
# AIR FORCE PACKAGING EVALUATION ACTIVITY

*40 Years of Packaging Excellence 1952 - 1992*

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

1. The year 1992 marked a major milestone in history for the Air Force Packaging Evaluation Activity (AFPEA). Although officially formed on 21 April 1952, AFPEA's roots actually go back to World War II when a packaging branch was formed under the Engineering Standards Division of the Army Air Corps. Throughout the more than four decades of packaging excellence, AFPEA has contributed tremendously to the technological advances in packaging. The entire federal packaging community has benefited from the AFPEA contributions. I offer my thanks to the hundreds of AFPEA employees who have served our nation over the forty-plus years by developing packaging to ensure the safety of critical Department of Defense assets during handling, storage and transportation.

2. During 1992, AFPEA continued to provide a leadership role in the development and application of packaging policy and engineering technology. Some of the more significant projects for the past year include: design engineering support for containers for the Space Shuttle Rocket Motor Casing, Minute Man Guidance system, B-52 Receiver/Transmitter, F-15 Canopy container, Advance Cruise Missile, Combat Talon II, and the Gun Ship 25mm Ammunition; testing support for the Swiss Maverick Missile container; in-house design and construction of a new tie-down tester; and purchase of a new environmental chamber, and compression/tensile tester. The activity continued its work with industry organizations such as the American Society for Testing and Materials (ASTM), Society of Automobile Engineers (SAE), and National Institute of Packaging, Handling, and Logistics Engineers (NIPHLE). Additional foam materials were identified that are free of the harmful chlorofluorocarbons. Information newsletters addressing packaging, hazardous materials, standardization, the environment, training, special accomplishments, and metrics information are periodically distributed throughout the Department of Defense. AFPEA also represented the Air Force on the Defense Ammunition Packaging Council and is managing four major projects to investigate DOD ammunition packaging requirements and perform research and development to improve packaging performance.

3. As in the past, we encourage both DOD and industry to share improvements which can be of benefit to our world-wide packaging operations. We look forward to continued cost effective improvements in new materials and container designs in support of our weapon systems.

RICHARD D. SMITH
Major General, USAF
Director of Logistics

DEPARTMENT OF THE AIR FORCE
Headquarters Air Force Materiel Command
Wright-Patterson AFB OH 45433-5501

AFMC PAMPHLET 71-7

1 March 1993

# ANNUAL REPORT 1992
# AIR FORCE PACKAGING EVALUATION ACTIVITY

This pamphlet is developed to detail project accomplishments for the calendar year of 1992.



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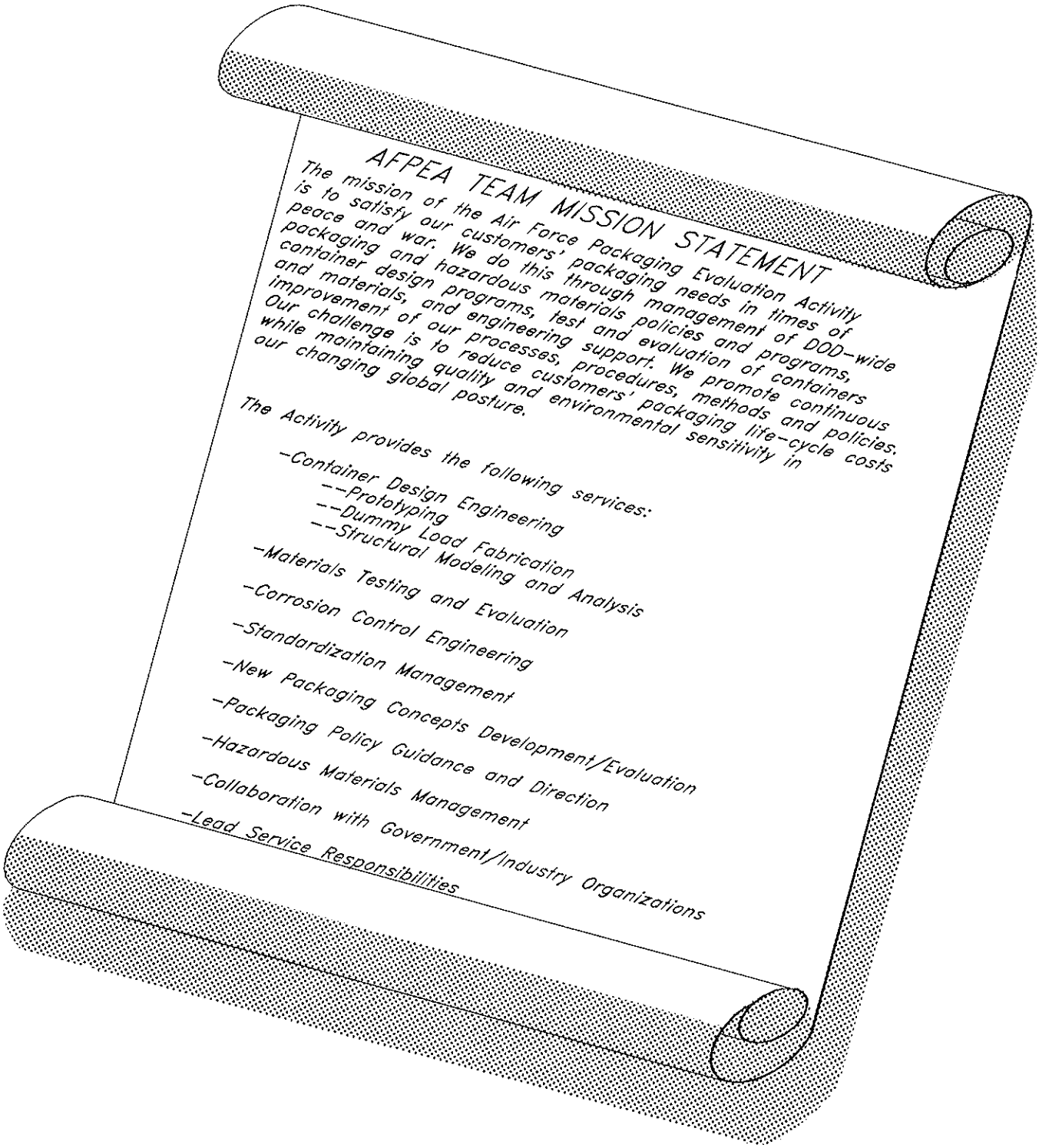

AFPEA TEAM MISSION STATEMENT
The mission of the Air Force Packaging Evaluation Activity is to satisfy our customers' packaging needs in times of peace and war. We do this through management of DOD-wide packaging and hazardous materials policies and programs, container design programs, test and evaluation of containers and materials, and engineering support. We promote continuous improvement of our processes, procedures, methods and policies. Our challenge is to reduce customers' packaging life-cycle costs while maintaining quality and environmental sensitivity in our changing global posture.
The Activity provides the following services:
-Container Design Engineering
--Prototyping
--Dummy Load Fabrication
--Structural Modeling and Analysis
-Materials Testing and Evaluation
-Corrosion Control Engineering
-Standardization Management
-New Packaging Concepts Development/Evaluation
-Packaging Policy Guidance and Direction
-Hazardous Materials Management
-Collaboration with Government/Industry Organizations
-Lead Service Responsibilities

# AF Packaging Activity makes 40 years on job

By RUFUS THOMAS
AFLC PUBLIC AFFAIRS

The Air Force organization that develops products to withstand the test of durability has, itself, stood up to the test of time.

The Air Force Packaging Evaluation Activity observed its 40th anniversary Tuesday at its Bldg. 70, Area C, facility.

It's the same organization whose package designs held up better than commercial packages during Operation Desert Storm.

Approximately 175 people, including many current and former employees attended the anniversary ceremony, Brig. Gen. Patricia Hinneburg, deputy chief of staff for logistics, was the guest speaker. Also present at the ceremony were representatives from related organizations in the Army, Marines, Defense Logistics Agency and the Office of Secretary of Defense for Production and Logistics.

Chuck Edmonson, chief of AFPEA, and only its second civilian chief, recognized past and present employees in attendance and thanked each of them individually for their efforts. He also accepted, on behalf of AFPEA, a certificate of appreciation from the School of Military Packaging Technology. The certificate was presented by Pete Hutter, the dean of the school, who noted the professionalism displayed by AFPEA over the years.

Hinneburg, who retires at the end of April, commended the organization's employees on their accomplishments during Desert Storm, noting that "AFPEA is not just a peacetime organization." She also received two awards from Edmonson, and the AFPEA personnel for her management style and for being what Edmonson called the "supreme advocate of quality."

The mission of AFPEA is to provide the Air Force packaging engineering capability while assuring technical progress in packaging. Among its responsibilities it is charged with the design, development and evaluation and engineering of materials and containers. It also shares its information with other government and industry organizations.

Products developed at AFPEA are subjected to stringent tests and evaluations to ensure their durability. The tests and evaluations include climate tests to see how a container stands up to extreme heat and cold; high impact tests to examine how much stress a package can withstand and many other tests.

Although officially born 40 years ago, the roots of AFPEA extend to World War II under the Army Air Corps where it was called the Packaging Branch. Started at Wright-Patterson, the then-Packaging Division moved in 1955 to Brookley AFB, Ala., where it remained until returning to Wright-Patterson in 1967.

While at Brookley, AFPEA went through several chiefs as well as several name changes, including Packaging Engineering Section, Packaging Research and Engineering Branch and the Air Force Packaging Laboratory. In 1964 the name was changed to the Air Force Packaging and Evaluation Agency. In 1987 it became the Air Force Packaging Evaluation Activity and has remained so since.

The organization lost much of its personnel in the 1967 move to Wright-Patterson. Only five of the 41 employees elected to move with the organization; two of those moved back after a short time. As a result, AFPEA had to rehire and rebuild its entire organization. Today there are 36 employees assigned to AFPEA.

U.S. Air Force Photo

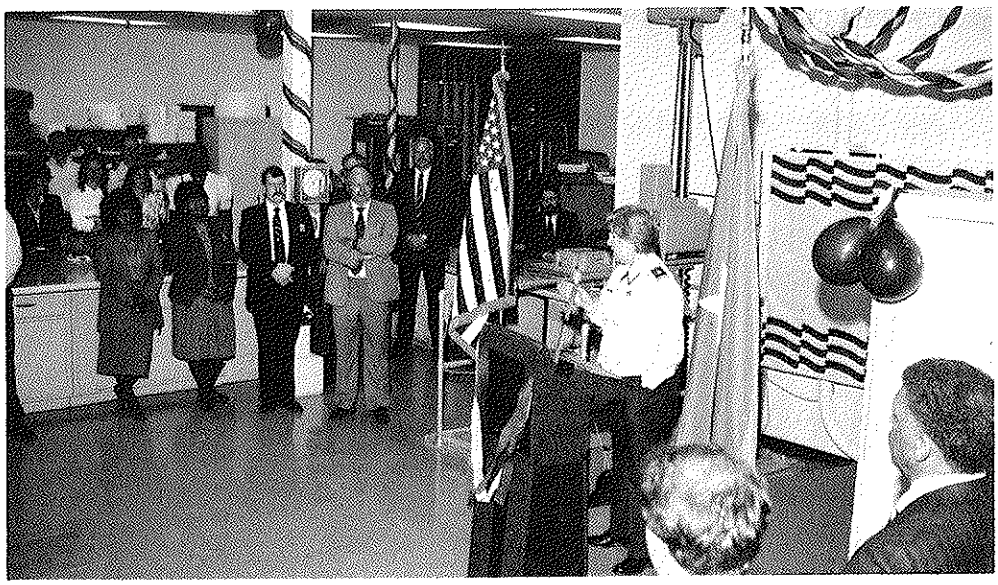
***Brig. Gen. Patricia Hinneburg, deputy chief of staff for Logistics, speaks at 40th anniversary ceremonies Tuesday at the Air Force Packaging Evaluation Activity in Bldg. 70, Area C.***

# AFPEA CELEBRATES 40TH ANNIVERSARY

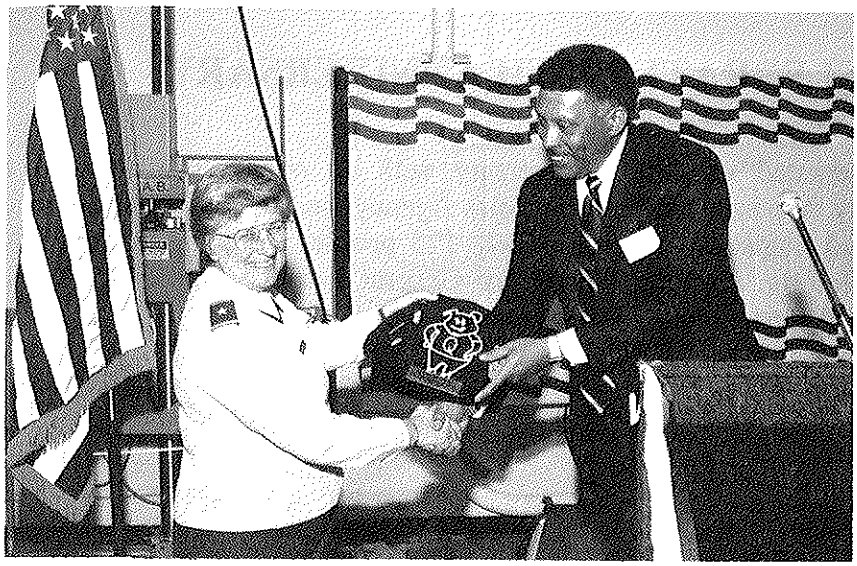
In April 1992, AFPEA celebrated its 40th Anniversary with an open-house attended by representatives from the Army, Marines, Defense Logistics Agency, and the Office of Secretary of Defense for Production and Logistics. Approximately 175 people, including many current and former employees attended the cermony. Brigadier General Patricia Hinneburg, Deputy Chief of Staff for Logistics, was the featured guest speaker.

