics, Naval Underseas Warfare Engineering Station

Stretch Wrapper - used in the preparation of various stretch film configurations up to pallet-load size for rough handling testing. NLABS
APPENDIX B EQUIPMENT DESCRIPTIONS

ARRADCOM

ENVIRONMENTAL TESTING EQUIPMENT
1. Cyclic Exposure Cabinet.
2. Humidity Chamber.
3. Oven - electric; 35ø to 180ø C.
4. Rain Room.
5. Sun and Rain Chamber - 31-in. diameter specimen drum; ambient to 190øF.
6. Temperature Chamber (four types): - low temperature; ambient to -65ø F. - low temperature, upright type; ambient to -60ø F. - high/low temperature; 15' x 6' x g'; -100ø to 160ø F.; for drop testing electrometric mounts.
7. Temperature/Humidity Chamber.
8. Temperature/Vibration Chamber.

PHYSICAL TESTING EQUIPMENT
1. Compression Tester - 30,000-lb capacity.
2. Drop Tester (see Temperature Chamber).
3. Drop Tower - 40 ft.
5. Vibration Tester - electro-hydraulic; 6-in. diameter piston; 25,000-lb force 2 to 300 Hz -65ø F. to 160ø F.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Balances and scales - used for analytical weighing of materials. Examples are: Mettler analytical balance, 200-gm capacity; scale, suspension type, 3,000-lb capacity with 5-lb graduations; analytical balance scale, 1/20 mg.
2. Diffusometer - used to determine water vapor transmission rates; infrared water vapor automatic operation and printout ability, 90XF8> to 120ø F. temperature range.
3. Dynamic Test Equipment - used in conjunction with shock and vibration testing. Examples are: accelerometers, charge amplifiers, electronic counter, 36-channel oscillograph, storage oscilloscope, variable filters, and voltmeters.
4. Manometer - 30-in. mercury; used in conjunction with pressure testing testing of sealed rigid containers.
5. Packaging Research Laboratory - various laboratory equipment used for analysis of packaging. This equipment includes: an air analyzer, microscopes centrifuges, balances, incubators, spectrometers, and fire testing apparatus.
6. ARRADCOM is designated lead activity for test and evaluation of all Army class V ammunition preservation, packaging, and packing, except for missiles and rockets.

US ARMY DEFENSE AMMUNITION CENTER AND SCHOOL

PHYSICAL TESTING EQUIPMENT
1. Compression/Tensile Tester - 50,000-lb capacity.
2. Compression Tester.
3. Container Tilt Test Facility - roll simulator; variable tilt and cyclic period with a 45ø tilt (maximum) at 13-second period (minimum) capacity.
4. Drop Tester - 1,600-lb capacity; Wright chain hoist; helicopter cargo release hook.
6. Incline Impact Tester - steel rail rack; 10ø incline; carriage; rigid bumper.
7. Railcar Impact Facility - WYE turn-around capability; five permanent buffer cars; permanent concrete car; and floor height test dock at impact site.
8. Transportability Testing Facilities - 150-ft long course c/o RR ties alternately spaced on 10- and 8-ft centers, imbedded in concrete and projecting 6 in. above the roadway (HAZARD Road Course); and 300-ft improved concrete roadway c/o RR rails laid laterally in the roadway on 24-in. centers and projecting 2 in. above the concrete (Washboard Course).


10. Transportability Test Vehicles - 2«-ton cargo truck M35A2; 5-ton cargo truck M54; 1-ton ammunition trailer M105A2; gamma goat M561; and tracked carrier M548.

INSTRUMENTATION/RECORDING EQUIPMENT

1. Recording Equipment.
   a. Thirty-two channel Bell and Howell tape recording unit with all associated electronics such as DC power supplies, balance bridges, DC amplifiers, oscillograph featuring filter type galvanometers. This instrumentation is installed in a mobile instrumentation van capable of recording shock vibration during laboratory unitization/palletization tests and full-scale rail impact, road, and tilt tests.
   b. Fourteen-channel EMR telemetry package with associated DC power supply, VCOs and transmitter capable of recording those shocks and vibrations incident to full-scale rail impact, road, and tilt tests. This package is mounted on the test vehicle and the shock and vibration data are transmitted to a receiver with appropriate discriminators, tape recorder, and oscillograph that is mounted in a second instrumentation van.
   c. Two 14-channel MARTEC data loggers and one data reader with associated equipment to record any slow and continuous environmental conditions such as temperature and humidity.
   d. Twenty mechanical clock-driven temperature/humidity recorders used to monitor in-transit trial shipments.
   e. Twenty mechanical clock-driven triaxial accelerometers used to monitor and record in-transit shock data.
   f. High-speed camera capable of recording test incidents up to a maximum of 40,000 frames per second.
   g. Peripheral Equipment - accelerometers (strain gauge and piezoelectric), strain gauges, pressure transducers, thermal couples, over-pressure transducers, load cells, displacement gauges, dryer oven, balances and scales, and an X-ray facility.
   h. Twelve-channel analog to digital converter with a sampling rate of 10,000 per second.
   i. TI 960 minicomputer for spectral analysis and curve integration.

