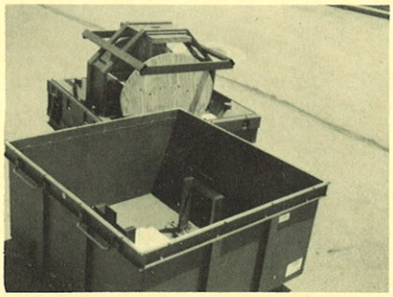
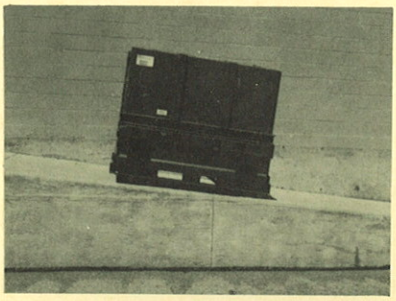
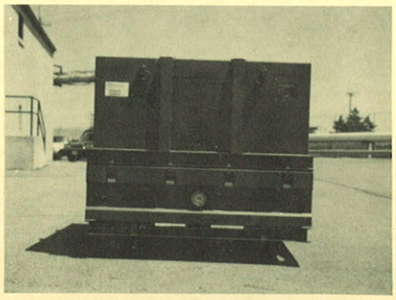
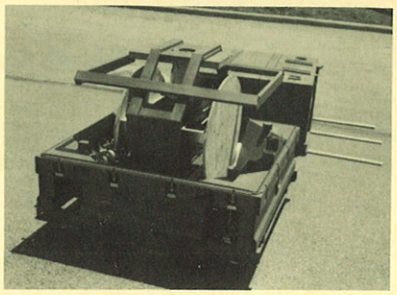


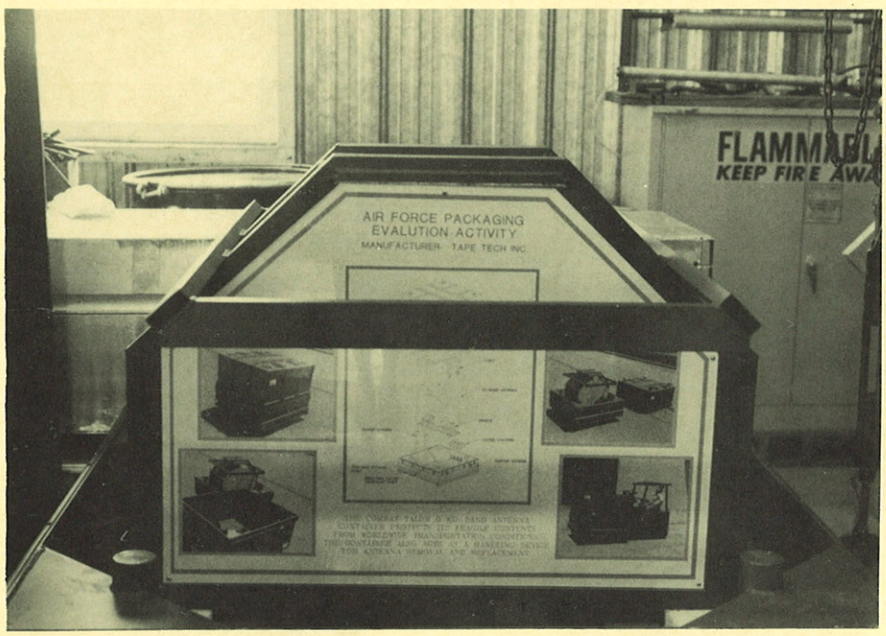


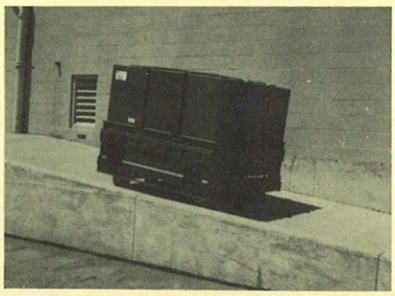


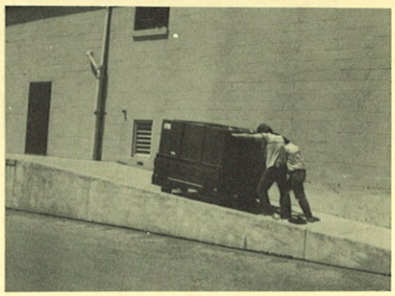
ANNUAL REPORT

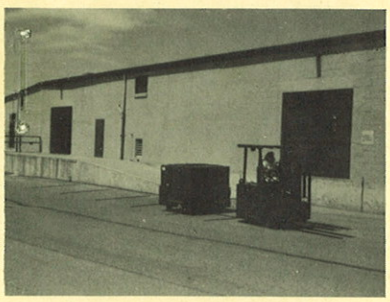


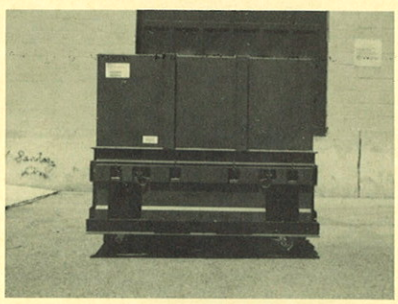
1990 AFPEA



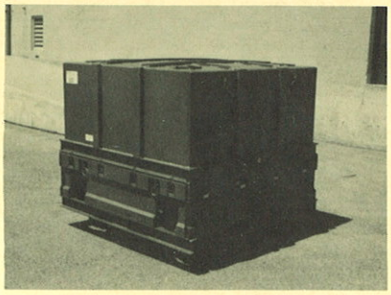


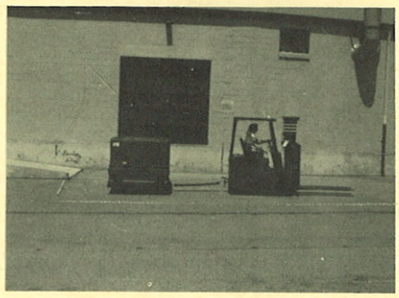


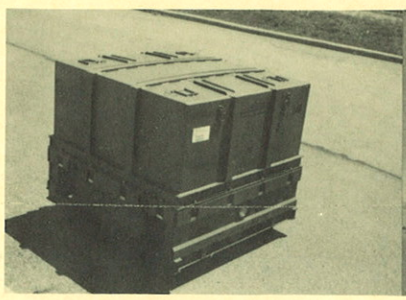




Air Force
Packaging Evaluation
Activity
Dayton, Ohio 45433







DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE LOGISTICS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-5001

1. During 1990, the Air Force Packaging Evaluation Activity (AFPEA) continued to provide a leadership role in the development and application of packaging engineering technology. A summary of the projects and major accomplishments are contained in this report.

2. AFPEA worked with the AFLC Packaging Policy Office and the Wright Patterson Contracting Center to award a contract for an independent, third party Performance Oriented Packaging test facility. The contract is available to all DOD organizations for testing of hazardous materials packagings to the United Nations requirements. The Activity has also been working with industry to identify cushioning materials that are free of chlorofluorocarbons. Progress was made on design of a family of three to five munitions containers to replace the more than 300 containers currently in the field. Acquisition of new 386 high speed computers for computer-aided-design, a new AT&T 3B2 computer for storing the more than 6500 Special Packaging Instructions, and purchase of many new equipment items are expected to increase the efficiency of AFPEA's support to the ALCs and other MAJCOMs.

3. In the future, AFPEA will continue to work with industry and other government organizations for continued improvements in new materials and container designs to assure protection of critical weapon system components.

Ronald D. Via

RONALD D. VIA, Colonel, USAF
DCS/Distribution

DEPARTMENT OF THE AIR FORCE
Headquarters Air Force Logistics Command
Wright-Patterson AFB OH 45433-5999

AFLC PAMPHLET 71-7

1 April 1991

ANNUAL REPORT 1990

AIR FORCE PACKAGING EVALUATION ACTIVITY

This pamphlet is developed to detail project accomplishments for the calendar year of 1990.

Supersedes AFLCP 71-7, 24 April 1990
No. of Printed Pages: 47
OPR: HQ AFLC/DSTZ
Approved by: HQ AFLC/DS
Writer-Editor: Gloria Baker
Illustrator: Tony Jenkins
Distribution: X

AFPEA MISSION

* PROVIDE AIR FORCE PACKAGING ENGINEERING CAPABILITY
* ASSURE TECHNICAL PROGRESS IN PACKAGING

RESPONSIBILITIES

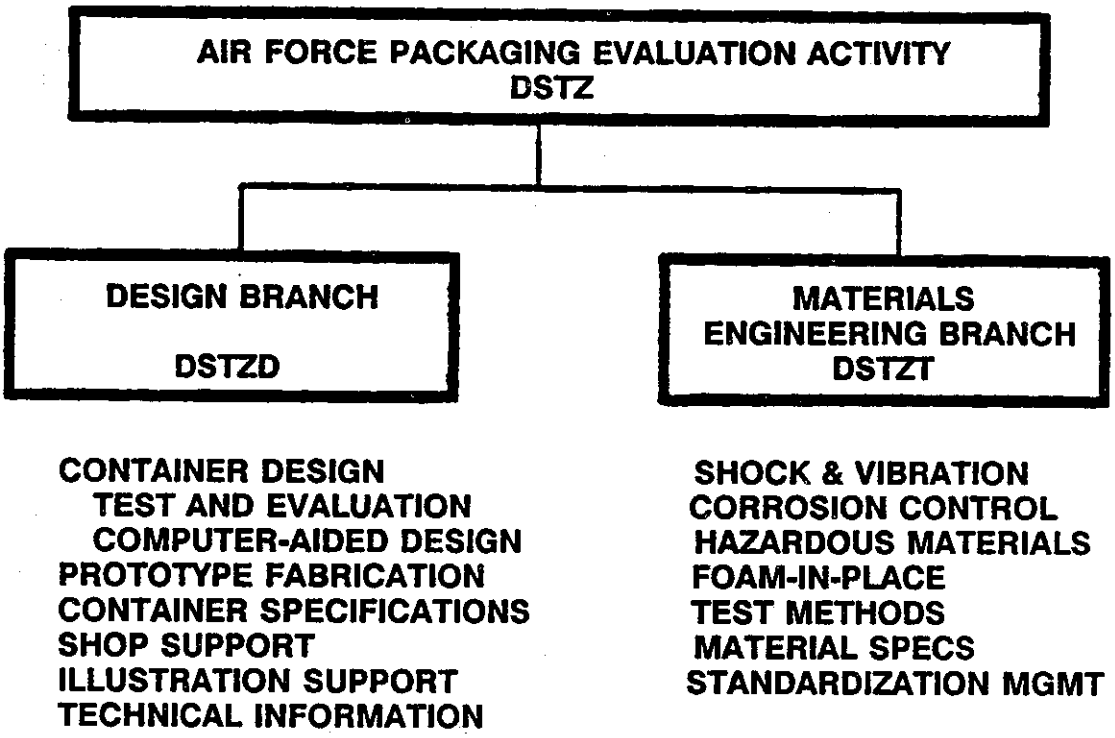
* DESIGN, DEVELOP, EVALUATE MATERIALS, CONTAINERS, TECHNIQUES
* PROVIDE ENGINEERING GUIDANCE AND DIRECTION
* COORDINATE NEW MATERIALS, DESIGNS, TEST EQUIPMENT PREPARE AND REPRESENT AIR FORCE ON SPECIFICATIONS/ STANDARDS
* SUPPORT ALL MAJOR COMMANDS
* EXCHANGE INFORMATION WITH OTHER GOVERNMENT AND INDUSTRY ORGANIZATIONS
* LEAD SERVICE IN ASSIGNED AREAS

MANAGEMENT/DIRECTION: AFLC

AIR FORCE PACKAGING EVALUATION ACTIVITY
HQ AFLC/DSTZ
Charlie P. Edmonson, Chief
Commercial (513) 257-2638

DESIGN BRANCH
Ted Hinds, Chief
HQ AFLC/DSTZD
DSN 787-3362
Commercial (513) 257-3362

MATERIALS ENGINEERING BRANCH
Larry Wood, Chief
HQ AFLC/DSTZT
DSN 787-4234
Commercial (513) 257-4234


AIR FORCE PACKAGING EVALUATION ACTIVITY
DSTZ
DESIGN BRANCH
DSTZD
MATERIALS
ENGINEERING BRANCH
DSTZT
CONTAINER DESIGN
TEST AND EVALUATION
COMPUTER-AIDED DESIGN
PROTOTYPE FABRICATION
CONTAINER SPECIFICATIONS
SHOP SUPPORT
ILLUSTRATION SUPPORT
TECHNICAL INFORMATION
SHOCK & VIBRATION
CORROSION CONTROL
HAZARDOUS MATERIALS
FOAM-IN-PLACE
TEST METHODS
MATERIAL SPECS
STANDARDIZATION MGMT

SPECIALIZED CONTAINER DESIGN SPECIFICATION FOR PROCUREMENT

One of the biggest problems facing the Air Force and other DOD activities today in the acquisition of specialized container design is establishing the requirements. The Air Force Packaging Evaluation Activity hopefully has made this job easier by updating two specifications: MIL-STD-5584 for larger containers and MIL-C-4150 for smaller containers. Either specification may be used for acquisition of specialized containers by identifying peculiar program requirements via a statement of work. For example: MIL-STD-5584 is developed primarily for a metal container; however, the primary materials may include fiberglass, plastic composites, etc., when allowed by the statement of work. If the requirement for a specialized container is not known at the time of contract award, then both specifications should be placed on contract along with a requirement for the contractor to submit a proposed statement of work that tailors the applicable specification.

