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UNITED STATES ARMY
MATERIEL DEVELOPMENT AND READINESS COMMAND
DIRECTORATE FOR MANUFACTURING TECHNOLOGY

PROGRAM ACCOMPLISHMENTS

IN
MANUFACTURING
METHODS & TECHNOLOGY



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PREPARED BY

US ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY
MANUFACTURING TECHNOLOGY DIVISION
ROCK ISLAND, ILLINOIS 61299



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

DRXIB-MT

SUBJECT: MM&T Program Accomplishments

SEE DISTRIBUTION

1. Reference AR 700-90, C1, Para 3-3e(5), Logistics, Army Industrial Preparedness Program, dated 15 March 1982.
2. This brochure describes recent accomplishments of the DARCOM Manufacturing Methods and Technology Program. The information is presented in three sections:

Section I - A concise summary of the benefits for each project.

Section II - Charts describing recently completed projects which have the potential to provide benefits.

Section III - Charts describing projects which have been implemented and are providing benefits.

3. Further information on the projects can be obtained from the MMT points of contact found on page 3.

FOR THE DIRECTOR:


JAMES W. CARSTENS
Chief, Manufacturing Technology Division

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INTRODUCTION

1. This brochure describes the results of recently completed projects funded by the Army Manufacturing Methods and Technology Program. The MMT Program is managed by the HQ DARCOM Directorate for Manufacturing Technology and the DARCOM major subordinate commands.
2. Project results which are depicted in this brochure are shown on one page charts. The charts are titled either: Accomplishment or Implementation. Accomplishment charts describe projects that are a part of a multi-year effort which has not yet been completed or they are recently completed and have not yet been surveyed for implementation. The implementation survey is made one year after project completion. The charts titled, Implementation, describe projects that have been surveyed for implementation. A comparison of these two types of charts is found on the following page.

ACCOMPLISHMENT CHART

IMPLEMENTATION CHART

DARCOM MMT ACCOMPLISHMENT

(Based on one or more Final RCS 301 Reports and satisfactory support data)

PROJECT NO: X XX XXXX

or

X XX,XX XXXX

(One or more FY shown)

RESULTS:

(Verb tense is past for project completion and future for implementation and savings)

DARCOM MMT IMPLEMENTATION

(Based on having all the Final RCS 301 Reports submitted, satisfactory support data and a completed RCS 303 Report)

EFFORT NO. X XXXX

(No FY shown)

BENEFITS:

(Verb tense is present or past for implementation and past, present or future for savings)

MMT POINTS OF CONTACT

COMMAND CODE

REPRESENTATIVE

PHONE

1

AVRADCOM

US Army Aviation R&D Command
ATTN: DRDAV-EGX, Mr. Dan Haugan
4300 Goodfellow Blvd.
St. Louis, MO 63120

C: 202 274-8284/8298
AV: 284-8284/8298

2 or F

CECOM

US Army Communications Electronics Command
ATTN: DRSEL-POD-P-G, Messr Feddeler/Esposito/Resnic
ATTN: DRSEL-PC-I-IP-1, Mr. Leon Field
Fort Monmouth, NJ 07703

C: 201 535-4926
AV: 995-4926
C: 201 532-4035
AV: 992-4035

2 or H

ERADCOM

US Army Electronics R&D Command
ATTN: DELET-R, Mr. Joseph Key
Fort Monmouth, NJ 07703

C: 201 544-4258
AV: 995-4258

3 or R

MICOM

US Army Missile Command
ATTN: DRSMI-RST, Mr. Richard Kotler
Redstone Arsenal, AL 35898

C: 205 876-2065
AV: 746-2065

4 or T

TACOM

US Army Tank-Automotive Command
ATTN: DRSTA-RCK, Dr. Jim Chevalier
Warren, MI 48090

C: 313 573-6065/5814
AV: 786-6065/5814

5

ARRCOM

US Army Armament Materiel Readiness Command
ATTN: DRSAR-IRI-A, Mr. Dennis Dunlap
Rock Island Arsenal
Rock Island, IL 61299

C: 309 794-3666/4398
AV: 793-3666/4398

MMT POINTS OF CONTACT

<u>COMMAND CODE</u>	<u>REPRESENTATIVE</u>	<u>PHONE</u>
6	ARRADCOM US Army Armament R&D Command ATTN: DRDAR-PMP-P, Mr. Donald J. Fischer Dover, NJ 07801	C: 201 328-2708 AV: 880-2708
E	MERADCOM US Army Mobility Equipment R&D Command ATTN: DRDME-UE, Mr. R. Goehner Fort Belvoir, VA 22060	C: 703 664-4221 AV: 354-4221