Charlie Edmonson

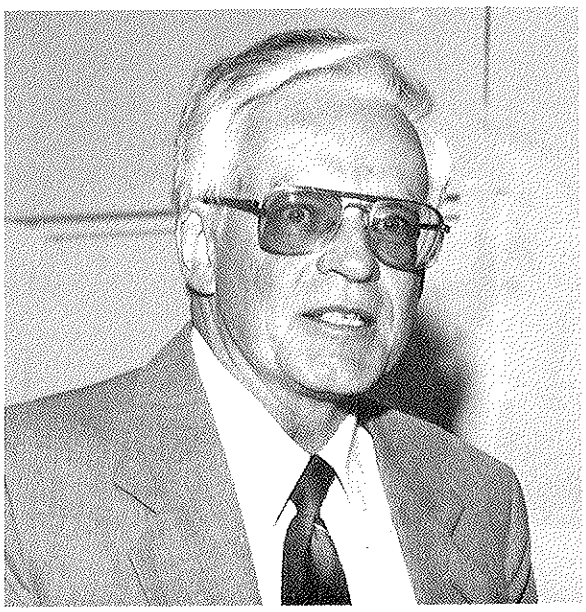
Brig Gen Hinneburg



40th Anniversary Cermony

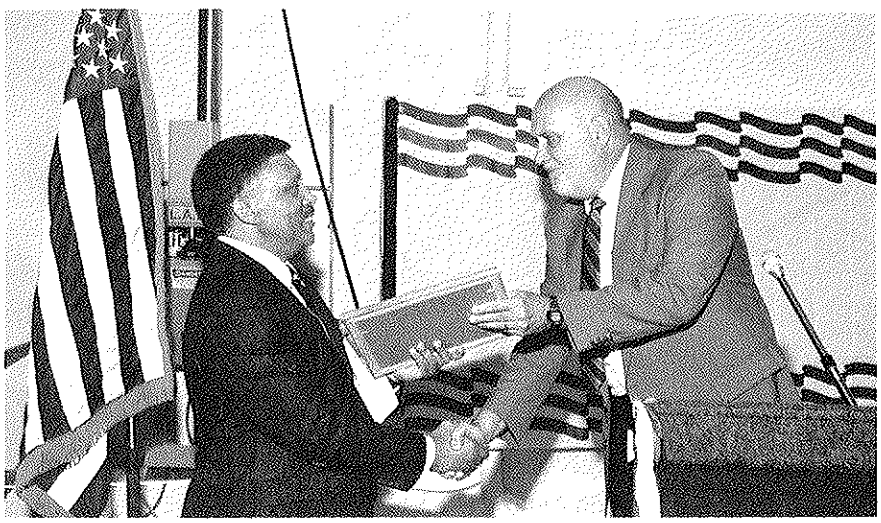


Charlie Edmonson presents "First Pig" Award to Big Gen Hinneburg



Jack Thompson, AFPEA Chief, 1976-1988

Left to Right: Col McLellan, Patricia Powers, Mike Dawson



Pete Hutter, Dean of SMPT, presents Certificate of Appreciation to AFPEA for 40 years of Packaging Support.

Former AFPEA Employees

Current AFPEA Employees

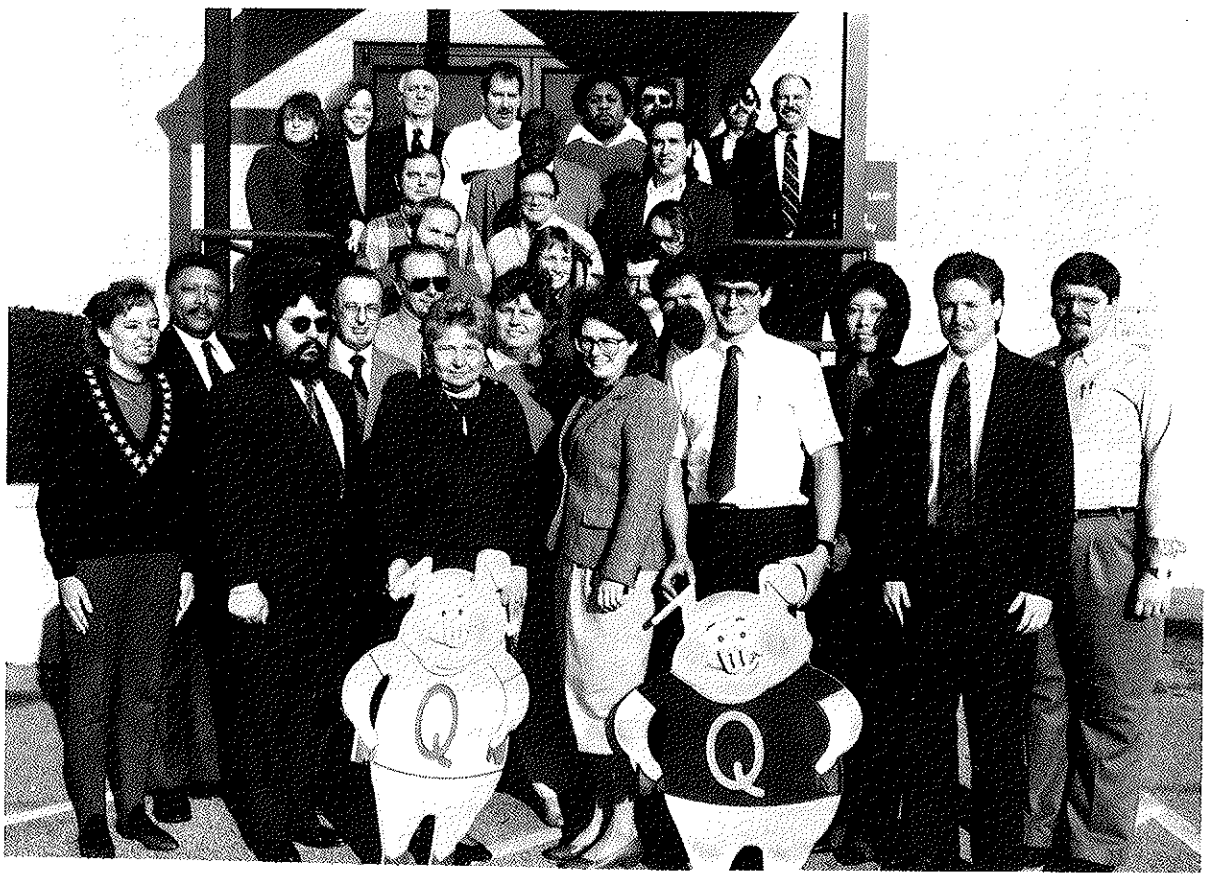
# QUALITY INITIATIVES AT AFPEA

The driving force behind AFPEA is the satisfaction of its customers' needs. In order to meet those needs, AFPEA has continued to pursue improvements of quality processes. Teams and mini-teams are formed as needed to work on improving our processes.

The Division meets every other payday to discuss division-wide issues and to raise quality awareness. The Division steering group schedules these meetings and generates surveys, action plans and coordinates the efforts of AFPEA quality teams. The steering group is comprised of two representatives from each branch, one branch management representative, one administrative representative, and the Division Chief.

Each branch also has their own team. Many issues are brought up at the branch level, discussed, and resolved. Some of the current efforts of the AFPEA quality groups include:

- Branch/Division Mission Statements
- Branch Responsibilities
- Suggestion Box (Many suggestions implemented)
- Climate Survey
- Mini-teams
    - -- Improve Test Method Processes
    - -- Training Procedures for Standardization



# AIR FORCE PACKAGING EVALUATION ACTIVITY

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**CHARLIE EDMONSON**
**CHIEF**

DSN: 787-2638
COMM: 513-257-2638

**CONTAINER DESIGN ENGINEERING**

**TED HINDS**

DSN: 787-3362
COMM: 513-257-3362

- CONTAINER DESIGN
  TEST AND EVALUATION
  COMPUTER-AIDED DESIGN
- PROTOTYPE FABRICATION
- CONTAINER SPECIFICATION
- SHOP SUPPORT
- ILLUSTRATION SUPPORT
- TECHNICAL INFORMATION

**MATERIALS ENGINEERING**

**LARRY WOOD**

DSN: 787-3362
COMM: 513-257-3362

- SHOCK AND VIBRATION
- CORROSION CONTROL
- HAZARDOUS MATERIALS
- FOAM-IN-PLACE
- TEST METHODS
- MATERIALS SPEC
- CUSHION MATERIALS TESTING

**PACKAGING POLICY**

**PAT POWERS**

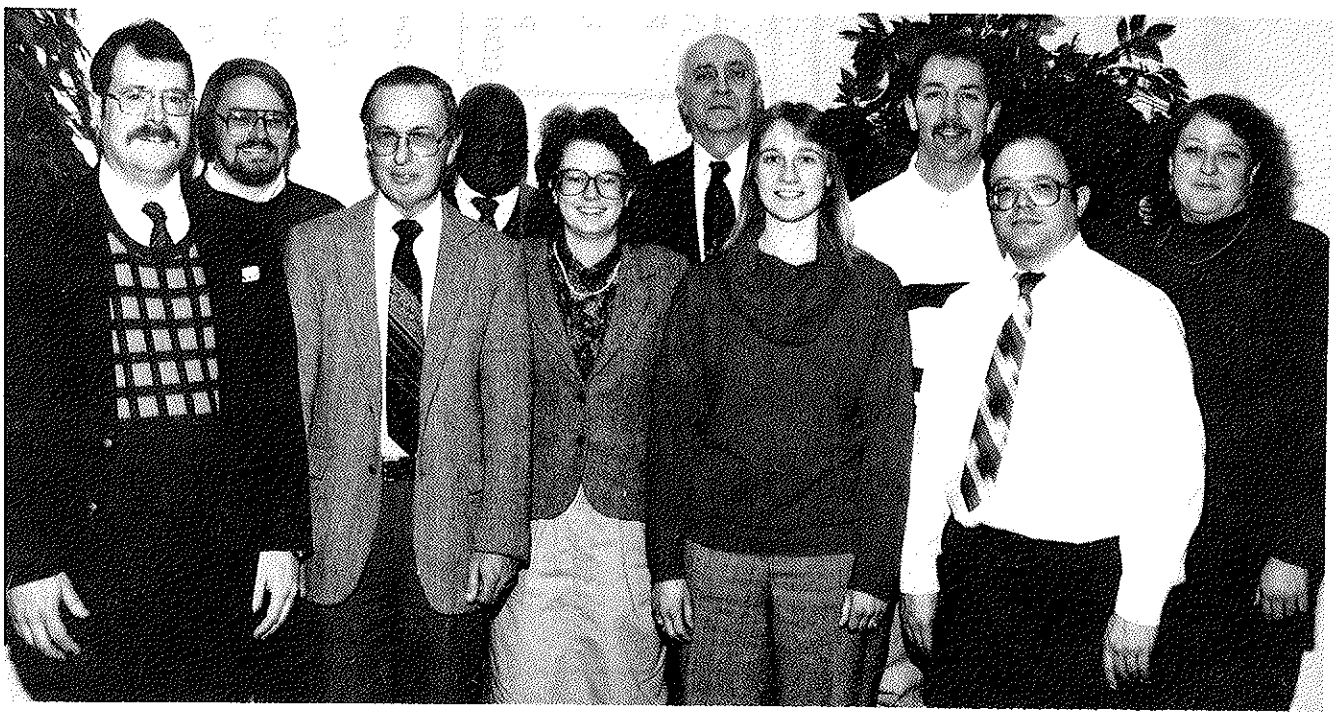
DSN: 787-3362
COMM: 513-257-3362

- PKG POLICY & GUIDANCE
  PKG SIMPLIFICATION
  PLASTICS REDUCTION
- HAZ MAT POLICY/ GUIDANCE
- MARKING POLICY/ GUIDANCE
- STANDARDIZATION
- POLICY & PROCEDURAL
  REGS, STDS, SPECS

# CONTAINER DESIGN ENGINEERING

Front Row: Ted Hinds, Carey Gravenstine, Tom Leszczynski, Larry Hatter, Robbin Miller, Stacie Smith
Second Row: Tony Jenkins, Jason Gilreath, Don Vance, Floyd Wanke, Jim Steiger
Not Pictured: Bob Tekesky, Ron DeLuga, Marlon Ricks

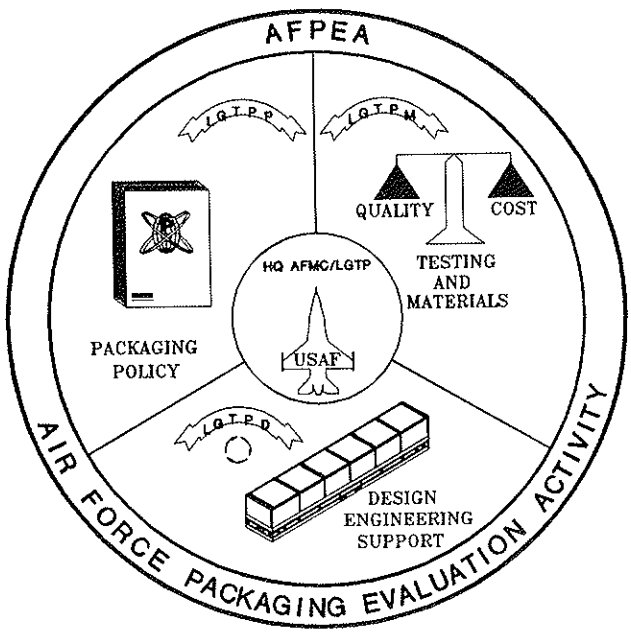
# MATERIALS ENGINEERING



Front Row: Larry Wood, Dave Filsinger, Caroline Buckey , Susan Misra, Keith Vossler
Second Row: Warren Assink, Avery Watson, Ed Moravec, Rick Hartley, Susan Evans
Not Pictured: Barbara Taylor

# PACKAGING POLICY

Front Row: Duane Pfund, Liz Smith, Jose Orsini
Second Row: Ken Dawson, Art Eggleton, Patricia Powers, Michael Werneke
Not Pictured: Joan Radcliffe



# CONTAINER RESEARCH & DEVELOPMENT

The Defense Ammunition Packaging Council (DAPC) has been established by the Office of the Secretary of Defense (OASD) to investigate ammunition packaging requirements and perform research and development in an effort to improve packaging performance. The DAPC has been funded via a line item on the FY93 congressional budget. Many of the areas being worked for ammunition will contribute substantially to packaging in general throughout the Department of Defense.