We also recommend that specialized container requirements be broken out as a separate line item in the contract. By breaking it out as a separate line item, the DOD activity can identify and evaluate specialized container cost. Data requirements for specialized containers are the same as any other piece of ground support equipment.

For assistance in evaluating your program requirements including proposed contract entries, development of the statement of work based on MIL-STD-5584 or MIL-C-4150, etc., contact AFPEA. In today's austere environment, we can help you make the right decision and make your budget go farther.

(HQ AFLC/DSTZD, Mr Ted Hinds, DSN 787-3362)

SUPPORT OF OPERATION DESERT STORM

In support of Operation Desert Storm, Air Force personnel and the manufacturer of a Mil Spec rubber preservative conducted accelerated tire preservation tests at Robins AFB, Georgia. the results of ultraviolet resistance tests clearly indicated the need for applying Age Master No. 1 to vehicle tires exposed to Saudi Arabian sunlight.

AF personnel from Productivity, Reliability Accountability and Maintainability (PRAM), ASD, AFLC, WR-ALC/LVRS, and AFPEA worked with the president of Chem-Pro Manufacturing Company (Buffalo, New York) to test Age Master treated, untreated, new and used tire sections in the company provided ozone chamber. In the accelerated and abbreviated program of up to 30 hours, it was apparent that new tires treated with MIL-P-11520 rubber preservative would last two to four times longer than untreated tires. The difference on used tires was similar.

Immediate implementation of preservative usage has been recommended for vehicle tires. The preservative normally penetrates 1/8 inch into the rubber; therefore, the remote probability exists that changes may occur in the coefficients of friction. For that reason, AFPEA has requested simulated take off and landing speed tests prior to recommending use on aircraft tires. Arrangements have been made for the Flight Dynamics Laboratories at WPAFB to conduct these tests. Following their successful conclusion, the use of MIL-P-11520 will be recommended for all DOD aircraft tires.

This product is used on USAF Museum aircraft, the Army's LACV-30 an air cushion vehicle, and is the only approved protective agent recommended by B.F. Goodrich for use on aircraft deicer boots. It is currently used on Boeing 747 SP and 757 SP and other commercial aircraft.

(HQ AFLC/DSTZT, Mr Avery D. Watson, DSN 787-7445)

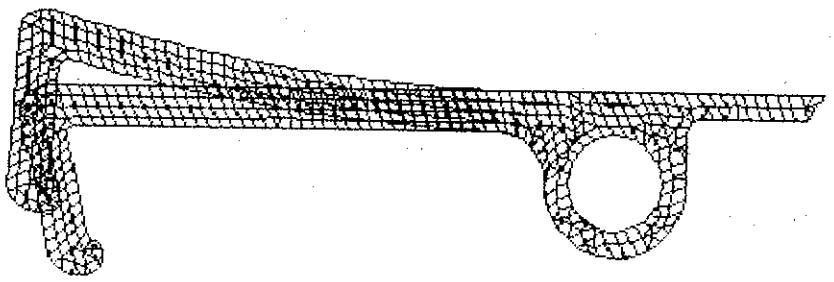
COSMOS/M RELEASE 1.6

COSMOS/M is a finite element analysis program developed by Structural Research and Analysis Corporation (SRAC). It is a program organized into a system of inter-related modules, which can be either menu or file driven. The present version is set up to run on an IBM 386 or compatible system.

COSMOS/M can handle problems with up to 15,000 nodes and 60,000 degrees of freedom. The format purchased by Air Force Packaging Evaluation Activity (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.

Work has been accomplished on a new latch design, using a borrowed computer. When the 386 computers that AFPEA purchased come on board, we see an increase in the support provided by this finite element program.

(HQ/AFLC/DSTZD, Mr Ronald E. DeLuga, DSN 787-3363)

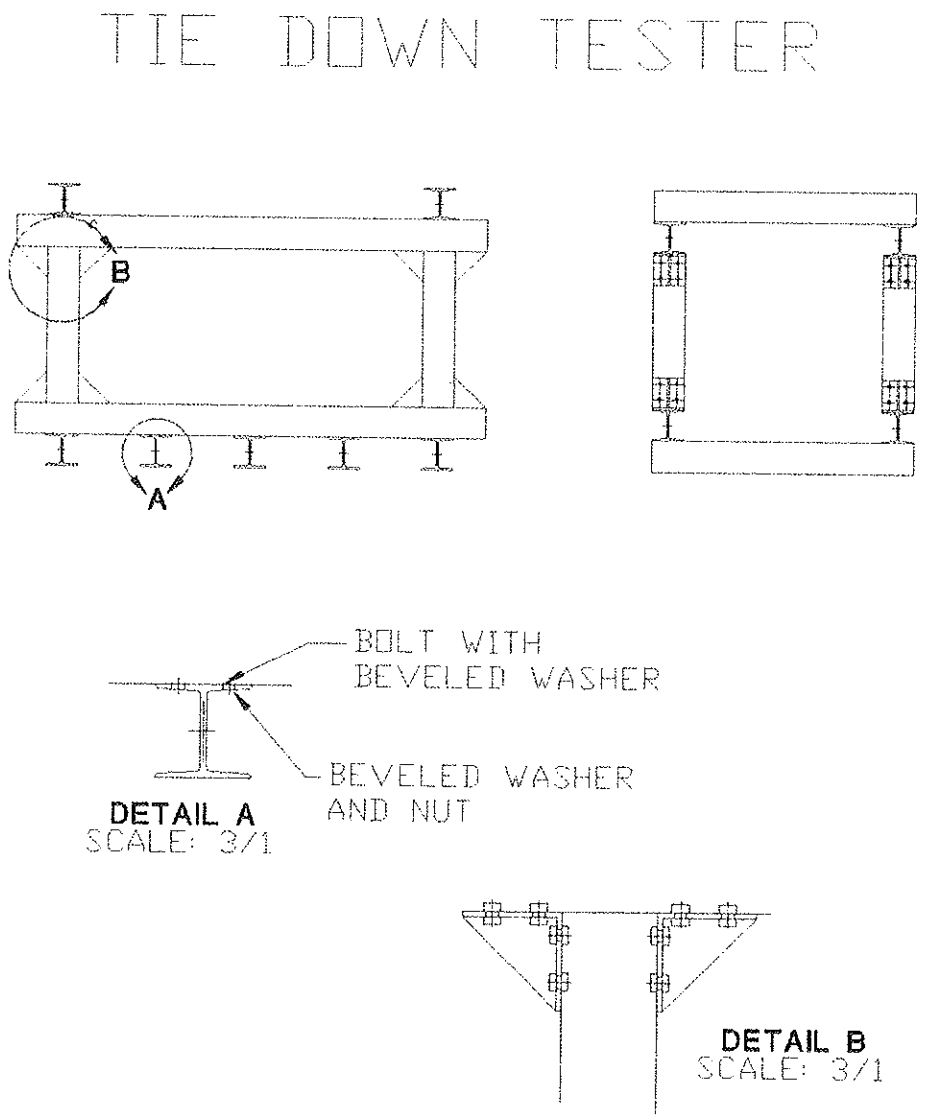


COSMOS/M graphical output for the Family of Munitions Containers New Latch Design. Output shows non-deflected shape overlayed by the deflected form.

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. We are solving this need with a tie-down tester designed and fabricated in-house. This tester will be able to test up to a 5,000 pound container with restraining a simulated 3G or 15,000 pounds forward force. The tie-down tester will be adjustable to test various sizes of containers. Initial operational capability is expected to be third quarter FY91.

(HQ AFLC/DSTZD, Mr James T. Steiger, DSN 787-3362)

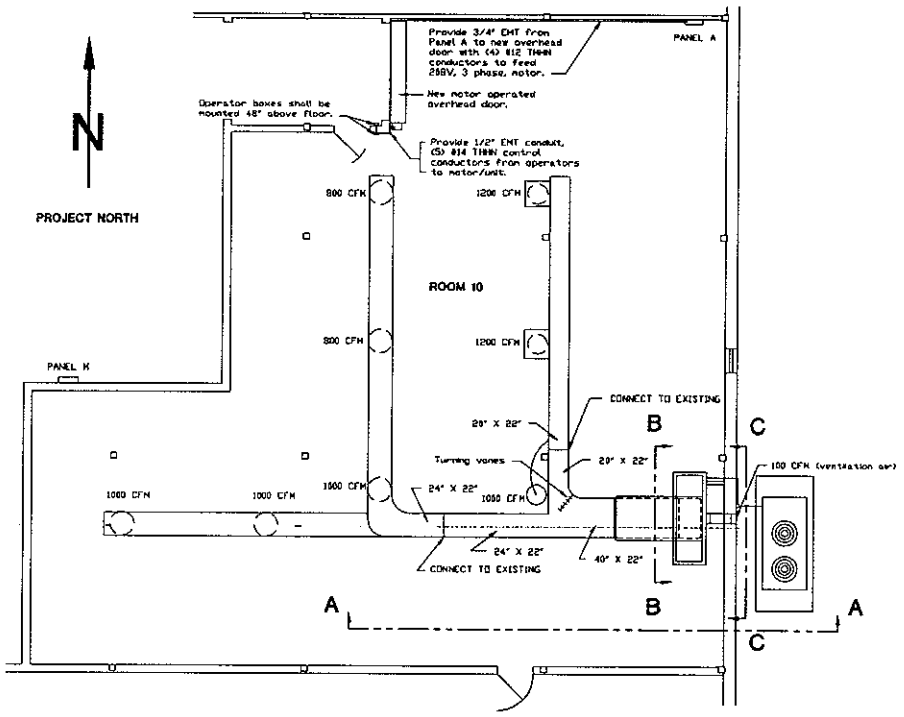


NEW AIR CONDITIONING SYSTEM FOR CONDITIONING/TESTING LAB

The Air Force Packaging Evaluation Activity (AFPEA) is getting a new heating, ventilating, and air conditioning (HVAC) system for the conditioning/testing laboratory.

AFPEA was experiencing some control problems with the existing 20 year old conditioner, so we went to the Base Civil Engineering (CE) to get a project initiated to replace it. CE said that they wouldn't be able to do the project for two to three years. We needed something done as soon as possible. Fortunately, we had Mr Floyd Wanke who had CE experience doing projects such as this. Mr Wanke designed and wrote specifications for a new HVAC system and to remodel the conditioning/testing laboratory. The specifications and drawings were then furnished to CE for contracting action. CE working through procurement has contracted for the installation of Mr Wanke's design. The project is under contract and is to be completed by 22 Jan 91.

(HQ AFLC/DSTZD, Mr Ted Hinds, DSN 787-3362)



MECH/ELEC FLOOR PLAN

PROGRESS ON CFC-FREE CUSHIONING FOAMS

In the conventional method of manufacturing cushioning foamed, chlorofluorocarbons (CFCs) have been used as blowing agents. However, in the early 1970s environmental scientists discovered that CFCs were among the chemicals causing ozone layer depletion. Because of this effect, the international community as well as the US Government are planning to reduce the use of CFCs to zero by the year 2000.

The movement affects all DOD in procurement of cushioning foams for transportation and storage. In compliance with DOD directive 6050.9, "Established Policy and Procedures for Reducing the Use of CFCs and Related Chemicals," AFPEA has developed a strategy to qualify CFC-Free cushioning foams from commercial suppliers. As lead service activity for prefoamed and foam-in-place, AFPEA is responsible for providing the technical support and engineering assistance on cushioning foams to all DOD organizations. To provide this support, AFPEA has developed a multistep process:

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

- Step 2 is the collection of CFC-Free samples from suppliers and conducting the materials evaluation to identify foams which have performance equal or better than that of the CFC blown foams.

- Step 3 is approval of the new foams for military procurement and revision of the mil-spec requirements to cope with the new CFC-Free foam properties.

Today, AFPEA is at Step 2. The following results have been achieved:

MIL-F-83671 Foam-In-Place
Class 1, A rigid CFC-Free foam has passed all requirements of category 1.
Class 2, A flexible foam has passed dynamic cushioning and relative combustibility tests.
Class 3, A semirigid CFC-Free foam has passed the dynamic cushioning, Hydrolytic stability and flammability tests.

MIL-P-26514 Prefoamed
Type I, A standard CFC-Free foam passed the dynamic cushioning Hydrolytic stability and relative combustibility tests for Grade B and C.
Type III, An Antistatic CFC-Free foam has passed the dynamic cushioning, relative combustibility and hydrolytic stability tests.