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SECTION I

SUMMARY OF BENEFITS

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS OTHER	ACTUAL BENEFITS \$ SAVINGS OTHER	REMARKS
E 78 & 79 3613	\$255/MODULE		PRODUCTION IS SCHEDULED FOR 1986
H 79 3504	INCREASED CAPABILITY & REDUCED SCRAP		USED IN FLIR COMMON MODULE & TOW NIGHT SIGHT
H 77 9751	\$270,000		AN/GVS-5 APPLICATION
2 76 9754	AUTOMATED PRODUCTION		FOLLOW-ON WILL COMPLETE. GE WILL IMPLEMENT
2 79 9783	\$15.00/GRAM		IMPLEMENTATION AT HUGHES
2 77 9792			
2 77 9808	\$2.00/CIRCUIT		100% INSPECTION IS NOW ECONOMICAL
1 76 7042	75% COST REDUCTION		FOLLOW-ON PROJECT WILL COMPLETE
1 75 7070	75% COST REDUCTION		NEAR NET SHAPE CASTING
1 76 7079	\$330,000/YEAR		FOLLOW-ON PROJECTS WILL COMPLETE
1 78 7086	\$1.7 MILLION/YEAR		FOLLOW-ON PROJECTS WILL COMPLETE THE EFFORT
1 79 7086	\$1.7 MILLION/YEAR		
1 78 7121	\$257,000/1000 BLADES		
1 77&78 7144	IMPROVED INSPECTION		GE WILL IMPLEMENT

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS	OTHER	ACTUAL BENEFITS \$ SAVINGS	OTHER	REMARKS
1 76 & 80 7156		IMPROVED MACHINING			CORPUS CHRISTI ARMY DEPOT WILL IMPLEMENT
1 76 7164		IMPROVED PERFORMANCE REDUCED WEIGHT & COST			HELICOPTER WINDOW APPLICATIONS
1 74 & 75 8035		PROVIDED PRODUCTION CAPABILITY			FOLLOW-ON PROJECT IS DEVELOPING ENHANCEMENTS PARTIAL IMPLEMENTATION AT PRATT & WHITNEY, SIKORSKY & HAMILTON STANDARD
2 78 9773		AUTOMATED TEST PROGRAMS			MARTIN-MARIETTA WILL IMPLEMENT
R 80 1021	\$720,000/YR				CHRYSLER ELECTRONICS IS IMPLEMENTING IMPLEMENTATION AT WESTINGHOUSE
R 77 & 78 3121	\$2.4 MILLION	IMPROVED PRODUCT			AN/TPQ-36 AN NAVY HMD-22 APPLICATIONS CHAPARRAL MOTOR APPLICATION
R 77 & 79 3160	\$970,000/YR				FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT
R 77 & 80 3169		AUTOMATED INSPECTION			APPLICATIONS TO COPPERHEAD AND NAVY 5"
R 78 3171	\$1 MILLION	AUTOMATED SOLDERING			COMBAT VEHICLE APPLICATIONS
R 78 & 79 3242		AUTOMATED DIAGNOSTICS			
R 79 3287	19% REDUCTION	IMPROVED TOOL LIFE			
R 78 3376		OPTICAL TESTING CAPABILITY			
R 78 3440		AUTOMATED INSPECTION			
T 79 5054		LASER HARDENING CAPABILITY			

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS OTHER	ACTUAL BENEFITS \$ SAVINGS OTHER	REMARKS
T 79 5082			
5 76 1311	\$1.56/KIT		FOLLOW-ON EFFORTS ARE IN PROGRESS
5 79 1905			M229 CHEMICAL AGENT ALARM REFILL KIT APPLICATION
5 75 & 76 3062	\$3.00/BATTERY		CASTING OF PBX EXPLOSIVE
5 76 3110	500,000/YEAR CAPABILITY		2.75 ROCKET APPLICATION
5 74,75&76 4009	160,000 SWITCHES PER MONTH INCREASED SAFETY		AUTOMATED ASSEMBLY, TEST AND PACKAGE AUTOMATED PACKAGING OF SHAPED CHARGES
5 75,76&78 4041	\$4.8 MILLION		MILAN AAP IMPLEMENTATION PLANNED
5 79 & 80 4137	13% ROI		ROCKET WARHEADS
5 78 4143	\$273,000/300,000 UNITS		
5 76 & 77 4211	INCREASED SAFETY		LOADING MOLTEN EXPLOSIVES
5 7T & 78 4249	INCREASED PRODUCTION AND SAFETY		IMPLEMENTATION AT HOLSTON AAP
5 77 4252	INCREASED PRODUCTION AND SAFETY		FOLLOW-ON PROJECTS WILL COMPLETE
5 78 4252	REDUCED PROCESS TIME		
5 76 4285	PROTECTIVE FACILITIES		APPLICATION TO RDX & HMX MANUFACTURE (HOLSTON AAP) APPLICATION TO SEVERAL PROPELLANTS & EXPLOSIVES