ENVIRONMENTAL TESTING EQUIPMENT

1. Altitude Chamber - 100,000-ft capability with corresponding temperatures; 150 cu ft; 5' x 5' door opening; to 90,000 ft in less than 45 minutes; to 60,000 ft and -100Ø F. in less than 1 hour; manual and automatic control.

2. Cyclic Exposure Cabinet - 0Ø F. to 200Ø F.; 20% to 95% RH; 22" x 48" door opening; 17 in. depth; upright.

3. Humidity Cabinet (two types) -120Ø F. ± 2Ø F.; 100%RH; 2« x 2« x 3'; continuous condensation; ASTM D 1748. - atmosphere control; 100Ø F., 95% RH.

4. Laboratory Ovens (seven types): - electric; 20" x 15" x 20"; to 800Ø F. - forced draft; electric; 3' x 2« x 2'; to 620Ø F. (2 each). - convection drying; 2' x 1« x 1«'; to 356Ø F. (2 each) - convection drying; 3' x 2« x 2«; to 356Ø F. - muffle furnace; electric; 13" x 7« x 5" to 2,000Ø F. - gravity convection, electric; 1' x 1' x 1'; to 450Ø F. (2 each). - infrared - 5' x 5' x 7«'; 24 independently operated banks of six lights each; maximum 200Ø F.; full opening.

5. Ozonator (Ozone Chamber) - flat specimens; to 200 parts per 100 million; ASTM D1149.
6. Rain Room - 16' x 12' (8' wide opening); to 4 in. per hour, uniformly dispersed; 50ø F. to 180ø F.; with provision for controlling salinity.

7. Salt Fog/Spray Chamber - 3' x 3' x 3'; 5 and 20% NaCl solutions; 95ø F.

8. Standard Conditioning Room - 24-hour per day maintenance of average 72ø F. and 50% RH; 38' x 22'; in accordance with ANSI/ASTM E-171.

9. Temperature Chambers (two types) - walk-in; ambient to -85ø F.; 12' x 8' x 10'; 500-lb maximum capacity per sq ft of floor space; full opening door. - cold box; ambient to -130ø F.; 41" x 18" x 30".

10. Temperature/Humidity Chambers (two types): - walk-in; -30ø F. to 165ø F.; 10% to 98% RH; 7-' x 7-' x 7-'; full opening door; automatic cycle capability. - (cabinet) -80ø F. to 185ø F.; 10% to 95% RH; 3' x 3' x 3'.

11. Temperature/Vibration Chamber - "AGREE" type; -100ø F. to 250ø F.; 4-" x 4-" x 3'; 500 lb maximum load; 20 to 60 Hz @ 3.2 maximum g's. full access; automatic program controller.

12. Weatherometer - extended range; xenon or carbon arc lamp provision; 15% to 60% RH over full temperature 100ø F. to 200ø F. (lamp on); to 100% over full temperature 50ø F. to 130ø F. (lamp off); holds 54 panels of specimens.

PHYSICAL TESTING EQUIPMENT
1. Abrasion Testers (two types): - Taber abraser; two abrading wheels in sliding rotation; 30 square centimeter abraded surface area. - Abraser/Pin-hole Detector - reciprocating abrasive block; variable speed; specimen acts as a dielectric; electrical circuit completed upon failure; digital counter; automatic cut-off.

2. Compression/Tensile Testers (two types): - Instron; 50 gm to 10,000-lb ranges; incremental load rate to 20 in. per minute, automatic chart recording; environmental chamber - 100ø F. to 400ø F. - Universal; 60,000 lb in four ranges; 1-" x 1-" x 41" maximum working volume between guides.

3. Compression Tester (two types): - box type; 30,000 lb in four ranges; 5' x 6' x 8' maximum working volume between guides; 0.5 to 10 in per minute. - National Forge; 750-lb capacity; 12" x 12" x 17" maximum working volume between guides; incremental to 2.5 in per minute; standard environment.

4. Drop Testers (three types): - Gaynes drop-leaf type; 200-lb capacity; up to 54-in drop height; foot pedal release. - 3-in thick steel drop plate; 3' x 3'; embedded in 6 ft of reinforced concrete. - 3/4-in thick steel drop plate; 10' x 10'; embedded in 4 ft of reinforced concrete.

5. Drum Tester, Revolving (two types) ASTM D782: - 14-ft diameter; 600-lb capacity; 1 rpm; steel flooring. - 7-ft diameter; 250-lb capacity; 2 rpm; steel flooring; puncture hazard.

6. Flex Tester - Gelbo; variable stroke.

7. Incline Impact Tester - 10,000-lb capacity; 6' x 6' dolly on steel rail; 10' x 9' backstop; 14-in incline distance; calibrated; timber hazard.

8. Puncture Testers (three types): - Beach type; triangular pyramid puncture point; ASTM D781. - Mullen type (burst); Model "A;" hydraulic principle. - Elmendorf type (tear); ASTM D1424 (2 each).

