

LEAF

U S ARMY

12⁹

MATERIEL DEVELOPMENT AND READINESS COMMAND

PROGRAM ACCOMPLISHMENTS

MANUFACTURING

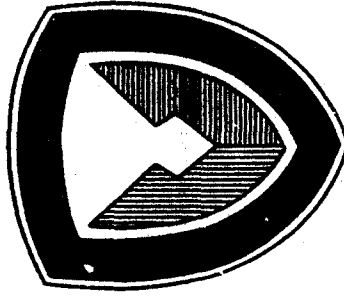
METHODS

&

TECHNOLOGY

AD A082514

See 1473 in back



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PREPARED BY

FEB 80

MANUFACTURING TECHNOLOGY DIVISION

U S ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY

ROCK ISLAND, ILLINOIS 61299

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US ARMY
DEPARTMENT OF THE ARMY
INDUSTRIAL BASE ENGINEERING ACTIVITY
ROCK ISLAND, ILLINOIS 61299

11 MAR 1980

DRXIB-MT

SUBJECT: MM&T Program Accomplishments

SEE DISTRIBUTION

1. Reference is made to AR 700-90, Cl, Para 3-8e(2), Logistics, Army Industrial Preparedness Program, dated 10 March 1977.
2. This brochure illustrates some of DARCOM's MM&T Program accomplishments. It presents the achievements by Major Subordinate Command with emphasis on illustration of the types of projects pursued. The purpose of the document is to publicize results of the program and thereby promote communication and increase technology transfer.
3. This document is published periodically based on the results of MM&T projects. DARCOM elements are requested to take action to assure that accomplishment information will be available at the conclusion of projects in order to publicize the program.
4. Further information on the projects illustrated in this brochure should be obtained from the MM&T representatives, project officers shown, or from Mr. John Petrone, Acting Chief, Manufacturing Technology Division, AV 793-5113.


JAMES W. CARSTENS
Acting Director

Industrial Base Engineering Activity

INTRODUCTION

The Army Manufacturing Methods and Technology (MMT) Program was begun in 1964. The purpose of the program was to develop new manufacturing processes that could be applied to the production of Army items. Over the years hundreds of these projects have been funded and used to develop new technology. This brochure records the results of some of those projects.

The project results are divided into DARCOM major subordinate commands. Each project is identified by title, funding, and project number. A brief description is given of the results. A contact point is provided for additional information on technical details.

The purpose of this brochure is twofold: first, to record the results of the MMT Program, and second, to disseminate information on new technology.

TECHNOLOGY TRANSFER

Much literature has been written recently about how to transfer technology from the "laboratory" to actual production. It is often difficult to make this transition. The fact remains, however, that the full benefits of the new technology can only be obtained if the process or technique is actually implemented in production. The Army is trying to place more emphasis on this phase of the project cycle. An important step will be to assure documentation of project results and the potential benefits. This information will then be more widely disseminated throughout the Army in order to spread the knowledge to potential users. This will be accomplished through end of project demonstrations; preparation of technical reports, project summary reports, and technical notes; and, through inclusion of technology information in bulletins and journals. All of these techniques, however, serve only to disseminate the information. Real benefits can only accrue when the new technology is implemented.

Each action officer dealing with MMT projects should be stressing the need for implementation and taking an active role in assuring that implementation is being carried out by the producers of Army materiel.

ACQUISITION	
DATE	1/2/72
BY	John J. ...
DIST	
AVAILABILITY	
SPECIAL	

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272 9366 Part B High Power Traveling Wave Tubes with Improved Heat Tolerance

274 9470 Fast Rise-High Altitude Meteorological Ballon

274 9523 Manufacturing Methods for the Production of Infrared Filters

274 9535 Production of a Four Stage Thermoelectric Cooler

272 9641 Development of Interface between CAD and CAM for Communications and Electronics Packages

276 9732 Fabrication and Attachment of Heat Pipes to Thyristor Wafers

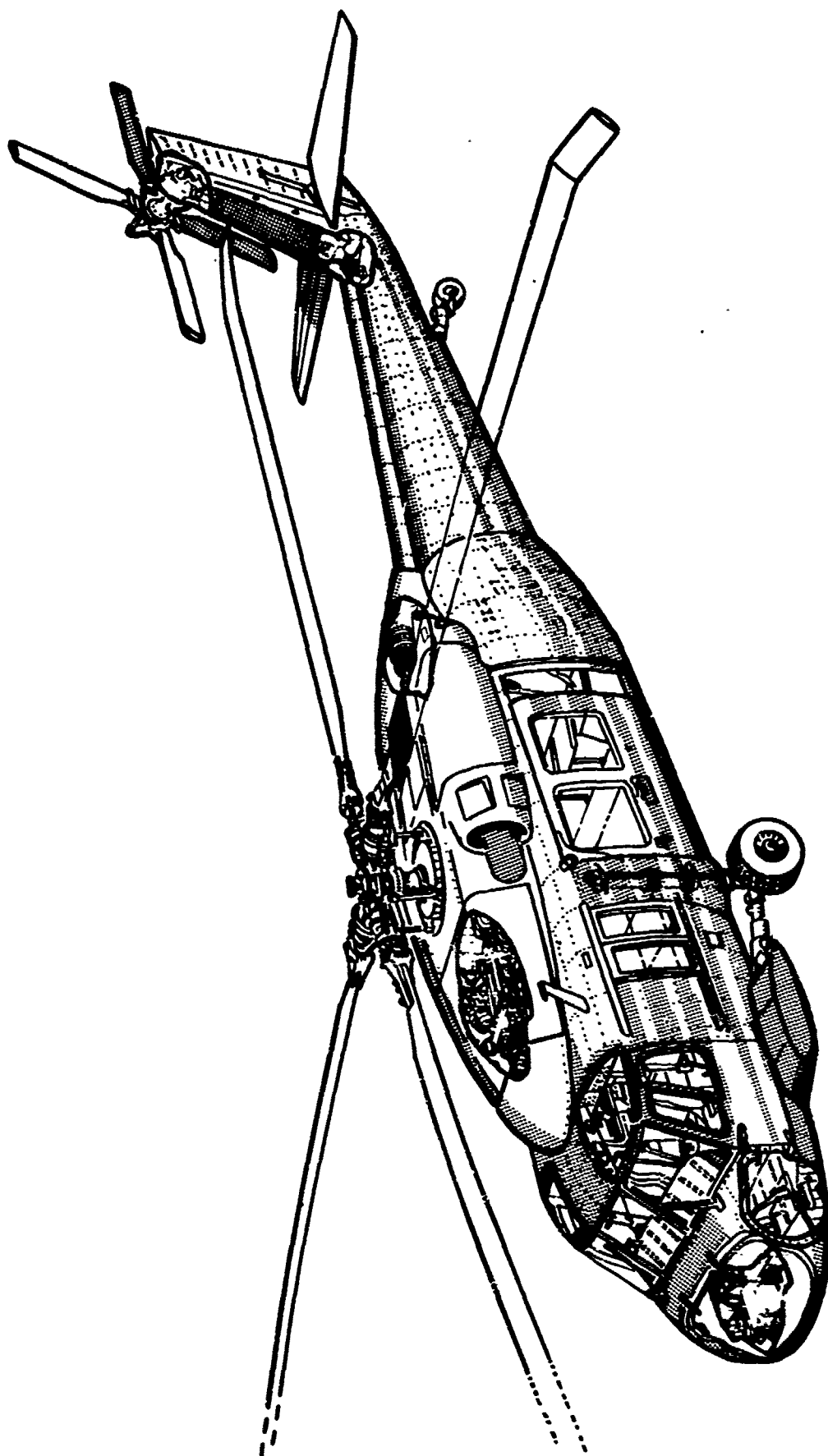
277 9832 Automatic Wire Wrap Verifier

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**AVIATION R&D COMMAND
(AVRADCOM)**

AVRADCOM

MM&T Representatives:

AV 698-6476
(314) 268-6476

Mr. Robert Vollmer
US Army Aviation Systems
R&D Command
DRDAV-EXT
12th & Spruce Streets
St. Louis, MO 63166

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

AUTOMATED TAPE LAYUP

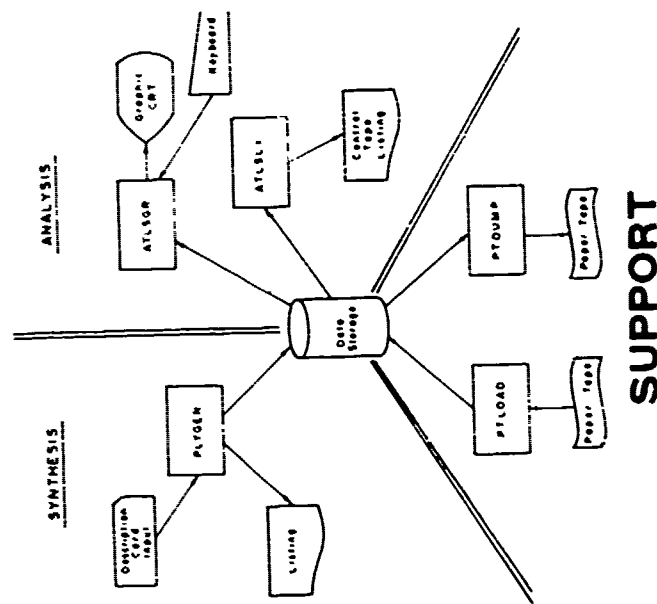
PROJECT NO: 1 75 8162

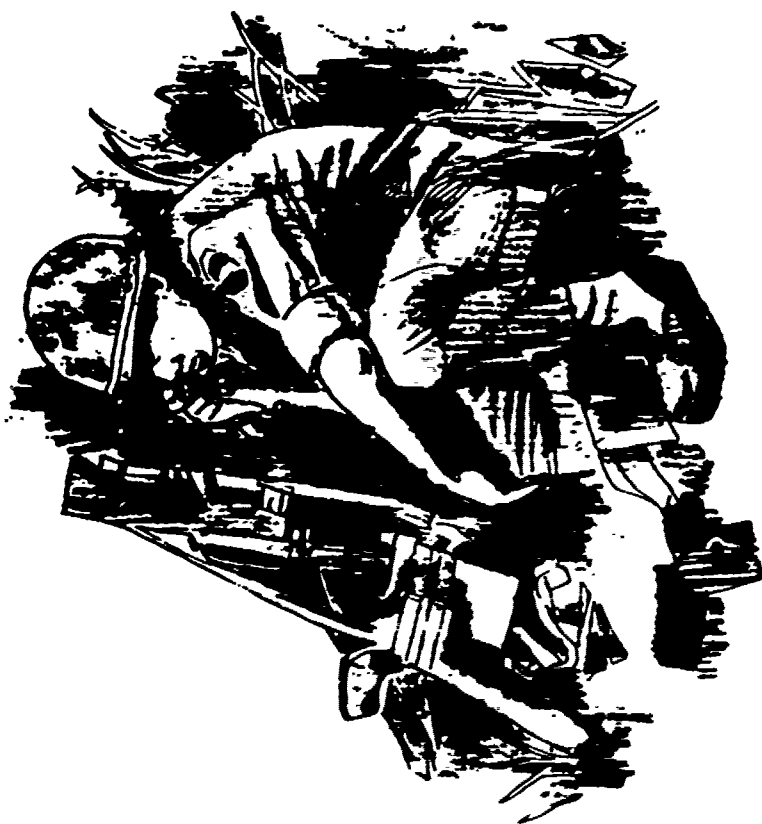
TITLE: FEASIBILITY OF MODIFYING NC
LANGUAGE FOR THE AUTO-
MATED TAPE LAYUP SYSTEM

COST: \$86,000

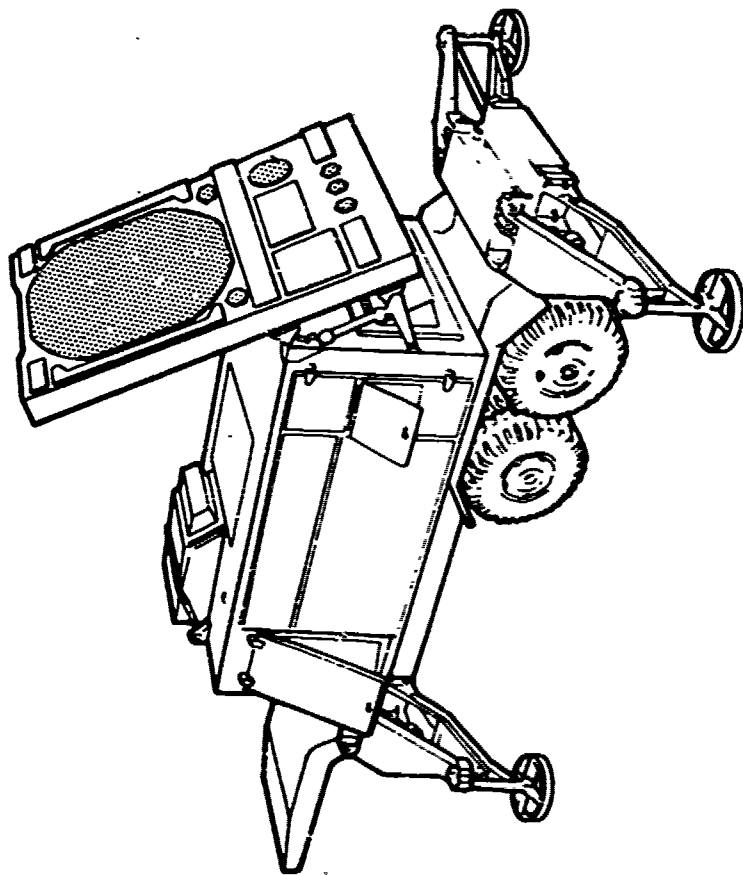
RESULTS

AN INTERACTIVE SOFTWARE SYSTEM
THAT PROVIDES PREPROGRAMMING
CAPABILITIES FOR ROOT LOOP TYPE
COMPONENTS WAS DEVELOPED. THE
SOFTWARE WAS DEVELOPED FOR USE
WITH THE 5-AXIS ATLAS HARDWARE.