In addition, AFPEA has issued a selected waiver to the Hydrolytic Stability tests for a period of one year (December 1990 to December 1991). The waiver will be issued upon written request, and is intended to encourage development and implementation of the CFC-Free foams to the maximum extent possible.

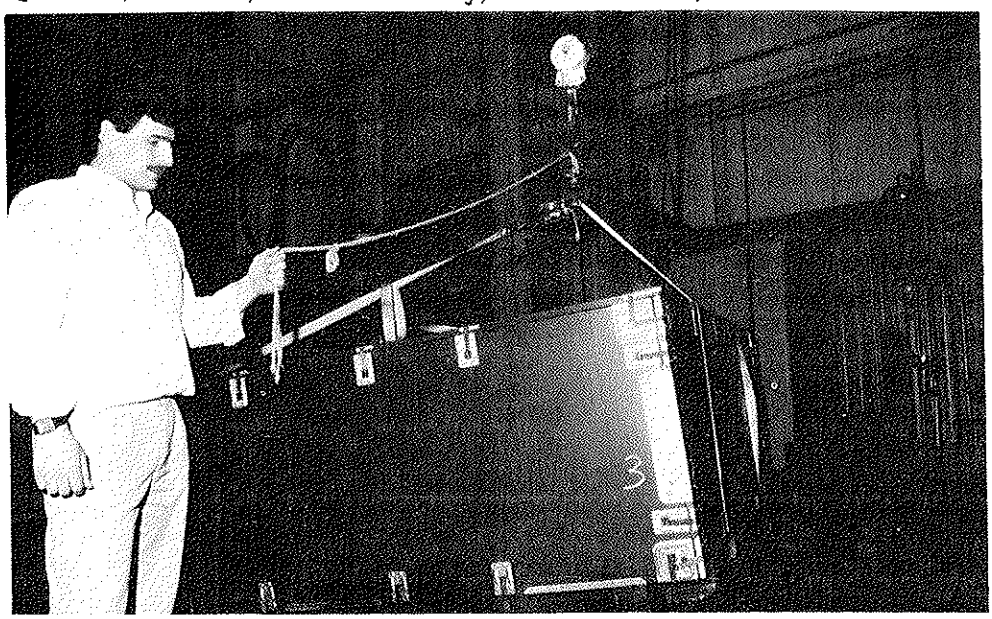
(HQ AFLC/DSTZT, Mr Francis Tran, DSN 787-4519)

TRANSPORTABLE COLLECTIVE PROTECTION SYSTEM (TCPS) TESTING

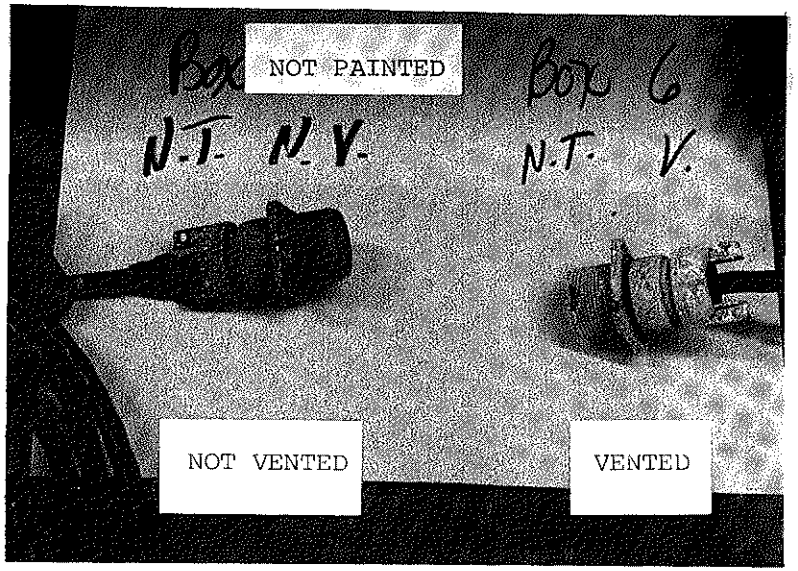
Human System Division (HSD/YAGD), Wright-Patterson AFB, Ohio requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) to conduct vibration, shock, and environmental testing on three Rowley containers with contents. The contents consisted of a TCPS. The TCPS, manufactured by ILC/Dover Inc., is a chemical warfare tent.

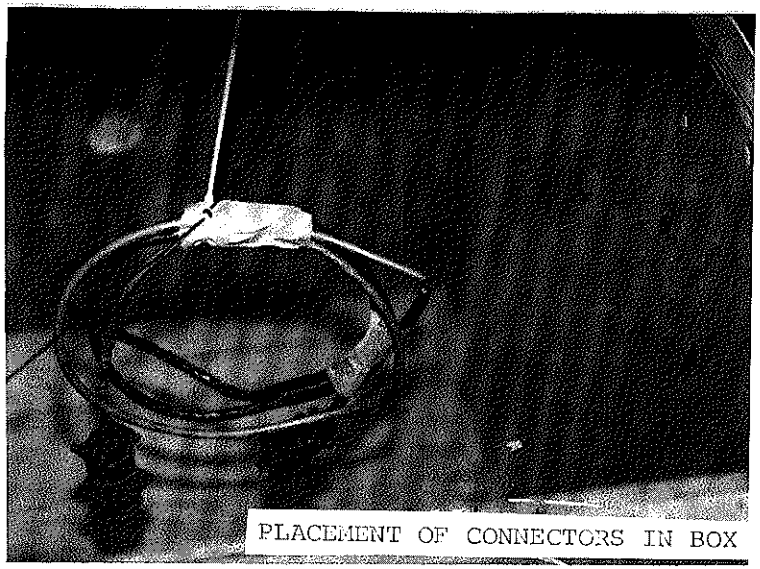
These containers were originally scheduled to be tested by the manufacturer; however, HSD/YAGD found it would be more cost effective if the tests were conducted at Air Force facilities. HSD/YAGD came to AFPEA with test requirements of hot/cold vibration testing per FTMS 101, Method 5019.1, corner/edge drop testing, pendulum impact testing, cold/hot storage testing. AFPEA had capabilities to perform all the tests including AFPEA's newest capability to perform hot/cold vibration. The containers passed all tests with the exception of some recommendations for improvements from AFPEA. AFPEA was able to furnish HSD/YAGD with quality testing and engineering support with substantial cost savings to the Air Force.

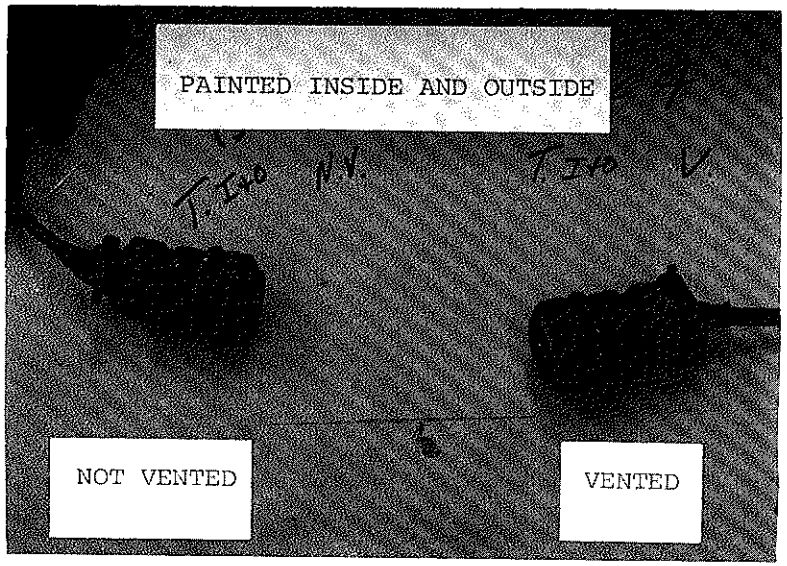
(HQ AFLC/DSTZD, Robert Tekesky, DSN 787-3362)

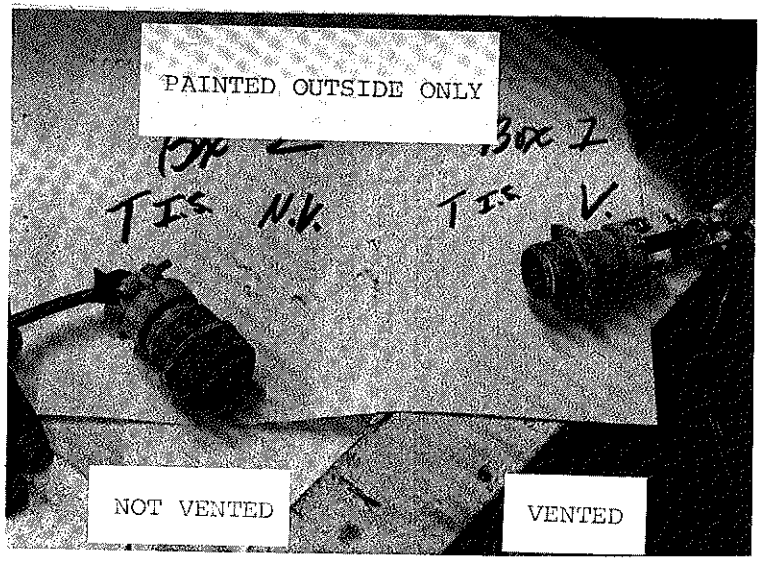


Free Fall 17" Drop Test


NOT PAINTED
NOT VENTED
VENTED


PLACEMENT OF CONNECTORS IN BOX


PAINTED INSIDE AND OUTSIDE
NOT VENTED
VENTED


PAINTED OUTSIDE ONLY
NOT VENTED
VENTED

CORROSION ON CADMIUM-PLATED PARTS IN WOOD BOX

As a result of the corrosion experienced on the B1-B Pylon, the Air Force Packaging Evaluation Activity performed a series of tests on cadmium-plated connectors inside wood boxes. The boxes were basically 2x2x2 or eight cubic feet in size. The Aerospace Maintenance and Regeneration Center (AMARC) boxes were built in accordance with MIL-C-104 and MIL-C-26195 bottom opening demountable. Two of the boxes were painted inside and out, with one container having vents. Two of the boxes were painted outside only, with one container having vents. Two containers were bare wood, with vents in one of them. Except for the differences noted above, the boxes were identical. The covers (lids) of each of the boxes had cadmium-plated connector plugs attached in such a manner that they would not touch each other or the box. The tests conducted were high temperature and high humidity in an effort to accelerate corrosion. The tests were run for a period of five weeks with weekly inspection every week for three weeks and a final inspection after five weeks.

The results of the tests, contrary to what was expected, show that in all cases venting the box led to a higher rate of corrosion than not venting. The parts inside the box which had been painted inside and out and not vented showed the least amount of corrosion. The other two boxes not painted inside and not vented came in second.

Painting of the interior and exterior or just the exterior of the boxes is done in an effort to prevent the plywood from drying out.

The tests indicated that venting a wood box can lend itself to increased corrosion on parts stored inside. However, we recommend that further testing with tighter controls be conducted in an effort to ascertain which box configuration is best overall.

(HQ AFLC/DSTZD, Ms Robbin Miller, DSN 787-3362)

F100-PW-229 ENGINE MODULAR CONTAINERS

The Aeronautical System Division Packaging Office (ASD/ALXP) requested the Air Force Packaging Evaluation Activity (AFPEA) to provide engineering support by reviewing information concerning the F100-PW-229 engine modular containers in November 1989. Pratt and Whitney (P&W) is the prime contractor and has developed and tested fiberglass modular shipping and storage containers for the F100-PW-229 engine. These containers include an inlet fan container, a core container, a low pressure turbine container, and a high pressure turbine container.

A critical design review of these fiberglass containers was accomplished at West Palm Beach, Florida in January 1990. The design concept was acceptable and P&W started the fit and qualification testing of the four containers.

AFPEA was sent a copy of the fit check and qualification test reports for review. The test reports indicate that the fiberglass containers provide adequate protection to the item. The end users did and do not want to contend with the problems associated with fiberglass containers. Therefore, the contention is the life cycle costs of aluminum containers are less than fiberglass containers, even though the initial cost may be higher. AFPEA has not been able to initiate a change in the container material through either the program office or Pratt and Whitney.

(HQ AFLC/DSTZD, Ms Stacie Smith, DSN 787-3362)

VIDEOCASSETTE TAPE CONTAINER EVALUATION

The Armed Forces Radio And Television Service (AFRTS) requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) in evaluating videotape cassette containers. AFRTS had received many complaints from the field about the containers. The major complaint was the decomposition of the foam inserts which left dust particles in the containers. This posed a great threat to the videotape cassettes. Other problems included latches falling off and cushion adherence. The AFPEA evaluated the containers and gave alternative recommendations to AFRTS's container problems.

(HQ AFLC/DSTZT, Caroline J. Buckey, DSN 787-4519)

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 material handling standards.

AFPEA is active in the following subcommittees: D10.3 on Interior Packaging, D10.19 on Packaging Recycling and Disposability, D10.21 on Shipping and Container Environment, D10.22 on Handling and Transportation Test Methods, and D10.23 on Storage Test Methods. AFPEA is also represented on the ASTM/ DOD/Federal Agencies Packaging Liaison Group.