The AF has four of the six major programs identified as joint service, is a major contributor in a fifth, and a minor contributor on the sixth. AFPEA is responsible as the lead service for the Air Force effort. The areas of research and development with the points of contact are shown below:

| Program | Service | Project Manager |
|---|---|---|
| Tri-Service- | A,AF,N(J1) | Ted Hinds |
| Extrusion Technology /Development | AF(J6) | Floyd Wanke, Ron DeLuga |
| Gasket Technology-Development | AF(J7) | Robbin Miller |
| Security Seals Development | AF(J5) | Stacie Smith |
| Anti-Static Cushioning- | AF(J3) | Caroline Buckey, Carey Gravenstine |
| Smart Sensors- | A(J4) | James Steiger, Robert Tekesky |
| Simulation/Modeling Technology- | A(J4) | Robert Tekesky |
| Missile Extraction Sys | A1 | James Frankovic |
| Thermal Protection | A2 | SMCAR-AEP |
| Adv. Organic Material | A3 | DSN 880-2861 |
| Injection Molded Plastic Technology | A4 | |
| Recycle Preservative Treated Wood | A5 | |
| Adhesive & Bonding Technology | N1 | Jim Raevis Technology NWS EARLE 50221 |
| Vibration Damping Systems | N2 | DSN 449-2820 |

We at AFPEA are excited about the opportunity to solve some of the packaging problems currently being experienced by the ALCs and the users throughout the DOD. If you have any information on any of the projects listed or would like additional information, please give us a call.

HQ AFMC/LGTPD, Ted Hinds, DSN 787-3362

# IMPORTANCE OF THE AIR FORCE PACKAGING MATERIAL RECLAMATION/RECYCLING PROGRAM

The dynamics of global, political, economic, and environmental realignments are redefining the way AF performs its mission. Now more than ever, it is imperative for AF activities at all levels to participate in reclamation/recycling programs. Programs such as the Reusable Container Program (AFR 71-9) have proven their ability to support the AF mission needs and protect the environment, while generating significant savings when compared with other alternatives. In addition, we have developed a list of nationwide recycling centers that will enhance the effectiveness of this program by providing you an alternative disposal method for packaging materials no longer usable.

In FY91 the Air Logistic Centers (ALCs) reported $9.3M savings by reclaiming/recycling containers and cushioning materials. Since the transfer of AF depot functions to DLA included the ALC reclamation/recycling programs, we do not have access to the FY92 cost savings. However, years of experience have shown this program to be a cost effective and environmentally friendly way to protect AF assets. Savings are computed by prorating the cost over the projected life-cycle of a container as follows:

| | SINGLE-TRIP | REUSABLE |
|---|---|---|
| INITIAL COST | $2.50 | $15.00 |
| PROJECTED TRIPS | 1 | 10 |
| TRIP/COST | $2.50 | $ 1.50 |

The AF success in reclaiming/recycling packaging material and reusable containers has triggered an OASD study to develop a DOD Reusable Container Program. This program is being modeled after the AF program using AFR 71-9 as a foundation. The continued success of this program is in the hands of the users. We encourage you to review AFR 71-9 or to call us for details.

HQ AFMC/LGTPP, Jose G. Orsini, DSN 787-4503

# PACKAGING RECYCLING

In support of Executive Order 12780 of 31 Oct 91 and a request from San Antonio Air Logistics Center, AFPEA began a major effort to present detailed options for the reuse and recycling of cushioning scrap. The ALCs, depot activities and DOD warehousing operations generate significant quantities of post packaging scrap. The types we are primarily concerned with recycling are the polyurethane, polyethylene, polypropylene and polystyrene cushioning materials. AFPEA has been investigating possible options to reduce amounts of these materials being sent to landfills. The names and addresses of area recyclers, re-use programs of foam and foam chemical manufacturers and the nation's energy conversion facilities have been compiled and provided to the affected ALCs and other activities.

HQ AFMC/LGTPM, Avery Watson, DSN 787-4519

# RESEARCH OF GASKET SHAPES AND MATERIALS

AFPEA has been tasked by the Defense Ammunition Packaging Council (DAPC) to research materials and shapes for a gasket(s) to use in environmentally sealed containers. The objective of this project is to develop a new gasket that will enhance container sealing, eliminate gasket adhesion problems and extend the projected life cycle of the gasket.

We are presently in the process of researching new materials, gasket fabricating processes, bonding techniques and currently used extrusions designs. We will use this information to determine the best possible combination of material, shape(s), fabrication and bonding technique for our new gasket. There will also be testing performed to determine compression and force requirements to obtain the optimum seal between cover and base. This project is to run for one year at which time a recommendation of gasket material and shape(s) will be made for use throughout DOD.

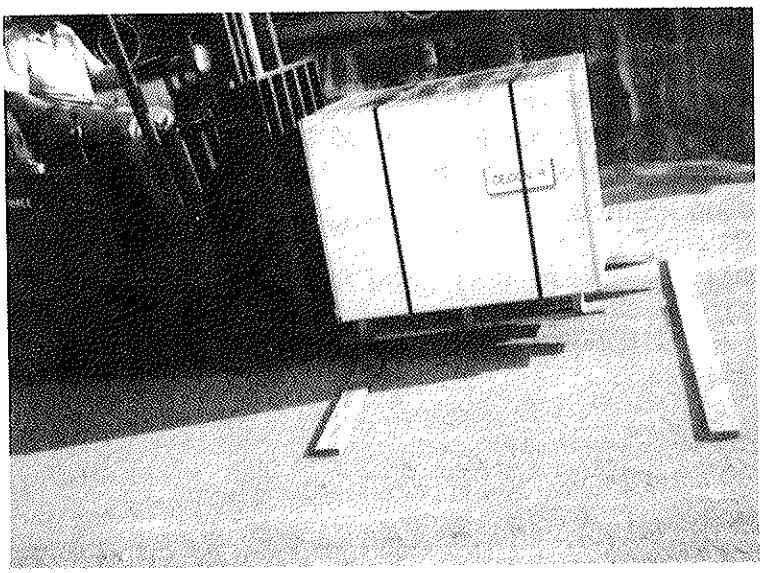
HQ AFMC/LGTPD, Robbin Miller, DSN 787-3362

# EVALUATION OF NAVY COLLAPSIBLE EMBARKATION CONTAINER (CECON)

At the request of the Carderock Division, Naval Surface Warfare Center, Bethesda, MD, the Air Force Packaging Evaluation Activity evaluated a modular collapsible aluminum container developed under contract. The container configuration evaluated consisted of two aluminum end caps serving as top and bottom and two 18 inch collars and is secured to a 40 x 48 inch wood shipping pallet to an overall height of 41 inches by steel strapping. The advantage of the CECON container is that it can be disassembled, collapsed, and stacked for return shipment with greatly reduced volume. With a 1000 pound net weight load, the CECON container was subjected to a rough handling test series consisting of superimposed load, mechanical handling, repetitive shock vibration, 20 inch edgewise and cornerwise drop, 18 inch flat bottom drop, 10 feet per second pendulum impact, and blowing rain tests.

Interim report of test has been forwarded to the NAVY Carderock Division.

HQ AFMC/LGTPM, E. P. Moravec, DSN 787-4519.



# DEVELOPMENT OF IMPROVED CUSHIONING MATERIALS AND DYNAMIC PERFORMANCE TESTING FOR AMMUNITION CONTAINERS

The Defense Ammunition Packaging Council (DAPC) has established a tri-service three year project for research on package cushion materials and potential improvements in materials and the way they are tested.

DAPC chose AFPEA to manage this three year (FY93-FY95) project because of its testing facility, engineering capability, expertise, and lead service responsibility on cushioning materials. The project scope includes the following three areas.

Updating peak acceleration-static stress cushion design curves for high-use cushion materials is one area of study. Design engineers will use the information to develop better cushion designs and as a baseline to evaluate improved materials and testing methods for ammunition containers.

Investigation and evaluation of additional cushioning materials for use in ammunition containerization is another area of study. After the materials have been selected, a variety of tests will be performed to determine how they react under varying conditions. Test results will be compared to the existing materials previously baselined to determine whether the new materials will meet DOD requirements.

The final area of study is the development of a performance-oriented dynamic cushion test which will help the container engineer to create better cushioning design systems. The different test methods will be developed and compared against one another and against the baseline method.

HQ AFMC/LGTPM, Caroline Buckey, DSN 787-4519

# SIMULATION/MODELING TECHNOLOGY FOR MUNITIONS PACKAGING

AFPEA has been given the opportunity to work jointly with the Army (lead service) and Navy through the Defense Ammunition Packaging Counsel (DAPC). The objective of this project is to look at the possibilities of using Finite Element Analysis (FEA) to develop a new process to optimize container design for munitions. The new process would better determine loading of munitions, structural supports and wall thickness of containers, while reducing destructive testing, total acquisition time and cost.

Presently, Rockwell International has developed a program that locates the most probable point of failure. It is believed that this program can be used by the DOD to better design munitions packaging. Research will be done, jointly, to try to determine the best way to bring into and use this technology in the packaging arena. This project will run for three years researching, developing the process to use FEA in munitions packaging, and validating FEA results with actual test results.

HQ AFMC/LGTPD, Robert S. Tekesky, DSN 787-3362

# PACK YACK

The Packaging Policy Branch periodically distributes an information letter and it is titled PACK YACK. It shares current packaging policy and hazardous materials information throughout the Department of Defense packaging community. In addition to packaging information, PACK YACK also contains information on subjects such as metrics, standardization, the environment, training, and special accomplishments by individuals. We are eager for packaging activities to participate in PACK YACK by submitting articles or items of interest for publication. Please contact our office if your activity would like to submit an article or be included in the distribution of PACK YACK.

HQ AFMC/LGTPP, Joan Radcliffe, DSN 787-4503

# SPECIAL PACKAGING INSTRUCTION STORAGE AND RETRIEVAL SYSTEM (SPISRS)

The Air Force Packaging Evaluation Activity (AFPEA) is responsible for managing, storing and maintaining the Air Force Special Packaging Instructions (SPIs). Designed and developed by each Air Logistics Center (ALC) the SPIs are provided to AFPEA to place into the SPI Storage and Retrieval System (SPISRS).

The SPISRS, an AT&T 3B2/600G Computer System, has more recently been enhanced with the installation of a local area network (LAN). The AFPEA LAN provides a faster means of computer connectivity throughout the AF other than the typical use of modem.

The Storage portion of the system currently holds over eleven thousand SPIs. These are currently placed into and retrieved by the SPISRS Managers; however, limited capability will soon be extended to the ALC illustrators who have access to the Defense Data Network (DDN). This limited capability still in prototype phase is expected to enhance the retrieval of a SPI by an illustrator for updating and then resubmission to the SPISRS.

The system also supports the "SPIBase," a database specifically designed to work in conjunction with the addition of new SPIs and/or older SPIs that have been revised. The SPIBase, a separate feature of the system supporting its own information table has gone through a complete revision so that it may be supported on the SPISR System. Still in the prototype phase, updating and retrieval of SPI information looks promising. Expected to grow, the prototype SPIBase has additional versatility over the last version known to the ALC community which includes the above mentioned file transfer and interactive abilities specifically developed to support the ALC illustrators.

The basic capability offered by the SPIBase is the ability to search the following fields:

- SPI Number
- ALC Identification
- National Stock Number (NSN)
- Container Identification
- Preservation Method
- Federal Stock Number (FSN)
- Item Dimensions (Length, Width, Height, Weight)
- Container Inside and Outside Dimensions (Length, Width, Height)
- Gross Weight and Volume

Unlike the past version of the SPI database which would allow only single field searches the prototype offers a search on any single or combination of fields. The ability includes the use of "greater than" or "less than" dimensioning when performing a search. This will assist in searching the AF SPI inventory for an existing SPI that may fulfill new needs based on "item" size or a combination of elements. This direct access is anticipated to benefit the illustrators by providing existing information prior to the beginning of new or modified SPIs.

Other capabilities targeted will be the ability for other users to gain "view access" to the SPIBase via the DDN. This proposed function with the intent to reduce duplication and speed up delivery of SPI information to field operating activities will allow "anonymous" users to see what is currently available within AF SPI System.

HQ AFMC/LGTPD, Carey Scott Gravenstine, DSN 787-3362

## AMMUNITION CONTAINER SECURITY SEAL DEVELOPMENT

The Defense Ammunition Packaging Council (DAPC) has established a Tri-Service project for the research along with the development of a performance specification to address the requirements of a security seal for ammunition containers that does not present a safety hazard of Foreign Object Damage when broken and more readily identifies unauthorized intrusion.

The Air Force Packaging Evaluation Activity (AFPEA) has been assigned lead service responsibility for this project. The project will explore current and new material seals that can be used on a wide range of container materials. After narrowing the material choices down, a test plan will be developed and coordinated with all three services. Following testing and evaluation, a performance specification will be written and a final report generated.

HQ AFMC/LGTPD, Stacie Smith, DSN 787-3362

# LITER READER

FY93 marks the beginning of United States acceptance of the metric system, or International System of Units (SI), as the "preferred system of weights and measures for United States trade and commerce."

As established by the Omnibus Trade and Competitiveness Act of 1988 (Public Law 100-418, Section 5164), DODI 5000.2 (Part VI, Section M), and Executive Order 12770 (signed by President George Bush), the SI metric system is now the measurement system that Federal agencies are required to use in procurement, grants, and other business related activities.

HQ AFMC/LGTPP is trying to make the Air Force packaging transition to the SI metric system as painless as possible by issuing a periodic letter of information called the "Liter Reader." The "Liter Reader" contains metrics-related topics like history, current facts, training, and odds and ends in an effort to help facilitate the implementation of this "new" measurement system. Every attempt has been made to keep the information user-friendly.

Topics covered in the first two issues concern familiarization with the basic SI metric units of measure, application of metric units to common items, and training. Comments and articles for the "Liter Reader" are very welcome.

AFMC/LGTPP, Art Eggleton, DSN 787-4503

# DEFENSE LOGISTICS AGENCY (DLA) SUPPORT OF AIR FORCE WHOLESALE PACKING NEEDS AT THE AIR LOGISTICS CENTERS (ALCs)

In the spring of 1992 all ALC wholesale depot functions transferred to DLA under the Defense Management Review Decision (DMRD) 902. What this means to packaging is that while the AF has kept control of the development of packaging protection requirements for assets it manages, DLA is now totally responsible for the execution of these requirements (i.e., preservation, shipment packing, and construction of shipping containers). Due to the high levels of dependency the AF (ALC and bases) now have on DLA for packing, we have assumed an active role with HQ DLA/OWS to define the parameters of our new partnership and to address/resolve issues impacting that relationship.

As with any major organizational change, there are some areas that require additional negotiations. We are confident in our ability to resolve outstanding issues and to establish a successful partnership.