COMMUNICATIONS R&D COMMAND (CORADCOM)



ELECTRONICS R&D COMMAND (ERADCOM)

MM&T Representatives:

ELECTRONICS

AV 995-2541
(201) 544-2541

Dr. Clarence G. Thornton
US Army Electronics Research and
Development Command
DELET-D, Bldg. 2700
Ft. Monmouth, NJ 07703

AV 995-4829
(201) 554-4829

Mr. Bernard Reich
US Army Electronics Research and
Development Command (ERADCOM)
DELET-DS, Bldg. 2700
Ft. Monmouth, NJ 07703

AV 290-3330
(201) 394-3330

Mr. James Predham
US Army Electronics Research and
Development Command (ERADCOM)
DRDEL-EP-ED
2800 Powder Mill Road
Adelphia, MD 20783

AV 995-4258
(201) 535-4258

Mr. Joseph Key, MMT Coordinator
US Army Electronics Research and
Development Command (ERADCOM)
DELET-DT
Ft. Monmouth, NJ 07703

AV 992-4950
(201) 532-4950

Mr. Mortin Eichel, MMT Coordinator
US Army Communications and Electronics
Readiness Command (CERCOM)
DRSEL-LE-R
Ft. Monmouth, NJ 07703

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT TRAVELING WAVE TUBES

PROJECT NO: 272 9366 PART A

**TITLE: HIGH POWER TRAVELING WAVE
TUBES WITH IMPROVED HEAT
TOLERANCE**

COST: \$513,811

RESULTS

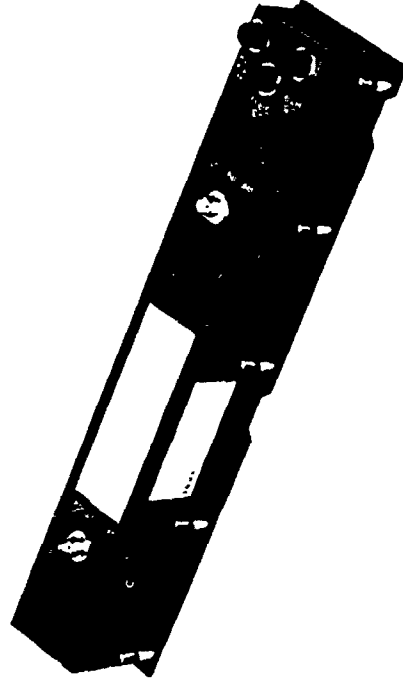
**TELEDYNE MEC DEVELOPED MANUFACTURING
PROCESSES TO UTILIZE SAMARIUM COBALT
MAGNETS IN A 100 WATT CONTINUOUS WAVE
TWT FOR LONGER LIFE AND GREATER GAIN.**

**TELEDYNE ALSO APPLIED SAMARIUM COBALT
MAGNETS TO THEIR TYPE MT1-5001 AND
MT2-5002 TUBES FOR ECM APPLICATIONS.**

**SAMARIUM COBALT MAGNETS IMPROVE TEMPERATURE TOLERANCE
OF THE TUBES AND EXTEND THEIR LIFE.**

**SAMARIUM COBALT MAGNET TECHNOLOGY WAS TRANSFERRED
FROM AFML PROGRAM.**

CONTRACT NO. DAAB05-72-C-5846



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT TRAVELING WAVE TUBES

PROJECT NO: 272 9366 PART B

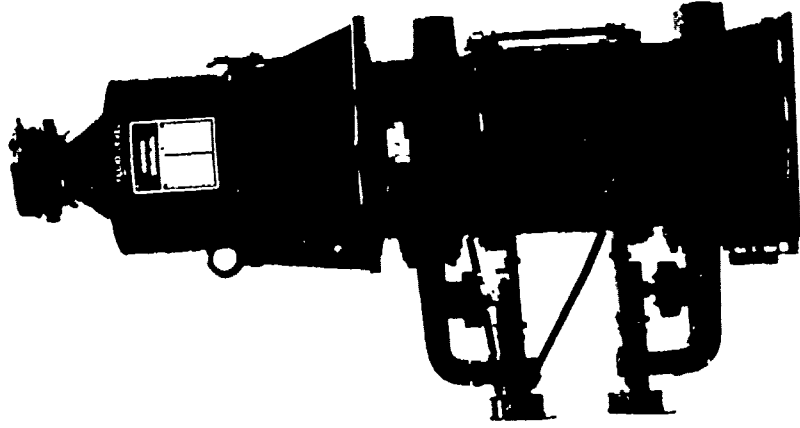
**TITLE: HIGH POWER TRAVELING WAVE TUBES
WITH IMPROVED HEAT TOLERANCE**

COST: \$513,811

BENEFITS

**HUGHES DEVELOPED PROCESSES AND SPECIAL
TOOLING FOR FABRICATING A 10 KILOWATT
CONTINUOUS WAVE TWT WITH VAPOR PHASE
COOLING AND 50% MINIMUM TOTAL SYSTEM
EFFICIENCY OVER A 13% FRACTIONAL
BANDWIDTH.**

**THE VAPOR PHASE COOLING TECHNOLOGY WAS
TRANSFERRED TO VARIAN WHO INCORPORATED
IT IN THEIR 10 KILOWATT CONTINUOUS WAVE
KLYSTRON TUBE FOR THE AN/TRC-170
COMMUNICATIONS SET.**



**CONTRACT
DAAB05-72-C-5863**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

METEOROLOGICAL BALLON

PROJECT NO: 274 9470

TITLE: FAST RISE, HIGH ALTITUDE,
METEOROLOGICAL BALLON

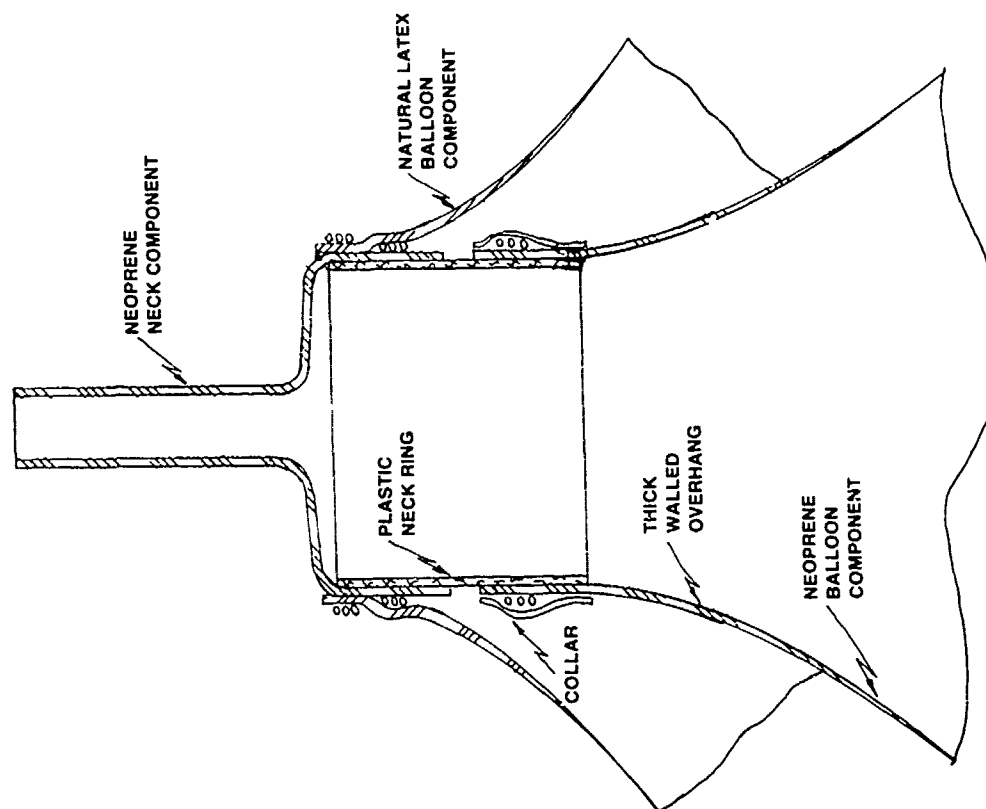
COST: \$97,094

RESULTS

KAYSAM CORP. developed production methods for making double walled meteorological ballons for carrying radiosondes rapidly to 100,000 ft.

Established methods for multiple dipping of neoprene inner sphere and natural rubber outer sphere, and for molding the neoprene neck component.

Also solved dusting problem, inflation stretching, and low altitude burst problem.



SECTIONAL VIEW SHOWING CONSTRUCTION
OF NECK ASSEMBLY

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

INFRARED FILTERS



INFRARED FILTER
FOR AN/VSS 3A
SEARCHLIGHT

PROJECT NO: 274 9523

TITLE: MANUFACTURING METHODS
FOR THE PRODUCTION OF
INFRARED FILTERS

COST: \$43,552

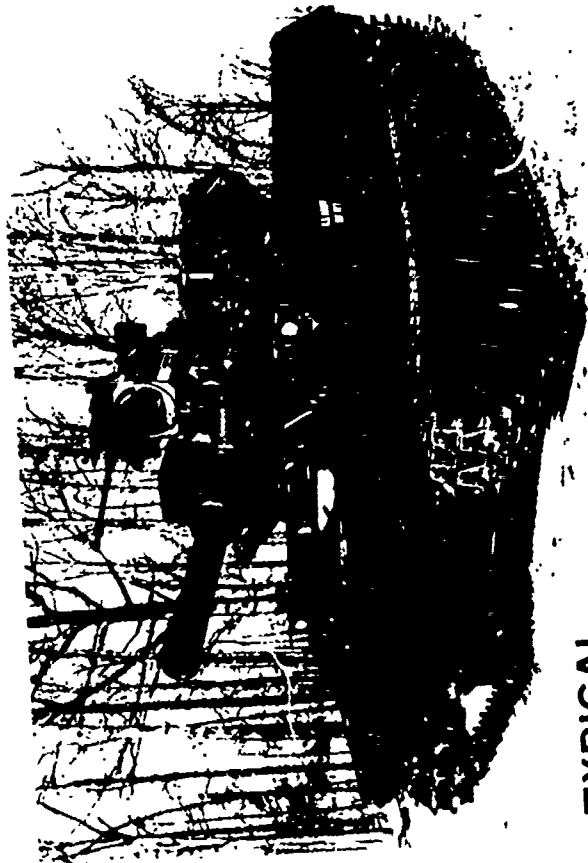
RESULTS

METAVAC ESTABLISHED MANUFACTURING PROCESSES THAT SUBSTANTIALLY REDUCED THE NUMBER OF PINHOLES IN THE FILTER COATING THEREBY IMPROVING SECURITY OF THE SEARCHLIGHT.

PRODUCTION YIELD WAS INCREASED CONSIDERABLY.

FILTER LIFE WAS INCREASED FROM APPROXIMATELY 300 HOURS TO AT LEAST 800 HOURS.

WITH YIELD INCREASED FROM 40% TO 60%, UNIT PRICE WAS SUBSEQUENTLY REDUCED FROM \$400 TO \$225.



TYPICAL
SEARCHLIGHT/
INSTALLATION

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT THERMOELECTRIC COOLER

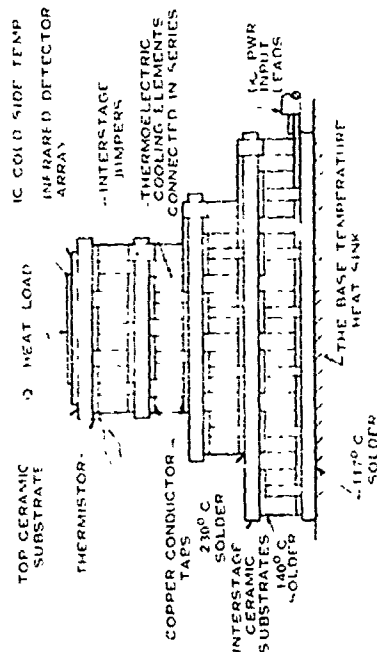
PROJECT NO: 2 74 9535

TITLE: PRODUCTION OF A FOUR
STAGE THERMOELECTRIC
COOLER

COST: \$220,000

RESULTS

A PILOT LINE WAS ESTABLISHED FOR
THE PRODUCTION OF 50 FOUR-STAGE
THERMOELECTRIC COOLERS PER
MONTH. THIS DEVICE IS NOW
AVAILABLE AS A PRODUCTION ITEM.



FOUR STAGE THERMOELECTRIC COOLER

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

INTEGRATION OF CAD + CAM

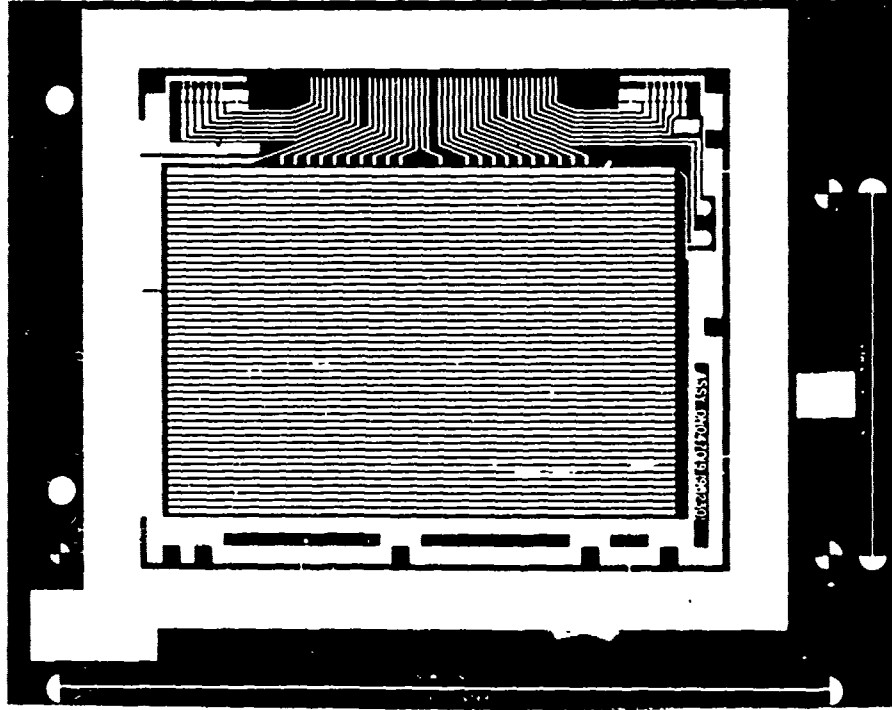
PROJECT NO: 2 72 9641

**TITLE: DEVELOPMENT OF INTERFACE
BETWEEN CAD AND CAM FOR
COMMUNICATIONS AND
ELECTRONICS PACKAGES**

COST: \$200,000

RESULTS

**INTERFACE COMPUTER PROGRAMS
WERE WRITTEN AND A PAPER TAPE
CONNECTION WAS MADE TO LINK AN
AUTOMATIC DRAFTING DIGITIZING
SYSTEM TO AN INTERACTIVE GRAPHICS
SYSTEM. THE RESULTING SYSTEM WAS
USED IN THE FABRICATION OF
DISTRIBUTED PARAMETER MICROWAVE
DEVICES AND MULTILAYER PRINTED
CIRCUIT BOARDS.**



ARTWORK MASTER LAYER 1

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

HIGH POWER THYRISTOR

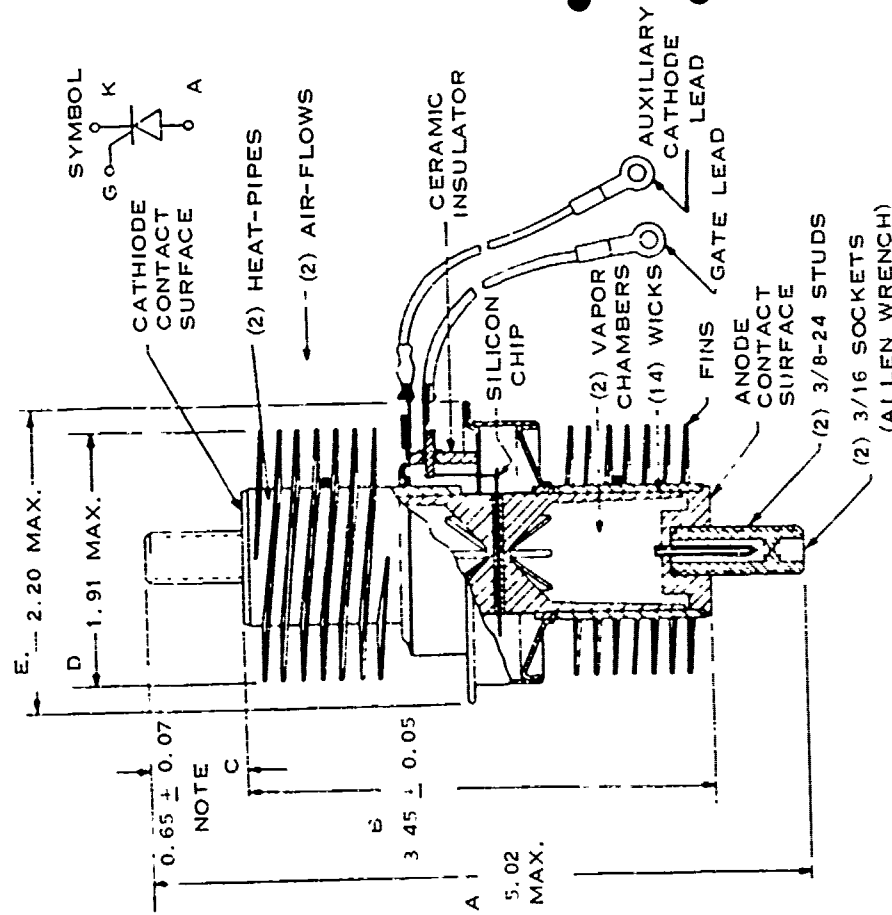
PROJECT NO: 2 76 9732

TITLE: FABRICATION AND
ATTACHMENT OF HEAT
PIPES TO THYRISTOR
WAFERS

COST: \$346,000

RESULTS

- LIGHTER WEIGHT SMALLER SOLID STATE THYRISTOR.
- MAINTENANCE AND LOGISTICS ARE REDUCED.
- IMPROVED RELIABILITY.
- UNITS ARE ALSO AVAILABLE AS COMMERCIAL ITEMS.