9. Railcar Impact Facility - loaded test car; depot-assisted simulated humping.

10. Shock Tester - programable square and half-sine wave pulses; seismic base; dual trace scope; automatic cycle capability; 600-lb capacity; 1 millisecond minimum pulse duration to 600 peak g's.

11. Tensile Testers (two types): - Schopper type, medium duty; 15- and 75-lb ranges; 4 or 12 in per minute load rate (2 each). - Scott type; heavy duty; 50- and 250-lb ranges; 2, 4, 6, 10, 12 and 20 in per minute.

12. Vibration Testers (three types): - 10,000-lb capacity; brute force; 0.0625 to 0.50-in double amplitude, vertical linear and synchronous motion, in-floor; 4 to 20 Hz limited by 2 g safety cutoff switches, 8' x 12' table size. - 2,000-lb capacity; brute force; vertical linear and synchronous motion; 1-in. double amplitude; 10' x 5' table size; with restraining gates. - 500-lb capacity; reaction type; 5 to 60 Hz; 10 g maximum input to rated load; 3' x 4' table size; vertical/horizontal motion.
PROCESS TESTING EQUIPMENT

1. Automatic Packaging Machines - vacuum/heat forming skin-to-skin packaging concept; 2.5-minute cycle; maximum item size 36" x 10" x 8"; automatic cycle and package cutting (2 each).
3. Foam-In-Place Dispensing Machines (three types): - maximum 6-lb per minute; mobile; hand-held gun; 1 to 1 ratio. - maximum 20-lb per minute; silicone control rectifier drives; counterbalanced dispensed head; recirculating; solvent flush warning. - maximum 30-lb per minute; recirculating; timed dispense; 4-ft boom.
4. Mechanized Materials Handling System - prototype unit; maximum 24" x 24" containers; occupies 43 ft by 17 ft.
5. Shrink Tunnel/Applicator (three types): - variable speed; conveyor belt; maximum 12" x 12" x 9" items. - 5' x 6' door opening; 20 pallet loads per hour; to 400øF.; power shuttle; propane. - thermo-pak heat cannons; portable; propane.
6. Symbol Analyzer - helium-neon laser; 5-mil spot; keyboard includes decode, percentage decode, start-stop bar widths, static reflectance, usable for code 39.
8. OCR Wand Reader System - hand-held module, electronics module; adaptable for dot-matrix printer.

INSTRUMENTATION/RECORDING EQUIPMENT

1. Balances/Scales - many types; e.g., Toledo scale, 800-lb capacity; Toledo scale, 2,000-lb capacity; Hydroscale, 6,000-lb capacity, with lifting eye; Parcel Post scale, 70-lb; shadograph; torsion-balance; analytical 2,000 grams; Troemer beam balance; Mettler balance, 240 grams, optical tare.
2. Electrostatic Meters (two types): - Hand-held gun type; 5,000 v. @ 2 in, 10,000 v. @ 6 in and 20,000 v. @ 12 in. - Electrometer; solid state, measures static charge, voltage, current, and resistance.
3. Infrared Diffusometer - water vapor transmission rate (WVTR) tester, totalizer time profile record; detects as low as 1 microgram of water vapor per liter; extremely fast.
4. Instrumentation Console (Mobile) - self-contained; shock and vibration analyzer; includes oscillograph record, universal counter, calibration equipment, sensor amplifiers and storage oscilloscope.
5. Magnetometer - milligauss or milliampere recording; for magnetic shielding tests.
6. pH Meter, Digital - electronic; range pH 0.000 to pH 13.999 in 0.001 pH unit increments.
7. Ride Recorders and Shock Indicators - self-contained g indicators in various ranges.
8. Spectrum Analyzer - 3 to 10,000 Hz; automatic feature; 0.1 to 10 v. rms input; for vibration analysis.
9. Transmissibility System - multiplier, preamplifier, conversion and power modules; for determining magnification factors during vibration.
10. Video Tape System - camera with zoom lens; sound record; recorder and monitor; for monitoring physical testing.
11. Viscosimeters - universal sayboldt and kinematic bath types; for oils, preservatives, etc.
12. Sensors and Associated Amplifiers - strain-gauge type accelerometers, 16 of various g ranges; piezoelectric type accelerometers; 8 of various g ranges; humidity sensors (7); pressure transducers (4); vibration pickups (6); all sensors with associated amplifiers and meters.
13. Miscellaneous Test Equipment - includes oscilloscopes, FM tape recorder, scope camera, strobos, temperature potentiometers, manometers, microscopes, spectrometers, colorimeters, reflectometer, vacuum oven, pyrometer,
centrifuge, water still, air velocity meter, chemical analysis apparatus, insulation breakdown tester, torsion-wire apparatus, etc.