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
5 78 4288		IMPROVED SAFETY			APPLICATIONS AT HOLSTON AND IOWA AAP'S
5 78 4322		REACTIVATION PROCEDURES			APPLIED TO 9 AAP'S
5 79 4332	\$173,000				BLU 92/B GATOR MINE APPLICATION
5 78 4454		AUTOMATED INSPECTION			APPLICATION AT MILAN AAP. FOLLOW
5 78 4508		IMPROVED PRODUCT			-ON PROJECT WILL COMPLETE
5 76 6640		LEAD TIME REDUCTION IMPROVED TOOL LIFE			APPLICATION AT HOLSTON AAP. FOLLOW-ON PROJECTS WILL COMPLETE
5 79 6716					APPLICATION TO ARTILLERY METAL PARTS
6 78 & 80 3901		IMPROVED PRODUCT			
6 73 7087		MANPOWER REDUCTION & QUALITY IMPROVEMENT			ROCK ISLAND ARSENAL WILL IMPLEMENT
6 77 & 79 7213		REDUCED FACILITIES AND POLLUTANTS			
6 75 7589	\$135,000/YR				AUTOMATED TARGETING
6 77 7644	\$0.70/RECEIVER	REDUCED SUPPLY REQUIREMENTS			
6 77 7707	\$2.5 MILLION/YR				ROCK ISLAND ARSENAL WILL IMPLEMENT
6 77 7715	\$46,000/YR(FYDP) \$138,000/YR (MOB)				ROCK ISLAND ARSENAL WILL IMPLEMENT

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS	ACTUAL BENEFITS \$ SAVINGS OTHER	REMARKS
6 77 & 78 7716		REDUCED MAINTENANCE AND REWORK	REDUCED POLLUTANTS
6 78 8045	\$8,500/YEAR	IMPROVED YIELD	WATERVLIET ARSENAL WILL IMPLEMENT
6 80 8059	\$20,000/TUBE	AUTOMATED CONTROLS	WATERVLIET ARSENAL WILL IMPLEMENT

IMPLEMENTATION SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS	ACTUAL BENEFITS \$ SAVINGS OTHER	REMARKS
2 9640		\$3.7 MILLION	IMPLEMENTED AT HONEYWELL RADIATION CENTER
2 9741		\$1.0 MILLION	IMPLEMENTED AT FORT MONMOUTH
2 9746		\$12.6 MILLION/10 YRS	APPLIED TO AN/PVS-7 NIGHT VISION GOGGLE
2 9842		\$11.8 MILLION/7 YRS	APPLIED TO AN/PVS-6 AND AN/PVS-7
R 3112		\$6.4 MILLION/7 YRS	APPLIED TO COPPERHEAD
R 3135		\$30 MILLION/7 YRS (FYDP)	APPLIED TO VIPER
		\$72.5 MILLION/7 YRS (MOB)	
R 3171		\$1.1 MILLION/YR	IMPLEMENTED AT WESTINGHOUSE AND ELECTROVERT
3 3230		\$5.7 MILLION/ /10 YRS	IMPLEMENTED AT GENERAL DYNAMICS
5 1249		\$112,000/YR (FYDP)	QUALITY IMPROVEMENT
5 1339		SAFER METHOD	IMPLEMENTED BY TECH DATA PACKAGE CHANGE
5 3063		\$180,000/YR (MOB)	
		\$1.25 MILLION	IMPROVED TEST METHODS
5 4005		\$1.7 MILLION	IMPLEMENTED AT LOUISIANA AAP ('H' LINE)
5 4263	IMPROVED YIELD		IMPLEMENTATION WILL BE AT MILAN AAP (FY 84)
5 4280		\$4.6 MILLION/6 YRS	IMPLEMENTED BY 3 VENDORS
6 7191	IMPROVED TEST & EVALUATION		IMPLEMENTED BY A MIL SPEC

IMPLEMENTATION SUMMARY

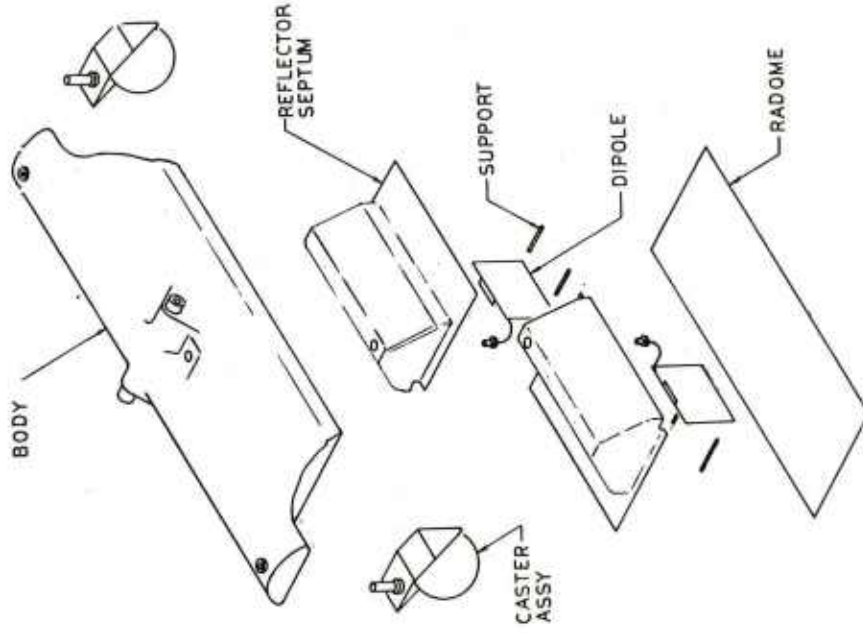
PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
6 7461				ESTABLISHED MACHINING PARAMETERS	IMPLEMENTATION BY TECHNICAL REPORT
6 7479			\$1 MILLION		STEDI-EYE M-3A & TRANS-LENS APPLICATIONS
6 7578		SIMPLIFIED PROCESSING			BEING EVALUATED AT PICATINNY ARSENAL