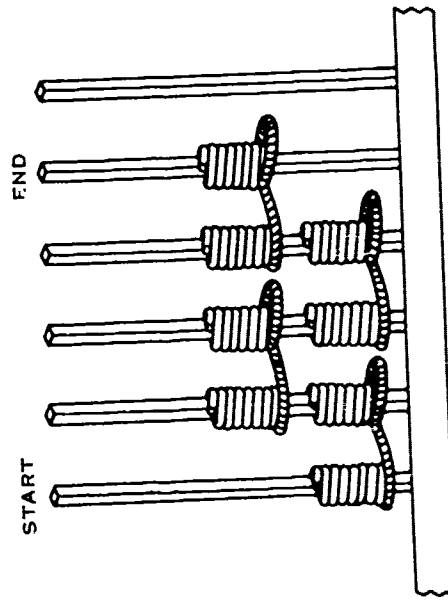
DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

NUMERICAL CONTROL OF WIRE-WRAPPING

PROJECT NO: 2 77 9832

TITLE: AUTOMATIC WIRE-WRAP VERIFIER

COST: \$30K



WIRE-WRAP VERIFIER

RESULTS

A COMPUTER PROGRAM WAS DEVELOPED THAT PRODUCES A NUMERICAL CONTROL (NC) TEST TAPE FOR VERIFYING THE WIRING OF HIGHLY COMPLEX DIGITAL CIRCUITS.

THE SOFTWARE DESIGN WAS BASED ON A ALGORITHM THAT IDENTIFIES KEY POSTS.

THE NC TAPE RUNS ON NC WIRE-WRAPPING MACHINES.

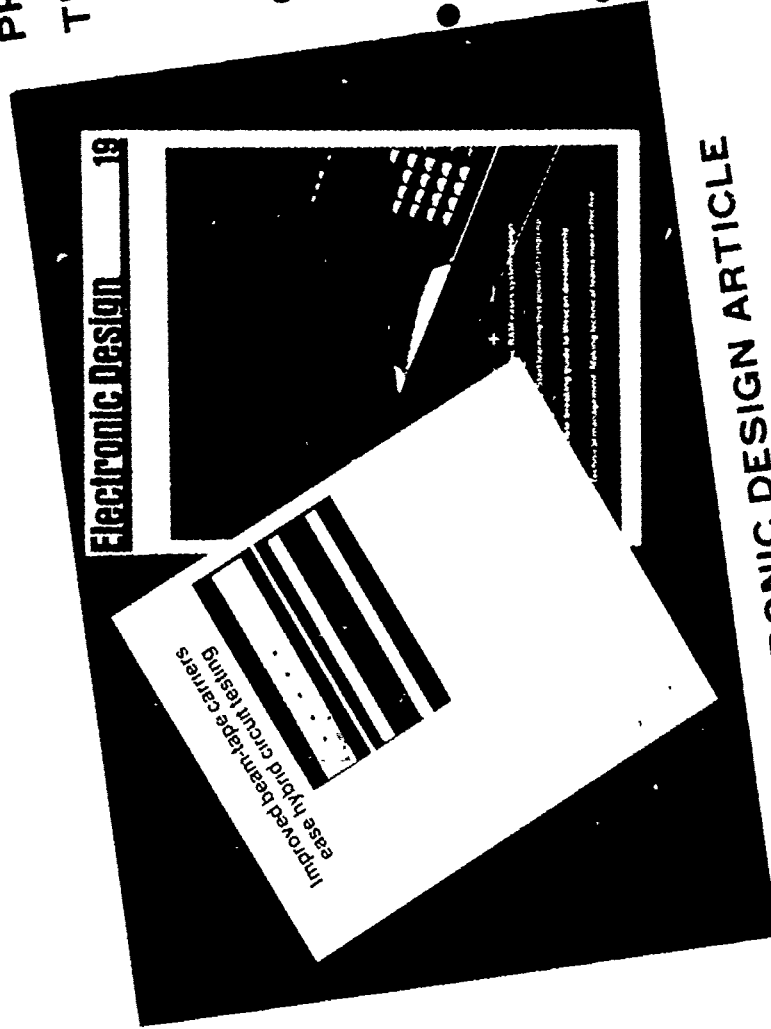
DARCOM PRIOR YEAR MM&T ELECTRONICS ACCOMPLISHMENT

PROJECT NO: H779857
TITLE: MM&T FOR AUTOMATIC
SEPARATION CARRIER
MOUNTING AND TESTING
OF SEMICONDUCTOR DICE.

COST: \$901,885

RESULTS

- Honeywell Avionics Division developed an automated line for assembling hybrid microcircuits.
- A screen printer prints 800 substrates per hour.
- Loading and unloading is automatic.
- An automatic belt furnace preheats, fires and cools the substrates.
- Airveyors move substrates between stations.

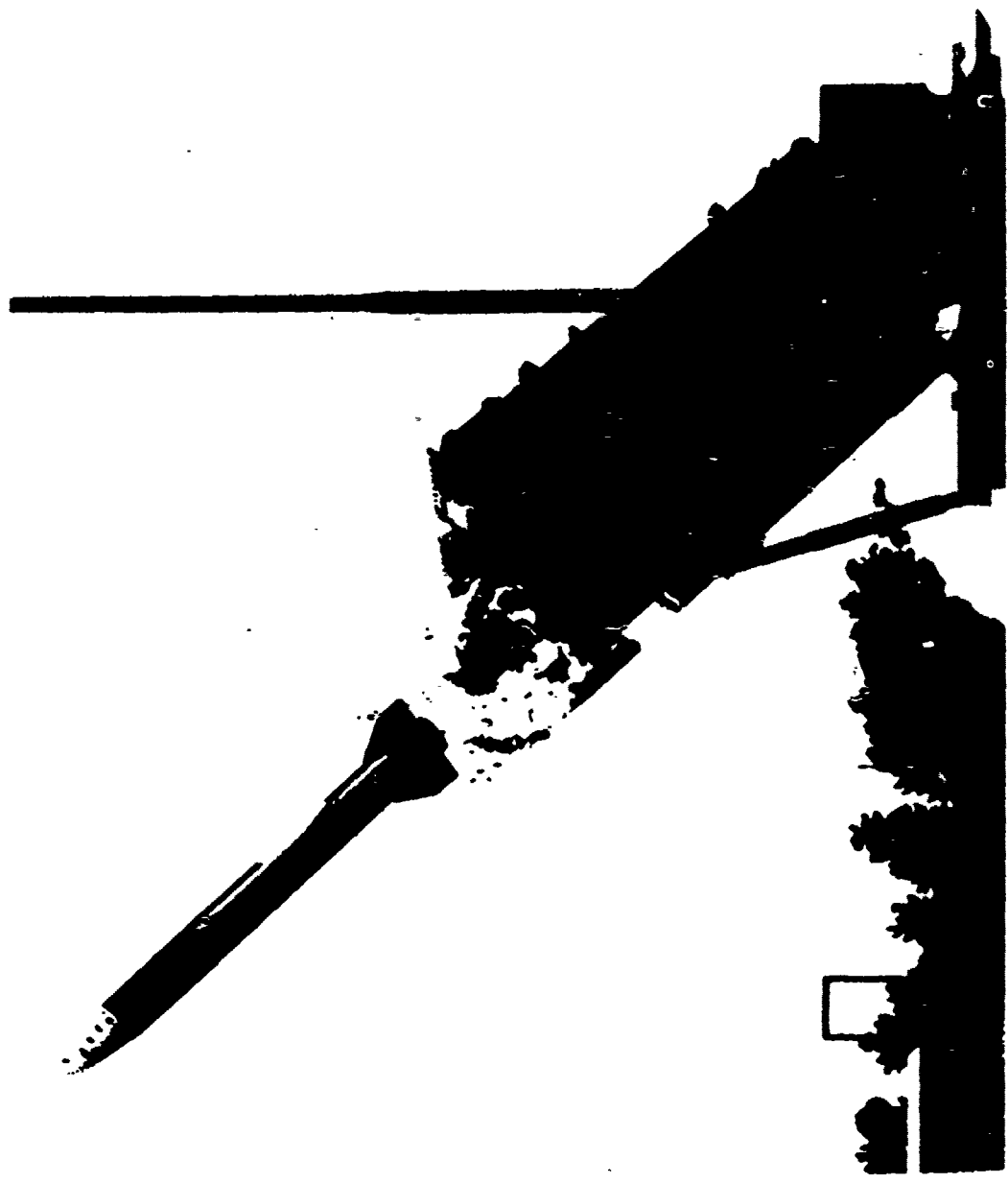


ELECTRONIC DESIGN ARTICLE

Improved beam-lead carriers ease hybrid circuit testing

- A pick-and-place unit applies components to the circuit.
- Solder reflow station is automatic.
- A burn-in system permits aging semiconductor chips on the tape.

CONTRACT NO. DAAB07-77-C-0526



**MISSILE COMMAND
(MICOM)**

MM&T Representatives

MISSILES

AV 746-3461
(205) 876-3461

Mr. Willie Patterson
US Army Missile Research and
Development Command
DRDMI-EAT
Redstone Arsenal, AL 35809

AV 746-2065
(205) 876-2065

Mr. Richard Kotler
US Army Missile Research and
Development Command
DRDMI-EAT
Redstone Arsenal, AL 35809

AV 746-3685
(205) 876 3685

Mr. Victor Ruwe
US Army Missile Research and
Development Command
DRDMI-EAA
Redstone Arsenal, AL 35809

AV 746-3321
(205) 876-3321

Mr. Douglas J. Saunders
US Army Missile Research and
Development Command
DRDMI-EAT
Redstone Arsenal, AL 35809

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

NON-DESTRUCTIVE TEST OF RADOMES

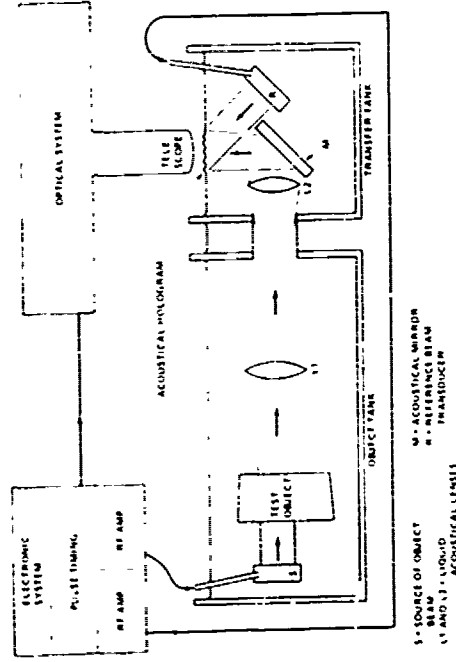
PROJECT NO: R 76 3138 & R 77 3138

**TITLE: AN ACOUSTICAL HOLOGRAPHIC
PASSIVE NON-DESTRUCTIVE
TESTING TECHNIQUES FOR
CERAMIC RADOMES**

COST: \$173,000

RESULTS

THIS EFFORT PRODUCED AN ACOUSTICAL REAL TIME HOLOGRAPHIC IMAGE REPRODUCTION SYSTEM (ARTHIR). THE SYSTEM HAS SUFFICIENT POWER AND DAMPING CHARACTERISTICS FOR NON-DESTRUCTIVE TESTING OF CERAMIC COMPOSITE STRUCTURES.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT TEST EQUIPMENT

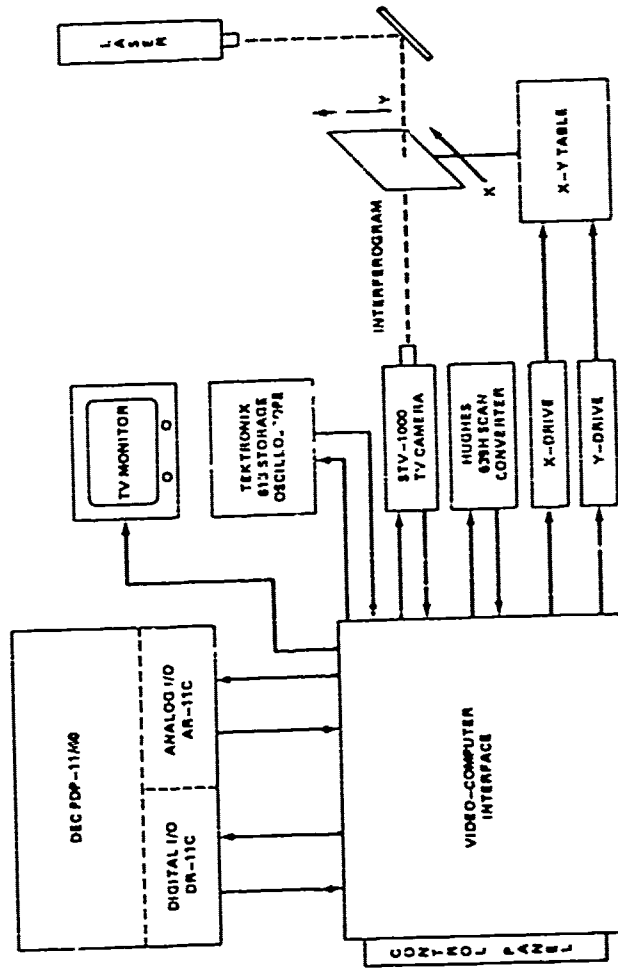
PROJECT NO: R 76 3145
& R 77 3145

TITLE: COMPUTER AIDED SPECKLE
COMPOSITE VOID
DETECTION SYSTEM (CAM)

COST: \$390,000

RESULTS

A PROTOTYPE NON-DESTRUCTIVE
SYSTEM TO DETECT, LOCATE, SIZE
AND QUANTIFY FLAWS IN FIBER
REINFORCED COMPOSITE MISSILE
LAUNCH TUBES WAS DESIGNED,
ASSEMBLED, AND INTERFACED.



COMPUTER-AIDED SPECKLE ANALYZER

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

PHASE SHIFTERS

PROJECT NO: 3 75 3157

TITLE: QUANTITY PRODUCTION TECHNIQUES
FOR DIODE PHASE SHIFTER ELEMENTS

COST: \$650,000

RESULTS

HUGHES AIRCRAFT CO. INTEGRATED RADIATORS,
PHASE SHIFTERS AND POWER DISTRIBUTION
NETWORKS INTO LOW LOSS MICROWAVE CIRCUITS
ON THICK FILM CERAMIC SUBSTRATES.