MERADCOM

ENVIRONMENTAL TESTING EQUIPMENT
1. Climatic Chambers (three types): - heavy equipment; 23-ton capacity; 32' x 14' x 13'; -85ø to 165ø F.; 20% to 100% RH; 35,000-ft altitude; dew, fog, and frost simulation. - portable; 3,000-lb capacity, 7' x 6' x 6'; -65ø to 165ø F.; 20% to 100% RH; dew, fog, and frost simulation. - tropical; 23-ton capacity; 14' x 14' x 13'; 75ø to 85ø F.; 90% to 100% RH; dew simulation.
2. Weatherometers.

PHYSICAL TESTING EQUIPMENT
1. Burst Tester - Mullen; 0-1,500-lb pressure.
2. Compression Tester - 0-100 lb.
3. Drop Tester - free fall; 300-lb capacity; 12- to 60-in drop height.
4. Flex Tester - Gelbo.
5. Impact/Monorail System - 1,000-lb capacity.
6. Incline Impact Tester - 1,000-lb capacity.
8. Railcar Impact Facility - complete instrumentation and recording equipment.
9. Shock Tester (two types): - repetitive; 1,000-lb capacity; 5' x 5' table; 0-15 Hz; 1-in double amplitude. - 500-lb capacity; 78-in maximum height.
10. Tear tester - internal; 0-100 lb.
11. Tensile Tester.
12. Transportability Testing Facilities - complete mobile instrumentation.
13. Vibration Tester - 10,000-lb generated force; 2,000-5,000 Hz; resonant frequency 2,500 Hz nominal; complete instrumentation and recording equipment.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Equipment mentioned above associated with railcar, transportability, and vibration testing.
2. Photographic Support - capability available for still and motion pictures, ultrahigh-speed and time-lapse photography in both black and white and in color.

NLABS

ENVIRONMENTAL TESTING EQUIPMENT
1. Standard Room; 72ø F. and 50%RH.
2. Cycling Room; 33ø to 160ø F. and 20% to 90%RH.
3. Tropical Room; 100ø F. and 95%RH.
4. Desert Room; 140ø F. and 10%RH.
5. Entomological Packaging Laboratory: Equipment necessary for preparation and conduct of tests, to include maintenance of the required insect population, controlled atmosphere rooms for viability, and physical and chemical equipment and facilities as required for long-term tests.

PHYSICAL TESTING EQUIPMENT
1. Revolving Drum, 7 ft; 500 lb.
2. Compression Machine; 60,000 lb.
3. Compression Machine; 10,000 lb.
4. Instron Tensile Tester S.N. 809; 0-500 newtons.
5. Instron Tensile Tester; 1,000 lb.
6. Incline Impact Tester; 500 lb.
7. Incline Impact Tester; 10,000 lb.
8. Puncture Tester; 1,350 units.
9. Drop Tester, 5 ft; 100 lb.
10. Drop Tester, 15 ft; 100 lb.
11. Pendulum Tester; 48 ft/lb.
12. Transportation Vibration Simulator; 10,000 lb.
13. Infrared Spectrophotometer - to identify films and laminates; IR Range 1-16 microns.
15. Ox-Trans 100 Oxygen Permeability Tester.

PROCESS TESTING EQUIPMENT
2. Shrink Tunnel; 20 loads per hr.
3. Stretch Pallet Wrapper; 20 pallets per hr.
4. Semiautomatic Vacuum Closing Machine, Mdl 227-SV, Modified for Half-Size Steam Table Containers; 1 to 4 in height; adjustable.
5. Laboratory Process Simulator, Retort, Mdl 1000; 30-in diameter; to include basic heat sealing unit with sealing dies (0-650ø F.) and sets of simulator change parts for various modes of operation.

INSTRUMENTATION/RECORDING EQUIPMENT
Retort (and Foxboro Control System, Mdl 39RCS); 36-in diameter.

ENVIRONMENTAL TESTING EQUIPMENT
1. Humidity Chamber - room temperature to 170ø F.; RH - full range; size - 13-1/2" x 13-1/2" x 9" I.D.; chamber is a precise mechanical convection controlled unit.
2. Oven, Gravity-Convection - 40ø C. - 200ø C.; dual thermostats control accurate to ± 2ø C.; size - 18" x 15" x 17-1/2" I.D.
3. Temperature Test Chamber - 73ø C. to + 177ø C. ± 2ø C.; size - 38" x 38" x 38" I.D.; chamber is equipped with a temperature controller.
4. Salt-Fog Cabinet - size - 45" x 30" x 39" I.D.; designed to meet latest revisions to ASTM B-117, B-287, and B-368.

PHYSICAL TESTING EQUIPMENT
2. Incline Impact Tester - 3000-lb capacity; 6' x 6' dolly on steel rail, 8' x 6' backstop; 7.0-ft incline distance; calibrated; timber hazard.
3. Vibration Testers (two types): - 250-lb capacity; 30" x 36" table; variable speed drive; interval timer; RPM indicator; motor control. - 3000-lb capacity; 60" x 60" table; variable speed drive; out-of-phase mechanism; nonsynchronous motion; interval timer; RPM indicator; motor control.
4. Heat Tank - quick leak; size - 36" x 24" x 24" I.D.; variable thermostat control; hinged safety lid.