SECTION II

RECENTLY COMPLETED PROJECTS

DARCOM MMT ACCOMPLISHMENTS

MOBILITY EQUIPMENT RESEARCH AND DEVELOPMENT COMMAND



RECOMMENDED ANTENNA MODULE

PROJECT NO: E 78.79 3613

TITLE: VEHICLE MOUNTED ROAD MINE DETECTOR
SYSTEM ANTENNA.

COST: \$326.000

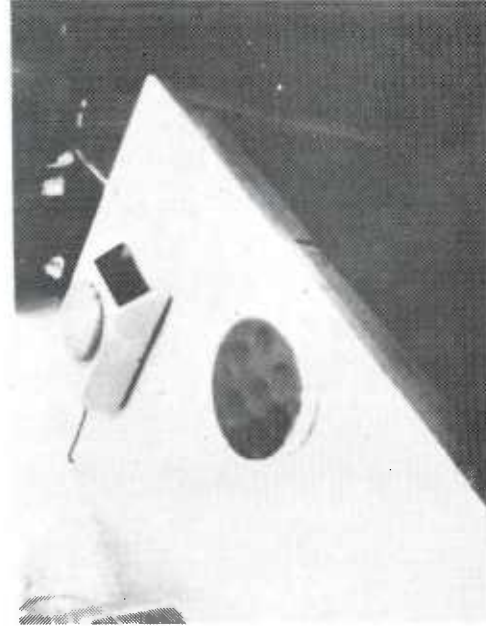
GOAL: REDUCE THE COST OF PRODUCING THE
ANTENNA MODULES WHILE MAINTAINING
THE NECESSARY RUGGEDNESS.

RESULTS

- ROTATIONAL MOLDING TECHNIQUE WAS DEVELOPED TO PRODUCE A HOLLOW ONE PIECE ANTENNA BODY.
- IMPLEMENTATION IS ESTIMATED TO REDUCE THE ANTENNA MODULE COSTS FROM \$350 TO APPROXIMATELY \$95. PRODUCTION OF THESE ANTENNAS IS SCHEDULED FOR 1986.

DARCOM MMT ACCOMPLISHMENTS

ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND



CORE DRILLED GLASS PLATE

EFFORT NO: H 79 3504

TITLE: FABRICATING CHALCOGENIDE GLASS

COST: \$305,142

GOAL: ESTABLISH AN INCREASED PRODUCTION
CAPACITY FOR GEASSE INFRARED
LENSES.

RESULTS

- GEASSE GLASS WAS COMPOUNDED AND CAST IN LARGER 8 INCH AND 10 INCH DIAMETER PLATES.
- CAST YIELD WAS INCREASED TO 80 PERCENT AND LENS BLANK POTENTIAL PER PLATE WAS INCREASED 180 PERCENT.
- GEASSE LENSES ARE USED IN THE ARMY FLIR COMMON MODULES AND IN THE TOW NIGHT SIGHT.
- ADDITIONAL COST SAVINGS WERE ACHIEVED BY RECASTING GLASS SCRAP AND BY PRESHAPING GLASS BLANKS TO CURVED FORM.