HQ AFMC/LGTPP, Jose G. Orsini, DSN 787-4503

# PRAM BATTERY TESTING PROJECT

The PRAM office requested the use of AFPEA's large walk-in environmental chamber to conduct cold cranking battery tests on various pieces of Ground Support Equipment (GSE).

A new solid type battery was also used in the -25°F tests. The GSE and batteries did not perform as well as desired, but valuable information was obtained. The new solid type battery performed better at cold temperatures than did the conventional lead-acid batteries.

The PRAM office and the users stated that the use of AFPEA's large cold chamber was indispensable in performing the required tests and completing this project.

HQ AFMC/LGTPD, Floyd Wanke, DSN 787-3362

A generator unit in the cold chamber after a -25 °F battery cranking test.

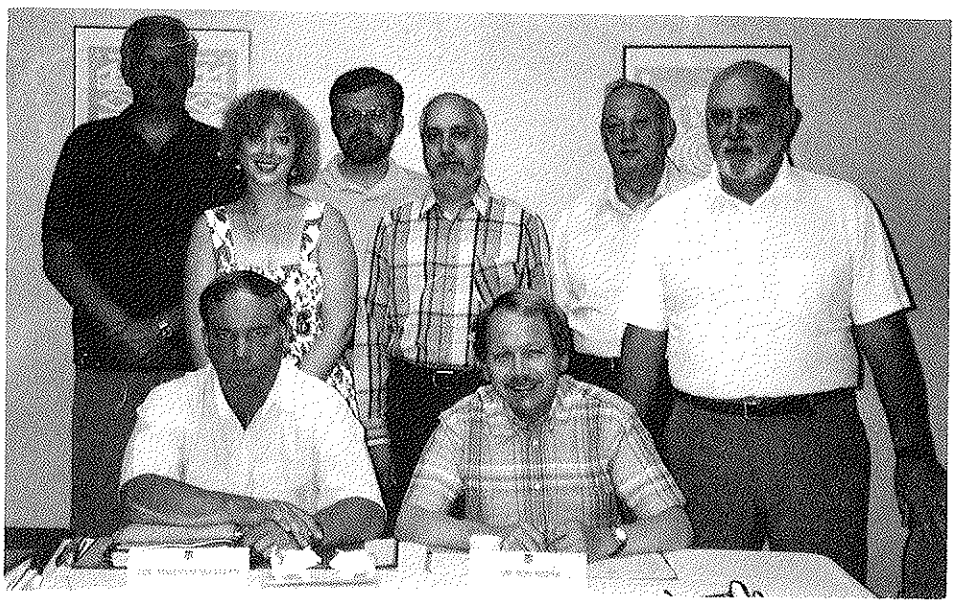
# DEFENSE PACKAGING POLICY GROUP (DPPG) INITIATIVES

The Defense Packaging Policy Group is a group of DOD packaging policy managers. Their concerns primarily involve application of new packaging concepts, standardization among the services/DLA, packaging training, increased productivity, and cost effectiveness of military packaging. LGTPP is the Air Force representative of the group, which is chaired by Colonel McLellan, OASD (P&L).

DPPG initiatives undertaken in 1992 include developing DOD policy for retrograde; establishing packaging goals for the year 2000; investigating the impact of supply operations transfer to DLA; and monitoring implementation of POP training and procedures.

DPPG accomplishments during the past year include: resolved specific packaging issues common to the services and DLA; eliminated duplicate packaging materials and process testing; implemented the joint working group for hazardous materials; initiated document consolidation; created packaging specialist certification program; established policy for the reduction of combustible materials; eliminated hazardous chemicals in packaging processes; and enhanced packaging training for DOD. Minutes of the DPPG meetings, which are held semiannually, are sent to all HQ MAJCOMS and AFMC activities. If you are interested in obtaining a copy of the minutes, contact your HQ MAJCOM.

HQ AFMC/LGTPP, Elizabeth D. Smith, DS 787-4503



Front Row: (Left to Right) Col Malcolm McLellan (OASD-Chair), Ron Kozak (Army)
Back Row: (Left to Right) Mike Dawson (USMC), Pat Powers (AF), Joe Maloney (DLA), Frank Guerrero (DCMC), Norb Karl (Navy), Pete Hutter (SMPT)

# EXTRUSION TECHNOLOGY RESEARCH & DEVELOPMENT

The Defense Ammunition Packaging Council (DAPC) has established a Tri-Service three year project for the research along with development of extrusions for small munitions containers and related topics affecting reusable containerization and container design.

The Air Force Packaging Evaluation Activity (AFPEA) has been assigned lead service responsibility for this three year (FY93 - 95) project. The project has three distinct parts. First, there will be a developmental effort to create an automated container design/drawing system. This automated system will reduce the time required to design/draw a specialized aluminum container, while also reducing the number of errors in the entire design drawing package. Second, there will be design and development research into new materials and manufacturing processes to improve the design of thin walled lightweight containers for small munitions items. The improvement of the lightweight munitions containers will mainly be through standardization of design/hardware, improved sealing, and thinner wall sections. Third, long term corrosion testing will be conducted to determine the best materials and techniques to be used in fabrication of aluminum containers for shipping and storage. This corrosion testing may increase the life cycle of the container by providing information on materials with higher corrosion resistance and possibly different fabrication methods.

HQ AFMC/LGTPD, Floyd Wanke and Ronald DeLuga, DSN 787-3362

# "SMART" SENSOR PACKAGING TECHNOLOGY FOR MUNITIONS PACKAGING

AFPEA has been given the opportunity to work jointly with the Army (lead service) and Navy through the Defense Ammunition Packaging Counsel (DAPC). The objective of this project is to develop a new improved humidity/corrosion sensor.

The goal is to upgrade the existing humidity (color change) indicator to a more reliable indicator device, to retain reasonable costs and for the new sensor to be interchangeable with the existing humidity indicator.

HQ AFMC/LGTPD, James T. Steiger and Robert S. Tekesky, DSN 787-3362

# CONTAINER FABRICATION & PROTOTYPING

The Air Force Packaging Evaluation Activity (AFPEA) has a very diverse shop/fabrication facility. The personnel in this facility are responsible for fabrication of all prototypes and modifications that AFPEA makes to container design programs. They also fabricate and modify test equipment as necessary to meet customer needs and program requirements. This year they have:

* Built six Radome Pallets
* Prototyped ALQ-155 Receiver-Transmitter Container
* Prototyped F-15 One & Two Man Canopy Container
* Prototyped Family of Munitions Container #3
* Prototyped Family of Munitions Container #2
* Modified Four X-Band Containers
* Modified six Ku-Band Containers
* Provided technical assistance to engineers in the evaluation of manpower requirements identified on contractor proposals
* Fabricated Single Point Compression Creep Fixture
* Fabricated and Installed the Tie-Down Tester

In addition to the fabrication of containers and test fixtures/equipment the shop personnel are integral in the testing of all containers. Especially the testing of:

* ALQ-155 Receiver-Transmitter Container
* F-15 One & Two Man Canopy Container
* Family of Munitions Container #3
* Transportable Collective Protective System container
* Corrugated Plastic Containers
* Navy containers
* Several Container Designs from Eglin AFB

HQ AFMC/LGTPD, Don Vance and Larry Hatter, DSN 787-3362

# TESTING OF CNU-180 MUNITION CONTAINERS

In support of OO-ALC/LIWB's request for immediate help, AFPEA conducted certification testing on the CNU-180 Munition Containers. All testing and a letter report was completed within ten calendar days of the initial request. The testing consisted of rotational cornerwise and edgewise drops, pendulum impact, repetitive shock vibration, and a stacking test. The container passed all the tests. It should be noted that the containers were in excellent condition, with only uniform non-flaking rust on the outside of the container, minimal or no rust on the inside of the container, and no damage to the container. The results of these tests were used by OO-ALC to request a Competent Authority Approval (CAA) for the CNU-180 Container.

HQ AFMC/LGTPD, James T. Steiger, DSN 787-3362

Superimposed Load Test of CNU-180 Munition Container

# M-16 WEAPONS CONTAINER TESTS

AFPEA received a request for testing assistance from WR-ALC/DSTD. A new contract, with first article testing requirements, was awarded for procurement of additional M-16 weapons containers. Container testing was required to be equivalent to the first article production qualification testing previously performed by AFPEA.

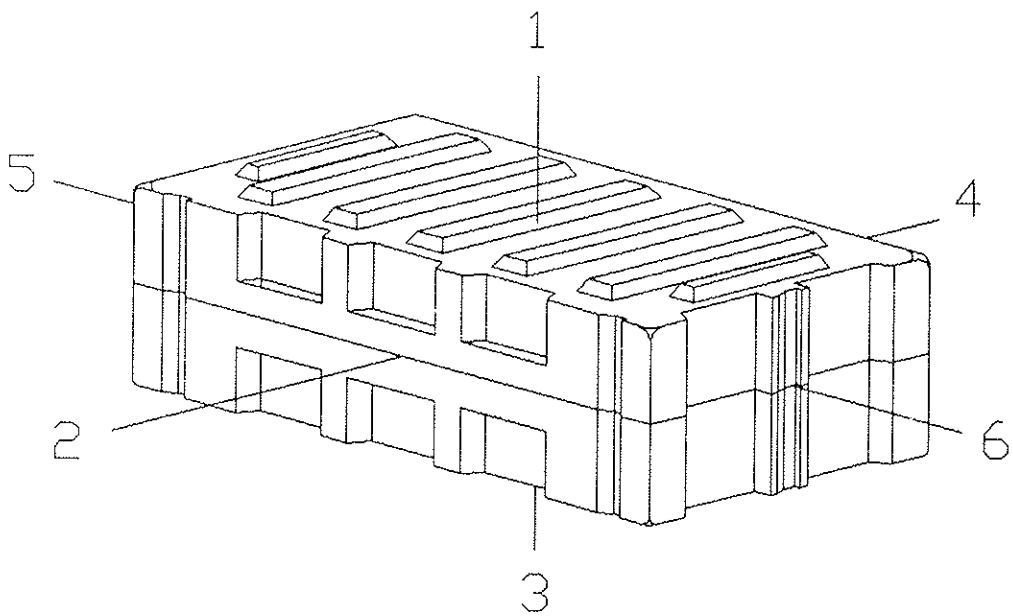
The M-16 weapons container is an olive drab color polyethylene rotomolded container. Maximum outer container dimensions are 44 inches length, 24 inches width, and 17.5 inches depth.

The container consists of a cover and base, each of which are designed to hold six M-16 rifles (total of 12 rifles per container). A polyethylene retaining bar, with two metal locking bars, secure the rifles in the cover and base. Each retaining bar (two per container) is secured by a metal cable to each container half. The container tested and the simulated load was provided by WR-ALC/DSTD.

The AFPEA Container Test Plan, dated 22 Apr 85, Project No. 84-P-142 was referenced and modified. The M-16 Weapons Container was tested in accordance with AFPEA Test Plan, dated 15 Jul 92, Project Number 91-P-119. This test plan referenced MIL-C-5584D, MIL-STD-648A, and FED-STD-101. The test methods constitute both the procedure for performing the tests and performance criteria for evaluation of container acceptability. The tests are commonly applied to special shipping containers providing shock and vibration protection to sensitive items.

The tests were performed at AFPEA and a test report is available upon request.

HQ AFMC/LGTPM, Keith A. Vossler, DSN 787-4519



# PACKAGING POLICY

As part of an ongoing quality initiative to improve internal operations and customer service, the Packaging Policy Office has developed a mission statement and vision. The vision of the Packaging Policy Office is "Policies to Preserve the Item, the Nation, the Environment." The mission statement reads as follows: "Our Mission is to satisfy our customers' packaging and hazardous materials needs in times of peace or war. We effectively develop, implement, and manage DOD and AF packaging programs by providing clear, responsive planning and policies. Our goal is to provide an environment for continuous improvement of packaging and hazardous materials policies and processes. Our challenge is to set the pace into the future with sensitivity to our environment, our dwindling DOD resources, and our changing global role."

That's well and good, you might say, but what does that mean to me, the customer? The answer to that question is that the Packaging Policy Office endeavors to provide our customers a quality product in a timely fashion. So what product could a Packaging Policy Office ever provide me that satisfies a need I may have? The answer is service. This service is in the form of written policies, regulations and manuals, and/or consultation services from experts in the packaging field.

Basically the Packaging Policy Office provides expertise to the Air Force in six key areas. These are packaging policy, hazardous materials, packaging data systems, training, standardization support, and other miscellaneous areas. If you have questions concerning any of these areas, or if you just need to talk to somebody about AF packaging or hazardous materials policy, call the Packaging Policy Office.

HQ AFMC/LGTPP, Kenneth Dawson, DSN 787-4503

# FAMILY OF MUNITIONS CONTAINERS

Ogden Air Logistics Center, Air Munitions Program Management Division (OO-ALC/MMW), requested engineering assistance on their PRAM Project OO-237. The idea of a Family of Munitions Containers came from an OO-ALC/MM Process Action Team (PAT), headed by OO-ALC/MMW. This PRAM Project was approved 18 September 1989 and actually started 18 October 1989. It is scheduled for completion in the summer of 1993. The goal of the project is to replace the more than 200 current munitions containers the Air Force presently uses with a family of four to six containers. The exterior of the container would stay the same but the interior dunnage would change depending on the item placed in the container. We have completed a Preliminary Design Review, a Critical Design Review (CDR) for the three smallest containers, and tested container Number 3. At the CDR we had prototypes of these containers available for the users to see and touch. OO-ALC/LIWDT, formerly MMW, the PRAM Project Manager, put the two largest containers on hold. We are designing, prototyping, and testing the containers; and providing other engineering support as needed. Following are descriptions of the three smallest containers.

HQ AFMC/LGTPD, James T. Steiger, DSN 787-3362

# FAMILY OF MUNITIONS CONTAINER #1

Container #1 is the smallest of the Family of Munitions containers. It has inside dimensions of 305mmL x 152mmW x 229mmD (12" x 6" x 9") and an empty weight of approximately 6.8kg (15 pounds). This is a sealed container with pressure/vacuum relief and air filling valves. The sealing gasket is located in the cast aluminum lid. The container body is a two-piece double wall aluminum extrusion made from a single extrusion die. The container is designed to contain small explosives and munition items.

Drop testing was started this past year, but halted after the cast lid cracked during the second sequence of drop testing. As a result the lid was redesigned and an alternate cast aluminum alloy is being procured. Environmental, rough handling, and UN (POP) testing should be completed by June 1993.