NEW 64 ELEMENT SUBARRAY MODULAR DESIGN
DEMONSTRATED THE FEASIBILITY FOR LIGHTER-
WEIGHT PHASED ARRAY ANTENNAS.

ANTENNA RELIABILITY WAS IMPROVED AND
ASSEMBLY COST REDUCED.

PROJECT RESULTS ALSO HAVE APPLICATION TO
MICROWAVE FILTERS, COMBINING NETWORKS, AND
AMPLIFIER CIRCUITS.

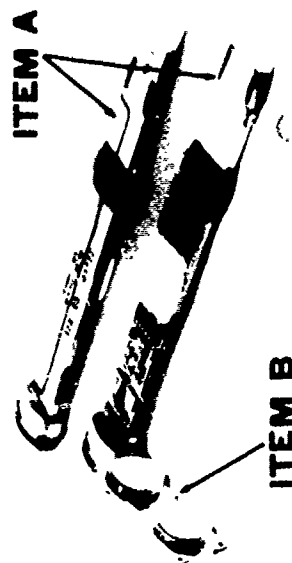


FIGURE 1 - DISCRETE COMPONENT ELEMENT ITEM A,
COMPARED TO INTEGRATED PHASE-SHIFTER
RADIATOR ELEMENT ITEM B.

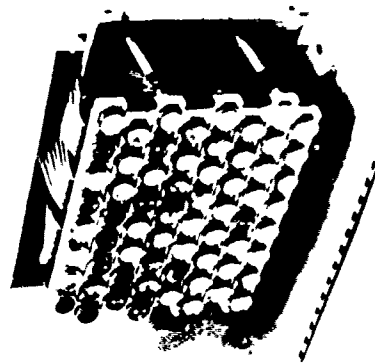


FIGURE 2 - C-BAND 64-ELEMENT INTEGRATED
SUBARRAY MODULE MOUNTED ON TEST FIXTURE.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

PROJECT: R 76 3232 & R 7T 3232
TITLE: COMPUTERIZED PRODUCTION PROCESS
PLANNING

COST: FY 76 \$100K
FY 77 \$145K

RESULTS

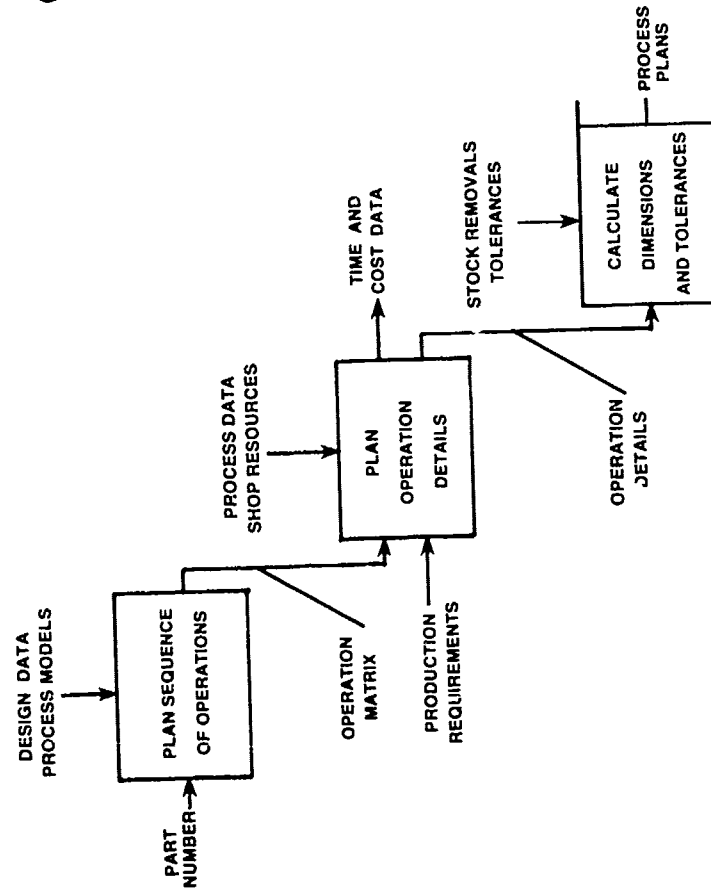
United Technologies developed a computerized production process planning system.

The system assists process planners to plan the machining of cylindrical parts.

Computer software interacts with the process planner to determine:

- Candidate machine tools,
- Candidate cut sequences,
- Types of cuts,
- Candidate cutter tools,
- Machining parameters,
- Production rates and costs.

Selects best combination of tools, machine tool, and cut sequence.



PROCESS PLANNING FUNCTIONS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT COST DRIVER ANALYSIS

PROJECT: 3 7T 3232

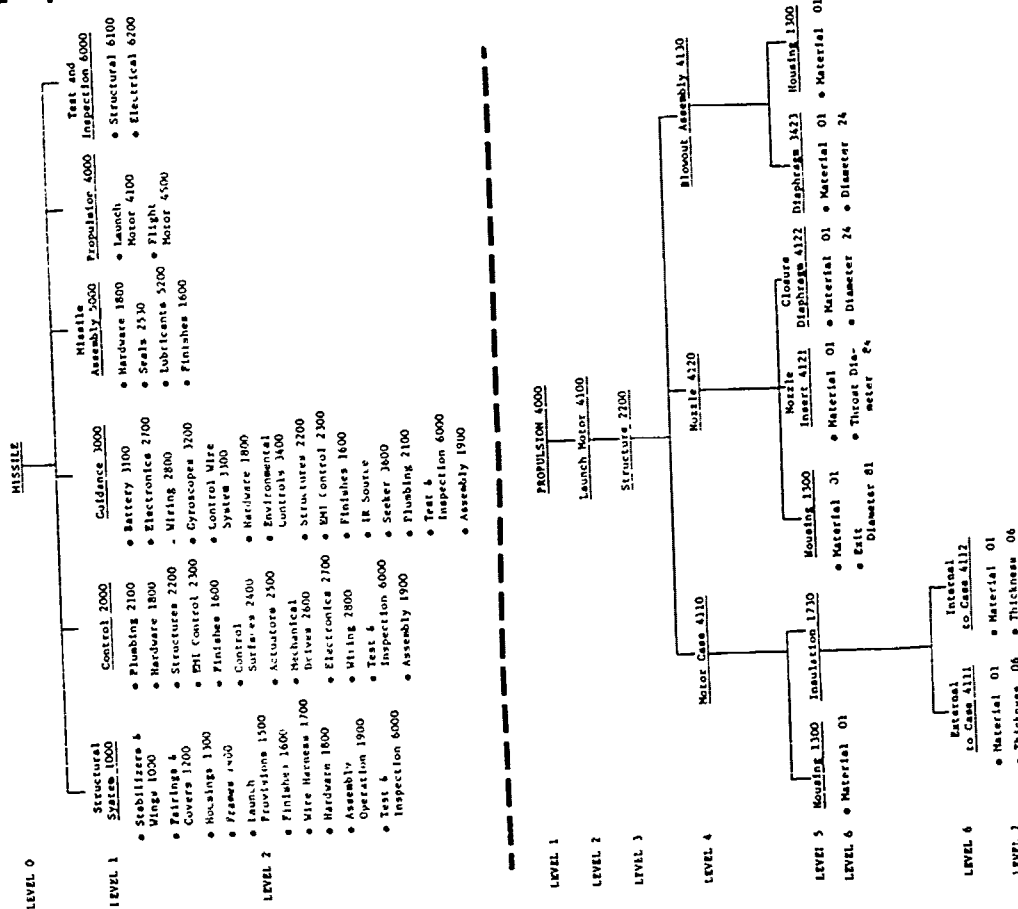
TITLE: COMPUTERIZED PRODUCTION PROCESS PLANNING (COST DRIVER ANALYSIS)

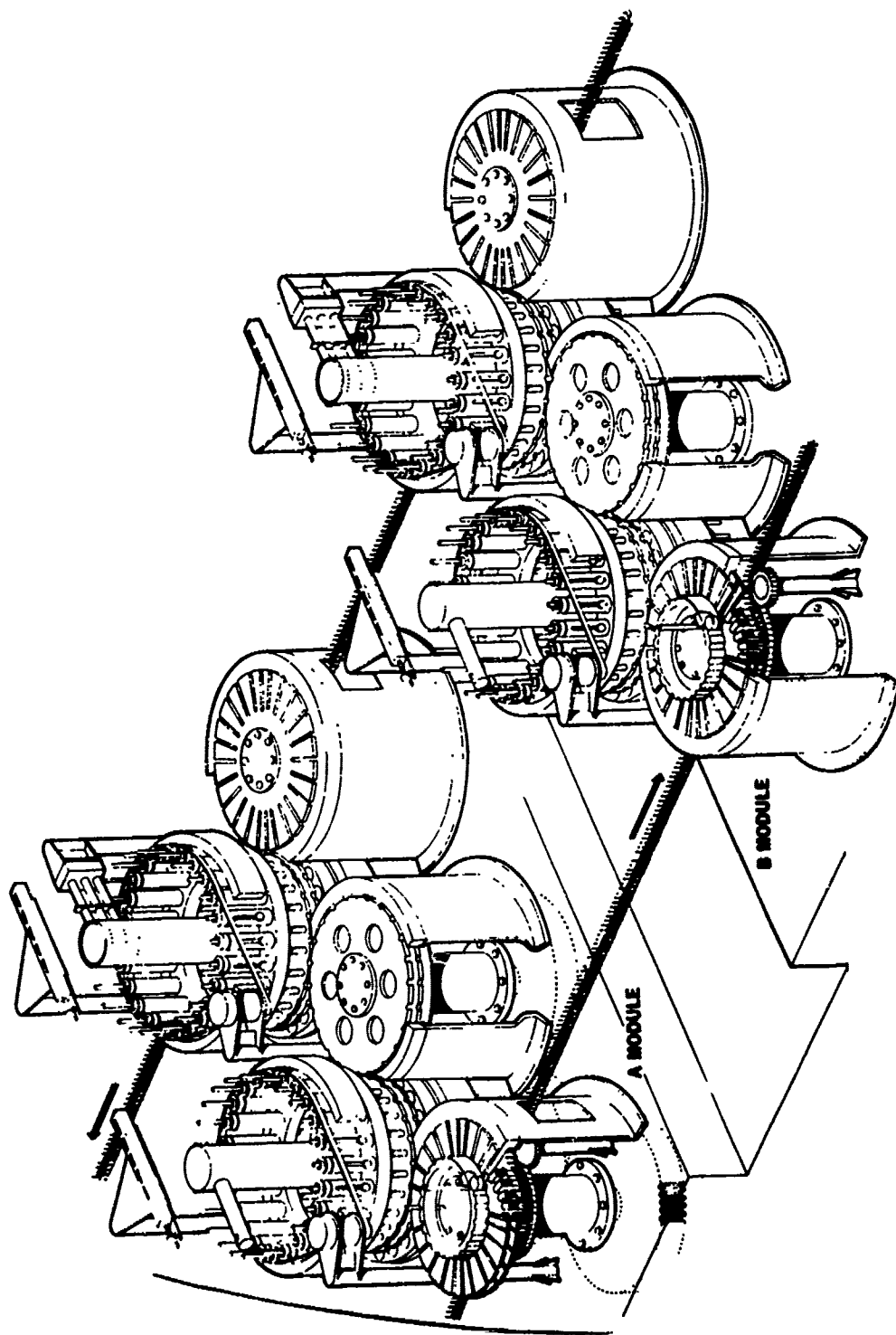
COST: \$100,047

RESULTS

A METHODOLOGY FOR A MISSILE PARTS CLASSIFICATION SYSTEM (MPCS) WAS DEVELOPED FOR EXAMINING COST DRIVERS IN MISSILE MANUFACTURE.

**THE MPCs WAS DEVELOPED IN
"TREE FORM" AND DEPICTS DATA
RANGING FROM MAJOR MISSILE
SECTIONS TO DISCRETE PART
DATA REFLECTING COMPONENT
CHARACTERISTICS.**





**ARRCOM/ARRADCOM
(AMMUNITION)**

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

AMMUNITION RELATED

MW&T Representative

Mr. Bob Mesuk
Munitions Production Base
Modernization Agency
ATTN: SARPM-PBM-T
Dover, NJ 07801

AV 880-6704
(201) 328-6704

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

AUTOMATIC DRAFTING AND DIGITIZING FOR MANUFACTURING

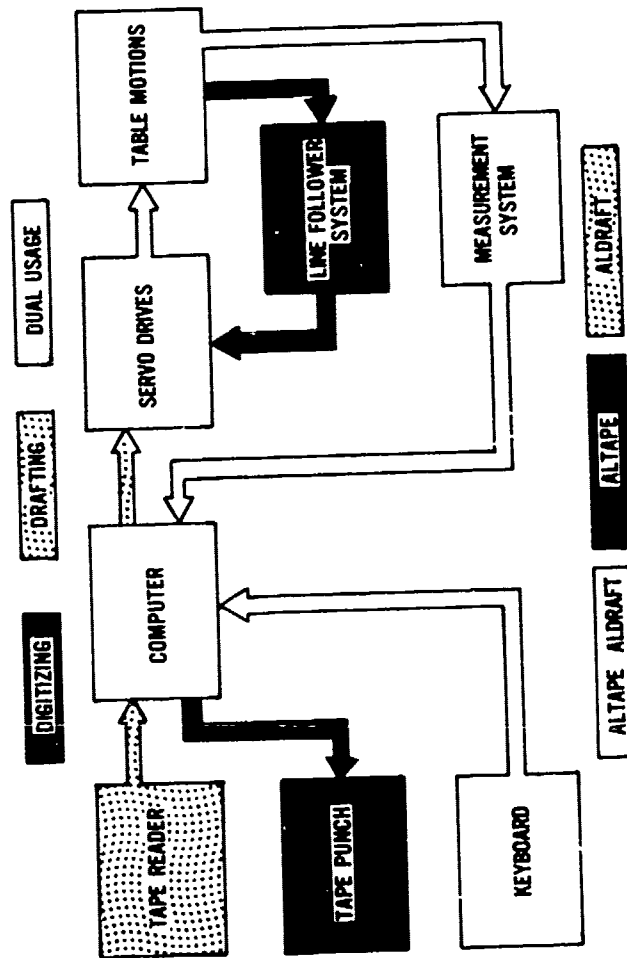
PROJECT NO: 5 73 1239

TITLE: APPLICATION OF AUTOMATIC
DRAFTING AND DIGITIZING
EQUIPMENT TO
MANUFACTURING USE

COST: \$60,000

RESULTS

THE PROJECT ADAPTED
COMMERCIALY AVAILABLE
EQUIPMENT TO THE PREPARATION
OF NC TAPES FOR LATHES AND
TWO-AXIS MILLING MACHINES.
THE SOFTWARE PERMITS
PREPARATION OF TAPES FOR
MACHINES WHERE POST-
PROCESSORS ARE ON FILE.