PROCESS TESTING EQUIPMENT
1. Polyurethane Foam Processing Equipment - 6-40 lb per minute capacity; individual chemical temperature controls 50ø F. - 150ø F.; automatic solvent flush; automatic drum feed system; liquid level controls; digital timer with pour time from 0.1 to 69.9 seconds and repeat accuracy of ± 0.1 seconds; and adjustable speed drive giving 6 to 1 variable throughput for each chemical.
2. Heat Cannon - portable, high capacity hot-air generator using propane gas; 140,000 BTU per hr; 1000øF. at 9 in away from cannon; used to shrink 3-mil and greater thickness film.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Balances/Scales - several types; i.e., O'Haus, 2,610 grams; O'Haus, 20 kilograms; Toledo Computogram with platform; and Dillon Dynamometer, 10,000 lb.
2. Hydrothermograph Recorders - 0øF. - 100øF.; 0-100% RH; Bendix model 594, 2 each; Brown recorder, 3 each.
3. Instrument Recording Operations - Easterline-Angus, model AW; for temperature and RH.
4. Instrument Recording and Sensing Unit - Foxboro, model FA; for RH and temperature.
5. Accelograph Kit - Humphrey model AX01-0101-1; measures g forces.
6. Psychrometer - Bendix, model 566; measures RH 0-100%.

ENVIRONMENTAL TESTING EQUIPMENT
1. Altitude Chamber - 80,000-ft capability; 200ø to -90øF.; I.D. 3' x 3' diameter.
2. Climatic Long-Term Test Room.
3. Cyclic Exposure Cabinet.
4. Humidity Chamber.
5. Oven (three types): -forced draft; 200ø to 500øF.; I.D. 3' x 3' x 2'; door opening 3' x 3'. -temperature, 100øF. to 450øF.; I.D. 12" x 12" x 12"; door opening 12" x 12". -muffle furnace; 2,500øF.; I.D. 7" x 14" x 5"; door opening 7" x 5".
6. Rain Room.
7. Rain/Salt-Fog/Wind Chamber - walk-in type; 2" to 5" rain per hr; salt-fog uses a 5% salt solution (by weight); 40 mph wind velocity; I.D. 6'4" x 13'4" x 6'6"; door opening 5'2" x 6'7".
8. Salt-Fog/Spray Chamber.
9. Temperature/Chamber (two types): -high temperature; 100ø to 500øF.; I.D. 4' x 9'9" x 5'; door opening 4' x 5'. -low temperature; walk-in; 170ø to -100øF.; I.D. 7'6" x 15'2" x 8'; 5'10" x 6'10" door opening; 4,000-lb drop test capability.
10. Temperature/Humidity Chamber - walk-in type; high temperature; ambient to 200øF.; 70% to 95% RH; I.D. 8'3" x 15'10" x 8'; 5' x 7' door opening; 4,000-lb drop test capability.
11. Weatherometer - 41" x 41" x 32-1/2"; ambient to 200øF.

PHYSICAL TESTING EQUIPMENT
1. Abrasion Tester - rotary platform; double head (as described in ASTM-D 1175-71).
2. Burst Tester (Mullen) - range 0 to 1500 lb.
3. Compression/Tensile Tester - Instron, 10,000-lb capacity; loading rate .02 to 20 in. per minute; environmental chamber permitting -100ø to 600øF. temperature range; integrator permits integration of area under stress/strain curves.
4. Compression Tester - 50,000-lb capacity; 6' x 4' x 3' plate; 8-ft platen opening; rate of loading .1 to 2.0 in per minute.
5. Crush Tester - compression range 0 to 1,000 lb.
6. Drop Tester (two types): -for cushioning material; guided vertical drop (as described in ASTM-D 1596); 9" x 9" plate, 8" x 8" sample size; 48 in maximum drop height, static stress range .03 to 2.0 psi. -for shipping containers (conforming to ASTM-D 775); 300-lb capacity; 60 in maximum drop height.
7. Flex Tester (Gelbo).
8. Leak Tester (Halogen).
9. Pendulum Impact Tester - 5,000-lb capacity 8' 7-1/2" x 18' x 12' maximum container size.
10. Puncture Tester - 0 to 2,600 Beach puncture units.
11. Scuff Tester.
12. Shock Tester - programable 24" x 24" table; 235-lb table weight; 600-lb maximum specimen weight; drop height 1 to 66 in.
13. Tear Tester.
14. Tensile Tester.
15. Vibration Machine (three types): -exciter, electrodynamic; peak sinusoidal force up to 4,000 lb and 100 g s; 5 to 3,000 Hz. -vertical, horizontal, or elliptical motion; 96" x 96" table; 5,000-lb capacity; 3 g s maximum acceleration; 1 in. maximum deflection; 0-40 Hz. -electrohydraulic, vertical motion; 48" x 48" table; 6,000-lb load rating; 6 in. maximum displacement; 1 to 200 Hz.