HQ AFMC/LGTPD, Floyd Wanke, DSN 787-3362

# FAMILY OF MUNITIONS CONTAINER #2

The Family of Munitions Container #2 is a small, sealed, generic, multi-use, two-person carrying container. The container will be used to carry fuses, boosters, etc. for a maximum gross weight of 68kg (150 pounds). The containers internal dimensions are 522mmL x 429mmW x 356mmH (20" x 16" x 14") and a tare weight of 24.9 (55 pounds).

The container is constructed out of two aluminum extrusions and sheet aluminum for the top and bottom. The container will have a cam-over-center latch, desiccant port, pressure relief valve, humidity indicator, and air filling valve. Stacking pads will be located on top of the container for easy lock-in-place stacking. Palletized loads will be made easier with this container's stackability. The containers external finish will be bare aluminum. This will cut cost in painting and maintaining the container and reduce adverse environmental impact caused by painting. Life cycle of this container will be 20 years.

The container will be ready for testing in December 1992. Upon completion of testing, manufacturing drawings will be generated and ready for procurement of the container by the first quarter of FY94.

HQ AFMC/LGTPD, Robert S. Tekesky, DSN 787-3362

# FAMILY OF MUNITIONS CONTAINER #3

The Family of Munitions Container #3 is a medium sized, sealed container. It is being designed specifically for the BSU 49, BSU 50, and MXU-650 fins. The container will be manufactured exclusively from aluminum with internal dimensions of 1244mmL x 965mmW x 838mmD (49" x 38" x 33"). The tare weight of containers is 120kg (265 pounds).

The major feature of this container is its short base, only 203mm (8") of internal height. This short base allows for easy removal and preparation of the fins. The fins will be stored just the opposite of the current method. The aft end of the fins will be placed in the base of the container. This allows the open end of the fin to be readily accessible to the user to prepare them for usage. The bottom aluminum extrusion includes the base and the skid of the container. This extrusion greatly simplifies the manufacture of the container. Standard latches, pressure/vacuum relief valves, air filling valves, and tie down rings will be used. Instead of being painted, the container will be left bare. This will greatly reduce the long-term maintenance costs, environmental impact, and reduce adverse environmental impact caused by painting. With bare aluminum, the stenciling can be applied using the standard stenciling ink, A-A-208.

The prototype container has passed all the qualification testing with the MXU-650 fins. Testing with the BSU-49 and BSU-50 fins should be completed in January 1993. This will be followed by finalizing the manufacturing drawings and project report.

HQ AFMC/LGTPD, James T. Steiger, DSN 787-3362

# ASTM COMMITTEE D-10 ON PACKAGING

AFPEA is represented on the American Society For Testing and Materials (ASTM) Committee D-10 on Packaging. The scope of this committee is the promotion of knowledge and the development of standards for packages. Standards include definition of terms, classifications (including dimensions), recommended practices, test methods and specifications. This work also includes defining or generating closely related packaging design criteria and developing related materials handling standards.

AFPEA has been active in many D-10 Subcommittees and Task Groups and is a member of the ASTM/DOD Federal Agencies Packaging Liaison Group which addresses mutual government/industry packaging issues.

We are also participating in the development of an ASTM specification for absorbent packaging materials (including vermiculite) as part of the D10.3 Subcommittee on Interior Packaging development. The D10.3 Subcommittee effort to convert Federal Specification PPP-C-1752, Cushioning Material, Packaging, Polyethylene Foam, to an ASTM Specification is another project AFPEA is strongly supporting.

Work is continuing on updating D2221 - Standard Test Method for Creep Properties of Packaging Cushioning Materials, and we will participate in laboratory verification of the standard.

AFPEA is assisting ASTM in the development of the "Guide for Recycling and the Disposability of Packaging Materials" document, which is under the jurisdiction of the D10.4 Subcommittee.

HQ AFMC/LGTPM, Keith A. Vossler, DSN 787-4519

# REVISION OF JOINT SERVICE REGULATION AFR 71-4

Joint Service Regulation AFR 71-4 (Preparing Hazardous Materials for Military Air Shipments) is in the final stages of a complete revision. This revision is required due to international and domestic policy changes relating to the packaging and transportation of hazardous materials. Comment from the draft revision and the Hazardous Materials Packaging and Transportation Conference have been incorporated. We are reviewing the Chapters, returned by the editors, to ensure all information is complete and correct, and all typographical errors are identified and corrected. We anticipate the regulation will be completed by the end of March 1993.

HQ AFMC/LGTPP, Michael Werneke, DSN 787-4503

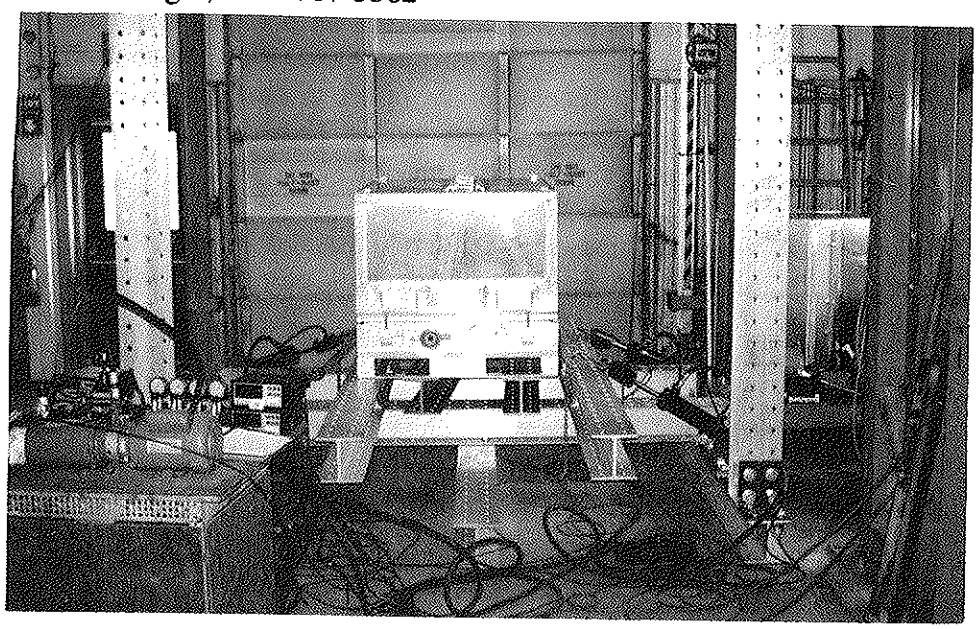
# TIE-DOWN TESTER

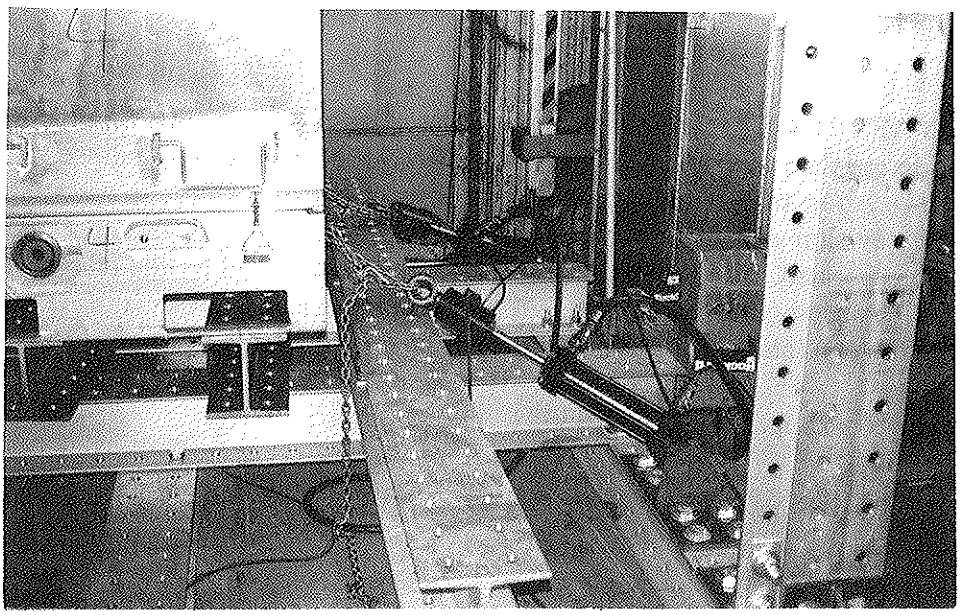
The Air Force Packaging Evaluation Activity (AFPEA) recognized the need for an in-house capability to test the tie-down rings on large containers. This need has been met with a tie-down tester designed and fabricated in-house. This tester is capable of testing a 5,000 pound container while restraining a simulated 3G or 15,000 pounds force. The tie down tester is adjustable to allow for testing various sizes of containers. It will accommodate a container over 20 feet long.

This new piece of equipment was first used on the Family of Munition Container Number 3 in November 1992. This was a 1,000 pound container and we applied a forward force of 3,000 pounds on each of the four tie-down rings. The tie-down tester worked beautifully.

HQ AFMC/LGTPD, James T. Steiger, DSN 787-3362

Overall view of Tie-Down Tester in operation.





Close up view of testing Tie-Down rings.

# PERFORMANCE ORIENTED PACKAGING (POP) OF HAZARDOUS MATERIALS

The second option year of the POP contract administered by AFPEA and Aeronautical Systems Center's Contracting personnel with Wyle Laboratories was not implemented due to lack of testing requirements by all of the services. Upon completion of the final paperwork, this segment of the project will be closed out.

Several specifications have also been completely rewritten this past year to conform with the POP requirements. This office expects a revised MIL-D-6054 and a new CID covering metal composite drums to be sent out for military and civilian coordination in 1993.

HQ AFMC/LGTPM, Warren Assink, DSN 787-4519

# FINITE ELEMENT ANALYSIS

The Air Force Packaging Evaluation Activity (AFPEA) utilizes COSMOS/M, a finite element analysis program developed by Structural Research and Analysis Corporation (SRAC). COSMOS/M is a program organized into a system of interrelated modules, which can be either menu or file driven.

COSMOS/M can handle problems with up to 15,000 nodes and 60,000 degrees of freedom. Structures to be examined can be drawn either in AutoCad or directly in COSMOS/M. AutoCad drawings can be transferred into COSMOS/M where the structure is meshed, constrained and material properties applied. The present version is set up to run on a PC IBM 386/486 or compatible system. The format purchased by AFPEA is able to work problems in linear and nonlinear statics, linear and nonlinear dynamics, advanced dynamic problems and fatigue problems. The program can be easily upgraded to work problems in heat transfer, fluid flow and electromagnetic, capabilities which at the present time there is no need.

AFPEA has and will be benefited greatly by having the capabilities of COSMOS/M. AFPEA can now better their ability to research and design containers, cradle systems or piece parts related to packaging. The whole design can be tested, redesigned and tested again without ever being built. This capability will save valuable fabrication time and money.

HQ AFMC/LGTPD, Robert S. Tekesky, DSN 787-3362

# ALQ-155 RECEIVER-TRANSMITTER CONTAINER

The Preliminary Design Review held in October 1991 was successful, the proposed container design met all the user requirements. Due to the urgency to provide a better container, the Critical Design Review was waived. It was decided that there would be a field test after the container passed all qualification testing at AFPEA.

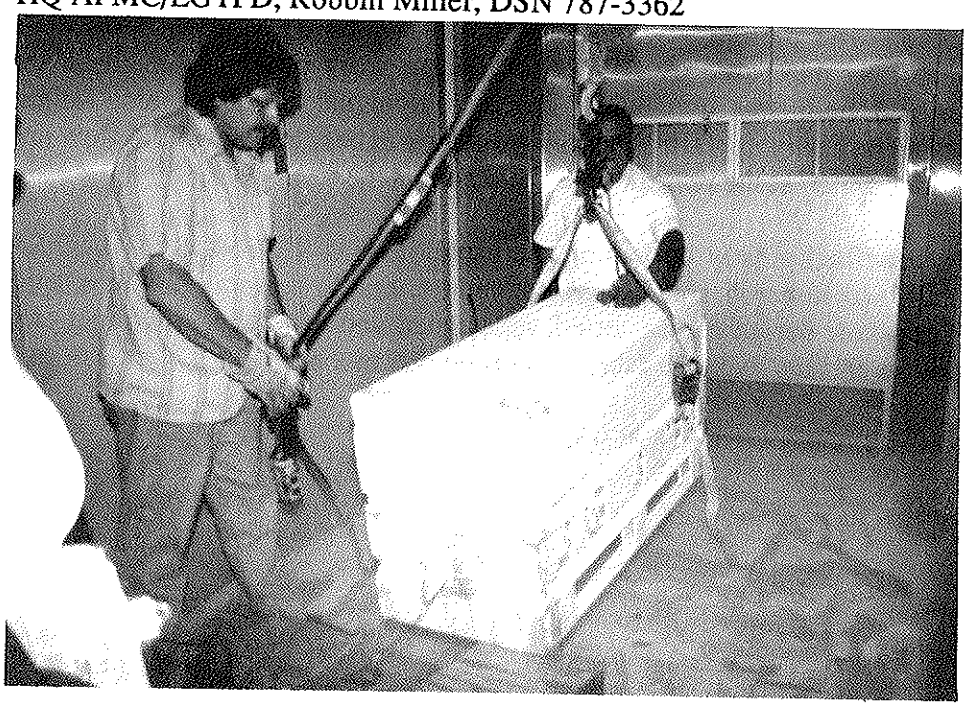
The next step in the project was to complete a level two drawing package so that a container could be prototyped for testing. During the drawing completion phase, research was done on new gasket materials. The R/T unit frequently leaks the damping fluid the unit uses as a coolant and this silicon fluid damages the silicone gasket typically used in container designs. The best new material for the gasket was determined to be a solid polyurethane.

Unexpectedly, it was also determined the polyethylene foam, used in the container for shock protection, absorbs the fluid as well. However, the absorption was limited to within 2mm of the surface of the foam. The cells within this area are open from the cutting procedure to size the foam. After discussing this problem with the foam manufacturers and performing tests on the fluid soaked cushions, it was determined the absorption of the fluid would not affect the cushioning properties of the foam.

The container was prototyped from the level two drawings and tested here at AFPEA. The container successfully passed all tests and was shipped out for a field test in July 1992. Functional units were transported between bases in the container with no damage to the units or the container. The field test was successful.