ALTAPE/ALDRAFT BLOCK DIAGRAM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

EXPLOSIVES MANUFACTURE

PROJECT NO: 5751274

TITLE: WHITE PHOSPHORUS DRY FILLING LINE

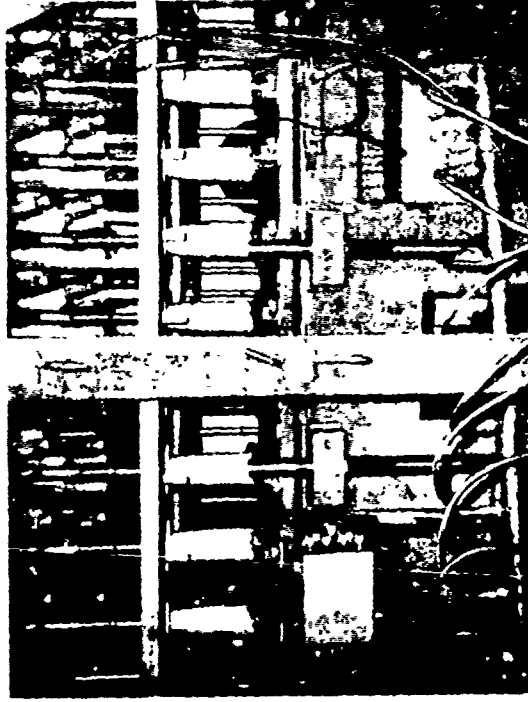
COST: \$575,000

RESULTS

Significantly reduced the amounts of air and water pollution generated during WP filling operations.

WP line is now in closer compliance with OSHA requirements.

Reduced number of personnel required.



WP DRY FILL STATION
WITH 8 FILLING PORTS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

PHASED ARRAY ANTENNA

PROJECT NO: 5 70 4139

**TITLE: APPLICATION OF RADAR TO BALLISTIC
ACCEPTANCE TESTING OF AMMUNITION
(ARBAT)**

COST: \$328,000

RESULTS

**AN X BAND 10' X 12' PLANAR PHASED ARRAY
ANTENNA WAS DEVELOPED. THE ANTENNA
HAS A LOW SIDE LOBE PENCIL BEAM AND WILL
BE USED FOR TRACKING SMALL ROCKETS,
MORTAR ROUNDS AND ARTILLERY
PROJECTILES.**

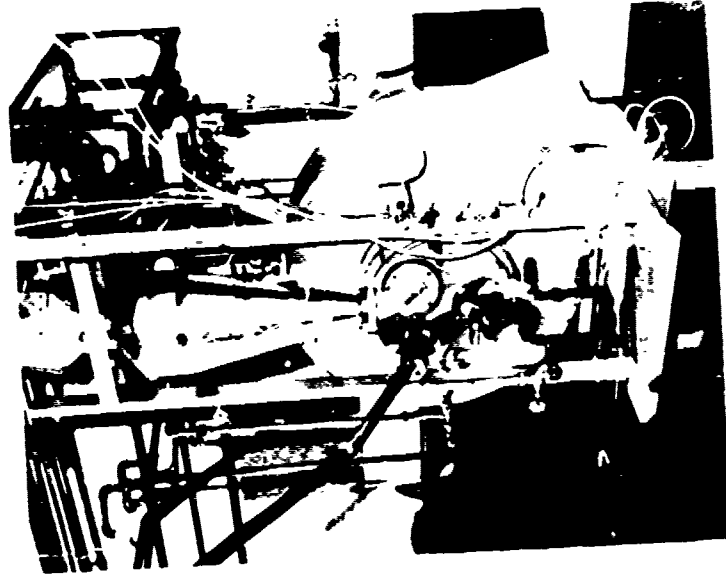


DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT MELTING HIGH EXPLOSIVES

PROJECT NO: 572 4162

**TITLE: AUTOMATED LINE FOR THE MELT-POUR
PROCESSING OF HIGH EXPLOSIVES**

COST: \$2,045,900



RESULTS

**THE MINUTE MELTER WAS FABRICATED AS A
RESULT OF THIS PROJECT. THE MINUTE
MELTER MELTS EXPLOSIVES BY DIRECT
CONTACT WITH SATURATED STEAM AND IS
CAPABLE OF MELTING BOTH RISER SCRAP AND
NEW FLAKE. THE MELTER WAS INSTALLED
AND DEBUGGED ON THE 81MM PRODUCTION
LINE AT MILAN AAP.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

NITROLYSIS OF HEXAMINE

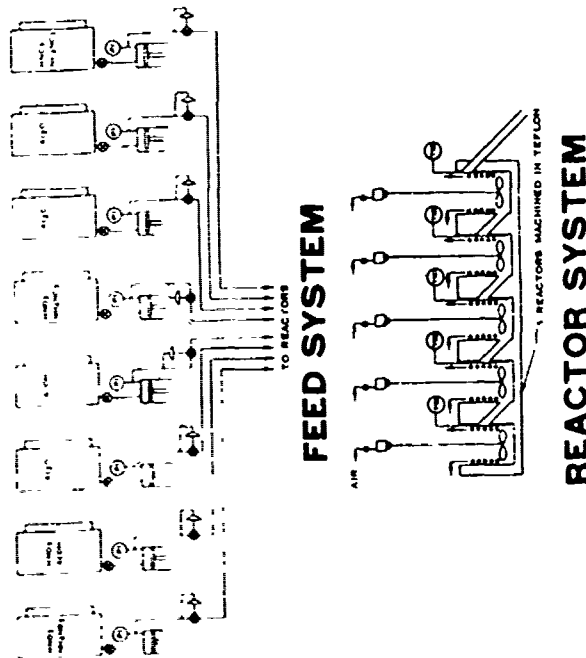
PROJECT NO: 5 73 4171

TITLE: INVESTIGATION OF PARAMETERS
AFFECTING THE NITROLYSIS
OF HEXAMINE

COST: \$98,900

RESULTS

A MINI PILOT PLANT SYSTEM WAS
DESIGNED FOR THE CONTINUOUS
PRODUCTION OF HMX. PARAMETERS
CAN BE VARIED TO DETERMINE THE
EFFECTS OF THESE PROCESS CHANGES
ON THE FINAL PRODUCT.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

PIEZOCERAMIC ELEMENTS FOR FUZES

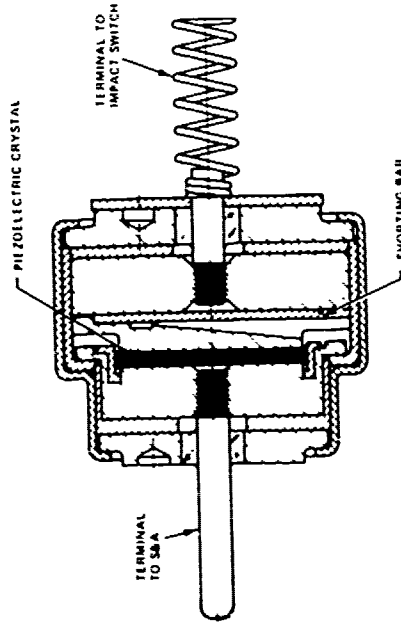
PROJECT NO: 5 74 4507 & 5 75 4507

TITLE: APPLICATION OF COMPUTER
AIDED DESIGN TO THE ACCEPTANCE TESTING OF
PRODUCTION PIEZONIDS

COST: \$250,000

RESULTS

THIS PROJECT RESULTED IN A COMPUTER MODEL FOR PROVIDING PRODUCTION ACCEPTANCE CRITERIA AND FAILURE ANALYSIS VERIFICATION. THE MODEL CAN SIMULATE THE PERFORMANCE OF THE POWER SUPPLY UNDER NORMAL AND ABNORMAL CONDITIONS.



PIEZO-ELECTRIC
POWER SUPPLY M456A1E2

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

ULTRASONIC TESTING

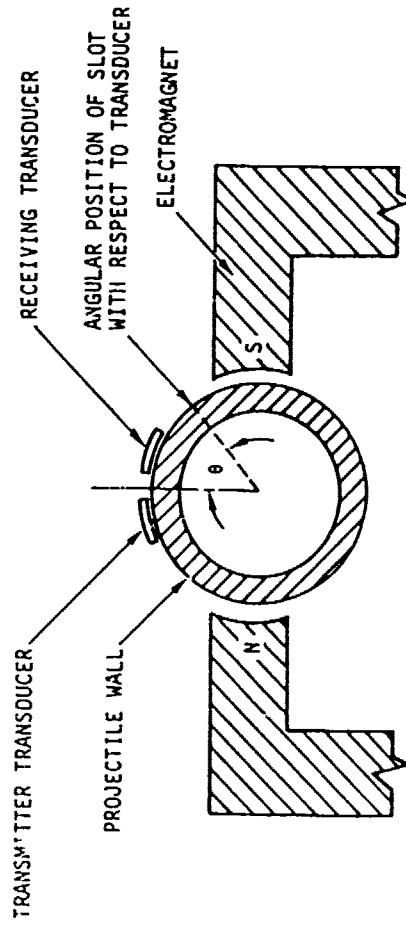
PROJECT NO: 5 73 6329, 5 74 6329,
& 5 75 6329

TITLE: AUTOMATED NON-
DESTRUCTIVE TECHNIQUES
FOR SOUNDNESS OF
MATERIALS FOR PRESENT
AND FUTURE GENERATION
ARTILLERY PROJECTILES

COST: \$694,000

RESULTS

THE FEASIBILITY OF A NON-
DESTRUCTIVE 100% INSPECTION
OF ARTILLERY PROJECTILES HAS
BEEN DEMONSTRATED.
A PROTOTYPE OF THIS
ELECTROMAGNETIC ACOUSTIC
TRANSDUCER SYSTEM (EMATS) IS
CURRENTLY BEING DEVELOPED.



ARTILLERY PROJECTILES INSPECTION
APPARATUS SCHEMATIC

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

BALL PROPELLANT

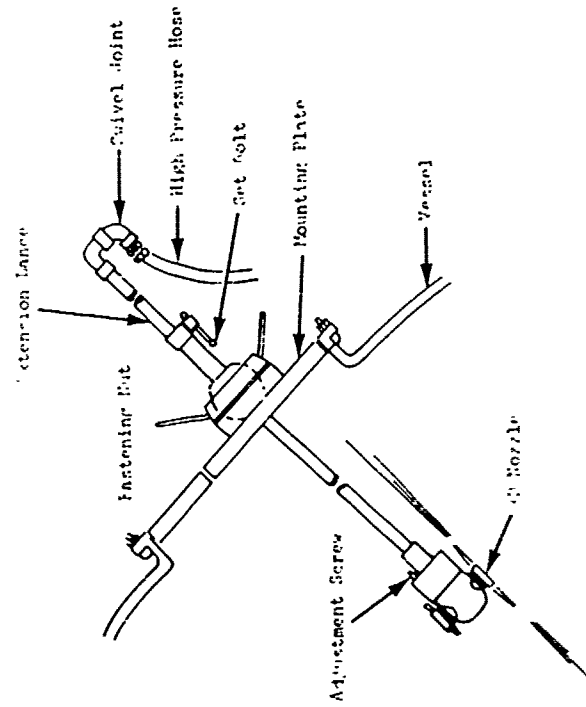
PROJECT NO: 5 74 6609

TITLE: BALL PROPELLANT HARDENING
STILL CLEANING SYSTEM

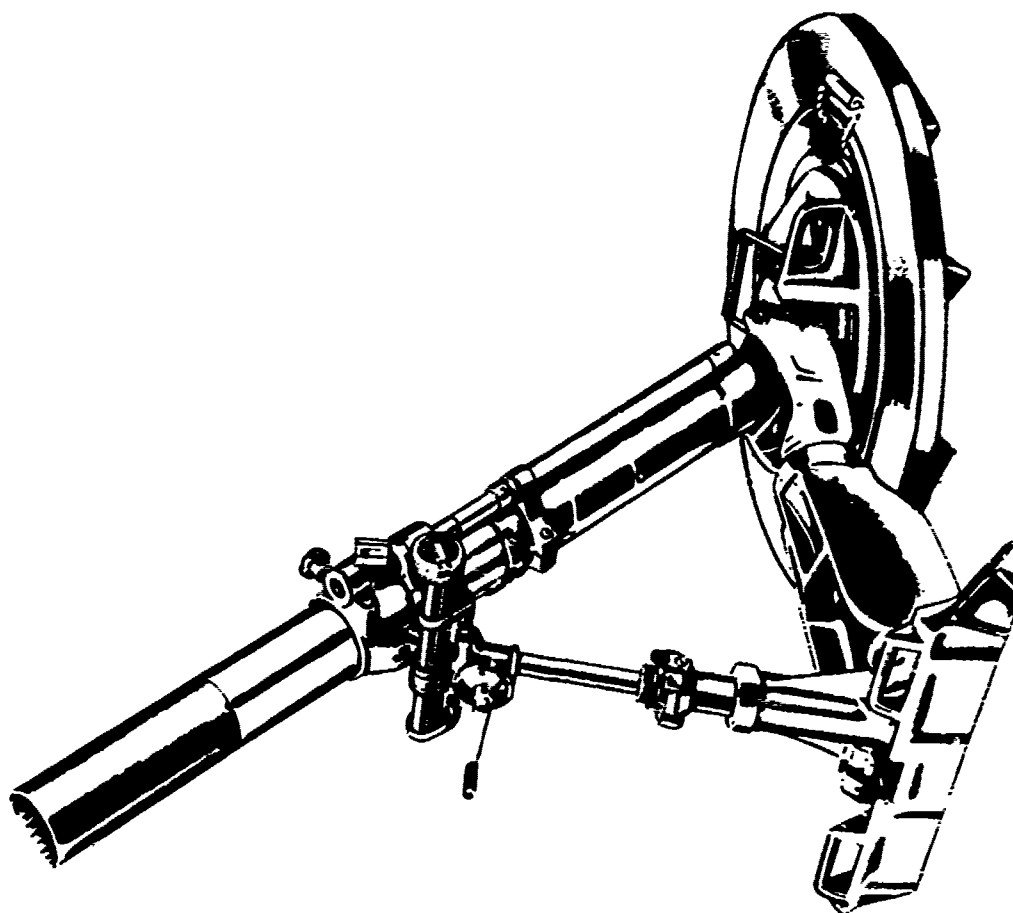
COST: \$63,700

RESULTS

HIGH PRESSURE CLEANING OPERATION
IS EFFICIENT AND CAN BE PERFORMED
REMOTELY THEREBY ELIMINATING
SAFETY AND HEALTH HAZARDS.
CLEANING IS MORE COMPLETE AND
MUCH FASTER.



**PROTOTYPE
CLEANING SYSTEM**



**ARRCOM/ARRADCOM
(WEAPONS)**

MM&T Representatives:

ARRCOM/ARRADCOM

AV 793-3166
(309) 794-3166

Mr. Arnie Madsen
US Army Armament Materiel
Readiness Command
DRSAR-IRW
Rock Island Arsenal
Rock Island, IL 61299

AV 793-4627
(309) 794-4627

Mr. Joseph DiBenedetto
Rock Island Arsenal
SARRI-EN
Rock Island, IL 61299

AV 974-5125
(581) 266-5125

M.. Leonard Slawsky
Watervliet Arsenal
DRDAR-LCB-S
Watervliet, NY 12189

AV 880-4240
(201) 328-4240

Mr. Eugene Kelly
US Army Armament R&D Command
Large Caliber Weapons Systems
Laboratory
DRDAR-LC
Dover, NJ 07801

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

OPTIMIZATION OF MACHINING

PROJECT NO: 6 72 6779

TITLE: OPTIMIZATION OF MACHINING
PARAMETERS FOR NUMERICALLY CONTROLLED AND
CONVENTIONAL MACHINING

COST: \$85,000

RESULTS

A COMPUTER PROGRAM (MACHOP) WAS DEVELOPED TO PROCESS DATA FOR MACHINING OPERATIONS. EVOLUTIONARY OPERATION ANALYSIS AND RESPONSE SURFACE REGRESSION ANALYSIS WAS PERFORMED TO GENERATE MACHINING PERFORMANCE DATA. THE RESULT WAS AN OPTIMIZATION PROGRAM ORIENTED TOWARDS NUMERICALLY-CONTROLLED MACHINING OPERATIONS.