PROCESS TESTING EQUIPMENT
Foam-In-Place Dispensing Machine.
a. Adjustable, pour-froth to spray foam density; 0.5 to 20 pcf dispensing range, lbs of liquid per minute: 5 to 14; viscosity, centipoise maximum 1500.
b. Pour type (5-gallon pressurized canisters); dispensing rate, lbs of liquid per minute: 8 maximum foams: 0.5 pcf semirigid and 2.0 pcf rigid.
c. Pour type (15 or 55-gallon drums); dispensing rate, lbs of liquid per minute: 8 maximum foams: 0.4 pcf and 0.75 pcf semirigid, 1.0 pcf flexible, 2.0 pcf rigid.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Gaussmeter - precalibrated; .0001 to 30,000 gauss.
2. Oscillograph - charts speed from .1 to 100 in. per second; band width 0-1000 Hz; multichannel.
3. Oscilloscope - 4-channel storage; 48 to 10 MHz; 10-second maximum sweep.
4. Recording Systems (five types): -tape; 3-channel magnetic records; 0-10,000 Hz. -temperature and RH; two 24-channel recorders with RH and temperature sensors; -30ø to 150øF.; 5% to 95% RH. -transportation environment; measures temperature, humidity and shock; 6" x 6" x 5". -temperature; thermocouple; multichannel 0-600øF. -transportation shock recorder, measures acceleration 1-500 g s and impact velocity .3-14 M/5.
5. Spectrum Analyzer; 25 to 31,500 Hz.
6. Water Vapor Transmission Tester (as described in TAPPI Test Method T523).
7. Balances - analytical, 160-gm capacity, reads to 0.1 mg; top loading, 1200 gm capacity digital readout to 0.1 gm.
8. Accelerometers - triaxial; piezoelectric; band width 3-3000 Hz; range 0-500 g s and supporting amplifiers.
9. Accelerometers - triaxial; strain gauge; band width 0-300 Hz; range 0-100 g s, and supporting signal conditioners amplifiers.
10.Spectrometer - infrared; analytical; 2.5-20 microns.
11.PH Meter - analytical; range 0-13 Ph.
12.Isocyanate Monitor - analytical; range 0-20 parts per billion.
13.Energy Computer - impact velocity and energy; rebound velocity and energy and coefficient of restitution.
14.High-Speed Motion Picture Camera - 0-9,000 pictures per second.

ENVIRONMENTAL TESTING EQUIPMENT
1. Altitude Chamber (two types): -80,000-ft capability; 10 cu ft; 26" x 68" door opening; 13'6" maximum container length. -50,000-ft capability; 5' x 3' x 4'.
2. Climatic Long-Term Test Room (5 each).
3. Engine Test Cell - I.D. 30' x 130' x 25'; 30' x 25' door opening.
4. Salt-Fog/Spray Chamber - 16' x 54' x 16'; 15' x 15' door opening.
5. Sun, Wind, Rain, and Dust Chamber - 50 sq ft; 20' x 15' door opening.
6. Temperature Chamber (two types): -4 cu ft; 4' x 4' door opening; +250ø to -100ø F. -main chamber; 250' x 60' door opening; 160ø to -70ø F.
PHYSICAL TESTING EQUIPMENT
1. Drop Towers (two types): - 80'; for inert items. - 40'; remote location; for live items.
2. Pendulum Impact Tester - capable of impacting a 10' x 35' x 14' container weighing 10,000 lb.
3. Transportability Testing Facilities - road surfaces ranging from rough terrain to blacktop; Belgian Block Course; portable acceleration recording equipment.
4. Vibration Machines (three types): - 2,000-cycle electromagnetic exciter; 600-lb capacity. - 2,000-cycle electromagnetic exciter; 60-lb capacity. - 2,000-cycle electromagnetic exciter; off-center mass for repetitive shock.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Recording Equipment - a tape recording unit tied in with an oscilloscope, and a memory oscilloscope with a Polaroid camera. The tape recorder has variable speed recording and playback. The oscilloscope recorder has variable paper speed with 16 recording channels.
2. Peripheral Equipment - available for use with this recording equipment are: accelerometers, strain gauges, pressure transducers, water manometers amplifiers, quick release hook, and power supply.

OGDEN ALC

PHYSICAL TESTING EQUIPMENT
1. Drop Tester (two types): - L.A.B. Corp. Quick Release Hook for Drop Tests; 6,000-lb capacity. - Gaynes Drop Table Model 104; 125-lb capacity; 60 in. maximum drop height.
2. Vibration Simulator (two types): - Gaynes Fixed Amplitude; 1-3.5 Hz; vibration table capacity 100 lb. - KSI Variable Displacement Vibration Transportation Simulator; 2-12 Hz; 0 to 1 in. double amplitude; capacity 4,000 lb.
3. L.A.B. Model 3000-OF Incline-Impact Tester; capacity 4,000 lb.
4. Pendulum Impact Tester; 4,000-lb capacity.
5. Monorail Hoist; 4,000-lb capacity.