(HQ AFLC/DSTZT, Mr Keith Vossler, 787-7445)

STANDARDIZATION PROGRAM

AFPEA actively participated in the Department of Defense standardization program again in 1990. We acted as Lead Standardization Activity (LSA), custodian, and preparing, user, and reviewer activities. As LSA we managed all documents within FSC 8145. As custodian, reviewer, and user activities we coordinated on 38 documents prepared by other organizations. As preparing activity we completed validations (MIL-E-6060-1 thru 7) and one revision (MIL-C-4150). Additionally, AFPEA maintained a 4.81 averaged document age which earned it "satisfactory" rating.

One new 1990 acquisition for AFPEA's standardization function was the Information Handling Services (IHS) CD-ROM system. This equipment provided AFPEA additional search and retrieval capabilities for all DOD standardization documents. The complete package consists of 2 readers, 60 CD-ROMs, Laser printer Interface card, plus required software. The CD-ROMs replaced the IHS VSMF (microfilm) system that AFPEA used previously.

(HQ AFLC/DSTZT, Mr Kenneth Dawson, DSN 787-4519)

F-100 FUEL TANK CONTAINER TECHNICAL ORDER (TO) MANAGEMENT

HQ USAFE/LGM requested that TO 00-20K-1 be changed to extend the inspection interval done on the WRM fuel tanks. If the inspection period is changed, the government will save on both manpower and material costs. The Air Force Packaging Evaluation Activity (AFPEA) suggested that an extended inspection interval be done at one location. After the extended inspection interval is accomplished, the fuel tank management office (OC-ALC/MM) and AFPEA will review the results before the new interval is made a worldwide policy.

(HQ AFLC/DSTZD, Mr Ted Hinds, DSN 787-3362)

STANDARDIZATION PROCESS ACTION TEAM (PAT)

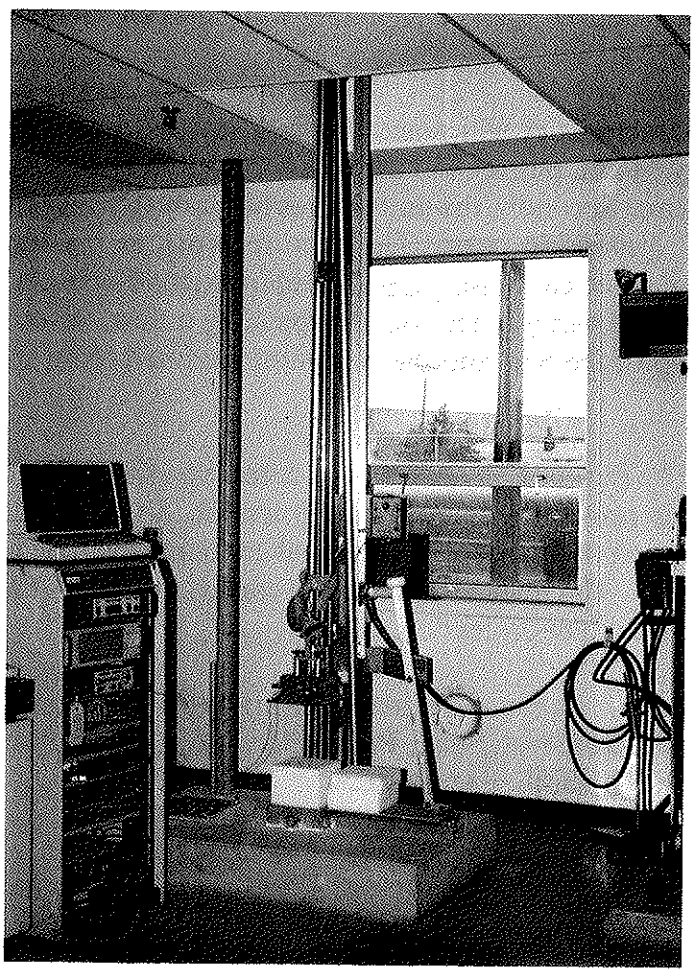
The Air Force Packaging Evaluation Activity (AFPEA) initiated a PAT team to streamline our in-house standardization process. The PAT team consisted of members from the Design Branch (DSTZD) and the Materials Engineering Branch (DSTZT). There are three main processes in the standardization programs: preparing activity, custodian for Air Force documents, and reviewer/user activity. The PAT only looked at the simplest process, the reviewer/user activity. The baseline, original process had 91 steps; once we simplified the process, we ended up with 46 steps. An office instruction was drafted for the new in-house standardization process.

(HQ AFLC/DSTZD, Mr James T. Steiger, DSN 787-3362)

CUSHION TESTER CERTIFICATION

Suppliers of cushion materials to the DOD must be able to show that their material meets the cushioning requirements of the appropriate purchase specification. The data required to demonstrate compliance must be taken using properly certified cushion testing equipment. As Lead Service for cushioning materials, the Air Force Packaging Evaluation Activity (AFPEA) is responsible for maintaining a cushion testing machine certification program as required in MIL-C-26861. Under this program four cushion testing machines have been certified during the past year. AFPEA plans to review this certification process during this next year to clarify and upgrade the procedure.

(HQ AFLC/DSTZT, Mr David Filsinger, DSN 787-4519)



MERGER OF ROBOTICS AND FOAM-IN-PLACE TECHNOLOGIES

Air Logistics Centers at San Antonio, Texas (SA-ALC) and Sacramento, California (SM-ALC) may soon have the most advanced container filling capabilities. Robotics, computer programming, and superior Foam-In-Place (FIP) technology are being combined in an R&D effort to give these AFLC organizations unique packaging capabilities. These will be superior to existing government and commercial operations. Controlled foam dispensing is the heart of the operation: AFPEA has project responsibility for the FIP phase of this HQ AFLC/DSXE project.

After the operator places a selected container and tray on separate conveyors, he/she places a part on the tray and enters the part number and container size at the console. The robotic unit then produces a sealed container which has an adequately cushioned part.

Three innovative characteristics will place this unit in the forefront of automated packaging technology. First, putting the part on a tray eliminates size and center of gravity related problems. Secondly, the unit utilizes two movable dispensing guns with computer controlled dispensing rates. This feature provides maximum control of pillow filling. Lastly, desired cushioning is provided by expanding foam filled and heat sealed pillows. The trayed part is placed on an expanding pillow. A second expanding pillow is placed on top of the part and the container confined foam conforms to the shape of the part.

Typical packages will be evaluated by AFPEA to determine the ability of the robotics processed containers to provide adequate item protection. In these tests the resistances to shock and vibration of the robotics prepared containers will be compared with manually prepared units. The manually processed containers have three, four, or five inches of foam to provide item protection.

The foam phase of the project is a coordinated effort by Automakers, Inc. (Stafford, Texas) the prime contractor; InstaFoam Production Inc., (Joliet, Illinois) the foam manufacturer; HQ AFLC/DSXE; and AFPEA.

(HQ AFLC/DSTZT, Mr Avery D. Watson, DSN 787-7445)

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 approximately 27 months. 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 for the three smallest containers. 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.

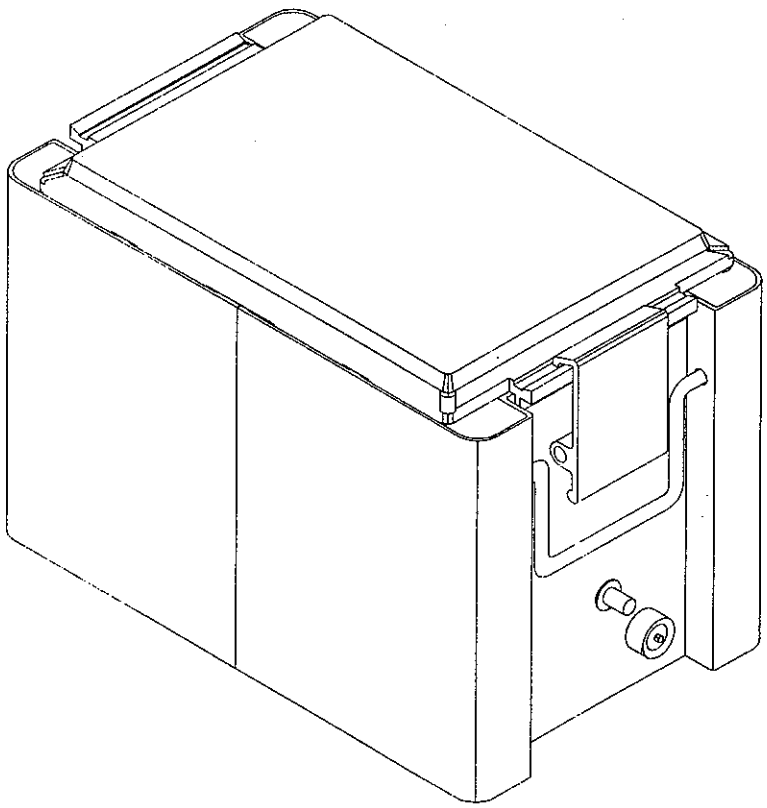
(HQ AFLC/DSTZD, Mr James T. Steiger, DSN 787-3362)

FAMILY OF MUNITIONS CONTAINER #1

Container #1 is the smallest of the containers being designed in this project. It has inside dimensions of 12"L x 8"W x 9"H. It is designed for small explosives and munition items. The container is a sealed container with pressure/vacuum relief and air filling capability. The container body is designed as a double-wall, two-piece aluminum extrusion made from a single extrusion die. The lid is cast aluminum with the sealing gasket located in the lid. The bottom is an aluminum sheet, inset so the container is stackable and interlocks with the lid. The latch is a new aluminum extrusion cam-over-center latch design, and the handles are deep enough to swing above the container lid for ease in carrying.

The body of the container is designed to be put together and welded in long sections, and then cut to the desired height. This will reduce manufacturing costs. The empty container should weigh 13-15 pounds and will cost approximately $50.00 each in large quantities.

(HQ AFLC/DSTZD, Mr Floyd Wanke, DSN 787-3362)

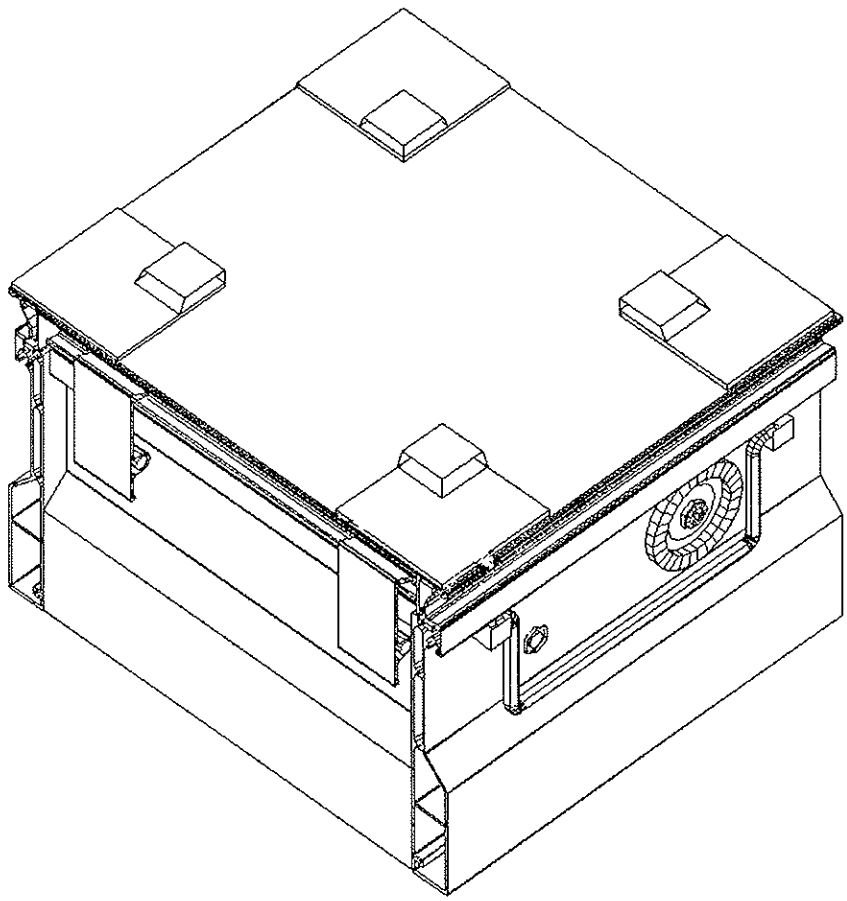


FAMILY OF MUNITIONS CONTAINER #1

FAMILY OF MUNITIONS CONTAINER #2

The Family of Munitions Container #2 is a small, sealed, generic ,two-person carrying container. Inside dimensions are 457mm x 406mm x 356mm (18" x 16" x 14"). This container will be used to carry fuzes, boosters, etc. for a maximum gross weight of 150 pounds. Manufacturing costs of this container has been minimized. The container is constructed out of only, two double wall aluminum extrusions with sheet aluminum for the top and bottom. It will utilize a new cam-over-center aluminum latch, pressure/vacuum relief valve and an air filling valve. The container will be stackable and easily palletized. The container finish may be bead blasted instead of painted to reduce the long-term maintenance cost on the container.