Data Summary for Experiment 1
Results for Recoil Cylinder - First Study

Speed (rpm) V	Feed (ipr) f	No. of parts	Production time	No. of tool edges	Cu \$/piece
192	0.0168	14	434	17	9.51
192	0.0187	18	410	18	7.28
192	0.0210	14	377	18	8.63
220	0.0168	13	396	23	9.90
220	0.0187	15	393	15	8.28
220	0.0210	20	440	44	7.52
255	0.0168	10	217	17	7.22
255	0.0187	11	267	29	8.39
255	0.0210	14	357	31	8.58

The optimal feed-speed combination is selected as the point which maximizes the predicted performance index PI and thus minimizes the predicted cost, Cu.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

GENERAL MANUFACTURING

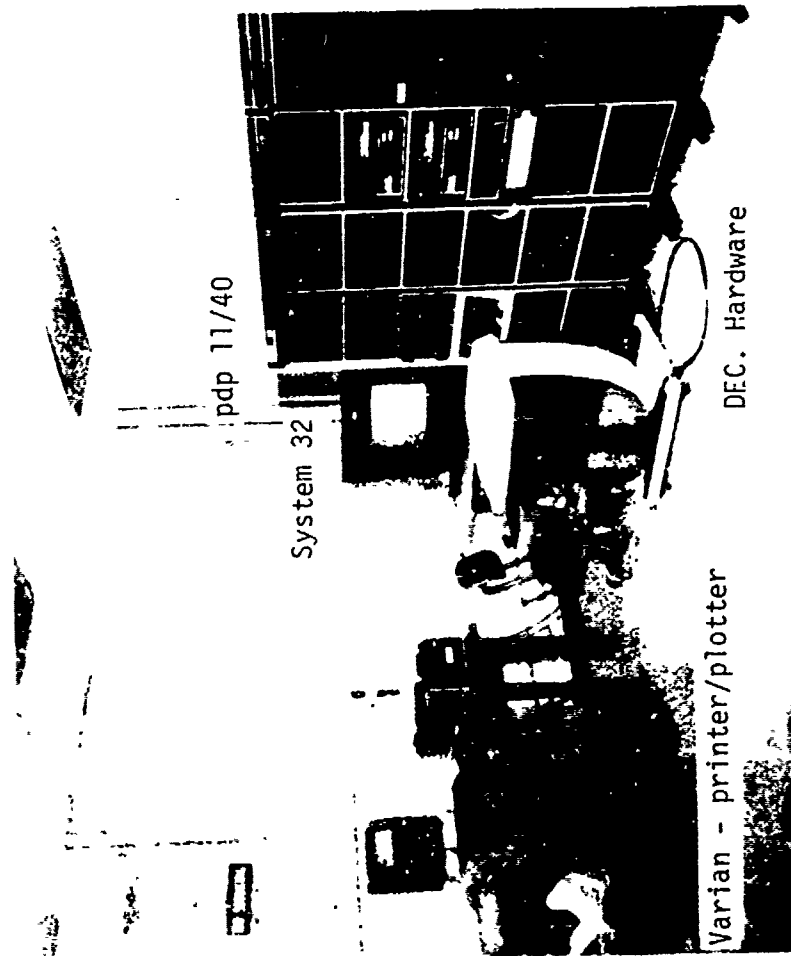
PROJECT NO: 6 75 7111

TITLE: COMPUTER ASSISTED
GRAPHICAL TECHNIQUES
FOR PRODUCTION OF
WEAPON SYSTEMS

COST: \$120,000

RESULTS

THE SOFTWARE PACKAGE
DEVELOPED WAS ABLE TO
HANDLE COMPOSING AND
LAYOUT OF SIMPLE
COMPONENTS AND WAS ABLE
TO GENERATE NC TAPES.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

OPTICS INSPECTION

PROJECT NO: 6737182

TITLE: HOLOGRAPHIC INTERFEROMETRY
SYSTEM FOR MEASURING LARGE
APERTURE OPTICS AND ASPHERICS

COST: \$135,000

RESULTS

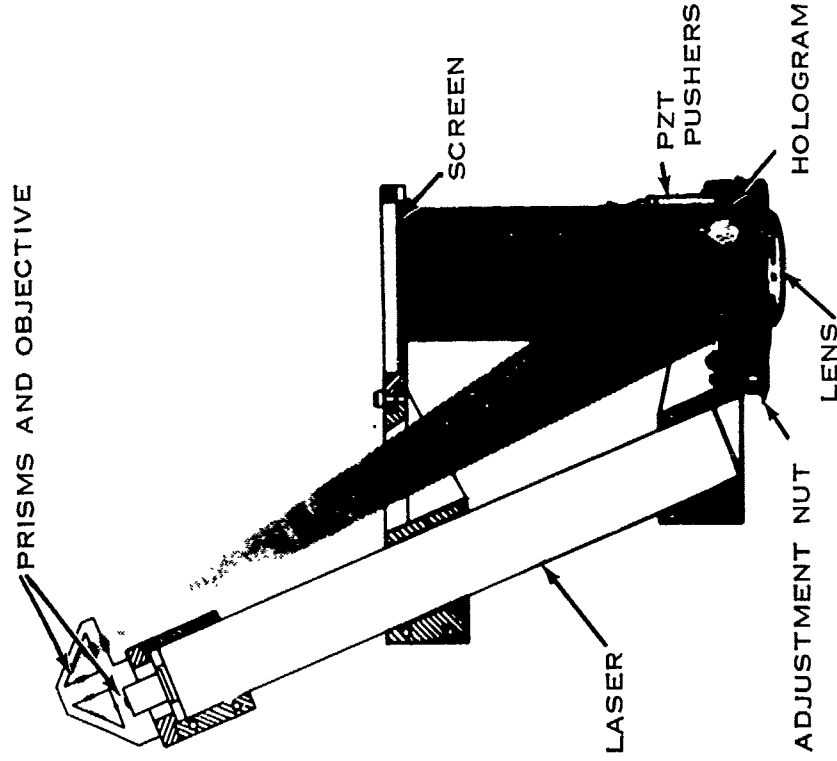
Battelle Northwest Labs developed a prototype instrument for testing up to 2" spherical optical surfaces.

A hologram picture now permits checking lens surfaces without test glasses.

Battelle wrote a computer program which is ten times faster than earlier programs for locating lens surface defects.

Holograms are more practical than test glasses for large optics.

Drawings are available for building additional instruments.



PROTOTYPE LENS TESTING
INSTRUMENT

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

FIRING TEST SIMULATOR

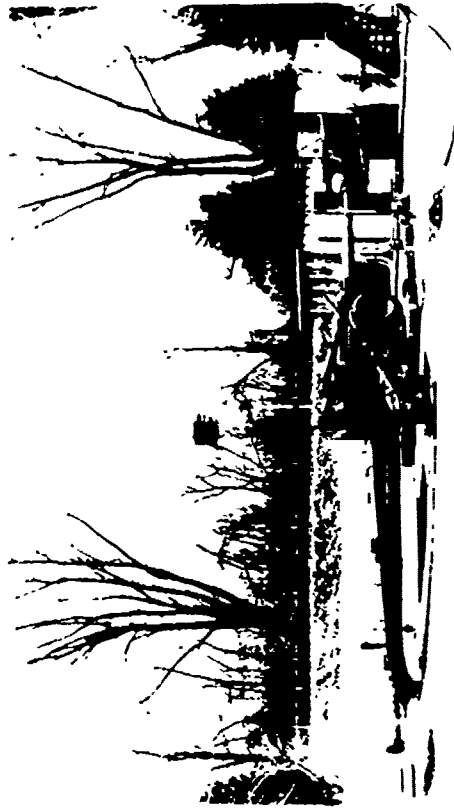
PROJECT NO: 6 73 7201

**TITLE: ARTILLERY WEAPON FIRING
TEST SIMULATOR**

COST: \$525,000

RESULTS

**A HYDRAULIC FIRING TEST
SIMULATOR WAS DESIGNED AND
FABRICATED. THIS TEST SET IS
CAPABLE OF SIMULATING A LIVE
FIRING AT A LOW QUADRANT
ELEVATION AND IS LESS EXPENSIVE
AND QUIETER THAN THE POWDER
GYMNASTICATOR.**



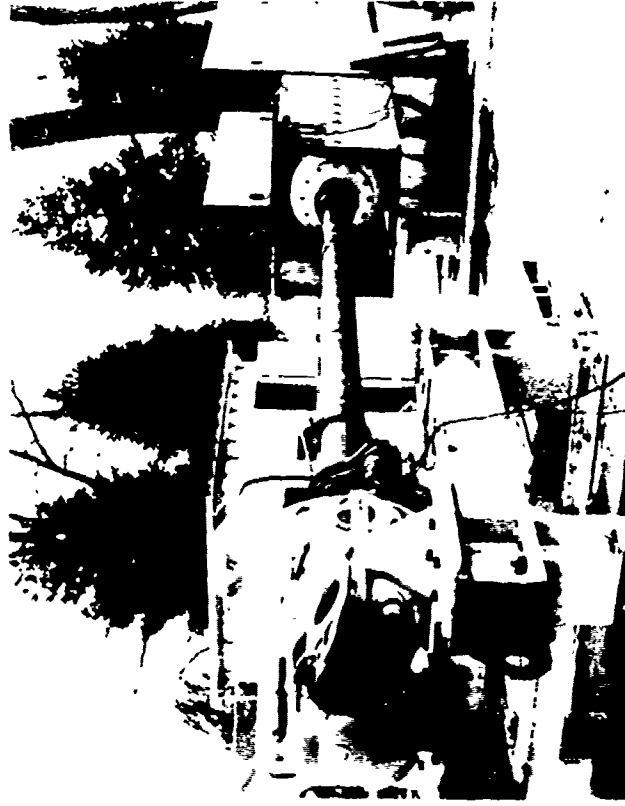
DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

FIRING TEST SIMULATOR

PROJECT NO: 6 75 7201 & 6 76 7201

**TITLE: ARTILLERY WEAPON FIRING
TEST SIMULATOR**

COST: \$455,000



RESULTS

**THESE PROJECTS PROVIDED THE
TESTS NEEDED TO QUALIFY THE
PRODUCTION EQUIPMENT DEVELOPED
ON PROJECT 6 73 7201.
THE EQUIPMENT HAS BEEN QUALIFIED
FOR TESTING THE M127, M140, M551
AND M60A2 GUN MOUNTS.**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT X-RAY STRESS MEASUREMENTS

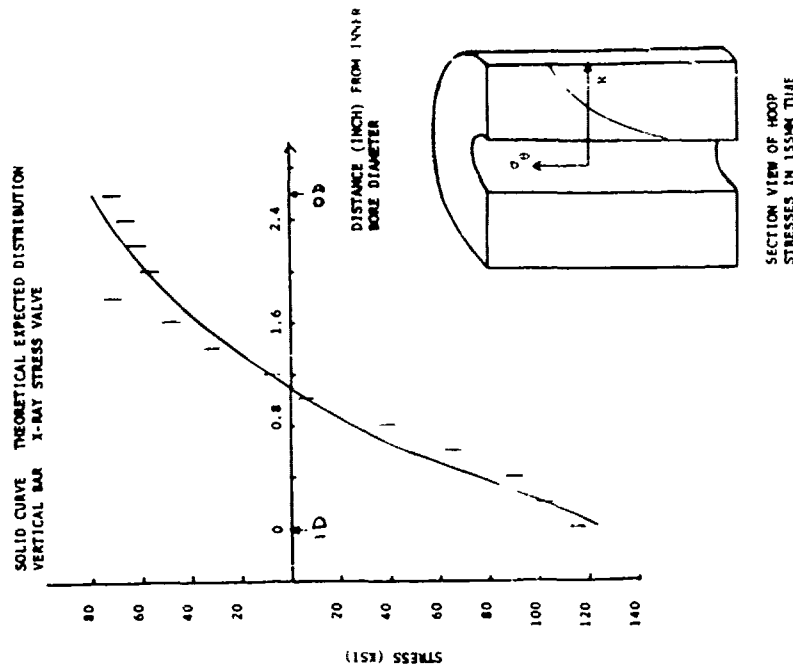
PROJECT NO: 6 74 7282

TITLE: X-RAY MEASUREMENT OF
RESIDUAL STRESSES INDUCED
IN GUN TUBES BY MANUFAC-
TURING PROCESS

COST: \$110,000

RESULTS

AN X-RAY SYSTEM WAS DEVELOPED
TO NON-DESTRUCTIVELY DETERMINE
THE RESIDUAL STRESSES IN AN
ARTILLERY BARREL. THE CORRELATION
OF THE X-RAY TECHNIQUE TO THE
ACTUAL STRESSES WAS FOUND TO
BE EXCELLENT.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

