AFLC PAMPHLET 71-7
24 April 1989

ANNUAL REPORT

1988

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

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

REPLY TO
ATTN OF: DS

SUBJECT: Air Force Packaging Evaluation Activity (AFPEA) Annual Report

TO: AFPEA Report Recipients

1. During 1988, Mr Jack E. Thompson, Director of the AFPEA, retired after 16 years with the organization. He will certainly be missed. Mr Thompson was replaced by Mr Charlie P. Edmonson who was previously a Program Manager in the Materials Handling Engineering Division.

2. The Activity has been involved extensively in the process of making numerous changes in container design to cut costs and lead time required for container development. Changes included improvement in the use of computer-aided design to implement the standardized aluminum container design. The use of standard container component parts such as extrusions, fasteners, closure configuration, pressure equalization valves, etc., have added to reliability and quality in Air Force programs. In addition, the AFPEA can now develop, prototype, test, make immediate design changes, and manage procurement of initial container and container system buys for major Air Force programs. The text of this report gives an overview of the support being provided to many of the weapon systems which assist in maintaining our future defense posture.

3. With very recent capability improvements, the future for AFPEA's technological progress in packaging engineering work and guidance is increasing rapidly. We look forward to providing better quality in the packaging, container design, and maintenance-free, long-term storage of valuable Air Force assets. Further implementation of the new AFPEA container design and development process will continue to reduce program costs and improve reliability.

4. 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 are looking forward to continued cost effective improvements in new materials and container designs to assist in making progress in supporting our weapons systems.

Don Via

RONALD D. VIA, Col, USAF
DCS/Distribution

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

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AIR FORCE PACKAGING EVALUATION ACTIVITY

This pamphlet is developed to detail project accomplishments for the calender year of 1988.

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AFPEA MISSION

THE AIR FORCE PACKAGING EVALUATION ACTIVITY PROVIDES THE DEPARTMENT OF THE AIR FORCE WITH AN ENGINEERING CAPABILITY THAT IS AVAILABLE TO ALL MAJOR COMMANDS AND TO CERTAIN OTHER FEDERAL AGENCIES. TO ASSURE DYNAMIC ENGINEERING AND TECHNICAL PROGRESS IN PACKAGING, THE AFPEA INVESTIGATES, DESIGNS, DEVELOPS, TESTS, AND EVALUATES CONTAINERS, MATERIALS, METHODS, AND TECHNIQUES. THE ACTIVITY:

- IS RESPONSIBLE FOR AN AVERAGE OF 80 PROJECTS.
- MAINTAINS 44 SPECIFICATIONS AND STANDARDS.
- IS AIR FORCE CUSTODIAN AND COORDINATOR OF OVER 350 SPECIFICATIONS AND STANDARDS.
- IS LEAD SERVICE ACTIVITY FOR TESTING IN 12 ASSIGNED AREAS.

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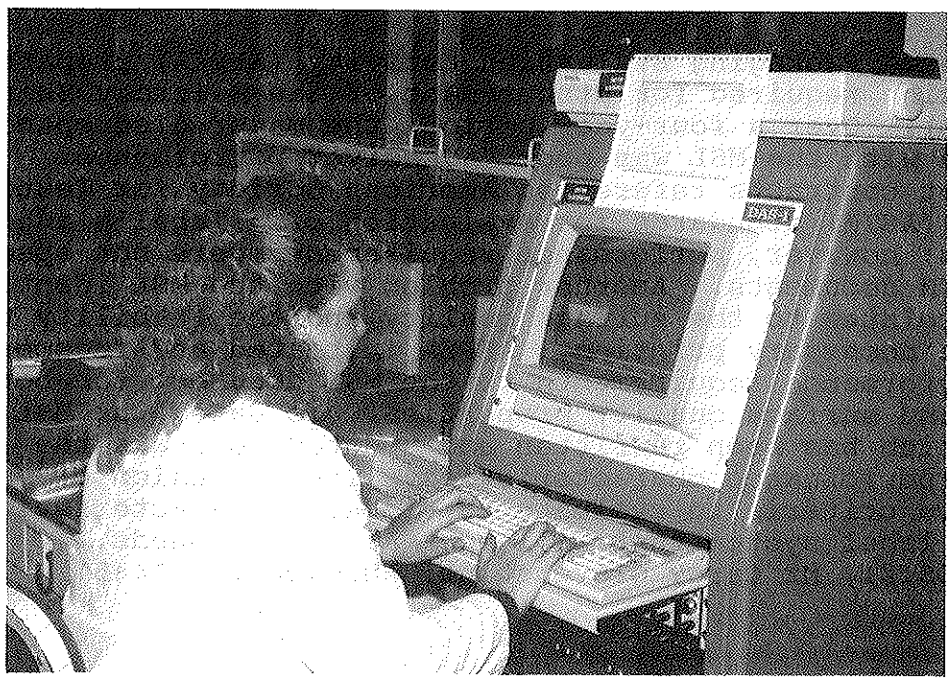
DATA ACQUISITION SYSTEMS