A meeting is scheduled for January 1993 to discuss any possible design improvements and how AFPEA can assist with the procurement of the containers. A level three drawing package (production level) will be presented at that time.

HQ AFMC/LGTPD, Robbin Miller, DSN 787-3362

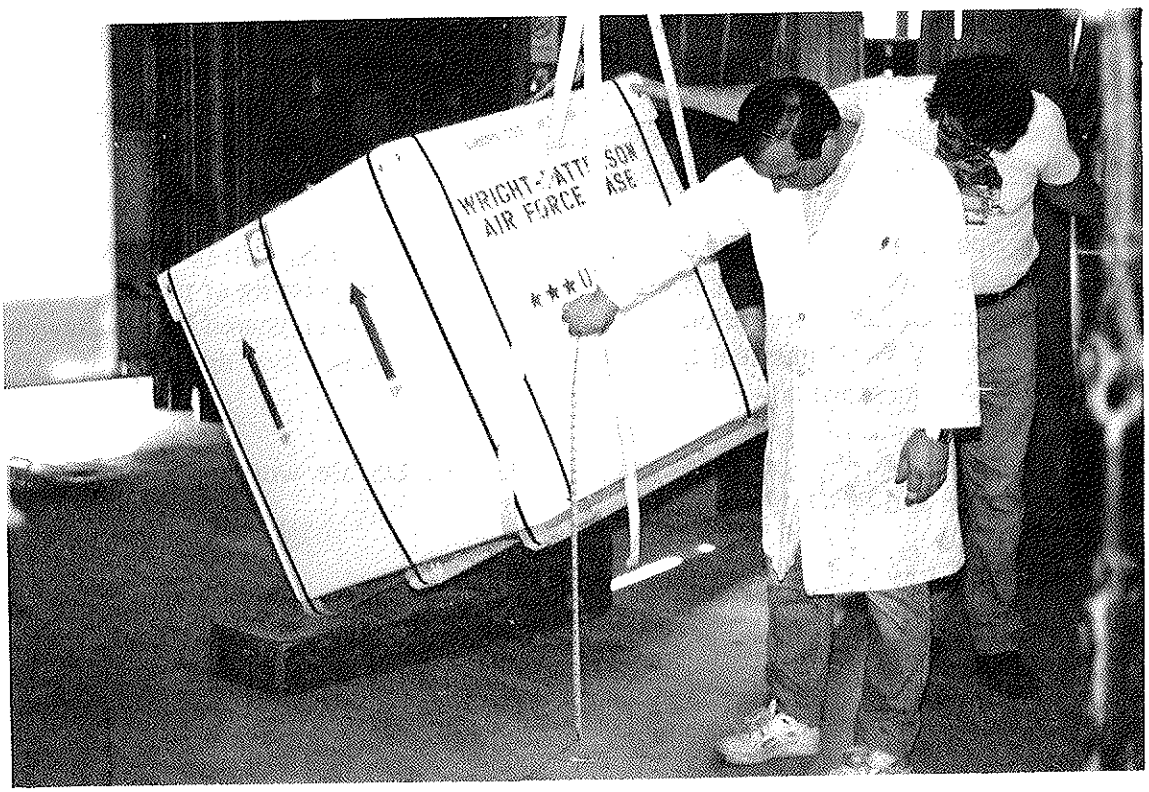


Corner-Drop Test, -20°F

# EVALUATION OF CORRUGATED PLASTIC CONTAINERS

In November 1991, AFPEA conducted an evaluation of a new concept, heavy corrugated high-density polyethylene material as an alternative to cleated plywood PPP-B-601 containers in cooperation with Oklahoma City Air Logistics Center. AFPEA performed testing in February 1992 on three different sizes of the plastic corrugated containers. All three passed the Level B rough handling and vibration tests, and with addition of corner posts, the containers passed the superimposed load test. The test report is available upon request.

HQ AFMC/LGTPM, Caroline J. Buckey, DSN 787-4519



Three Foot Corner Drop

# COMPUTER-AIDED DESIGN SYSTEM (CADS)

As a continuing effort, the Air Force Packaging Evaluation Activity (AFPEA) supports the "lead service" concept in providing container engineering, design, development, and prototyping services to the Air Force and the DOD.

The AFPEA CAD Systems are operating AutoCad 386 Release 10 software in conjunction to supporting COSMOS M finite element analysis (FEA) software and NC Polaris Computer Aided Machining (CAM) software. Set up as a prototype project two years ago this basic CAD configuration continues to support programs and projects with minor changes. Through design conception, engineering development, and the final physical prototyping the AFPEA CADS makes it happen.

AFPEA's internal Local Area Network (LAN) forms the communication backbone for the engineers working on the CAD Systems, making it possible to transfer/receive large files to/from each CADS Workstation. Currently, AFPEA uses AutoCad on each CAD System; however, only a single package of COSMOS FEA and NC Polaris software is loaded on separate individual CAD Systems. Utilization of the LAN has made it possible to improve the continuity between engineering functions, offering an excellent means in moving "working files" and significantly speeding up the overall engineering processes.

Additionally, the Special Packaging Instruction Storage and Retrieval System (SPISRS) located in house, provides the ability for the engineers to spool drawings for printing or plotting without tying up the individual CADS Workstations. This process has even been geared to plot drawings after normal duty hours. Drawings sent for plotting can then be ready first thing the next day, extending the overall process window.

From design conception to physical prototyping, AFPEA CADS are working toward quality team support to the AF and DOD.

HQ AFMC/LGTPD, Carey Scott Gravenstine, DSN 787-3362

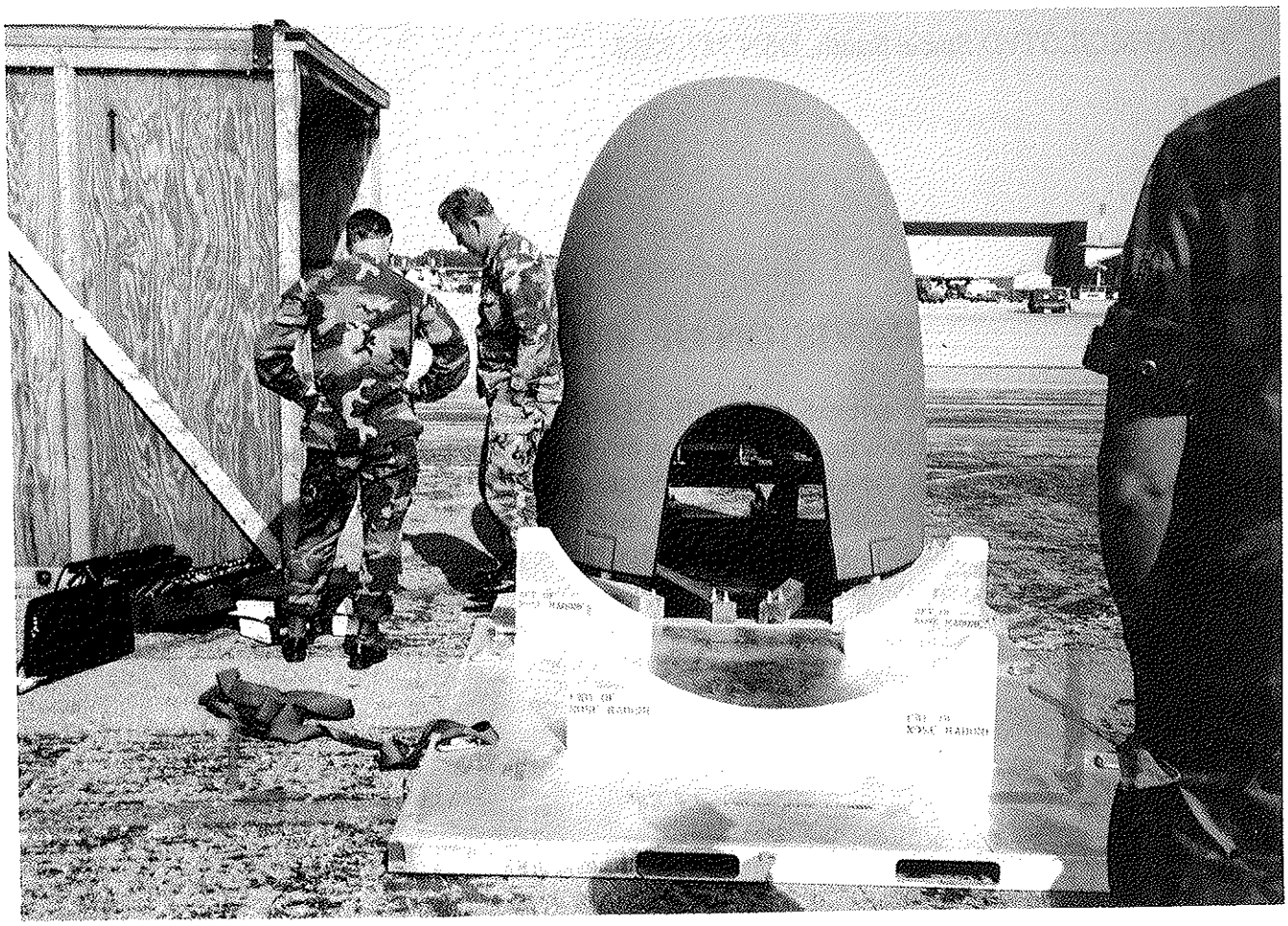
# COMBAT TALON II CONTAINERS

The Air Force Packaging Evaluation Activity (AFPEA) is providing engineering support to the Combat Talon II (CTII) program office. CTII is a modified C-130 aircraft. Over the past year, AFPEA supported the CTII SPO by modifying four ku-band antenna containers, two x-band antenna containers and built six nose radome pallet assemblies for second and third site activations at Kirtland AFB, New Mexico and Alconbury, England.

AFPEA provided engineering support during contract award phase of the infrared detection set (IDS) contract negotiations and during the ku-band and x-band container modification contract. The result was a cost savings of over $300,000. A contract to build 68 IDS container at around $3,000 a copy to modify all the x-band antenna containers and to modify 15 ku-band antenna containers at a total cost of $100,000 was awarded in mid-September to U. S. Aeromotive (USA). USA is a small disadvantaged business contractor located in the Dayton area. First articles are scheduled for mid-December with production to be finished in September 1993.

The CTII SPO and AFPEA are currently rewriting the technical orders (TO) procedures for all of the aluminum containers. The TOs will be revalidated when the first article containers are fit tested at Hurlburt Field, Florida.

HQ AFMC/LGTPD, Stacie Smith, DSN 787-3362



CTII Nose Radome Production Pallet

# COMBAT TALON II LINE REPLACEABLE UNITS CONTAINERS

A sealing and stacking problem was identified in the line replaceable units (LRU) plastic containers. Presently, the plastic containers do not meet MIL-C-4150 sealing and stacking requirements. The containers were subjected to a simulated 16 foot high stack test under high humidity and high temperature conditions. The containers passed the initial pressure test but bowed and failed the final pressure test. AFPEA has been working closely with the contractor to identify the solution to this problem. The containers will be retrofitted with a new "D' shaped gasket that fit the grove of the plastic container. The containers will also have an aluminum "u" channel riveted to the side walls of the container to prevent bowing in the stack test. Preliminary testing at elevated high temperature and low humidity have been promising. Follow on testing at high temperature and high humidity will be performed at AFPEA in January 1993. We anticipate favorable results from these tests. All of the existing containers have been shipped to the contractor for modification. The containers should be returned to the field units in early 1993.

A word of caution when buying off-the-shelf containers, specify the containers meet MIL-C-4150, MIL-C-5584, or other similar specifications with pressure test requirements in the purchase request. Otherwise, the container received may not be the one needed, but in all probability it will be the one contracted for.

HQ AFMC/LGTPD Stacie Smith, DSN 787-3362

# REVISION OF MIL-HDBK-304

In 1989, AFPEA initiated a revision of MIL-HDBK-304B, the military handbook for package cushion design. The revision includes deletion of obsolete materials and transmissibility curves, revision of text, review of the bibliography, updating of figures, removal of Chapter 5 (MIL-C-26961-Its Ramifications in Cushioning Design) and the addition of a section on electronic pulse filtering. AFPEA based the overall direction for the revision on a survey of MIL-HDBK-304 users. The projected completion date is December 1993.

HQ AFMC/LGTPM, Caroline J. Buckey, DSN 787-4519

# PROGRESS ON CFC-FREE CUSHIONING FOAMS

AFPEA fully supports the recently enacted Public Law 101-484, National Defense Authorization Act for FY93, Sub Title "C-Environmental Provisions" which requires that after 1 June 1993, no Department of Defense contracts shall be awarded for products which contain chlorofluorocarbons (CFCs).

This action is taking place due to data which demonstrates that the atmospheric conditions caused by these chemicals deplete the earth's protective stratospheric ozone layer. Stratospheric ozone depletion is predicted to have a significant adverse global impact on human health, climate and natural environmental systems. Further data, collected in April 1991, revealed the ozone situation to be twice as bad as was believed in 1990.

As the lead activity for prefoamed and foam-in-place foams, AFPEA is responsible for providing the technical support and engineering assistance on cushioning foams to all DOD organizations. In compliance with DOD directive 6050.9, "Established Policy and Procedures for Reducing the Use of CFCs and Related Chemicals," AFPEA developed a strategy to qualify CFC-free cushioning foams from commercial suppliers:

**Step 1** - Conduct a literature search and analysis to get the latest policy on CFCs from the DOD and obtain information on cushioning foams, processes, foam processing equipment and testing methods.

**Step 2** - Collect CFC-free samples from suppliers and conduct material evaluations to identify foams which have performances equal to or better than that of CFC blown foams.

**Step 3** - Approve new foams for military procurement and revise mil-spec requirements to cope with the new CFC-free foam properties.

Today, AFPEA is at Step 3. As of December 1992 the following results had been achieved:

MIL-F-83671, Foam-In-Place
Class 1 - A rigid CFC-free foam has been approved for military procurement.
Class 2 - Two flexible CFC-free foams have been approved for military procurement.
Class 3 - Three semi-rigid CFC-free foams have been approved for military procurement.

MIL-P-26514F, Prefoamed
Type I - Standard CFC-free foams (Grades B and C) have been approved for military procurement.
Type III - An anti-static CFC-free foam has been approved for military procurement.
In addition, AFPEA (in an effort to encourage development and implementation of CFC-free foams) is in the process of issuing a revision which rewrites the Hydrolytic Stability test procedure such that conformance to the CFC-free goal is obtainable.