DARCOM MMT ACCOMPLISHMENTS

ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: H 77 9751

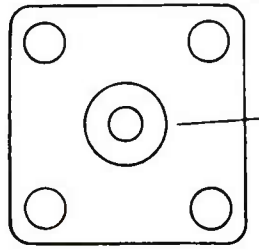
TITLE: FABRICATION OF YAG LASER RODS

COST: \$142,000

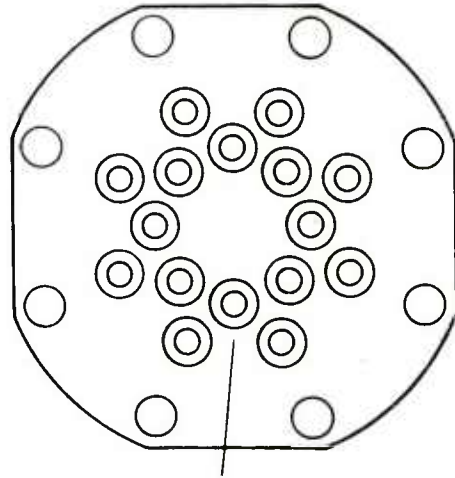
GOAL: REDUCE COSTS

RESULTS

- FIXTURING AND PROCESSES FOR BATCH PRODUCTION OF YAG LASER RODS WERE DEVELOPED.
- A PRODUCTION RATE OF 14 RODS OF THE AN/GVS-5 CONFIGURATION PER 8 HOURS IS NOW POSSIBLE.
- FINISHED ROD FACES ARE PARALLEL WITHIN 20 SECONDS OF ARC AND PERPENDICULAR TO THE ROD AXIS WITHIN 5 MINUTES OF ARC.
- ESTIMATED SAVINGS BY IMPLEMENTING THIS PROJECT ARE \$270,000.



SINGLE ROD
POLISHING FIXTURE



MULTIPLE ROD
FIXTURE (16 RODS)

DARCOM MMT ACCOMPLISHMENTS

COMMUNICATIONS AND ELECTRONICS COMMAND

PROJECT NO: 2 76 9754

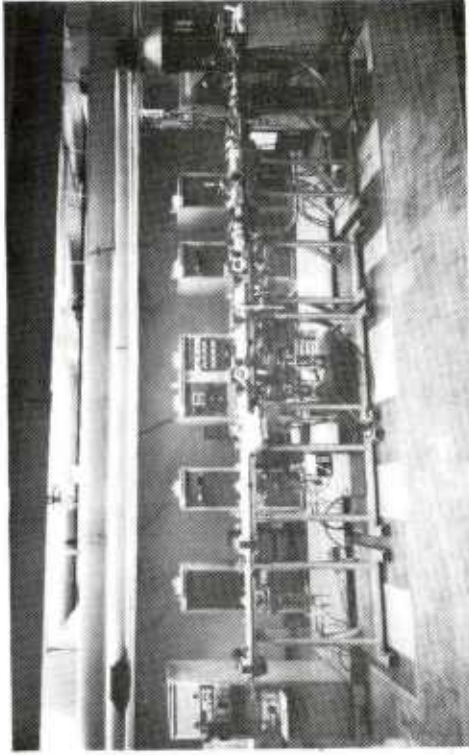
TITLE: PRODUCTION OF SHOCK RESISTANT
QUARTZ CRYSTAL UNITS

COST: \$826.650

GOAL: ESTABLISH AN AUTOMATED PRODUCTION
LINE

RESULTS

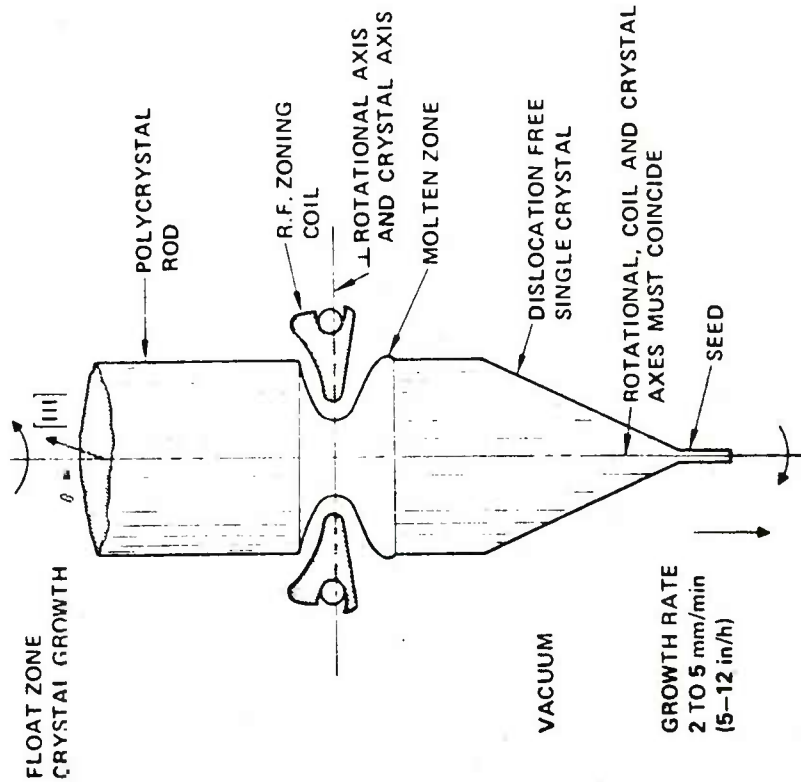
- PRODUCTION METHODS FOR HIGH SHOCK RESISTANT 22 MHZ AT-CUT QUARTZ CRYSTALS WERE DEVELOPED. THESE CRYSTALS ARE REQUIRED FOR SINGARS. AND SEVERAL SYSTEMS INCLUDING SOTAS.
- A VACUUM SYSTEM WAS BUILT WITH SEPARATE CHAMBERS FOR CRYSTAL ULTRAVIOLET CLEANING. BAKING. PLATING AND SEALING.
- A FOLLOW ON PROJECT WILL ESTABLISH THE COMPLETE PILOT LINE AT GENERAL ELECTRIC NEUTRON DEVICES.