ENVIRONMENTAL TESTING EQUIPMENT
1. Tenny Hi-Low Temperature/Humidity Test Chamber with Digitenn; Model T14; temperature range from low -80ø C. (-112ø F.) to high 177ø C. (350ø F.); humidity from 0%RH to 100%RH; chamber interior dimensions 28" x 26" x 34" (71cm x 66cm x 86cm).
2. Taylor Temperature/Humidity Recorders; range in temperature -17.8ø C. (0ø F.) to 37.8ø C. (100ø F.); humidity -0%RH to 100%RH.

PROCESS TESTING EQUIPMENT
1. Vibration Meters - displacement from .001 to 1 in.; total velocity from .01 to 1000 in. seconds vector; acceleration from 1 to 1,000 g vector.
2. Moisture Meter Model DC2.
3. O'Haus Triple Beam Balance - analytical; capacity 0 grams to 2,610 grams.
4. Bell Gauss Meter - model 640 with model MOE4 probe; range Img (milligauss) to 30 Kg (kilogauss).
9. Three Impact Register Transportation Accelerometers - G-range, 5-50 g s each axis; frequency C.P.S. 12-35 Hz each axis.

INSTRUMENTATION/RECORDING EQUIPMENT
1. CEC Recording Oscillograph - Type 5-124; provides up to 18 channels of data; records in five speeds from .25 to 64 in. per second.
2. Type RM-15 Oscilloscope.
3. Peripheral Equipment - available for use with recording equipment; includes piezo-resistive and piezoelectric single axis/triaxial accelerometers with charge amplifiers and signal conditioners.

OKLAHOMA CITY ALC

PHYSICAL TESTING EQUIPMENT
1. Drop Tester - table; leaf type; 125-lb capacity.
2. Incline Impact Tester - 400-lb capacity.
3. Vibration Tester - table type; 400-lb capacity.
4. Model RM Compressor and Tension Tester; 0 to 500-lb capacity.
5. Hoist, Electric Portable - 1,000-lb capacity.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Dynamic Test Equipment - used to determine if a container, method, design, technique, or material is sufficient to protect an item to a specified fragility level. It records and monitors the results of instrumented packs subject to various types of rough handling tests such as drop, incline impact, or vibration. This equipment includes: oscilloscopes, storage and visicorder; accelerometer amplifiers; accelerometers, triaxial and piezotron; and calibrators.

SACRAMENTO ALC

PHYSICAL TESTING EQUIPMENT
1. Drop Tester - table; leaf type.
2. Vibration Tester - table type; 400-lb capacity.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Acceleration Recording Equipment - used to record G force acceleration: accelerometers, amplifiers and power supplies.
2. Oscilloscope - instrumentation and display for transducer readout.

SAN ANTONIO ALC

PHYSICAL TESTING EQUIPMENT
1. Drop Tester - table type; 26" x 28".
2. Incline Impact Tester - 4,000-lb capacity.
4. Vibration Tester - speed range 100 to 300 RPM; 250-lb capacity.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Accelerometers - sensing transducers for miscellaneous testing.
2. Oscilloscope - instrumentation and display for transducer readout.

WARNER ROBINS ALC

PHYSICAL TESTING EQUIPMENT
1. Drop Tester - 12" x 72" drop height in 3-in. increments.
2. Pendulum Impact Tester - 5,000-lb capacity.
3. Vibration Tester - low frequency, 2 to 6 Hz.

INSTRUMENTATION/RECORDING EQUIPMENT
1. Acceleration Recording Equipment - used to record G forces acceleration experienced by an item in each of three directions. This equipment includes: accelerometers, charge amplifiers, and power supplies.
2. Manometer, Meriam - used in conjunction with leak testing to pressure-test sealed rigid containers.
3. Oscilloscope, Storage.

NAVAL AVIONICS CENTER

PHYSICAL TESTING EQUIPMENT
1. Vibration Tester - 100/500.

PROCESS TESTING EQUIPMENT
1. Dryer (oven).
2. Shrink Tunnel.

NAVAL UNDERSEAS WARFARE ENGINEERING STATION

PROCESS TESTING EQUIPMENT
1. Skin Packaging Machine - platen size 24" x 30".
2. Right Size Box Machine - maximum stock width 36".
3. Box Fabricator - metal edge fastener as per PPP-D-665, class 2, style A.

NWHC

ENVIRONMENTAL TESTING EQUIPMENT
1. Salt-Fog/Spray Chamber (two types): - I.D. 6' x 6' x 20'; 95ø F. - I.D. 2-1/2' x 3' x 4'.
2. Temperature/Humidity Chamber (three types): - walk-in; 8' x 8' x 16'; 200ø to -65ø F.; 20% to 95% RH; can be doubled in size at some sacrifice to performance. - I.D. 5' x 3' x 3'; 400ø to -100ø F.; 10% to 98% RH. - I.D. 4' x 4' x 4'; 300ø to -100ø F.; 20% to 95% RH.