(HQ AFLC/DSTZD, Mr Robert Tekesky, DSN 787-3362)



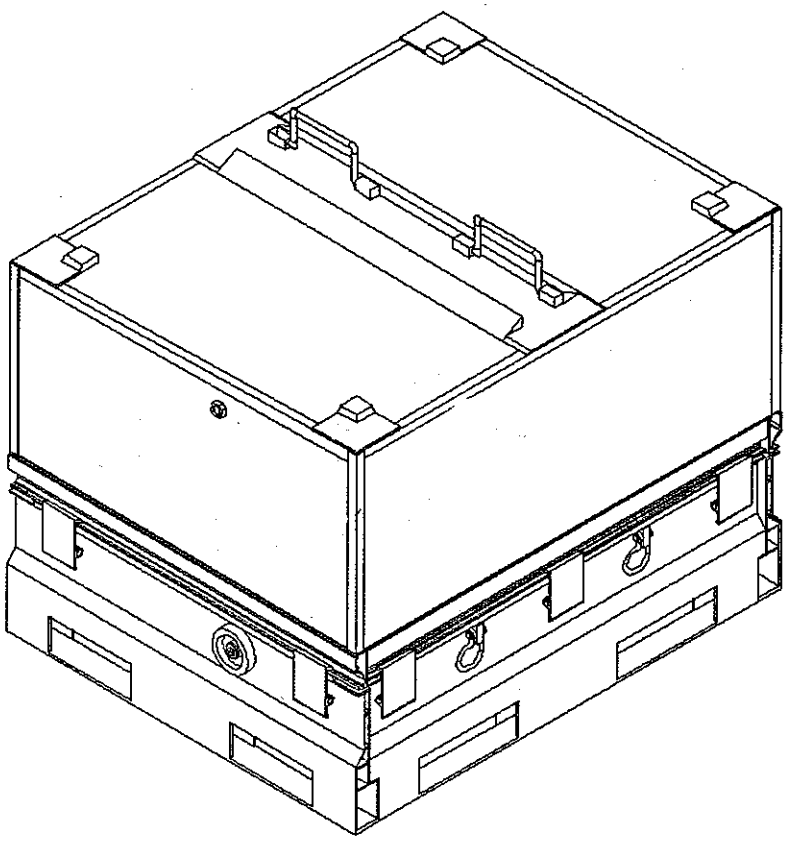
Family of Munitions Container #2

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 MSU 650 fins. The container will be manufactured exclusively from aluminum with internal dimensions of 1244mm x 965mm x 838mm (49" x 38" x 33").

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, while also incorporating a one piece skid/base. This single piece greatly simplifies the manufacture of the container. Standard latches, pressure/vacuum relief valves, air filling valves, and tie down rings will be used. However, the finish applied to the containers may be bead blasted instead of painted, due to the reduced long-term maintenance costs and environmental impact.

(HQ AFLC/DSTZD, Mr Ronald E. DeLuga, DSN 787-3362)

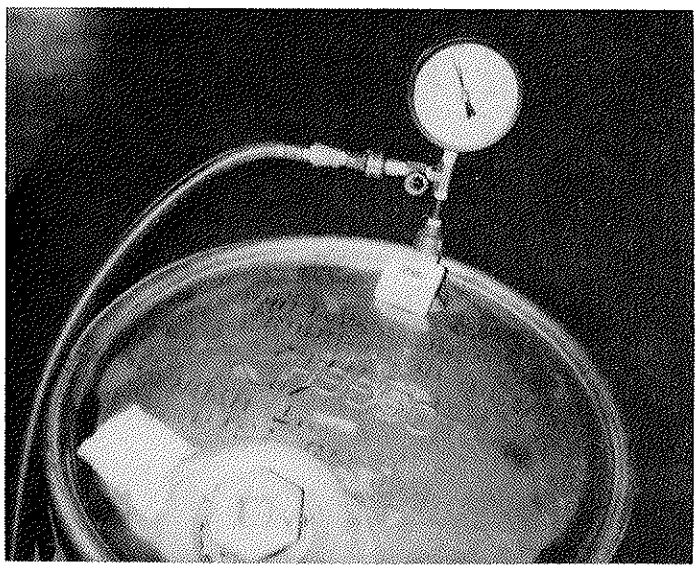


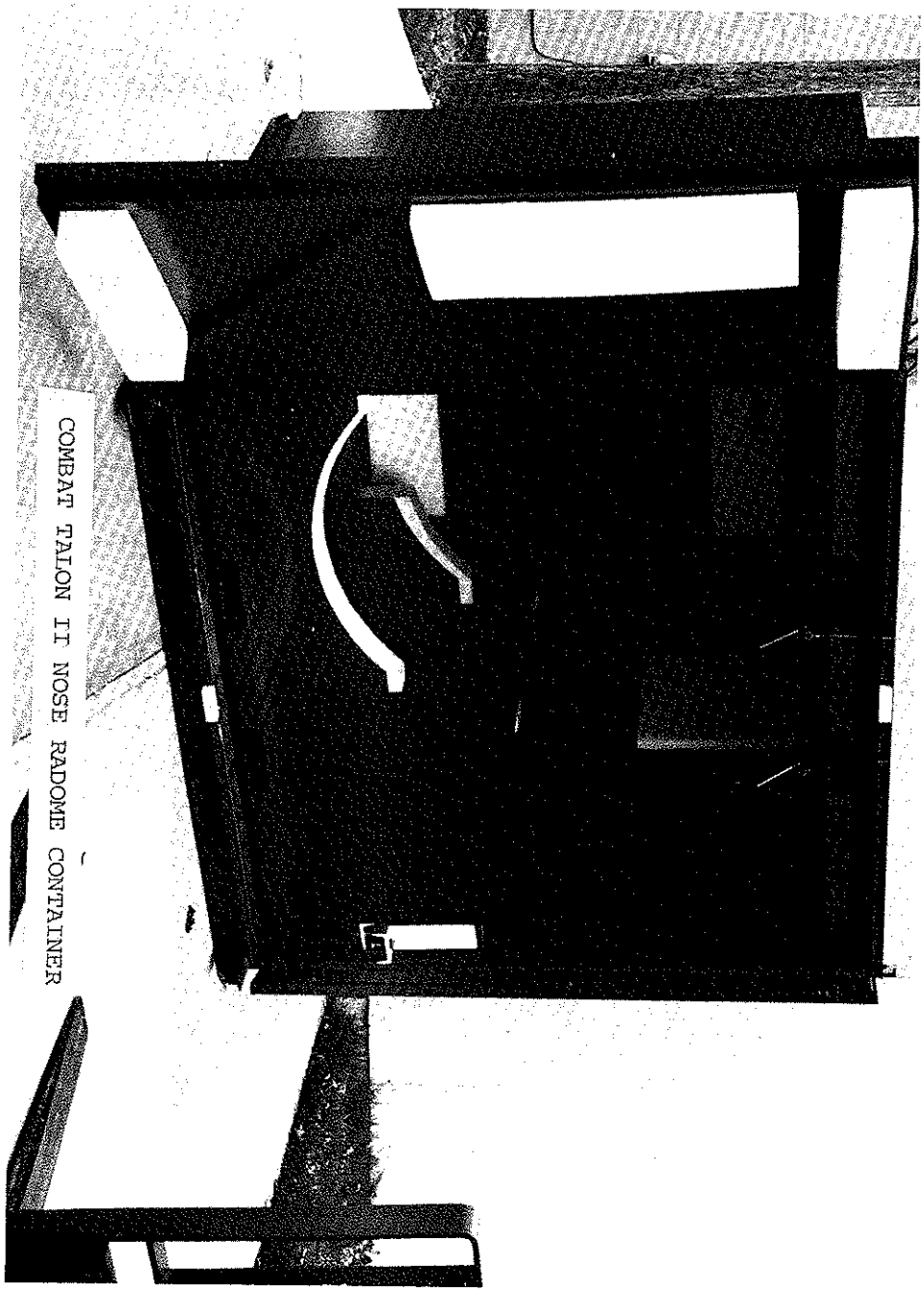
FAMILY OF MUNITIONS CONTAINER #3

PERFORMANCE ORIENTED PACKAGING (POP) OF HAZARDOUS MATERIALS

In the waning hours of FY90; AFPEA, Packaging Policy Office, and the Wright-Patterson Contract Center awarded a Department of Defense (DOD) wide contract for an independent, Department of Transportation approved, third party POP test facility. The contract was awarded to Wyle Laboratories of Huntsville, Alabama. Every DOD organization or activity can use this pay-per-test contract through their respective hazardous materials lead service organization. The contract remains valid through the end of FY91 with options through FY93 available.

(HQ AFLC/DSTZT, Mr Warren Assink, DSN 787-4519)





COMBAT TALON II NOSE RADOME CONTAINER

COMBAT TALON II CONTAINER UPDATE

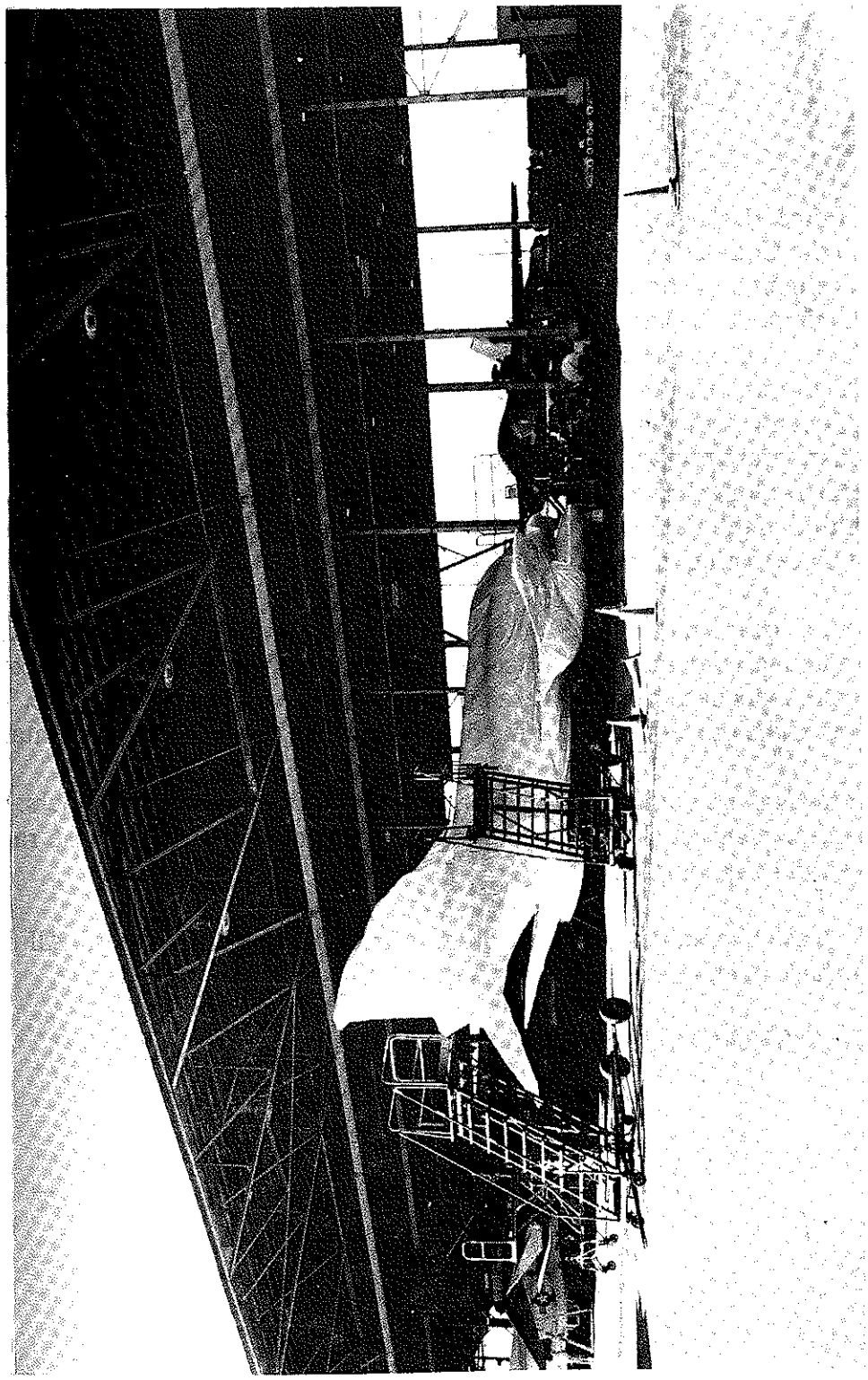
The Air Force Packaging Evaluation Activity (AFPEA) is providing engineering support to the Combat Talon II (CTII) program office in the design, manufacturing, and management of worldwide shipping and storage containers for ten items of CTII support equipment: ku-band antenna, x-band antenna, infrared detection set (IDS), nose radome, and six line replaceable units (LRU). CTII is a modification of the MC-130H aircraft providing added protection to cargo and personnel by terrain following, enemy avoidance, and weather guidance. Over the past year, AFPEA completed in-house pre-production models of two nose radome containers, and four IDS containers along with ten additional IDS cradles. The ku-band antenna container was submitted to the Packaging Expo at Chicago, Illinois. The container won a Gold Star (first place) rating for the military division.