QUARTZ CRYSTAL FABRICATION FACILITY

DARCOM MMT ACCOMPLISHMENTS

COMMUNICATIONS AND ELECTRONICS COMMAND



FLOAT ZONE CRYSTAL GROWTH

PROJECT NO: 2 79 9783

TITLE: PRODUCTION OF HIGH RESISTIVITY
SILICON MATERIAL

COST: \$918,000

GOAL: REDUCE MANUFACTURING COST

RESULTS

- EQUIPMENT FOR VACUUM ZONE REFINING OF POLYCRYSTALLINE RODS INTO HIGH PURITY SINGLE CRYSTAL RODS WAS BUILT AND IS OPERATIONAL AT HUGHES, CARLSBAD.
- THE FLOAT-ZONE CRYSTAL GROWING MACHINE IS IN OPERATION AT HUGHES, AND HAS DOUBLED THE OUTPUT OF DETECTOR GRADE SILICON.
- FUTURE AUTOMATION OF THE ZONE REFINING EQUIPMENT IS EXPECTED TO REDUCE THE COST OF SILICON FROM \$30 PER GRAM TO \$15 PER GRAM.

DARCOM MMT ACCOMPLISHMENT

ELECTRONICS RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 2 77 9792

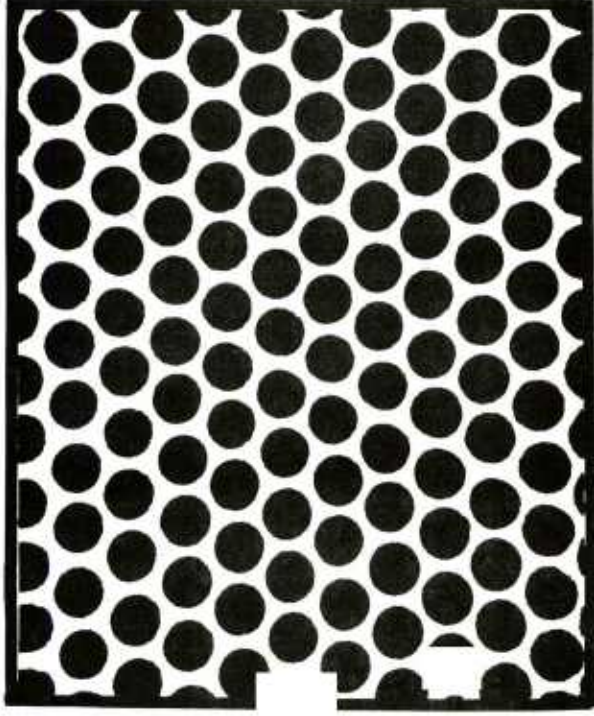
**TITLE: FABRICATION OF LOW NOISE FIGURE ION
BARRIER MICROCHANNEL PLATES**

COST: \$600,000

**GOAL: PROVIDE A VOLUME PRODUCTION
CAPABILITY**

RESULTS

- **THE ABILITY TO PRODUCE 10 ACCEPTABLE
MICROCHANNEL PLATES IN AN 8 HOUR DAY WAS
DEMONSTRATED.**
- **ENVIRONMENTAL AND OPERATIONAL LIFE TEST
PERFORMANCE WAS SATISFACTORY**
- **IMPROVED TESTING METHODS WERE DEVELOPED
TO MONITOR PRODUCT QUALITY. IMPLEMENTA-
TION OF THIS TECHNOLOGY FOR THE ANVIS
PROGRAM IS EXPECTED TO RESULT IN A \$10.6
MILLION SAVINGS.**