The Air Force Packaging Evaluation Activity (AFPEA) has acquired three data acquisition systems designed to provide general purpose recording and analysis of data. Each unit is a complete stand alone system for data acquisition and analysis. Each is capable of sampling up to 32 channels, with a maximum aggregate throughput of 27,500 samples per second. The machines are capable of storing the data on disc at the maximum transfer rate. Signal conditioning is included for up to nine strain gage inputs as well as nine accelerometer inputs. Anti-aliasing filters are available and are set at 500 Hertz. Transducers are available for measuring pressure, acceleration, temperature and relative humidity. Analysis software permits careful examination of the data, including the ability to perform Fast Fourier Transforms on the data. Data may be transferred to the AFPEA VAX or to a Z-248 micro-computer for further examination.
(HQ AFLC/DSTZD, Mr Mark Boals, AUTOVON 787-8236)



RETESTING OF THE M-16 RIFLE CONTAINER

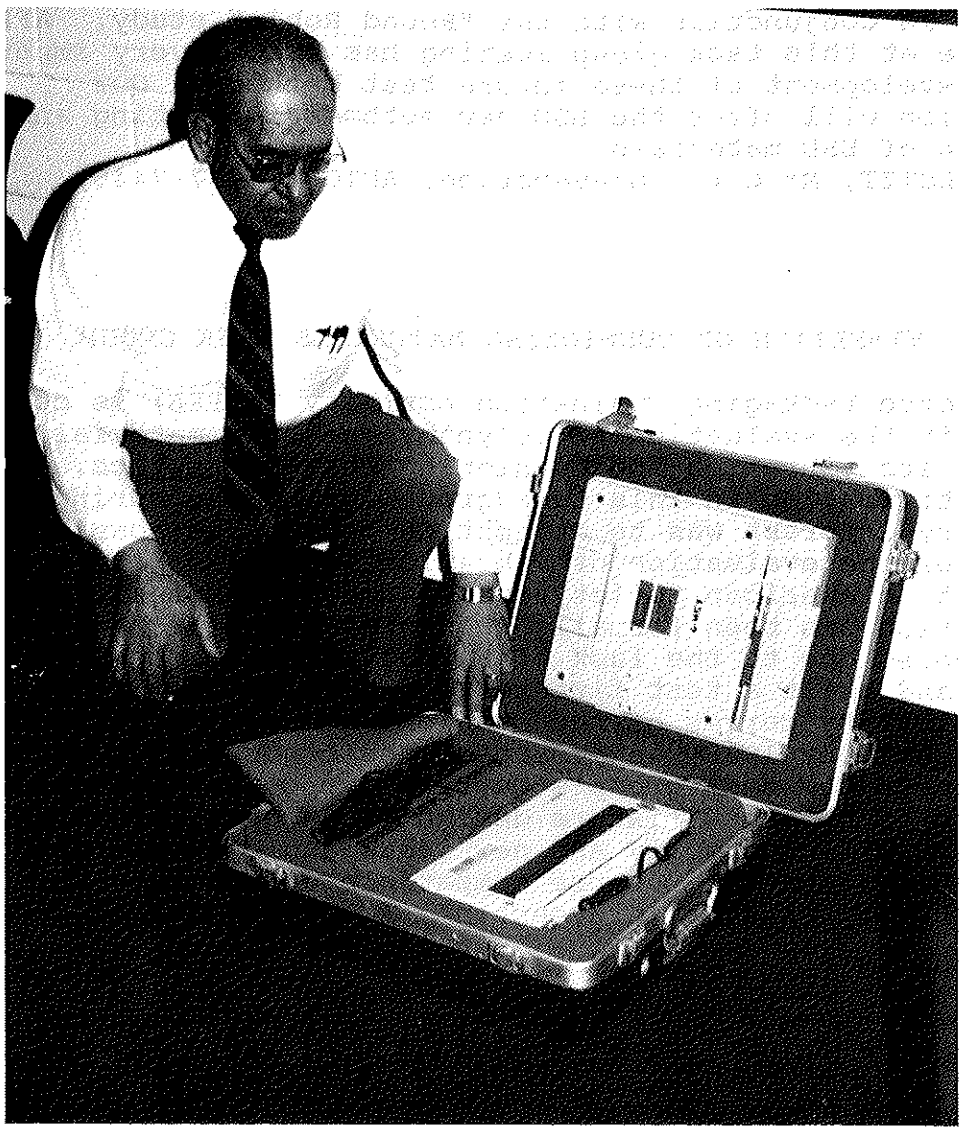
At the request of Warner Robins Air Logistics Center (WR-ALC/DSTD) Robins Air Force Base (AFB) Georgia, the Air Force Packaging Evaluation Activity (AFPEA) began retesting the M-16 rifle container. This was initiated when bowing problems and corrosion on rifles were identified by a reserve unit at Carswell AFB Texas.