Tape-Tech, a local small business manufacturer, was awarded the contract for 50 ku-band antenna containers and 50 x-band antenna containers. All of the x-band antenna containers have been delivered to the government ahead of schedule. Tape-Tech is now in the process of delivering the ku-band and has delivered 25 containers.

Level III drawings are being completed for the IDS and nose radome containers. Once completed, the contract and production of 50 IDS containers and six nose radome containers will be accomplished.

The LRU plastic containers were all ordered from Hardigg Industries. All of the containers have been delivered to their destinations.

(HQ AFLC/DSTZD, Ms Stacie Smith, DSN 787-3362)



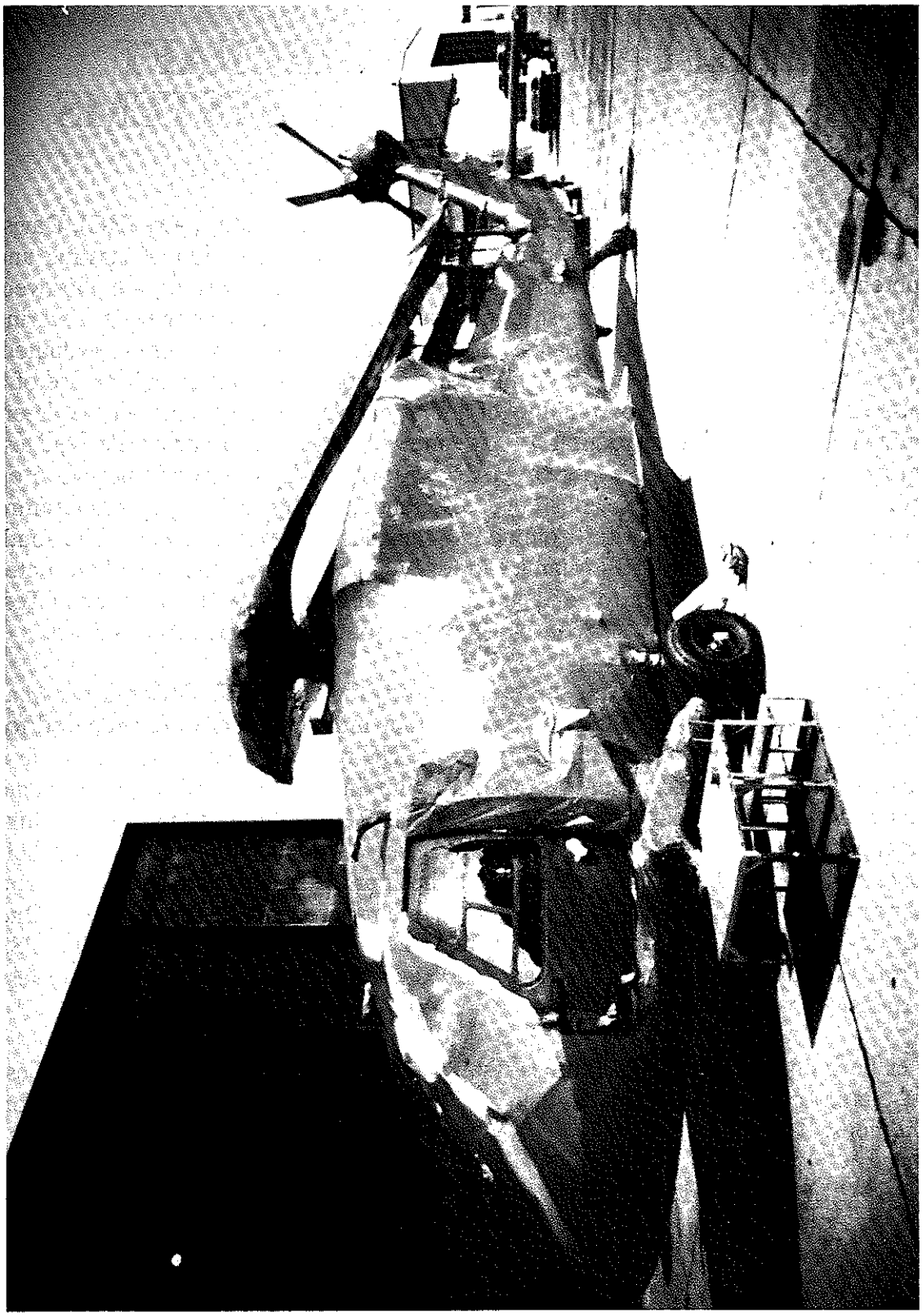
EVALUATION OF AIRCRAFT PROTECTIVE COATING SYSTEMS

In support of Aerospace Maintenance and Regeneration Center (AMARC), Davis-Monthan AFB, Arizona, this activity is conducting an evaluation of existing and potential aircraft protective systems. Currently, two materials/systems are approved. They are Spraylatting, a two coat spray on system and a tailor-made "baggie" covering by Global Chemical. Six additional candidate materials/systems are being evaluated. They include shrinkwrapping (four film), another spray-on coating and the use of a less expensive "baggie." Acceptability of additional candidate systems will be determined during a two-phase program. Phase one will be a seven month accelerated test program simulating four years of AMARC exposure. Exposure will be based on annual temperature extremes of 17 degrees F and 116 degrees F, rapid temperature changes (20 to 80 degrees within four hours), rain, dust and excessive wind. The South Florida Test Service (SFTS), Miami, Florida, will use an irradiance weatherometer and other instrumentation to conduct the tests. SFTS and the Environmental Test Application Center (ETAC), Scott AFB, Illinois, jointly developed the program.

The second phase involves on-site exposure of protected F4Cs during a two-year evaluation. Polyethylene shrink films from four manufacturers were prepared for AFPEA. Each film was formulated to provide UV resistance which would enable it to withstand four years exposure at AMARC. Films included three white polyethylene materials and one clear polyethylene material. Recently four films were shrink-wrapped on four F4Cs. Connecticut Packaging personnel applied the films using their patented propane heat guns. In addition to the approved use of Global "baggies" and shrinkwrapping, two additional candidate systems were applied to F4Cs. One resem- bles cocooning. It is the application of web like substances and is called PSS Protective Sealant. It, like Spraylat, is applied to selective surfaces. Also a less expensive "baggie" was used on the F4Cs.

For both phases, the eight materials/systems will be evaluated comparatively. Test results and critical fiscal restraints then will determine AMARC's aircraft preservation methods.

(HQ AFLC/DSTZT, Mr Avery D. Watson, DSN 787-7445)

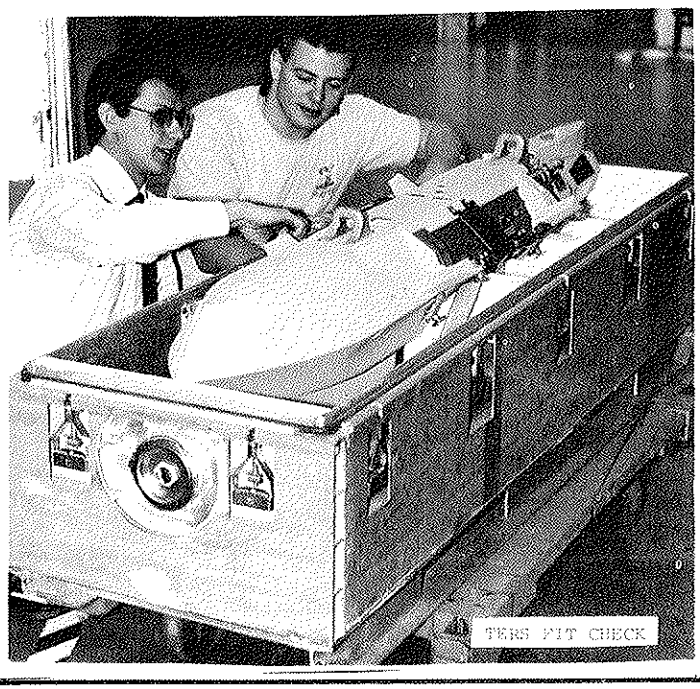


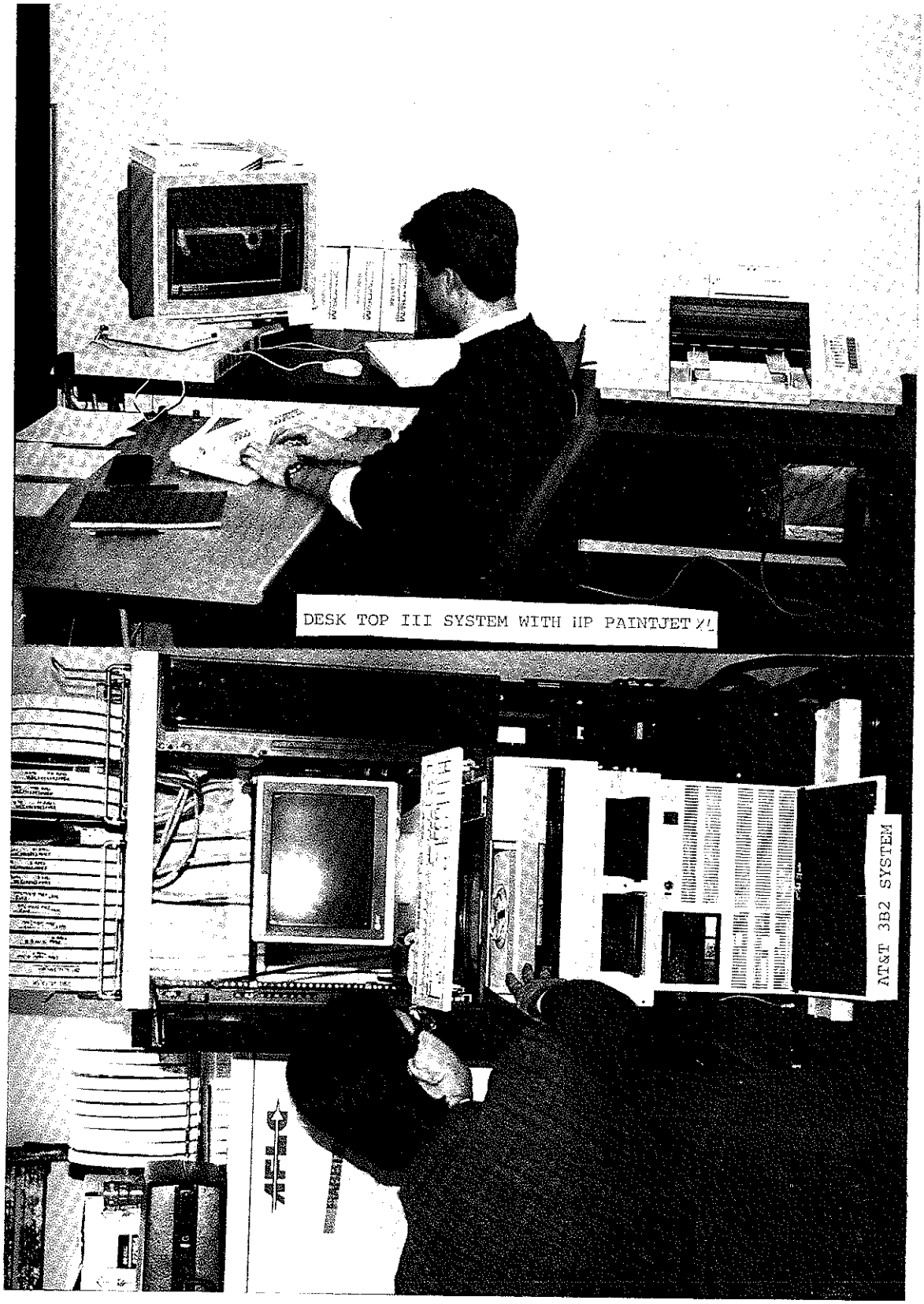
MERS/TERS CONTAINER DEVELOPMENT

A fit check of the Triple Ejector Racks (TERS) in the new prototype aluminum extrusion container was performed at Warner Robins Air Logistics Center (WR-ALC), 2 May 1990. During the fit checks, it was brought to our attention that there was a Modified TER-9A rack which is now being used on F-16s. The modified rack has an enhanced aerodynamic nose cone and fairings. The new nose cone also adds two inches to the overall length. The three other versions of the TERS fit nicely in the prototype container. Changes will be made to the container and internal cushioning to accommodate the Modified TER-9A rack. The Air Force Packaging Evaluation Activity (AFPEA) requested and is awaiting the shipment of a Modified TER-9A rack to complete testing on this container. It is unknown at this time when a Modified TER-9A will be obtained due to the crisis in the Middle East.