HQ AFMC/LGTPM, Susan J. Misra and Susan J. Evans, DSN 787-4519

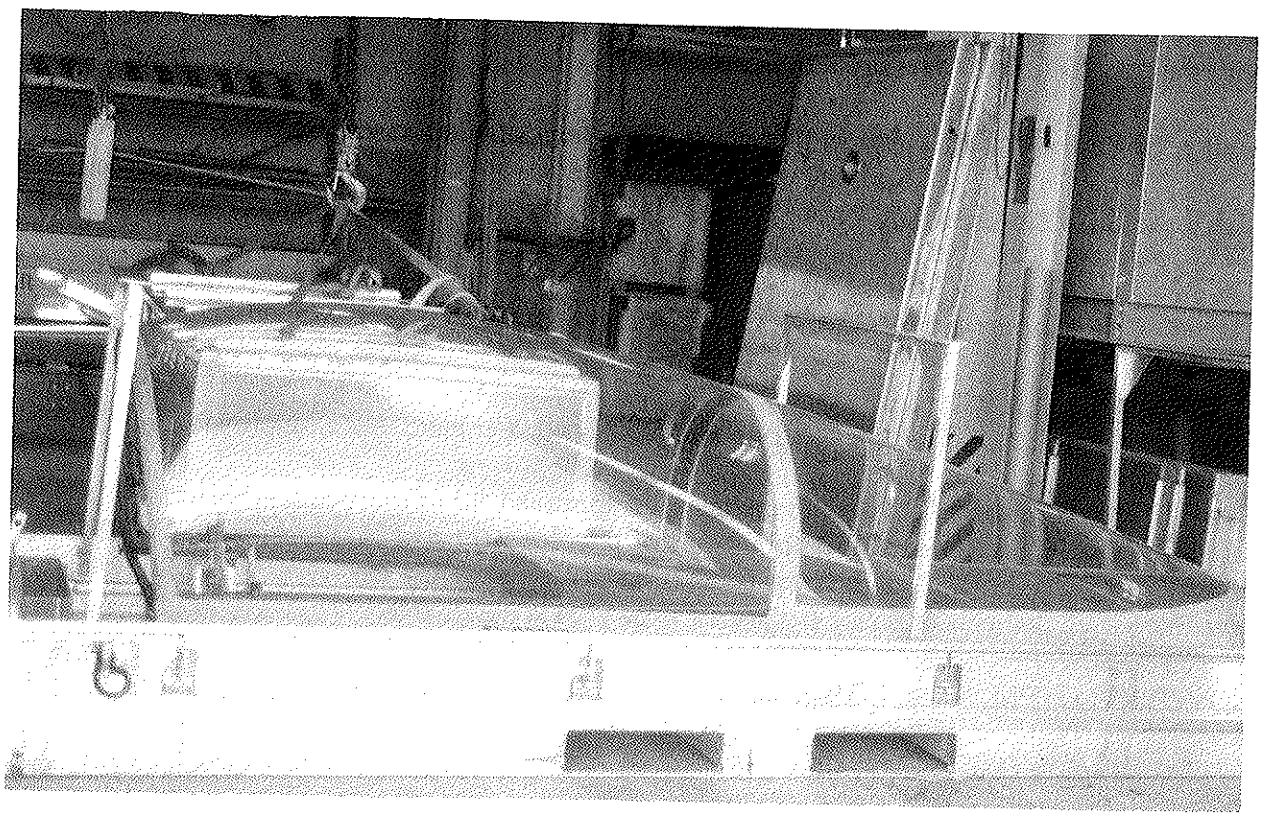
# F-15 ONE AND TWO MAN CANOPY CONTAINER

Warner-Robins Air Logistics Center (WR-ALC), the depot maintenance activity for the F-15, identified a problem with the one and two man canopies in July 1991. The canopies were elongating and deforming in their wooden shipping/storage containers. Once this deformation occurs, the canopy glass must be scrapped and replaced with a new glass at a cost of approximately $13,000. WR-ALC requested the Air Force Packaging Evaluation Activity (AFPEA) design an aluminum, sealed container that would ship/store either the one or two man canopy. Through user input, AFPEA incorporated a handling fixture into the container design. The current handling frame cost approximately $7,000 each.

AFPEA accepted the project and was able to develop a container design along with a removable handling frame for the canopies within a six month time frame. The container is designed from double walled aluminum extrusions and aluminum sheet. The outside dimensions are 3658mmL x 1219mmW x 1219mmH (12' x 4' x 4'). The container will be stackable up to 4877mm (16 feet) high and have quick release latches, desiccant port, humidity indicator, pressure relief valve, air filling valve, and hoisting rings. A prototype was fabricated and tested during the Spring of 1992. The container successfully passed all tests and the container drawings have been turned over to WR-ALC for first buy of the container.

This project has been completed and closed out. If you are interested in reading the final report of this project, please feel free to contact one of the persons below and reference Report No. 92-R-02.

HQ AFMC/LGTPD, Robert Tekesky and Robbin Miller, DSN 787-3362



The F-15 One Man Canopy - Inside Container

# STANDARDIZATION

AFPEA continues to be an active participant in the Department of Defense Standardization Program and is assigned Air Force responsibility for standardization actions in the following Federal Stock Classes (FSCs) and areas:

| FSC/Area | Commodity/Title |
|---|---|
| 8105 | Bags and Sacks |
| 8110 | Drums and Cans |
| 8115 | Boxes, Cartons, and Crates |
| 8125 | Bottles and Jars |
| 8130 | Reels and Spools |
| 8135 | Packaging and Packing Bulk Materials |
| PACK | Pack, Packaging, Preservation and Transportability |

AFPEA acts as Lead Standardization Activity for standardization actions in FSC 8145, Specialized Shipping and Storage Containers.

Revision C to MIL-C-9897 (Crate, Slotted Angle, Steel or Aluminum) was completed and published in April.

A-A-671 (Cushioning Material, Expanded Polystyrene, Loose-Fill Bulk) was canceled since this material was being procured under PPP-C-1683.

A new standard, MIL-STD-1816 (Preservation, Packaging, and Packing of Rubber and Nylon Fuel, Oil, and Water-Alcohol Cells), was prepared and published to replace MIL-P-25621, which was canceled.

Comments are being resolved on Revision A to MIL-F-83671 (Foam-In-Place Packaging Materials, General Specification for). A final draft is being prepared for coordination.

HQ AFMC/LGTPM, Barb Taylor, DSN 787-4519

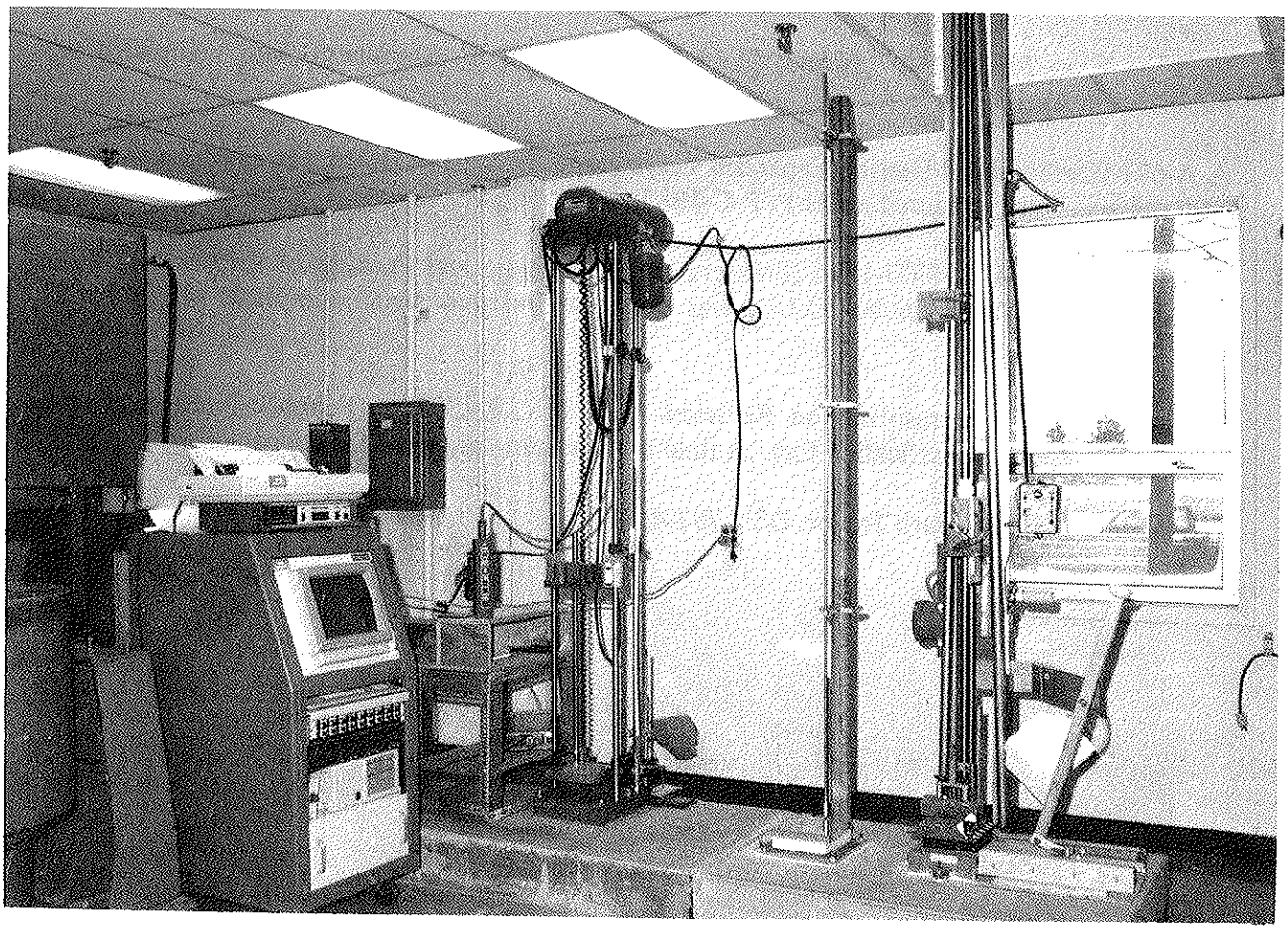
# PACKAGING EVALUATION TEST EQUIPMENT

The next few pages detail principal equipment of Air Force Packaging Evaluation Activity's (AFPEA) test and evaluation capabilities. The equipment is used extensively to eliminate existing packaging problems and to avoid introducing new problems into the system. Evaluations are made on new containers and materials intended for Air Force/Department of Defense use. (Dimensions are in inches unless otherwise specified.)

We maintain most of this equipment in support of the joint document "Lead Activities for Testing Packaging Materials and Processes," identified as:

AFMCR 71-2
AMC-R 700-17
NAVSUPINST 4030.51
MCO 4030.34B
DLAR 4145.32

The Lead Service concept is effective in reducing the equpment expenses of the participating services by locating specialized equipment in a single location, thus eliminating redundant test capability.



Cushion Testing Equipment

# TEST FACILITIES/CAPABILITIES AVAILABLE AT AFPEA

## 1. LOW TEMPERATURE WALK-IN ENVIRONMENTAL CHAMBER:

TEMPERATURE RANGE: Ambient to 170 to -100 degrees Fahrenheit (F) (ambient to 76 to -72 degrees Celsius (C)

INSIDE DIMENSIONS: 90 width x 182 length x 96 height (229 cm width x 462 cm length x 244 cm height)

DOOR OPENING: 70 width x 82 height (178 cm width x 183 cm height)

DROP TEST CAPACITY INSIDE OF CHAMBER: 4000 pounds (1814 kg)

## 2. VIBRATION EQUIPMENT:

a. VIBRATION TEST MACHINE (MECHANICAL):

TABLE SIZE: 98 length x 96 width (249 cm length x 244 cm width)
FREQUENCY RANGE: 0 to 40 Hertz
AMPLITUDE RANGE: .02 to 1.0 Double Amplitude (DA)
MAXIMUM LOAD: 5000 pounds (2268 kg)
MAXIMUM ACCELERATION: 3 Gs peak
FIXTURE SIZE: 127 length x 98 width (323 cm length x 249 cm width)
ENVIRONMENTAL CHAMBER: -40 to +140 degrees F (-40 to 60 degrees C)

b. VIBRATION TEST MACHINE (ELECTROHYDRAULIC):

TABLE SIZE: 48 length x 48 width (122 cm length x 122 cm width)
FREQUENCY RANGE: 1 to 200 Hertz
AMPLITUDE RANGE: 0 to 6 DA
MAXIMUM FORCE RATING: 6000 pounds peak sine (2722 Kg)
ENVIRONMENTAL CHAMBER: -40 to +140 degrees F (-40 to 60 degrees C)

c. VIBRATION TEST MACHINE (ELECTRODYNAMIC):

FREQUENCY RANGE: 5 to 3000 Hertz
AMPLITUDE RANGE: 0 to 1.0 DA
MAXIMUM FORCE RATING: 4000 pounds peak sine (1814 Kg)
FIXTURE SIZE: 25 length x 25 width (64 cm length x 64 cm width)
ENVIRONMENTAL CHAMBER: -40 to +140 degrees F (-40 to 60 degree C)

3. **TEMPERATURE/HUMIDITY WALK-IN ENVIRONMENTAL CHAMBER:**

| | |
|---|---|
| TEMPERATURE RANGE: | -65 to 185 degrees F (53.9 to 85 degrees) C |
| HUMIDITY RANGE: | 20 to 95 percent (Limited by +68 degree F (+20 degree C dry bulb temperature and +40 degree F (+4.5 degree C) dew point |
| INSIDE DIMENSIONS: | 10 feet (3.05m) width<br>16 feet (4.88m) depth<br>9 feet 6 inches (2.90m) height |
| DOOR OPENING: | 10 feet (3.05m) x 9 feet 6 inches (2.90m) height |

DROP TEST CAPACITY INSIDE OF CHAMBER: 5000 pounds (2268 Kg hoist)

4. **PENDULUM IMPACT TESTER:**

| | |
|---|---|
| CAPACITY: | 5000 pounds (2268 kg) |
| CONTAINER MAXIMUM SIZE: | 104 width x 216 length x 144 height (263 cm width x 549 cm length x 366 cm height) |