In October 1988, two containers were sent from Carswell AFB to AFPEA, along with two containers from WR-ALC. A container weighing 60 pounds from Carswell AFB was subject to a superimposed load of 1440 pounds and a leakage test. The container was permanently deformed 5/8 inch during the superimposed load test and was unable to hold pressure during the post leakage test. A container from WR-ALC was subject to the same tests as the Carswell AFB container with the same results. It has been determined that the bowing problem experienced by the Carswell AFB container was created by low container weight. A similar problem occurred during first article testing. To correct the problem the contractor added material to the container, changing the weight from approximately 60 to 68 pounds. It appears that the contractor did not change the amount of material for the production containers. AFPEA has recommended to WR-ALC/DSTD to contact the item manager to accept only those containers that weigh the same as the qualified containers.

Another concern of the containers was corrosion on the rifles at Carswell AFB. However, WR-ALC/DSTD personnel visited Moody AFB, Georgia and found no corrosion on M-16 rifles. Therefore, to ensure that the corrosion at Carswell AFB is not from saturated desiccant or improper handling, it was recommended that representatives from WR-ALC witness repacking of some weapons to determine if deficiencies exist.
(HQ AFLC/DSTZD, Mrs Susan Hughey, AUTOVON 787-3362)

Z-184 COMPUTER ENSEMBLE CASE FOR GLOBAL TRAVEL

On 16 Sep 88, the Air Force Institute of Technology (AFIT) requested the Air Force Packaging Evaluation Activity to design/ provide by 7 Nov 88 six each air-transportable, suitcase type containers for their training computer ensembles each consisting of a Z-184 laptop computer, Brother M-1109 portable printer, and power supply. This equipment is frequently used in teaching the Combat Logistics course, LOG 299 at various locations and had to go as carry-on baggage for lack of a suitable shipping case. On the required date, six suitably sized surplus cases; cleaned, painted, and outfitted with appropriately designed foam cushioning, were delivered to make their first overseas trip. AFIT was happy to report, "that the cases protected our computers throughout the trip."
(HQ AFLC/DSTZD, Mr Prisciliano Quijas, AUTOVON 787-3362)



TRANSPARENT STORAGE BAGS EVALUATED

The use of transparent storage bags would significantly reduce annual reinspection times for hand held weapons. Due to the known inferiority of transparent bags, the Air Force has continued to use opaque bags for weapons storage. The Air Force Packaging Evaluation Activity (AFPEA) is conducting an evaluation of the best transparent and the proven opaque storage bags. Indoor storage of hand held weapons (M-16 rifles and handguns) is a major concern of Warner Robins Air Logistics Center (WR-ALC) and the Air Force Logistics Command's Security Police (HQ AFLC/SPT). AFPEA had the lead service activity for preservation, the Army Materiel Command Packaging Storage and Containerization Center (AMCPSCC) Tobyhanna, Pennsylvania, conduct corrosion tests on candidate storage bag contents. Initially, three sets of transparent and one set of opaque bags were tested to determine corrosion protection of steel plates. Sealed bags were placed in sealed fiberboard boxes and subjected to high temperature and high humidity for periods ranging from 17 to 84 days. Results clearly indicated the superiority of the opaque aluminized plastic bags. It is equally apparent that the MIL-B-22019 cold seal barrier material, was the only transparent film which should be considered for intermediate to long-term storage. To establish the relationship between humidity chamber results and actual indoor warehouse storage, a two year evaluation program will be established at four continental Unites States locations. The resultant could be the establishment of acceptable storage periods for transparent MIL-B-22019 film bags at designated stateside locations.
(HQ AFLC/DSTZT, Mr Avery Watson, AUTOVON 787-7445)

PERFORMANCE ORIENTED PACKAGING ON MAVERICK MISSILE CONTAINERS

Ogden Air Logistics Center (OO-ALC/MMWMM), Hill Air Force Base, Utah requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) to conduct Performance Oriented Packaging (POP) testing on a fiberglass Maverick missile container (CNU-263/E) and a steel Maverick missile container (CNU-131/E). Also, the Maverick missile program office requested that AFPEA conduct POP testing on the CNU-399/425 and CNU-445/447 containers.

The CNU-263/E and CNU-399/425 containers were designed and fabricated by Plastics Research Corporation, Santa Fe Springs California. The CNU-131/E container was manufactured by the Champion Company, Springfield Ohio. The CNU-445/447 container was designed by AD/YBA, Eglin AFB. The containers are environmentally sealed with a humidity indicator, desiccant port, and a pressure relief valve. The containers are designed to protect one AGM-65 all-up-round Maverick missile during world-wide shipment, storage, and handling. The containers will also be used for one missile without the guidance unit and for one missile without the guidance unit and the hydraulic actuation system.