The prototype container for the Multiple Ejector Racks (MERS) was almost complete when AFPEA found out that the MERS were now being phased out. Since the item is being phased out over the next few years, AFPEA will not complete the design or prototype of this aluminum extrusion container, which would of had a life of over 20 years.

(HQ AFLC/DSTZD, Mr Floyd Wanke, DSN 787-3362)




DESK TOP III SYSTEM WITH HP PAINTJET XL
AT&T 3B2 SYSTEM

COMPUTER-AIDED DESIGN SYSTEM (CADS)

Under the "lead service" concept, The Air Force Packaging Evaluation Activity's (AFPEA) Design Branch provides container design, development, and prototyping services to the Air Force and DOD.

The Design Branch CADS consisted of four IBM AT computers with 20 inch color monitors, procured five years ago along with AUTOCAD software, a HP laserjet printer and plotter. Updated late in FY88, the IBM AT computers were made faster and additional AUTOCAD software was purchased for two older Zenith Z-248 PCs. Productivity was increased substantially. Budget restrictions and project time schedules have dictated the need to become even more effective and efficient in CADS design efforts. Investigation of this requirement led AFPEA to procure AUTOCAD 386 upgrades, COSMOS M Finite-Element Analysis software and a total of seven Unysis 386 PC computer systems from the Air Force Desktop III Contract. These systems offer more than a 25 percent increase in AUTOCAD performance plus the direct compatibility of performing finite-element analysis on developed AUTOCAD container designs. Costs to procure these systems were estimated to be less than half that required for current system modifications of lesser performance. Five Unysis 386 systems were delivered in December 1990 and two more are scheduled for delivery in January 1991.

The AFPEA's capability to electronically store and manage Special Packaging Instructions (SPI) is also undergoing an evolution which will save the Air Force approximately $80,000 a year in maintenance costs alone. The VAX 11/750 currently used, is being phased out and replaced by an AT&T 3B2/600G system. This new system received in September requires no special environmental conditioning and is less than 1/10 the size of the old VAX system. The 3B2 will provide the same service as the VAX ,but is more technically up to date and more cost effective, and is more compatible to newer computer related equipment and products. Like all transitions, the conversion process is projected to take several months in which some services may be interrupted. The approximate 6500 SPIs currently stored on the VAX will be transferred to the 3B2 system by the end of December and other services will follow.

(HQ AFLC/DSTZD, Mr Carey Scott Gravenstine, DSN 787-3120)

MIL-HDBK-304B (PACKAGING CUSHIONING DESIGN)

In FY89, AFPEA initiated a revision of MIL-HDBK-304B. The purpose of the project was a general document update. This included deletion of obsolete materials and transmissibility curves, revision of text, review of the bibliography, removal of Chapter 5 (MIL-C-26861 - 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 November 1991.

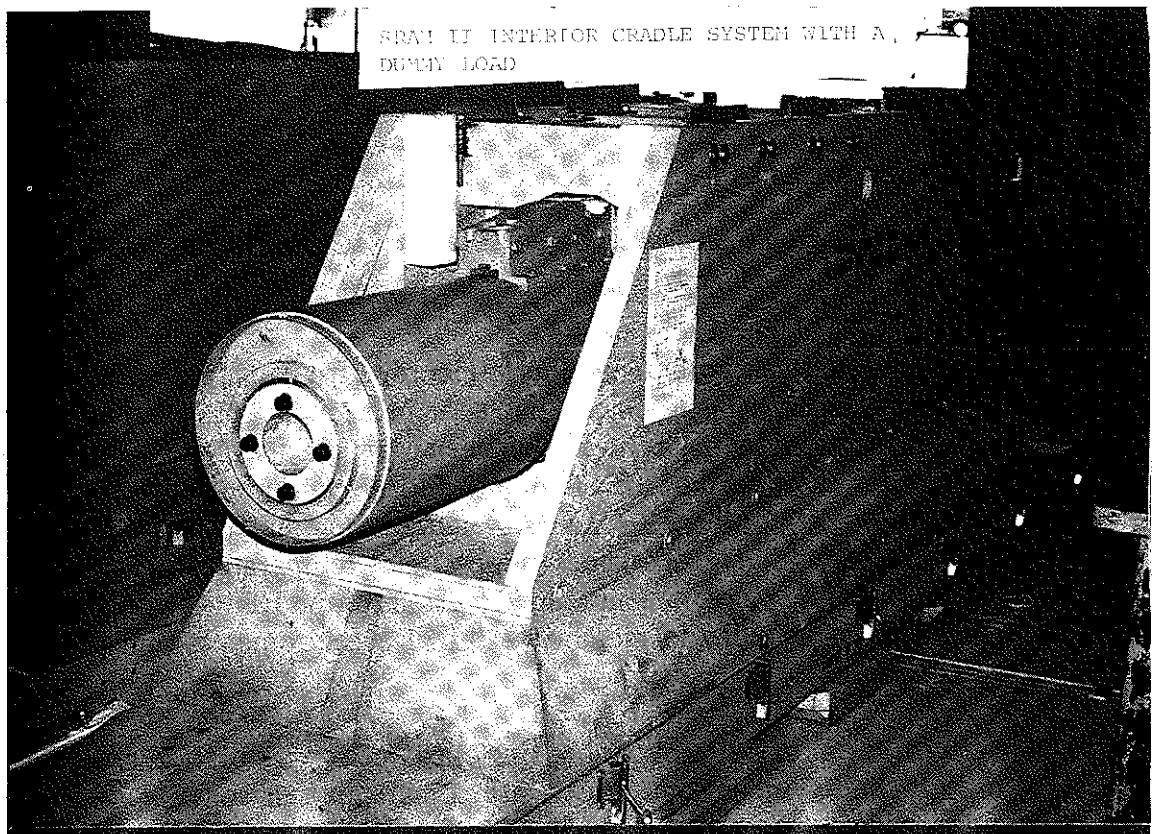
(HQ AFLC/DSTZT, Mr Kenneth Dawson, DSN 787-4519)

TRANSPORTATION ENVIRONMENT RECORDER (TER) DEVELOPMENT PROGRAM

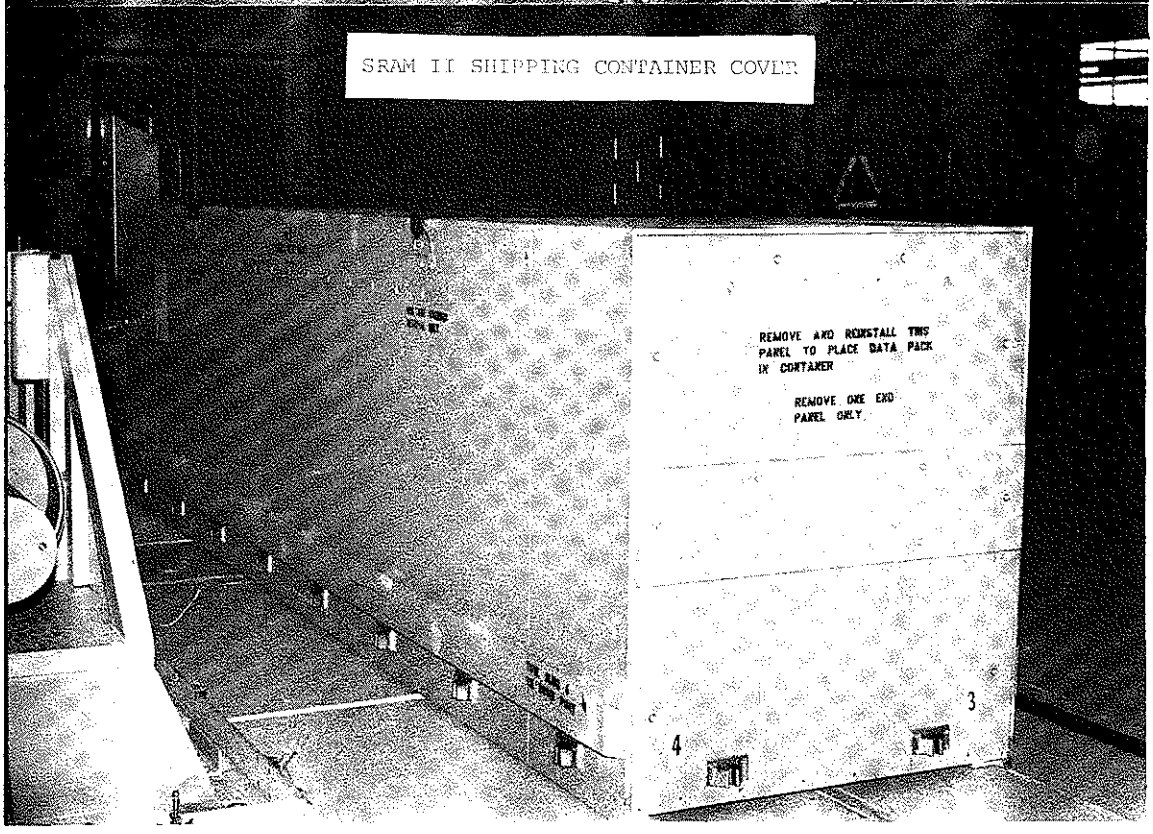
The EDR-3 Transportation Environment Shock Recorder, from Instrumented Sensor Technology, Inc. (IST), Lansing, Michigan, will soon be used in a pilot test program to measure the transportation environment between Wright-Patterson AFB and the ALCs. This recorder, developed by IST under an AFPEA sponsored contract in 1988 and 1989, measures only 4.2 x 4.4 x 2.2 inches, weight on 2.5 pounds, and is powered by 9 volt alkaline batteries that records shock, impact times, temperature and humidity. AFPEA is in the process of obtaining upgraded versions of the EDR-3 with features such as 896 kbytes of nonvolatile memory, external accelerometers and remote, auxiliary battery packs.

AFPEA is also in the process of obtaining single-axis peak acceleration recorders. These recorders, the IST-made SnapShock, are completely self-contained, battery powered and record peak acceleration levels for up to several months. Because they interface with a Remote Display Unit via a two-way IR data communication interface, the recorders function in a completely sealed, autonomous fashion. These recorders will be especially useful for monitoring expensive, delicate items in the military packaging environment.

(HQ AFLC/DSTZT, Ms Susan Evans, DSN 787-4519)



SRAM II SHIPPING CONTAINER COVER



SRAM II/T/TRAINER MISSILE CONTAINERS ENGINEERING SUPPORT

The Aeronautical Systems Division (ASD), Packaging Office(ASD/ALXP) requested engineering assistance from the Air Force Packaging Evaluation Activity (AFPEA) in April 1989. Boeing Aerospace is the prime contractor and has designed a wooden shipping container for the SRAM II missile. AFPEA provided engineering support to the SRAM Program Office, ASD/YGE, before and during the container design review. AFPEA also observed the FTMS 101, Method 5020.1, vibration test. AFPEA provided recommendations for improving the shipping container and recommended retesting of the container. The System Program Office (SPO) has not made a decision whether or not to redesign and retest the container.

In September 1990, the SPO requested AFPEA's expertise in reviewing drawings to procure a shipping container for the SRAM II training missile. AFPEA recommended that the SPO use one container for both the SRAM II and SRAM II training missiles. AFPEA is getting cost estimates to determine the procuring costs of the containers and the savings from using only one container for both missiles.

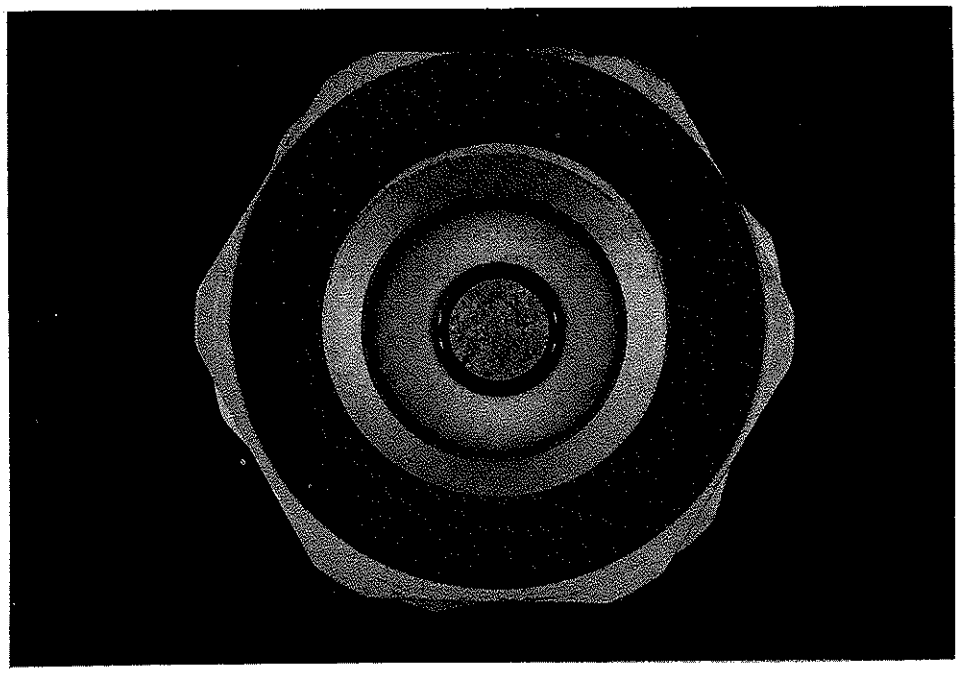
AFPEA will also be assisting the SPO in determining the design criteria for the SRAM T (Tactical) missile shipping container. This container will be used to deploy the SRAM T missile worldwide. Boeing Aerospace is the prime contractor and will be designing this shipping container. AFPEA will be working with the SPO to purchase the best container possible.