PHYSICAL TESTING EQUIPMENT
1. Compression/Tensile Tester - 120,000-lb capacity; 4' x 4' table; accommodates up to 1-3/4" x 3-3/4" (flat) and 1/2 to 2-in. diameter (round) specimens.
2. Compression Tester - 25,000-lb capacity; 72' x 8' (base) and 3' x 4' (top) usable working area; maximum working height 90 in.
3. Drop tester - (free fall) 125-lb capacity; drop height 1 ft to 4 ft; 24" x 30" platform.
4. Hydraulic Tilt Platform - 20,000-lb capacity; deck area 20' x 24'; tilt angle 0ø to 35ø.
5. Impact Wall/Monorail System - 10,000-lb lift hoist capacity; 6,000-lb haulback hoist capacity; capable of 20-ft lift; 17' x 25' working area; steel-reinforced, 1'-thick armor plate; impact velocity up to 10 ft per second.
6. Incline/Impact Tester - (Conbur) 5,000-lb capacity; platform dolly 6' x 6' surface area; 25-ft steel track; velocities of 6, 7, 8, and 10 ft per second.
7. Railcar Impact Facility - impact velocities up to 10 mph.
8. Shock Tester - 1,000-lb capacity; maximum vertical drop; 3' x 3' platform.
9. Tensile Tower - 50,000-lb tension load capacity; working height 24 ft to 32 ft; 8-ft vertical platform piston stroke; 18' x 13' working area (concrete base with tie-down fixtures of 25,000-lb load capacities).
10. Vibration Machine (three types): - low frequency; 5,000-lb capacity; 3 to 5 Hz fixed amplitude 1 in. (180 to 300 rpm); table surface area 10' x 6 1/2'. - (reaction type) 8,000-lb capacity; frequency range 5 to 60 Hz; table surface area 6' x 6'. - (electrodynamic) 12,000-lb force output; frequency range 5 to 2,000 Hz; 1 in. maximum double amplitude; maximum acceleration depends on frequency and load.
1. Laboratory Tape Recorder System - for recording multiple channels of analog data; consists of a 14-channel Sangamo Recorder, Model 4700; Endevco, Model 4470 Universal Signal condition system; and several Sanborn, Model 850, pen recorders. Calibration devices, filters, power supplies, and transducers are available to adapt this system to various types of laboratory applications.

2. Field Tape Recorder System - consists of two, 7-channel battery-operated recorders for data acquisition; a 7-channel Lockheed Recorder, Model STORE 7, for use with signal conditioning equipment and transducers; and a battery-operated Gould pen recorder, Model 222, used in providing permanent data records.

3. Transient Recorder - a 6-channel Zonic Transient Recorder, Model DMS, is used to capture and play back shock or other transient phenomena in both digital and analog form. It has a 200,000 Hz maximum sampling rate and a 2,000 word memory per channel. Data are transferred to a digital computer for analysis.

4. Stress/Strain Recording System - variety of instruments used to record and analyze the mechanical stress and strain of test items.

5. Shock and Vibration Analysis Equipment - a Hewlett-Packard, Model 1000/45 minicomputer and a Solartron Model 1170 Frequency Response Analyzer is used to conduct transmissibility, spectrum analysis, mechanical impedance, and other studies related to vibration testing. A shock spectrum recorder is used in connection with shock and impact tests.

6. Transducers - hundreds of accelerometers, pressure transducers, and temperature sensors covering a wide range of measurement parameters are used to measure and record test data.
APPENDIX C PACKAGING ACTIVITY POINTS OF CONTACT

US ARMY

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(AUTOVON 880-3521) Commander
US Army Armament Research and Development Command
ATTN: DRDAR-TST
Dover, NJ 07801

US ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
(AUTOVON 585-8711) Savana, IL 61074
DARCOMPSCC Commander
(AUTOVON 795-7682) US Army DARCOM Packaging, Storage, and Containerization Center
ATTN: SDSTO-TP
Tobyhanna, PA 18466

MERADCOM
(AUTOVON 354-5183) US Army Mobility Equipment Research and Development Command
ATTN: DRDME-VK
Fort Belvoir, VA 22060

NLABS
(AUTOVON 955-2501) US Army Natick Laboratories
ATTN: DRXNM-WP

TACOM
(AUTOVON 273-1569/2142) US Army Tank-Automotive Command
ATTN: DRSTA-GSP
Warren, MI 48090

US AIR FORCE

AFPEA
(AUTOVON 787-2638) Air Force Packaging Evaluation Agency
ATTN: AFALD/PTP
Wright Patterson AFB, OH 45433

AD
(AUTOVON 882-4411) Armament Development and Test Center
3246th Test Wing
ATTN: TESTW/TEP
Eglin AFB, FL 32542

Ogden ALC
(AUTOVON 458-4518) Ogden Air Logistics Center
ATTN: OO-ALC/DSTC
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Oklahoma City ALC
(AUTOVON 735-3544) Oklahoma City Air Logistics Center
ATTN: ALC/DSP
Tinker AFB, OK 73145

Sacramento ALC
(AUTOVON 633-6902) Sacramento Air Logistics Center
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