The test plan used for the container was derived from United Nation (UN) Standard, UN "Transport of Dangerous Goods", and DOD Hazardous Materials Packaging Test Plan.

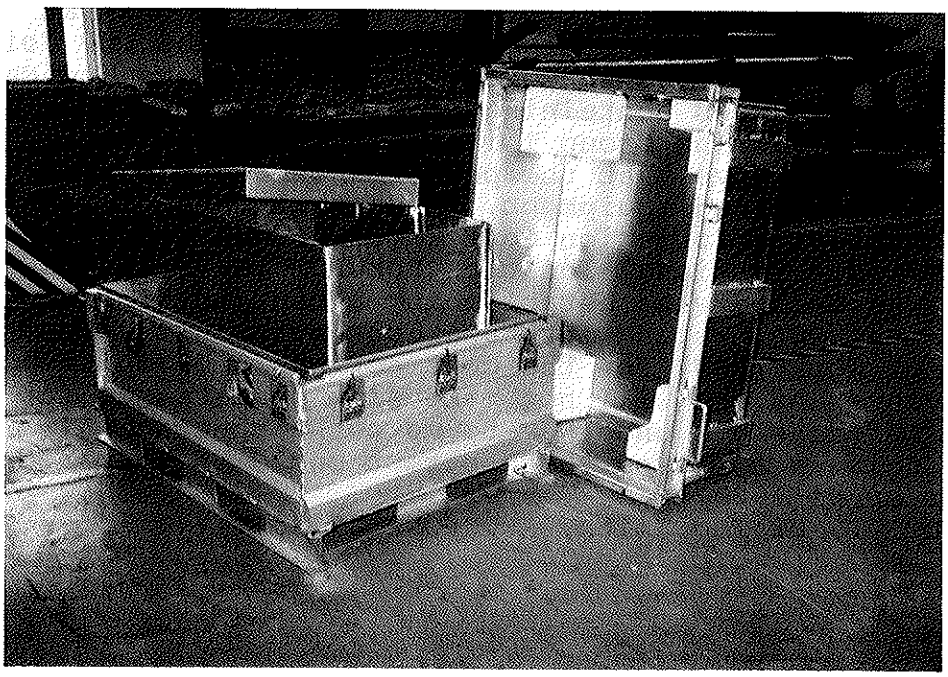
Results of the tests conducted on the containers were acceptable. The containers did successfully pass the POP tests, as prescribed by the UN test criteria.
(HQ AFLC/DSTZD, Mrs Susan Hughey and Mr Larry Nugent, 787-3362)

ALUMINUM CONTAINER DESIGN

The Air Force Packaging Evaluation Activity (AFPEA) has completed the in-house design, prototyping, and qualification testing of their second aluminum container, an antenna container. Two more containers for an Infrared Detection Set (IDS) and a radome are in the design phase with metal work starting on the IDS container.

The in-house design and development of containers has reduced program cost and the lead time required for container development. Many of the changes required during the design and development phase of the container program can now be done quickly and easily without the long lead time required for contract modification and cost increases. Standard container design can be controlled and promoted by the government when done in-house, in lieu of contracting to an independent contractor who has little concern for a standard container design.

The containers designed and developed can be procured via a small business set aside request for quote (RFQ). Normally 100 to 150 bid packages are sent out to private industry, with approximately 25 to 30 of those responding with bids. The companies are extremely competitive and the costs are reasonable.
(HQ AFLC/DSTZD, Mr Ted Hinds, AUTOVON 787-3362)



COMBAT TALON II CONTAINER DEVELOPMENT

The Air Force Packaging Evaluation Activity (AFPEA) is providing engineering support to the Combat Talon II (CT II) program office in the design of worldwide shipping and storage containers for ten items of CT II support equipment: ku-band antenna, x-band antenna, infrared detection set (IDS), radome and six line replaceable units (LRUs). CT II is a modification of the MC-130H aircraft, providing added protection to cargo and personnel by terrain following, enemy avoidance, and weather guidance. As a cost-saving factor, some of the container designs will incorporate handling devices. Many of the containers will use standard aluminum extrusions, with the following special features: a water lip, silicone gasket, desiccant port, cover standoffs, latches, and skids.

The aluminum ku-band antenna container design features include wheels, a yoke system and a cradle system. The inverted cover will serve as a receptacle for a downloaded antenna. In the past year, level II drawings and testing were completed for the ku-band antenna container.