5. **RAIN/SALT-FOG/WIND WALK-IN ENVIRONMENTAL CHAMBER:**

| | |
|---|---|
| TEMPERATURE RANGE: | Ambient |
| RAIN CAPABILITY: | 2 or 5 inch (5 or 13 cm) rain/hour |
| SALT-FOG CAPABILITY: | 5(percent salt solution by weight |
| WIND VELOCITY: | 40 miles per hour (64 km/hour) |
| INSIDE DIMENSIONS: | 76 width x 160 length x 78 height (193 cm width x 432 cm length x 198 cm height) |
| DOOR OPENING: | 62 width x 79 height (157 cm width x 201 cm height) |

6. **ALTITUDE CHAMBER:**

| | |
|---|---|
| TEMPERATURE RANGE: | -100 to 350 degrees F (-73.3 to 177 degrees C) |
| ALTITUDE: | Site Level to 100,000 feet (30,667m) |
| INSIDE DIMENSIONS: | 48 width x 48 length x 48 height (122 cm width x 122 cm length x 122 cm height) |

7. **THERMAL OVEN:**

| | |
|---|---|
| TEMPERATURE RANGE: | +100 to +500 degrees F (+40 to +260 degrees C) |
| INSIDE DIMENSIONS: | 48 width x 117 length x 60 height (122 cm width x 297 cm length x 152 cm height) |
| DOOR OPENING: | 48 width x 60 height (122 cm width x 152 cm height) |

8. **DYNAMIC CUSHION TESTER** (HARDIGG TYPE):

| | |
|---|---|
| CUSHION SIZE: | 8 x 8 (20 cm x 20 cm) |
| DROP HEIGHT: | 90 maximum (229 cm) |
| STATIC STRESS RANGE: | 065 to 1.6 pounds per square inch |
| LIFT SYSTEM: | Variable speed electric motor |
| GUIDE BEARINGS: | Linear ball and radial ball |

9. **DYNAMIC CUSHION TESTER** (LANSMONT MODEL 23):

| | |
|---|---|
| CUSHION SIZE: | 8 x 8 (20 cm x 20 cm) |
| DROP HEIGHT: | 60 (150 cm) |
| STATIC STRESS RANGE: | .065 to 1.6 pounds per square inch |
| LIFT SYSTEM: | Variable speed electric motor |
| GUIDE BEARINGS | Linear ball and radial ball |

10. **PROGRAMMABLE SHOCK TESTER:**

| | |
|---|---|
| TABLE SIZE: | 24 x 24 (61 cm x 61 cm) |
| TABLE WEIGHT: | 235 pounds (107 Kg) |
| SPECIMEN WEIGHT: | 600 pounds maximum (272 Kg) |
| LIFT SYSTEM: | Hydraulic |
| GUIDE BEARINGS: | Bronze |
| WAVEFORM LIMITS: | |
| | Half sine - 600 Gs at 2 ms |
| | Sawtooth - 100 Gs at 4 ms |
| | Square wave - 200 Gs at 2 ms |
| | Trapezoid - 200 Gs at 5 ms |

11. **CONTAINER DROP TESTER:**

| | |
|---|---|
| CONTAINER SIZE: | 20 x 24 maximum (51 cm x 61 cm) |
| CONTAINER WEIGHT: | 80 pounds maximum (36 Kg) |
| DROP HEIGHT RANGE: | 12 to 84 (30 to 213 cm) |

12. **XENON ARC, WATER-COOLED, LIGHT-EXPOSURE APPARATUS**

| | |
|---|---|
| LIGHT SOURCE: | 3500 Watt Water Cooled Long Arc Xenon Lamp |
| TEMPERATURE CONTROLS: | Automatic, Digital Set Point Black Panel/Dry Bulb |
| HUMIDITY CONTROLS: | Automatic, Digital Set Point Wet Bulb Depression/Condition Water |

Meets the requirements for ASTM G-26, Standard Practice for Operating Light-Exposure Apparatus (Xenon Arc Type) with and without water for exposure of nonmetallic materials.

## 13. UVCON ULTRAVIOLET/CONDENSATION SCREENING DEVICE

| | |
|---|---|
| TEMPERATURE RANGE: | 50 to 95 degree C |
| LIGHT SOURCE: | 8-40 Watt Fluorescent Lamps |
| SAMPLE SIZE: | 26 Holders for Samples Up to 3" x 12" (8 cm x 30 cm) |

Meets requirements for ASTM G53, Recommended Practice for Operating Light and Water-Exposure Apparatus, and ASTM D4329, Operating Light and Water-Exposure Apparatus.

## 14. CONSTANT TEMPERATURE/HUMIDITY CABINET

| | |
|---|---|
| TEMPERATURE RANGE: | 18 to 93 degree C (O to 200 degree F) |
| HUMIDITY RANGE: | 5% to 99% RH |
| INNER CHAMBER DIMENSIONS: | 26 x 25 x 18 |

## 15. ELECTROSTATIC DECAY (ESD) TEST AREA:

a. TEST CHAMBER:

| | |
|---|---|
| TEMPERATURE RANGE: | Ambient |
| HUMIDITY RANGE: | 8 to 15 percent |
| DIMENSIONS: | 36 length x 24 width x 18 height (91 cm length x 61 cm width x 46 cm height) |
| DOOR OPENING: | 12 x 12 (30 cm x 30 cm) |
| CONTROL: | Passive and active "Dessicant" systems |

b. STATIC DECAY METER:

| | |
|---|---|
| PEAK CHARGE: | ±5Kv |
| DECAY TIMER: | 0.01 to 99.99 seconds |
| SAMPLE SIZE: | 3 x 5 (8 cm x 13 cm) |
| TEST METHOD: | Federal Test Method Standard 101C, Method 4046 |

c. KEITHLEY ELECTROMETER:

| | |
|---|---|
| RANGE: | 100 ohms full scale to $10^{14}$ ohms in twenty-five linear 1x and 3x ranges |
| ACCURACY: | ±3 percent of full scale on 100 to $10^{10}$ ohm ranges using the largest available multiplier setting; ±5 percent of full scale on 3 x 10 ohm ranges. |

**16. DIGITAL PRESSURE/VACUUM MANOMETER**

**17. CFC-FREE LEAK DETECTOR**

**18. UNIVERSAL TENSILE/COMPRESSION TESTING MACHINE (new machine installation)**

**19. TIE DOWN/HANDLE PULL TESTER**

| | |
|---|---|
| MAXIMUM FORCE RATING: | 6,500 pounds per Actuator (4 Actuators) |
| ELECTRONIC READOUTS: | Forces from 100 to 10,000 +/- 10 pounds |
| CONTAINER SIZE: | Tester adjustable, Maximum 10 feet x 20 feet without special adaptation |

OFFICIAL

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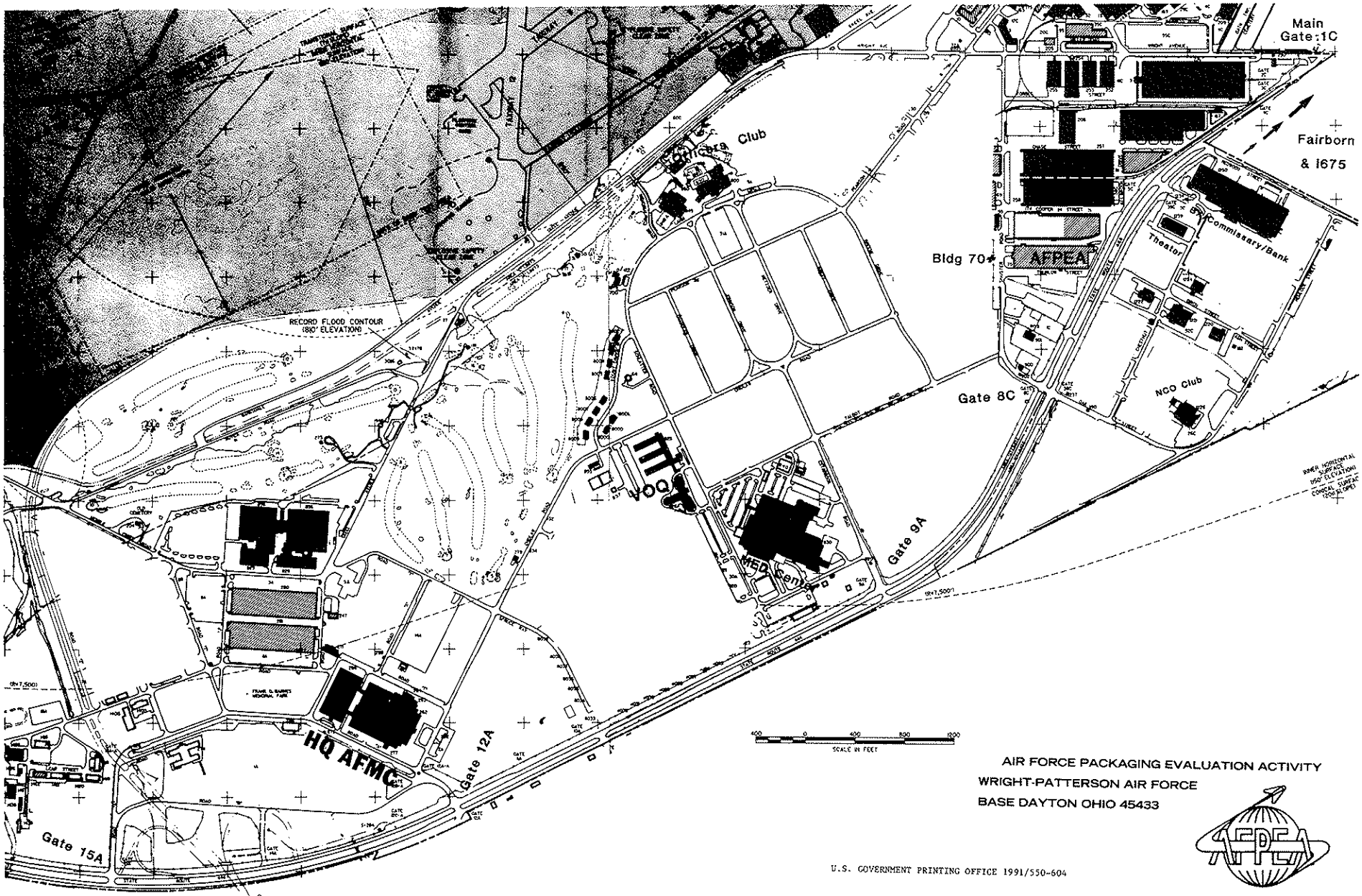


AIR FORCE PACKAGING EVALUATION ACTIVITY
WRIGHT-PATTERSON AIR FORCE
BASE DAYTON OHIO 45433

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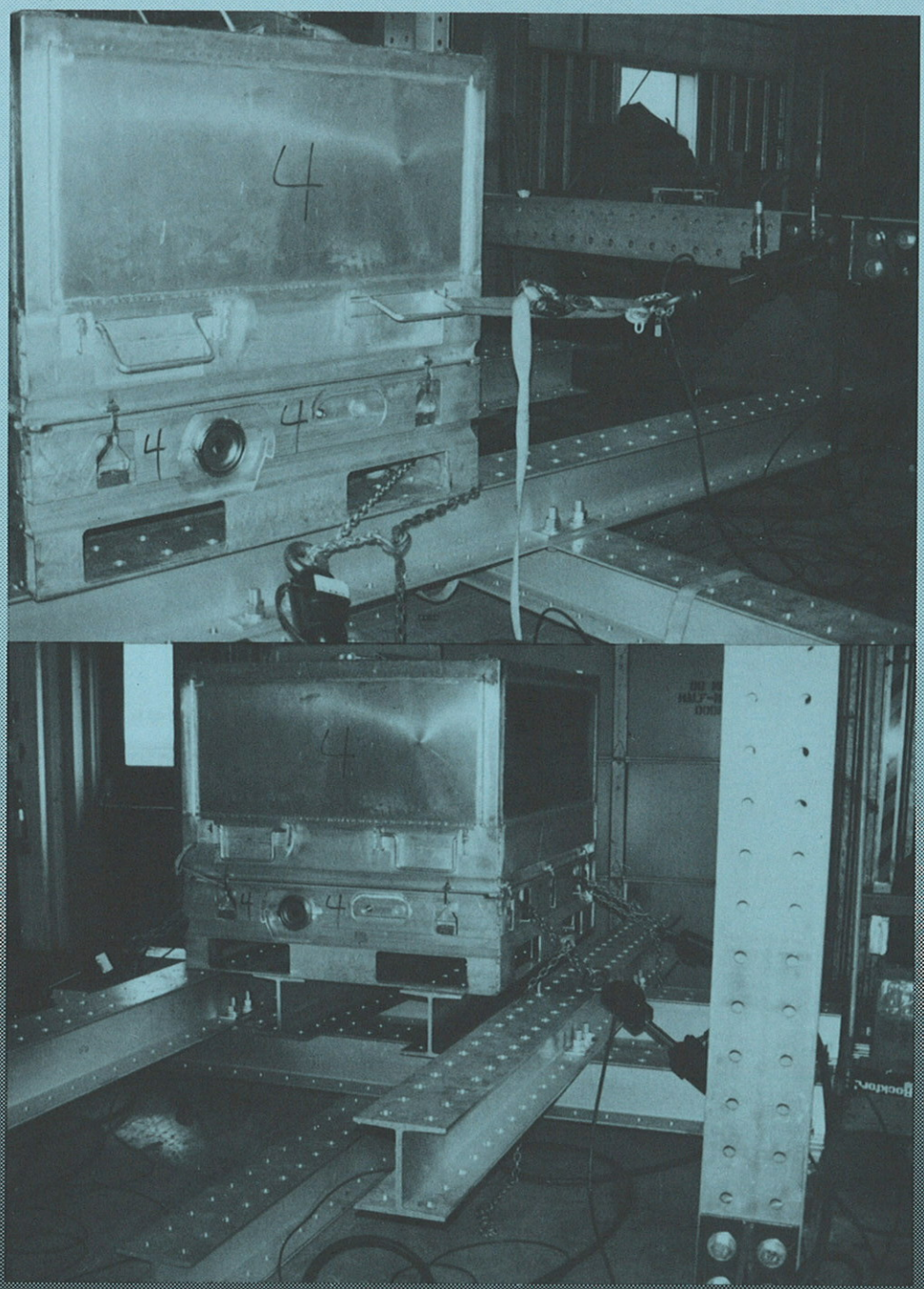

# ONE TEST IS WORTH A THOUSAND EXPERT OPINIONS