(HQ AFLC/DSTZD, Mr Robert Tekesky, DSN 787-3362)

JP-10 PASSIVE FUEL VAPOR MONITOR

The Tacit Rainbow missile is packed precharged with JP-10 fuel so that it may be used immediately upon being removed from its container. In the event of fuel leakage, it is desirable to be able to detect the JP-10 vapor at 20 to 30 percent of the lower explosive limit concentration by visual inspection without disturbing the container. A passive fuel vapor monitor based on color change of a chemical sensing agent is to provide this capability. Currently, AFPEA is evaluating the performance of a passive JP-10 fuel vapor monitor prototype developed by an independent research corporation for the Air Force.

(HQ AFLC/DSTZT, Mr Edward Moravec, DSN 787-4519)



NEW EQUIPMENT PURCHASED BY AFPEA IN 1990

1. Tie-Down Tester. Purchased hardware, hydraulics, instrumentation and aluminum stock to fabricate a tie-down tester in-house. This tester is designed to test up to a 5,000 pound container simulating a 3G force on the forward direction.

2. Desktop III - 386 computers (7 each) and associated software. These computers and software will upgrade our in-house design capability.

3. 3B2 File Serve/LAN System. This system will replace and upgrade our current VAX system.

4. LASERJET III (2 each). Upgrade our capability of printing out small size A drawings and reports.

5. PAINTJET XL - Hewlett Packard. This will allow us to graphically printout the analytical results from COSMOS M, our new Finite Element Analysis Package.

6. COSMOS M Finite Element Analysis. We upgraded our capability to analyze containers with a 15,000 node version of COSMOS M.

7. Draftmaster RX - Hewlett Packard. This will upgrade our capability to print out full scale drawings. It uses continuous feed paper and will print out up to size "E" drawings.

8. Spindle Cutting System - This is a large computer-controlled cutting system that will greatly decrease the time required to fabricate prototype aluminum containers. It has a cutting area of 6 x 6 foot and can cut wood, plastics, and aluminum extrusions.

9. Cut-off Saw - The cut-off saws will be used to cut steel and aluminum parts needed to fabricate containers.

10. Tube Bender - This piece of equipment will be used to bend tubes and aluminum rods used in fabricating containers.

11. Fume Extraction System - The fume extraction system is used to evacuate fumes, airborne particles of wood and foam from the air during welding and cutting operations.

12. Drop Tester - The drop tester will be used to facilitate performance oriented packaging (POP) tests.

13. Lansmont Model 23 Cushion Tester. This machine measures the dynamic cushioning properties of cushion materials over the range of .03psi to 2.0psi on 8 x 8 inch cushion samples. The maximum drop height is 55 inches. Added features include an electric hoist, pneumatic braking system, linear ball guide bearings, and electronic trigger interface for IMB-PC computer systems.

14. Two Electric Forklifts. Motorized hand trucks powered by electric storage batteries for use in confined areas or applications involving short distances of travel.

15. Four Environmental Recorders. Record shock, temperature, humidity experienced by packages in the military shipping environment. Two recorders have 256 kbytes memory and two have 896 kbytes memory. Powered by eight 9 volt batteries or external auxiliary power pack.

16. Two Mini Transportation Recorders. Single axis, self-contained and battery powered sensor/recorder of peak acceleration. May be installed in test environment for months. Data recovery and programming performed with HP calculator with infrared communication link.

17. DODISS CD-ROM System. This system consists of 60 CD-ROM disks, two readers and software. It provides access to computer readable copies of all DOD standardization documents.

18. Fluorescent UV Condensation Screening Device. A laboratory device for screening materials sensitive to ultraviolet light and condensation. Device exposes coatings, plastics, pigments and the like to alternate cycles of UV and condensation.

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.)

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

TEMPERATURE RANGE:	35 to 200 degrees F (2 to 92 degrees C)
HUMIDITY RANGE:	50 to 95 percent
INSIDE DIMENSIONS:	99 width x 190 length x 96 height (251 cm width x 483 cm length x 244 cm height)
DOOR OPENING:	60 width x 84 height (152 cm width x 213 cm height)
DROP TEST CAPACITY INSIDE OF CHAMBER:	4000 pounds (1814 kg)

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 (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:**

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. **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

10. **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)

11. **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

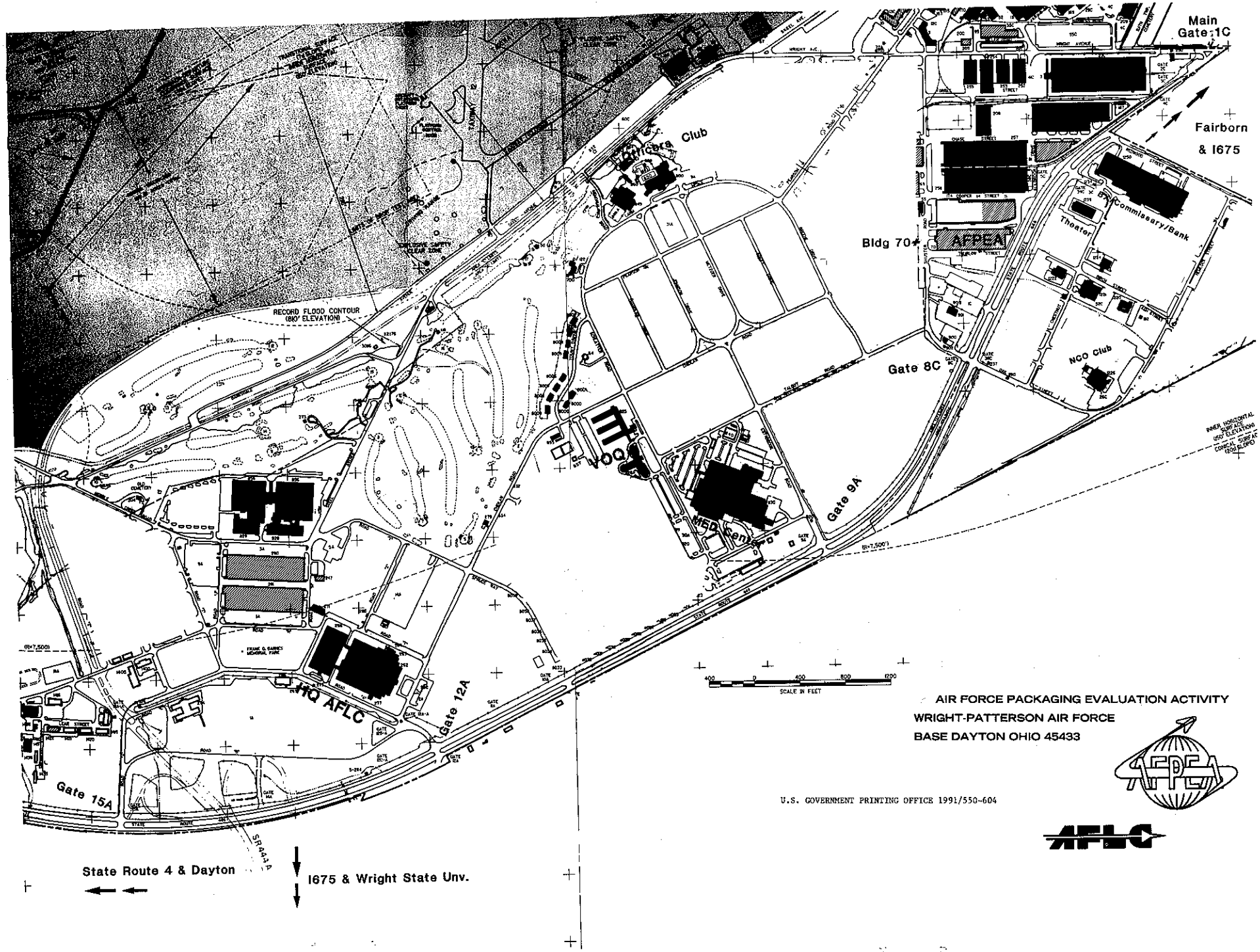
b. STATIC DECAY METER:

PEAK CHARGE:	$\pm$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

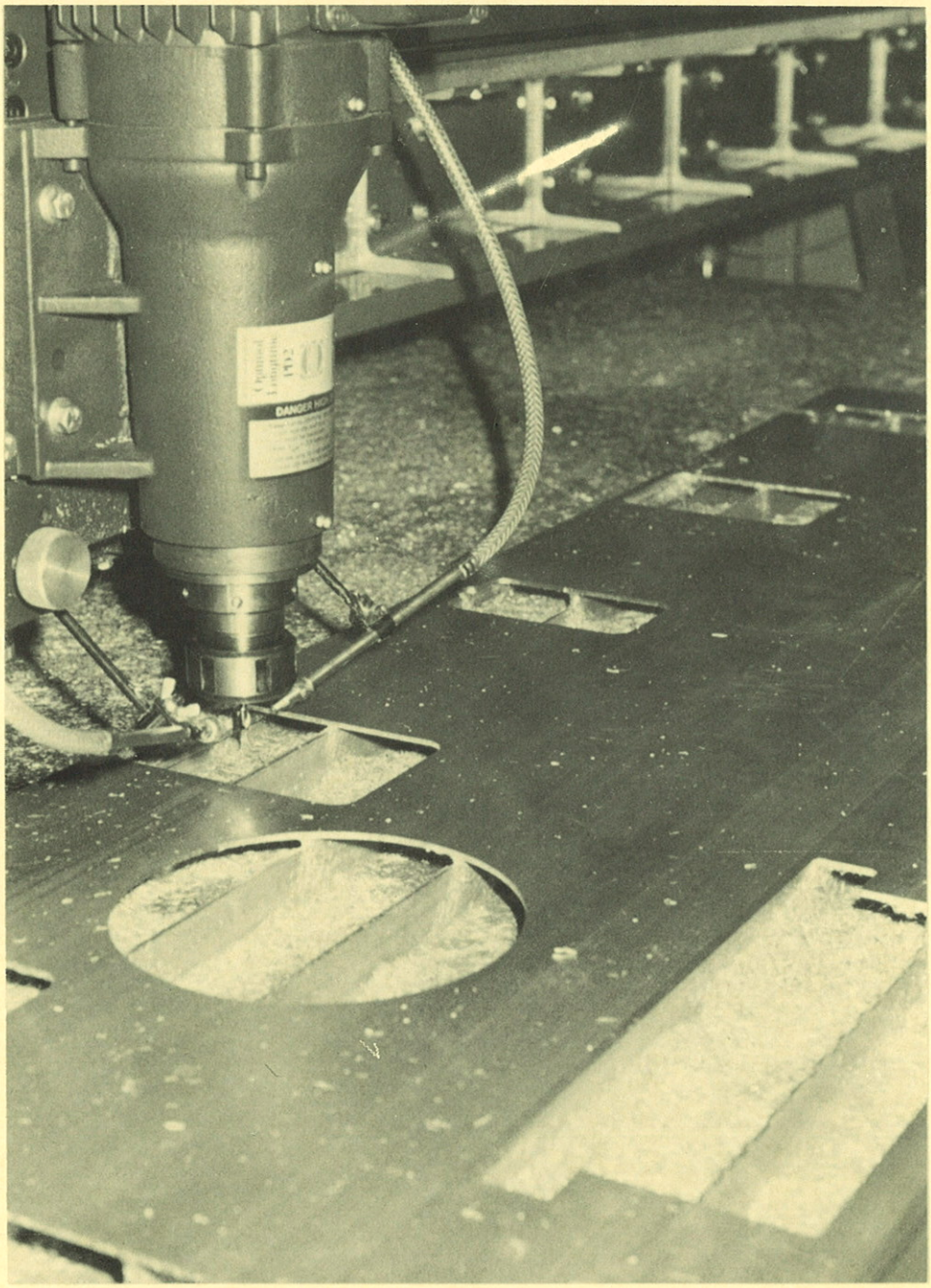
c. KETHLEY ELECTROMETER:

RANGE: 100 ohms full scale to 10^{14} ohms in twenty-five linear 1x and 3x ranges

ACCURACY: $\pm$3 percent of full scale on 100 to 10^{10} ohm ranges using the largest available multiplier setting; $\pm$5 percent of full scale on 3 x 10 ohm ranges.



U.S. GOVERNMENT PRINTING OFFICE 1991/550-604



SPINDLE CUTTING SYSTEM

AFPEA puts big production techniques to work in design, prototyping, and testing.