In June 1988, design and prototyping of the aluminum x-band antenna container began. The design features include a cradle system, eight corner pads and a support structure that secures a downloaded antenna. The container testing started in September 1988 and was completed in December 1988. A fit check with the cradle system and an actual antenna was completed on 28 November 1988 at Edwards Air Force Base. The level II drawings were completed in December 1988.

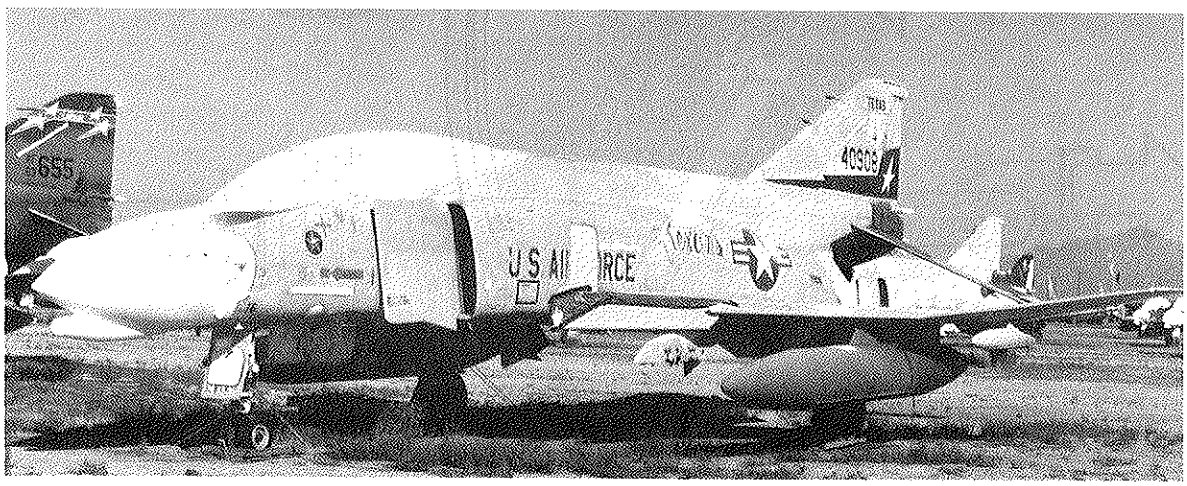
During 1988, design and prototyping of the IDS container began. The IDS container design includes a cradle system that interfaces with an IDS handling ring developed by Texas Instruments. Level II drawings and prototyping plan to be completed in early 1989.

The aluminum radome container design was conceptualized during 1988. The container dimensions will be approximately eight feet square and will have four sections. The inverted top section will act as a receptacle when downloading a damaged radome. The radome will require only physical and mechanical protection.

The six LRU were initially planned to utilize the existing multi-application containers referenced in MIL-STD-2073A, with slight modifications. However, after testing it was determined the containers would not provide the necessary protection for the LRUs. As an alternative, containers were ordered directly from the manufacturer with all required features. In December, containers were ordered with delivery scheduled for early in 1989. Testing should be completed during first quarter 1989. (HQ AFLC/DSTZD, Mrs Caroline Buckey and Mrs Susan Hughey, AUTOVON 787-3362)

EVALUATION OF AIRCRAFT PROTECTIVE SYSTEMS

In support of Aerospace Maintenance and Regeneration Center (AMARC), Davis-Monthan Air Force Base (AFB), Arizona, this activity is conducting an evaluation of existing and potential aircraft protective systems. Currently, approved systems include the spray-on-coatings and reusable tailored covers, "baggies". Acceptability of additional candidate systems will be determined during a two phase program. Phase one will be a seven month 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 degrees F at 0700 hours to 80 degrees F at 1130 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 will involve the on-site exposure of protected F-4C aircraft and their periodic inspection. Candidate systems for both phases will include proven systems, throw-away "baggies" and the first shrink films formulated for four year AMARC exposure. The films will be loaded with ultra violet protective additives. Test results and critical fiscal restraints then will determine AMARC's aircraft preservation methods.
(HQ AFLC/DSTZT, Mr Avery Watson, AUTOVON 787-4475)



F-15 -4 CONFORMAL FUEL TANK CONTAINER

The F-15 System Program Office, ASD/VFL, requested assistance from the Air Force Packaging Evaluation Activity (AFPEA) to design, prototype, and test a shipping and storage container for the -4 conformal fuel tank. AFPEA assisted in the redesign and evaluation of a wooden shipping container, but now a reusable, environmentally sealed container is required.

AFPEA will design the container using standard aluminum extrusions. Fabrication of two prototype containers and the test load will be contracted due to the size of the container (estimate 402 inches long by 48 inches wide by 72 inches high).