ROTARY FORGING

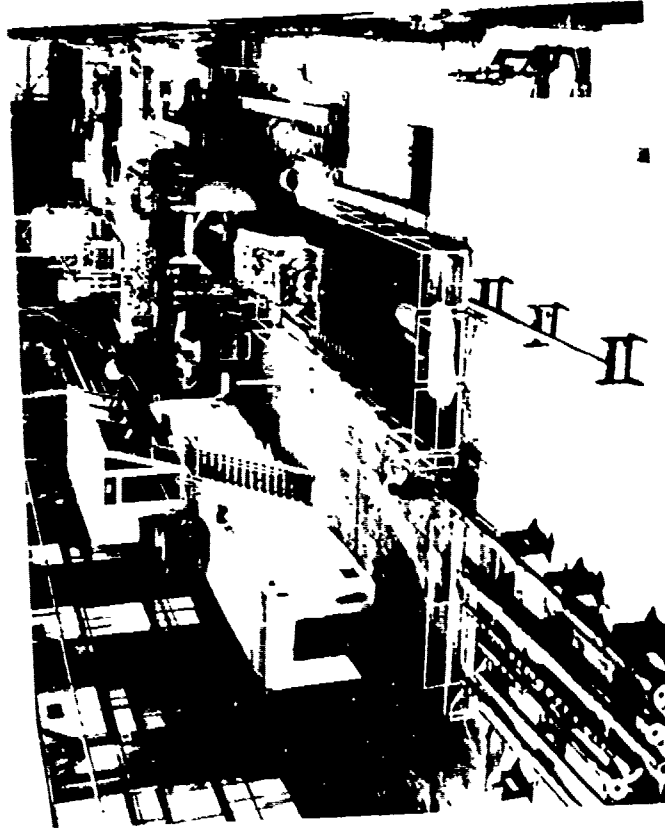
PROJECT NO: 675 7588 AND 676 7588

**TITLE: ROTARY FORGE INTEGRATED
PRODUCTION TECHNOLOGY**

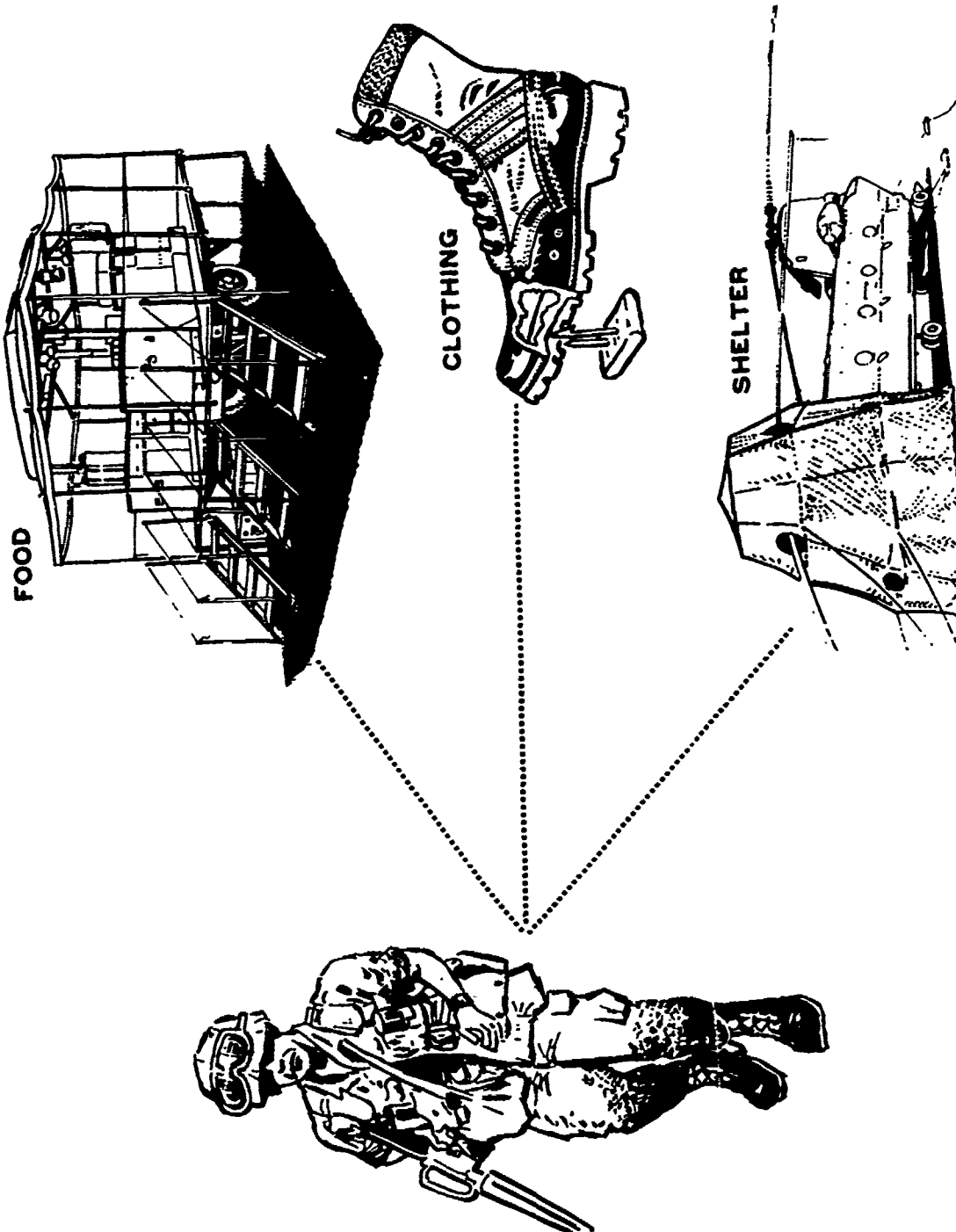
COST: \$620,000

RESULTS

**A VIABLE PRODUCTION PROCESS FOR
ROTARY FORGING CANNON TUBES
WAS DEVELOPED.THE TOOL DESIGN,
AND LOAD, PREHEAT CONDITIONS,
AND HEAT TREAT CYCLES WERE
ESTABLISHED AND VERIFIED IN
PRELIMINARY ACCEPTANCE TESTS.**



ROTARY FORGE SYSTEM



**NATICK R&D COMMAND
(NARADCOM)**

NARADCOM

MM&T Representatives:	Mr. Edward F. Levell US Army Natick R&D Command Attn: DRDNA-Z Natick, MA 01760	AV 955-2793 (617) 653-1000, ext 2793
	Mr. Irving Tarlow US Army Natick R&D Command Attn: DRDNA-EM Methodology Res. Branch Natick, MA 01760	AV 955-2349 (617) 653-1000, ext 2349
	Mr. Frank Civilikas US Army Natick R&D Command Attn: DRDNA-EM Natick, MA 01760	AV 955-2349 (617) 653-1000, ext 2349

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

CAM APPLICATION TO FOOTWEAR

PROJECT NO: Q 75 8035

**TITLE: AUTOMATED PRODUCTION OF
INSULATED FOOTWEAR**

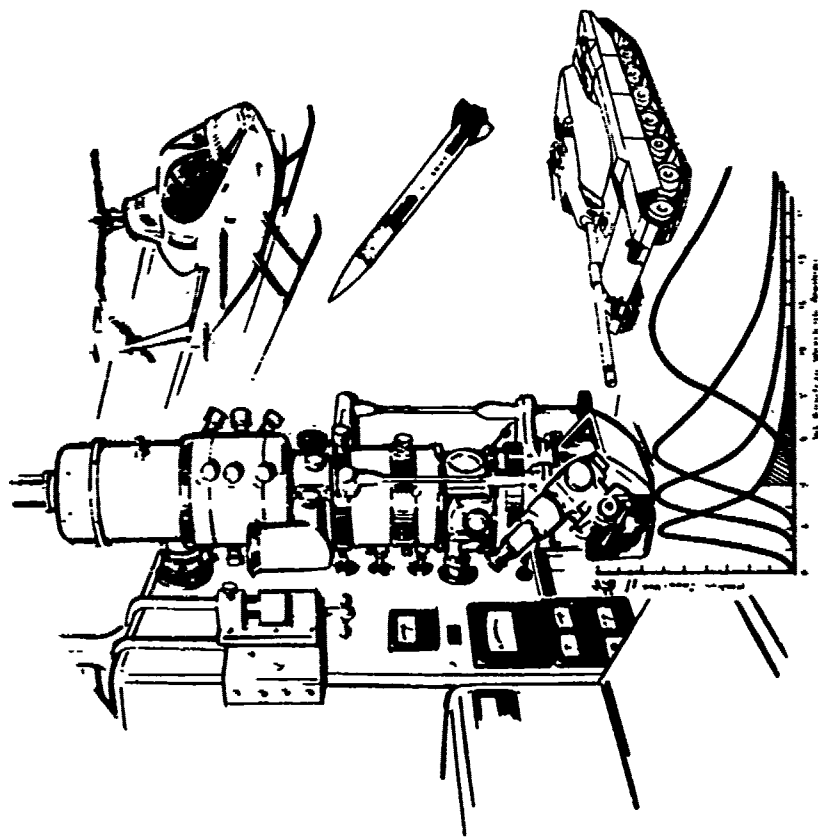
COST: \$310,000



**POLYURETHANE
INSULATED BOOT**

RESULTS

**PRODUCTION EQUIPMENT REQUIREMENTS
WERE ESTABLISHED TO SET UP AN
AUTOMATED FACILITY FOR INSULATED
BOOTS.**



MATERIALS & MECHANICS RESEARCH CENTER (AMMRC)

AMMRC

MM&T Representatives:

Mr. Raymond Farrow
US Army Materials & Mechanics
Research Center
DRXMR-PT Watertown, MA 02172

AV 955-3555
(617) 923-3555

Mr. Paul Ralston
MTT Project Engineer
US Army Material & Mechanics
Research Center
DRXMR-MQ Watertown, MA 02172

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

TESTING

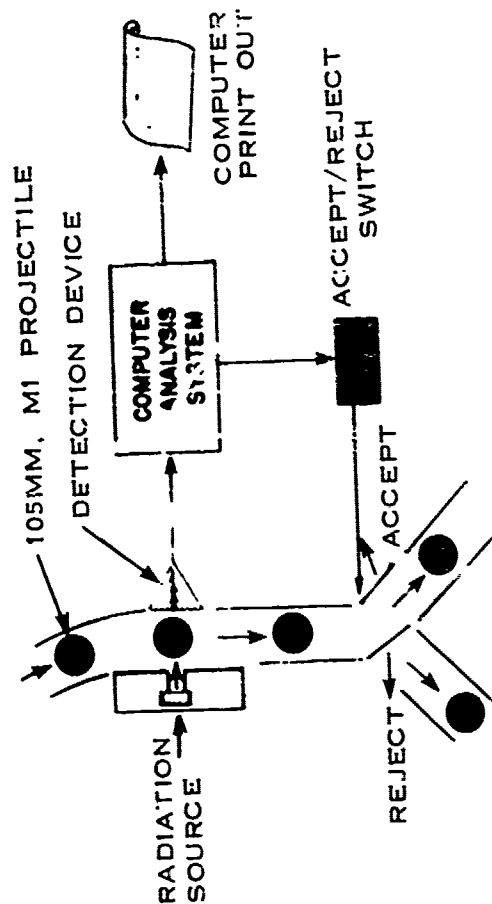
PROJECT NO: M 75, 76 6350

TITLE: MTT--AUTOMATIC
INSPECTION DEVICE FOR
EXPLOSIVE CHARGE IN
SHELL (AIDECS)

COST: \$517,000; \$649,000

RESULTS

AUTOMATIC ON-LINE INSPECTION OF
PROJECTILES FOR HAZARDOUS
CAVITIES IN THE EXPLOSIVE
IMPROVES SAFETY, CUTS COST,
AND ENHANCES SHELL RELIABILITY.
THE CONTINUOUS SPIRAL SCAN
METHOD WAS DEVELOPED INTO AN
ENGINEERING MODEL BY IRT. CORP.
WILL PERMIT 100% INSPECTION OF
44 ROUNDS PER MINUTE OF 105MM
AMMUNITION.



FLOW DIAGRAM OF AUTOMATIC
INSPECTION SYSTEM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

RIFLING TWIST MEASUREMENT

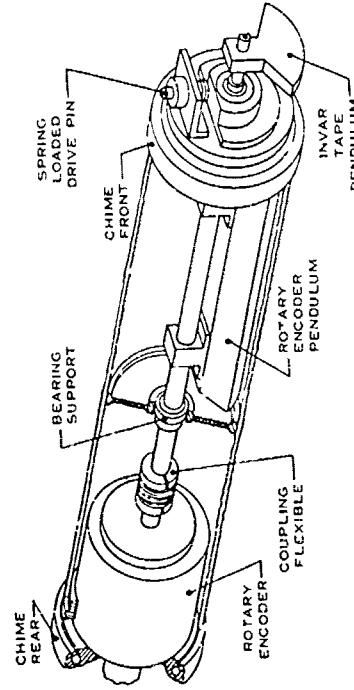
PROJECT NO: M 75 6350

TITLE: MEASUREMENT OF RIFLING
TWIST IN GUN TUBES

COST: \$42,000

RESULTS

DIRECT MEASUREMENTS CAN BE MADE OF THE RIFLING TWIST IN A GUN TUBE WITH THE EQUIPMENT THAT WAS DEVELOPED. A THERMAL PRINTER IS PROVIDED TO OBTAIN HARD COPIES OF THE DATA. THE SYSTEM IS USED FOR FIRST ARTICLE AND SAMPLING TESTS.



RIFLING TWIST
MEASUREMENT SYSTEM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

NUMERICALLY CONTROLLED MACHINE PROGRAMMING

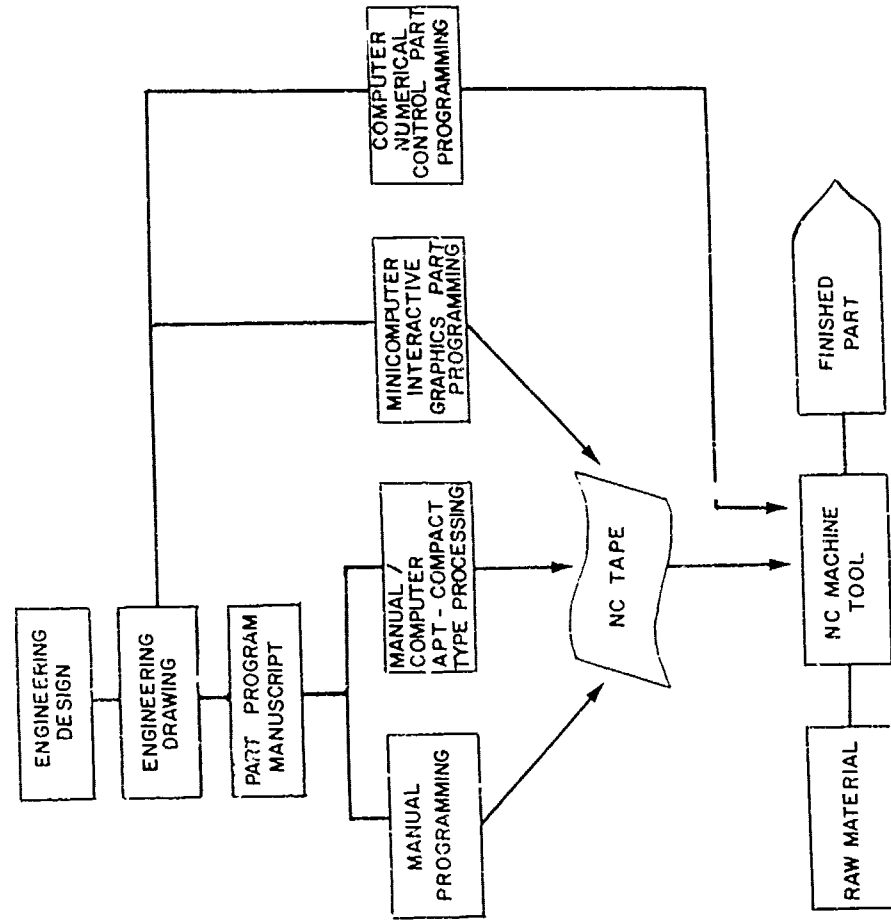
PROJECT NO: M 75 9000

TITLE: IMPROVED PARTS
PROGRAMMING FOR
NUMERICALLY CONTROLLED
MACHINES

COST: \$7500

RESULTS

THE DEPARTMENT OF INDUSTRIAL
ENGINEERING OF TEXAS A&M
UNIVERSITY DOCUMENTED THE
STATE-OF-THE-ART OF NC
MANUFACTURING TECHNOLOGY,
STANDARDIZATION OF PARTS
PROGRAMMING LANGUAGES
AND POST PROCESSORS.