**PHOTOMICROGRAPH OF
MICROCHANNEL PLATE OUTPUT**

DARCOM MMT ACCOMPLISHMENTS

COMMUNICATION AND ELECTRONICS READINESS COMMAND

PROJECT NO: 2 77 9808

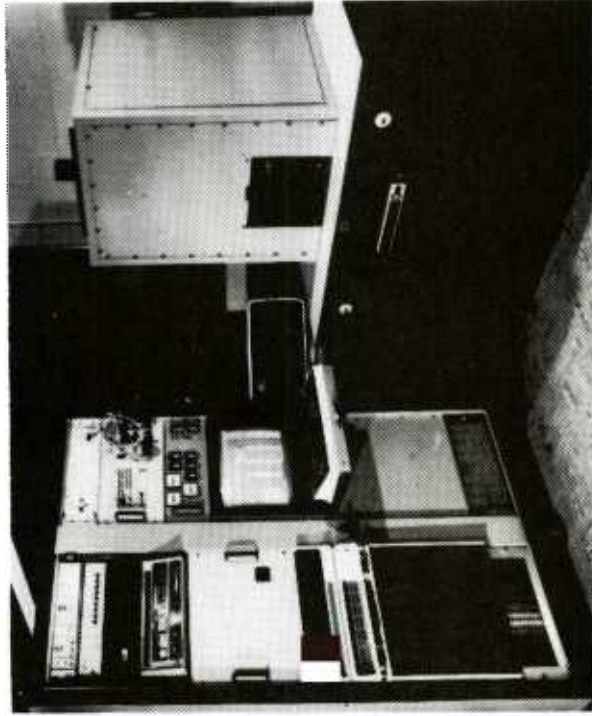
**TITLE: AUTOMATIC IN-PROCESS EVALUATION
OF THICK FILM PRINTING AND HYBRID
CIRCUIT ASSEMBLY**

COST: \$576,000

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- **THE FEASIBILITY OF APPLYING A COMPUTER CONTROLLED SYSTEM FOR AUTOMATIC INSPECTION OF HYBRID SUBSTRATES WAS DEMONSTRATED.**
- **THIS TECHNIQUE CAN INSPECT 750 HYBRID SUBSTRATES PER HOUR, MAKING 100% INSPECTION ECONOMICAL.**
- **WHEN IMPLEMENTED, THIS TECHNOLOGY WILL REDUCE THE COST OF HYBRID CIRCUITS BY \$2.00 PER CIRCUIT.**



AIME SYSTEM

DARCOM MMT ACCOMPLISHMENTS

AVIATION RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 1 76 7042

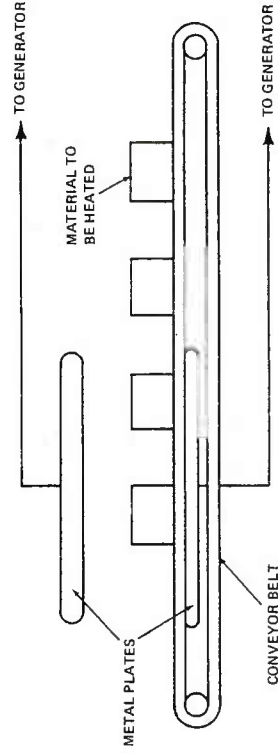
TITLE: MICROWAVE CURE OF EPOXY/FIBERGLASS
COMPOSITES

COST: \$250.000

GOAL: DEMONSTRATE THE APPLICABILITY OF CURING
EPOXY/FIBERGLASS COMPOSITE LAMINATES BY
RADIO FREQUENCY HEATING.

RESULTS

- THE TECHNIQUE WAS PROVEN.
- PROCESSING VARIABLES WERE IDENTIFIED AS ELECTRODE SPACING AND DURATION OF HEATING. POLYPROPYLENE AND POLYSULFONE WERE DETERMINED TO BE THE BEST MOLD MATERIALS.
- IMPLEMENTATION COULD RESULT IN A 75% REDUCTION IN CURING COSTS.