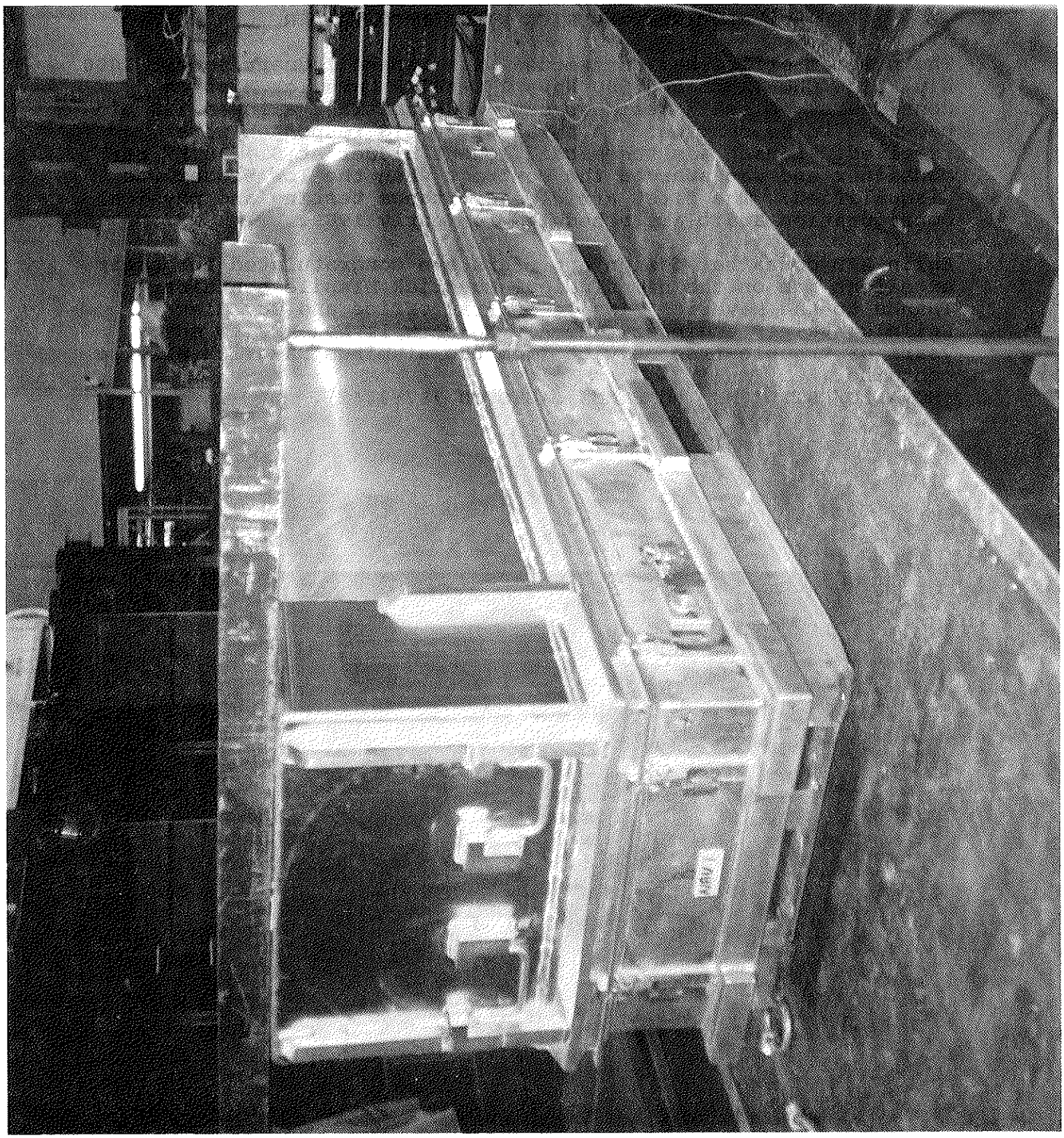
AFPEA will test the containers in early 1990.
(HQ AFLC/DSTZD, Mr Larry Nugent, AUTOVON 787-3734)

CONTAINER SYSTEM FOR LOW FRAGILITY AVIONICS

The low G container system consists of a set of four containers capable of providing 15G protection for sensitive avionics equipment. These containers will accommodate items ranging in weight from 10 to 91 pounds with dimensions up to 24 X 20 X 20 inches. The system is stock listed, and available for selection as a multi-application container in MIL-STD-2073-1B. Warner Robins Air Logistics Center has assigned an item manager to control this system and is in the process of procuring these containers in quantity for future program requirements.
(HQ AFLC/DSTZT, Mr Larry Wood, AUTOVON 787-4519)

COMPUTER-AIDED DESIGN SYSTEM

The Computer-Aided Design System (CADS) used for the development of special packaging instructions (SPIs) has been made easier with the personal computers (PCs) and increased productivity. The PCs with Autocad software for graphics have proven to be a more cost effective method of developing SPIs than either the drafting board or mini-computer. Specialized container designs based on a previous design can be done in about one-fourth the time of the original design, provided the basic concept remains the same. New specialized container designs can be accomplished in as little as one month depending on the internal shock attenuation system.
(HQ AFLC/DSTZD, Mr Ted Hinds, AUTOVON 787-3362)



FIBERGLASS MAVERICK MISSILE CONTAINER

During 1988, the Air Force Packaging Evaluation Activity (AFPEA) has supported the Maverick Missile system program office, ASD/SDML, with fiberglass container development. The support work included qualification testing of two additional sources to manufacture the fiberglass containers and evaluating engineering change proposals (ECP) for the current contract.