PART PROGRAMMING

ARMY MMT PROGRAM REPRESENTATIVES

HQ, DARCOM

US Army Materiel Development and Readiness Command

ATTN: DRCMT

5001 Eisenhower Avenue

Alexandria, VA 22333

C: 202 274-8284/8298

AV: 284-8284/8298

AVRADCOM

US Army Aviation R&D Command

ATTN: DRDAV-EXT, Mr. Robert Vollmer

12th & Spruce Streets

St. Louis, MO 63166

C: 314 263-1625

AV: 693-1625

CERCOM

US Army Communications & Electronics Materiel Readiness Command

ATTN: DRSEL-LE-R, Mr. Martin Ides

Fort Monmouth, NJ 07703

C: 201 532-4950

AV: 992-4950

CORADCOM

US Army Communications R&D Command

ATTN: DRDCO-PPA-TP, Mr. Al Feddeler/Sam Esposito/Burton Resnic

Building 2700

Fort Monmouth, NJ 07703

C: 201 535-2418/4262/4026

AV: 995-2418/4262/4026

ERADCOM

US Army Electronics R&D Command

ATTN: DELET-R, Mr. Joseph Key/John Teti

Fort Monmouth, NJ 07703

C: 201 544-4258

AV: 995-4258

MICOM

US Army Missile Command

ATTN: DRSMI-ET, Mr. Ray Farrison

Redstone Arsenal, AL 35809

C: 205 876-1835

AV: 746-1835

TARADCOM

US Army Tank-Automotive R&D Command

ATTN: DRDTA-KP, DRDTA-RCK, Dr. Jim Chevalier

Warren, MI 48090

C: 313 573-2065/1814/2467

AV: 273-2065/1814/2467

TARCOM

US Army Tank-Automotive Materiel Readiness Command

ATTN: DRSTA-EM, Ms. Vivian Buarkhalter

Warren, MI 48090

C: 313 573-2485

AV: 273-2485

ARRCOM

US Army Armament Materiel Readiness Command

ATTN: DRSAR-IRB, Mr. August Zahatko

Rock Island Arsenal

Rock Island, IL 61299

C: 309 794-4485/3730

AV: 793-4485/3730

ARRADCOM

US Army Armament R&D Command
ATTN: DRDAR-PML, Mr. Donald J. Fischer
Dover, NJ 07801

C: 201 328-6714/6715
AV: 880-6714/6715

TSARCOM

US Army Troop Support and Aviation Materiel Readiness Command
ATTN: DRSTS-PLEP(2), Mr. Don G. Doll
4300 Goodfellow Blvd.
St. Louis, MO 63120

C: 314 263-3040
AV: 693-3040

MERADCOM

US Army Mobility Equipment R&D Command
ATTN: DRDME-UPE, Mr. S. O. Newman
Fort Belvoir, VA 22060

C: 703 664-5530
AV: 354-5530

NARADCOM

US Army Natick R&D Command
ATTN: DRDNA-EZM, Mr. Frank Civilikas
Natick, MA 01760

C: 617 653-1000, x2793/4
AV: 955-2349/2351

TECOM

US Army Test & Evaluation Command
ATTN: DRSTE-AD-M, Mr. Grover Shelton
Aberdeen Proving Ground, MD 21005

C: 301 278-3677
AV: 283-3677

AMMRC

US Army Materials & Mechanics Research Center
ATTN: DRXMR-PT, Mr. Raymond Farrow
Watertown, MA 02172

C: 617 923-3150
AV: 955-3150

HDL

Harry Diamond Laboratories
ATTN: DELHD-PP, Mr. Julius Hoke
2800 Powder Mill Road
Adelphi, MD 20783

C: 202 394-1551
AV: 290-1551

Rock Island Arsenal

ATTN: SARRI-ENM, Mr. Joseph DiBenedetto
Rock Island, IL 61299

C: 309 794-4627/4584
AV: 793-4627/4584

Watervliet Arsenal

ATTN: SARWV-PPI, Mr. L. A. Jette
Watervliet, NY 12189

C: 518 266-5318
AV: 794-5318

PM for Munitions Production Base Modernization and Expansion

ATTN: DRCPM-PBM-DP, Mr. Joseph Taglairino
Dover, NJ 07801

C: 201 328-6708
AV: 880-6708

AMRDL

US Army Air Mobility R&D Laboratories
ATTN: SAVDL-EU-TAS, Mr. L. Thomas Mazza
Fort Eustis, VA 23604

C: 804 878-5732
AV: 927-5732

IBEA

US Army Industrial Base Engineering Activity

ATTN: DRXIB-MT, Mr. James Carstens

Rock Island, IL 61299

C: 309 794-5113

AV: 793-5113

DCSRDA

ATTN: DAMA-CSM, Mr. Rod Vawter

Room 3C400, The Pentagon

Washington, DC 20310

C: 202 695-0506/07/08

AV: 225-0506/07/08

DCSRDA (PA 1497, Aircraft)

ATTN: DAMA-WSA, LTC Jay B. Bisbey

Room 3B454, The Pentagon

Washington, DC 20310

C: 202 695-1362

AV: 225-1362

DCSRDA (PA 2597, Missiles)

ATTN: DAMA-WSM-A, Mr. John Doyle

Room 3B485, The Pentagon

Washington, DC 20310

C: 202 695-8740

AV: 224-8740

DCSRDA (PA 3297, Weapons; PA 3197, Tracked Combat Vehicles)

ATTN: DAMA-WSW, MAJ Gordon Winder

Room 3D455, The Pentagon

Washington, DC 20310

C: 202 697-0106

AV: 227-0106

DCSRDA (PA 5297, Communications/Electronics)

ATTN: DAMA-CSC-BU, COL Higgins

Room 3D440, The Pentagon

Washington, DC 20310

C: 202 695-1881

AV: 225-1881

DCSRDA (Other Procurement Activities:

PA 5197, Tactical and Support Vehicles)

ATTN: DAMA-CSS-P, LTC L. R. Hawkins

Room 3D416, The Pentagon

Washington, DC 20310

C: 202 694-8720

AV: 224-8720

DCSRDA (Other Procurement Activities:

PA 5397, Other Support)

ATTN: DAMA-CSS-P, LTC P. K. Linscott

Room 3D418, The Pentagon

Washington, DC 20310

C: 202 694-8720

AV: 224-8720

DCSRDA (PA 4950, Ammunition)

ATTN: DAMA-CSM-DA, COL Jack King

Room 3C444, The Pentagon

Washington, DC 20310

C: 202 694-4330

AV: 224-4330

DCSRDA (PA 4950, Ammunition)

ATTN: DAMA-CSM-P, Mr. John Mytryshyn

Room 3C444, The Pentagon

Washington, DC 20310

C: 202 694-4330

AV: 224-4330

DRXIB-MT

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PM, Aircraft Survivability Equipment (ASE), Attn: DRCPM-ASE (AVRADCOM)

PM, Amphibians and Watercraft (AWC), Attn: DRCPM-AWC (TSARCOM)

PM, Armored Combat Vehicle Technology (ACVT), Attn: DRCPM-CVT (TARADCOM)

PM, Army Tactical Communications Systems (ATACS), Attn: DRCPM-ATC (CORADCOM)

PM, Army Tactical Data Systems (ARTADS), Attn: DRCPM-TDS (CORADCOM)

PM, Automatic Test Support Systems, Attn: DRCPM-ATSS (CORADCOM)

PM, Blackhawk, Attn: DRCPM-BH (AVRADCOM)

PM, Cannon Artillery Weapons Systems, Attn: DRCPM-CAWS (ARRADCOM)

PM, CH-47 Mod. Program, Attn: DRCPM-CH47M (AVRADCOM)

PM, CHAPARRAL/FAAR, Attn: DRCPM-CF (MICOM)

PM, Chemical Demilitarization & Installation Restoration, Attn: DRCPM-DR (APG)

PM, COBRA, Attn: DRCPM-CO (TSARCOM)

PM, Division Air Defense (DIVAD) Gun, Attn: DRCPM-ADG (ARRADCOM)

PM, Family of Military Engr. Construc. Equip. (FAMECE)/Univsl. Engr. Tractor (UET), Attn: DRCPM-FM (MERADCOM)

PM, Fighting Vehicle Armament, Attn: DRCPM-FVA (TARADCOM)

PM, Fighting Vehicle Systems, Attn: DRCPM-FVS (TARADCOM)

PM, FIREFINDER, Attn: DRCPM-FF (ERADCOM)

PM, General Support Rocket System, Attn: DRCPM-RS (MICOM)

PM, Ground Laser Designators, Attn: DRCPM-LD (MICOM)

PM, HAWK, Attn: DRCPM-HA (MICOM)

PM, Heavy Equipment Transporter (HET), Attn: DRCPM-HT (TARCOM)

PM, Heliborne Laser Fire and Forget (HELLFIRE) Missile System, Attn: DRCPM-HE (MICOM)

DRXIB-MT

DISTRIBUTION (Cont'd):

Project/Product Managers (Cont'd):

PM, High Energy Laser System, Attn: DRCPM-HEL (MICOM)
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PM, LANCE, Attn: DRCPM-LC (MICOM)
PM, M60 Tank Development, Attn: DRCPM-M60TD (TARCOM)
PM, M60 Tank Production, Attn: DRCPM-M60TP (TARCOM)
PM, M110E2 Weapon System, Attn: DRSAR-HA (ARRCOM)
PM, M113/M113A1 Family of Vehicle Readiness, Attn: DRCPM-M113 (TARCOM)
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PM, Multi-Service Communications Systems, Attn: DRCPM-MSCS (CORADCOM)
PM, Navigation Control Systems (NAVCON), Attn: DRCPM-NC (ERADCOM)
PM, Nuclear Munitions, Attn: DRCPM-NUC (ARRADCOM)
PM, PATRIOT, Attn: DRCPM-MD (MICOM)
PM, PERSHING, Attn: DRCPM-PE (MICOM)
PM, Remotely Monitored Battlefield Sensor Systems (REMBASS), Attn: DRCPM-RBS (ERADCOM)
PM, 2.75 Rocket System, Attn: DRCPM-RK (MICOM)
PM, SATCOM, Attn: DRCPM-SC (ERADCOM)
PM, Selected Ammunition, Attn: DRCPM-SA (ARRADCOM)
PM, Signal Intelligence/Electronic Warfare (SIGINT/EW), Attn: DRCPM-SIEW (CERCOM)
PM, Single Channel Ground and Airborne Radio Subsystem (SINGARS), Attn: DRCPM-GARS (CORADCOM)
PM, Smoke/Obscurants (SMOKE), Attn: DRCPM-SMK (APG)
PM, Special Electronic Mission Aircraft (SEMA), Attn: DRCPM-AE (TSARCOM)
PM, Stand-off Target Acquisition System, Attn: DRCPM-STA (ERADCOM)
PM, STINGER, Attn: DRCPM-MP (MICOM)
PM, TOW-DRAGON, Attn: DRCPM-DT (MICOM)
PM, Training Devices, Attn: DRCPM-TND (Orlando, FL)
PM, US ROLAND, Attn: DRCPM-ROL (MICOM)
PM, VIPER, Attn: DRCPM-VI (MICOM)
PM, XM-1 Tank System, Attn: DRCPM-GCM (TARADCOM)

Project Officers:

PO, M60A1 Tank Camouflage Pilot Program, Attn: DRXFB-RT
PO, SLUPAE/SLUMINE, Surface Launch Unit Fuel Air Explosive (SLUPAE) Mine Neutralization System/Surface Launched Unit Mine (SLUMINE) Dispensing System, Attn: DRDME-NS (Ft. Belvoir)
PO, Stand-Off Target Acquisition/Attack System (SOTAS), Attn: DRSEL-CT
PO, Test, Measurement, and Diagnostic Equipment, Attn: DRCRE-T (DARCOM)
PO, Tactical Shelters, Attn: DRXNM-UBS

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Cdr, TARADCOM, Attn: DRDTA
Cdr, TARCOC, Attn: DRSTA
Cdr, TECOM, Attn: DRSTE
Cdr, TSARCOM, Attn: DRSTS
Cdr, MERADCOM, Attn: DRDME
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Cdr, Rock Island Arsenal (RIA), Attn: SARRI-CO
Cdr, Rocky Mountain Arsenal (RMA), Attn: SARRM-IS (2 cys)
Cdr, Watervliet Arsenal (WVA), Attn: SARWV

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Cdr, Hawthorne AAP, Attn: SARHW
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Cdr, Lone Star AAP, Attn: SARLS
Cdr, Longhorn AAP, Attn: SARLO
Cdr, Louisiana AAP, Attn: SARLA
Cdr, McAlester AAP, Attn: SARMC-FD
Cdr, Milan AAP, Attn: SARMI
Cdr, Mississippi AAP, Attn: SARMS
Cdr, Radford AAP, Attn: SARRA
Cdr, Riverbank AAP, Attn: SARRB
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Depots:

Cdr, Anniston Army Depot, Attn: SDSAN-MD
Cdr, Corpus Christi Army Depot, Attn: SDSCC-MPI
Cdr, Letterkenny Army Depot, Attn: SDSLE-MM
Cdr, New Cumberland Army Depot, Attn: SDSNC-ME
Cdr, Red River Army Depot, Attn: SDSRR-MO
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Cdr, Sierra Army Depot, Attn: SDSSI-EM
Cdr, Tobyhanna Army Depot, Attn: SDSTO-M
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Depot Activities:

Cdr, Lexington-Blue Grass Army Depot Activity, Attn: SDSLE
Cdr, Navajo Army Depot Activity, Attn: SDSTE-N
Cdr, Pueblo Army Depot Activity, Attn: SDSTE-PUM
Cdr, Savanna Army Depot Activity, Attn: SDSLE-VM
Cdr, Umatilla Army Depot Activity, Attn: SDSTE-UM
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Cdr, Army Ballistic Research Labs (BRL), Attn: DRDAR-BL
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Cdr, Watervliet Arsenal, ATTN: DRDAR-LCB-S, Mr. M. L. Slawsky

Army Organizations:

Dir, AMMRC, Attn: DRXMR, DRXMR-M (3 cys)
Dir, AMMRC, Attn: DRXMR-EO, Dr. Morton Kliman
Cdr, APG, Attn: STEAP-MT-M, Mr. J. L. Sanders
Cdr, Army Research Office (ARO), Attn: DRXRO-AO
Cdr, Army Weapons Support Center, Crane, IN
Cdr, ARRCOM, Attn: DRSAR-IRW, Mr. Arne Madsen
Cdr, ARRCOM, Attn: DRSAR-LEP, R. F. Tumasonis (6 cys)
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Cdr, ERADCOM, Attn: DRDEL-ED, Mr. Robert Ruth/Mr. Harold Garson
Dir, Installations & Services Activity (I&SA), Attn: DRCIS-RI

MT Representatives:

Cdr, ARRADCOM, Attn: DRDAR-PML, Mr. Donald J. Fischer (7 cys)
Cdr, ARRCOM, Attn: DRSAR-IRB, Mr. August Zahatko (5 cys)
Cdr, AVRADCOM, Attn: DRDAV-EXT, Mr. Robert Vollmer
Cdr, CERCOM, Attn: DRSEL-LE-R, Mr. Martin Ides
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Cdr, TSARCOM, Attn: DRSTS-PLEP (2), Mr. Don G. Doll
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Cdr, WVA, Attn: SARWV-PPI, Mr. L. A. Jette
PM, MPBM&E, Attn: DRCPM-PBM-DP, Mr. Joseph Taglairino
DCSRDA, Attn: DAMA-WSA, LTC Jay B. Bisbey
DCSRDA, Attn: DAMA-WSM-A, Mr. John Doyle
DCSRDA, Attn: DAMA-WSW, MAJ Gordon Winder
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DCSRDA, Attn: DAMA-CSS-P, LTC L. R. Hawkins, LTC P. K. Linscott
DCSRDA, Attn: DAMA-CSM-P Mr. John Mytryshyn
DCSRDA, Attn: DAMA-CSM-DA, COL Jack King

Navy Activities:

Cdr, NAVMAT, Attn: CPT F. B. HOLLICK, Code 064
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Cdr, Naval Surface Weapons Ctr/White Oak Lab, Attn: Code E345, Mr. Chas. McFann
Cdr, Naval Surface Weapons Ctr/Dahlgren Lab, Attn: Code CM-51
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Air Force Activities:

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Cdr, AFSC/DLF, Andrew AFB
Cdr, AFSC/DLFF, Andrew AFB
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Cdr, AFML/LT, Wright-Patterson AFB
Cdr, AFML/LTE, /LTM, /LTN, Wright-Patterson AFB
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