The first contractor delivered four containers in November 1987. These containers were unable to hold pressure and the cradle system was out of tolerance. The contractor submitted six additional containers in February and April 1988 for qualification testing; however, the containers did not pass testing. Deficiencies included broken straps, inability to pass leak tests after rough handling, cracks developed in the forward clamp during rough handling, and delamination in the base and around the desiccant basket.

The second contractor delivered two prototype containers in April 1988. Deficiencies in the containers included base cushion not glued down, inability to pass post leak tests after rough handling, cracks in the forward clamps after rough handling, and delamination. These containers did not pass qualification testing.

In September 1988, containers were delivered to AFPEA from the current contractor to evaluate two ECPs (squaring blocks and change in manufacturing technique of the cradle clamps). The ECP testing was completed during December 1988, which the containers passed.
(HQ AFLC/DSTZD, Mrs Susan Hughey, AUTOVON 787-3362)

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)

8. DYNAMIC CUSHION TESTER:

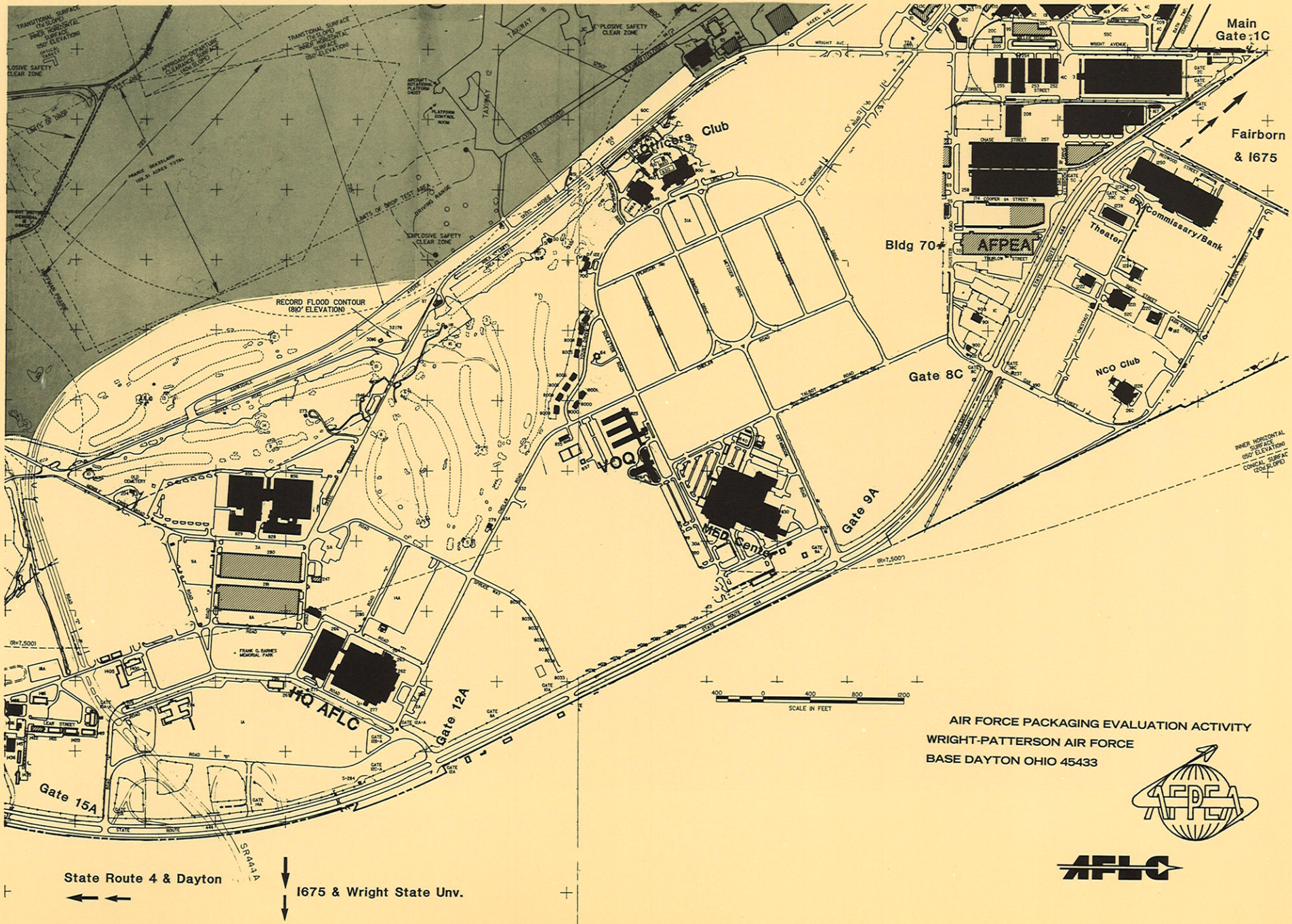
CUSHION SIZE:	8 x 8 (20 cm x 20 cm)
DROP HEIGHT:	90 maximum (229 cm)
STATIC STRESS RANGE:	.065 to 1.6 pounds per square inch
LIFT SYSTEM:	Variable speed electric motor
GUIDE BEARINGS:	Linear ball and radial ball

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)



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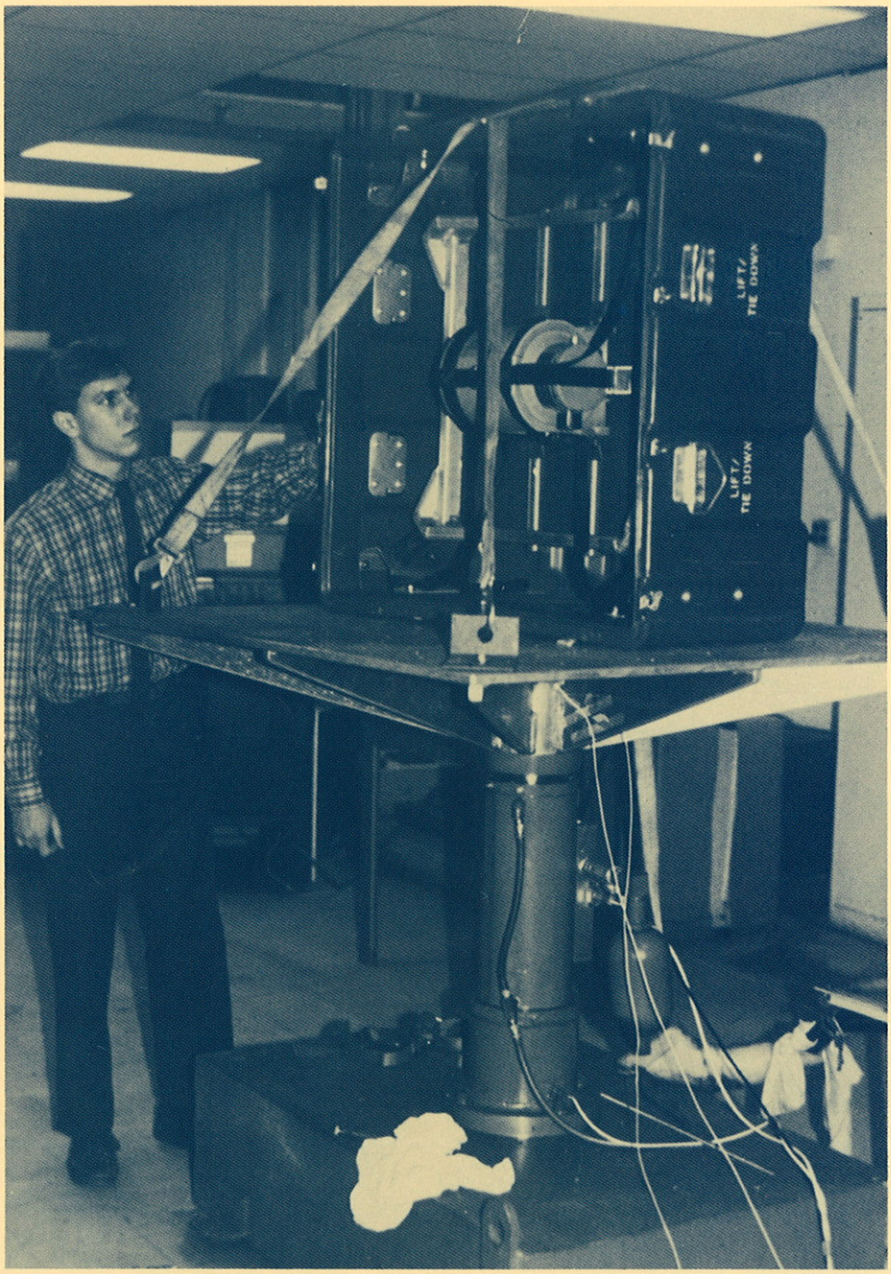
AFLC



ONE TEST IS WORTH A THOUSAND EXPERT OPINIONS