DIELECTRIC HEATING SYSTEM
WITH CONVEYOR

DARCOM MMT ACCOMPLISHMENT

AVIATION RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 1 75 7070

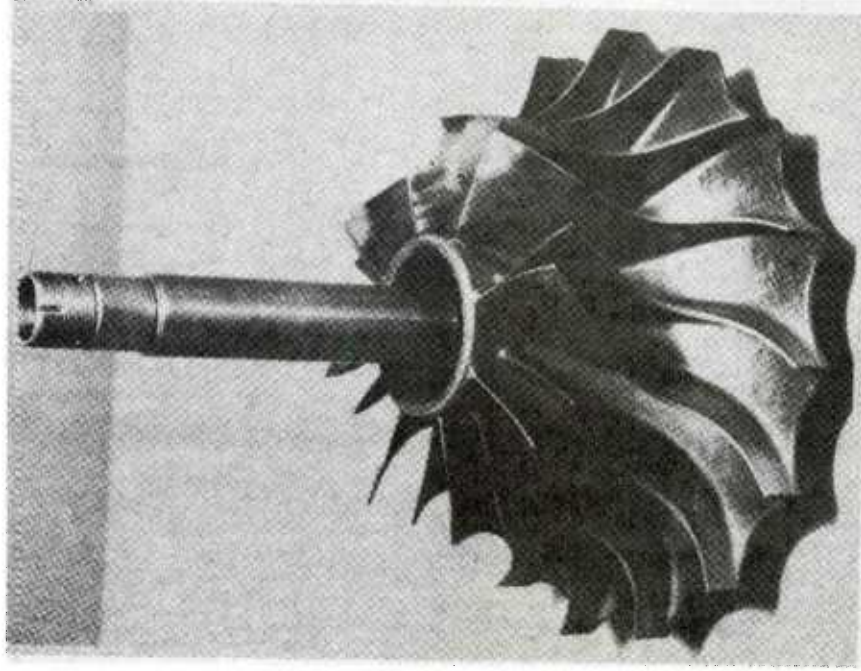
TITLE: CAST COMPRESSOR COMPONENTS

COST: \$195,000

GOAL: REDUCE METAL REMOVAL COSTS

RESULTS

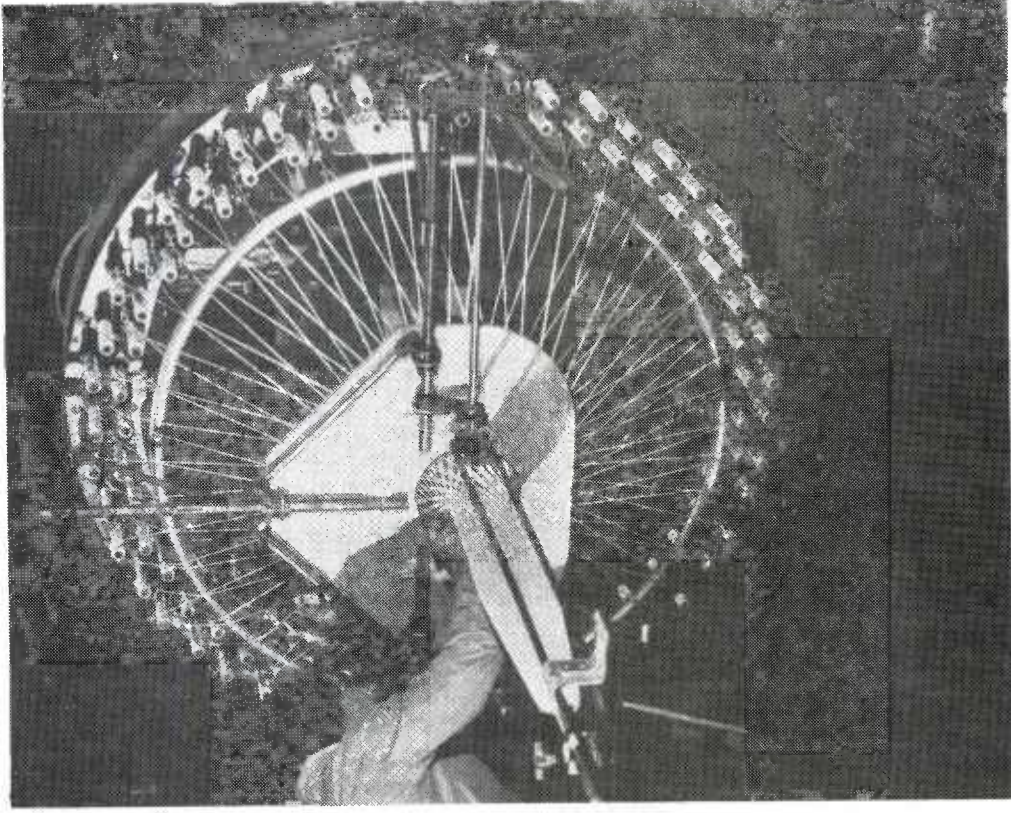
- **SOLAR TURBINE INTERNATIONAL AND PRECISION CAST PARTS CORPORATION SUCCESSFULLY CAST AND TESTED A SOLAR TITAN T62T-40 GAS TURBINE AUXILIARY POWER UNIT RADIAL COMPRESSOR IMPELLER.**
- **THE PRIOR PROCEDURE FOR THIS IMPELLER WAS TO MACHINE A 22 POUND TITANIUM ALLOY PANCAKE FORGING DOWN TO THE 2.6 POUND IMPELLER.**
- **THE PROJECTED MANUFACTURING COST SAVINGS IS 50% OVER CONVENTIONAL FORGED AND MACHINED IMPELLERS.**



**COMPRESSOR WHEEL
T62T-40C ENGINE**

DARCOM MMT ACCOMPLISHMENTS

AVIATION RESEARCH AND DEVELOPMENT COMMAND



COMPOSITE BRAIDING

PROJECT NO: 1 76 7079

TITLE: BRAIDING OF REINFORCED PLASTIC COMPONENTS FOR HELICOPTERS

COST: \$156.000

GOAL: EVALUATE MECHANICAL TUBULAR BRAIDING AS A MANUFACTURING PROCESS FOR HELICOPTER ROTOR BLADE SPARS.

RESULTS

- A PROTOTYPE BLADE, COMPATIBLE WITH EXISTING OH 58 HELICOPTERS, WAS DESIGNED AND FABRICATED USING BRAIDING TECHNIQUES.
- BALLISTIC TESTING INDICATED A GREATLY IMPROVED RESISTANCE TO DAMAGE OVER CURRENT SPARS.
- IMPLEMENTATION OF THIS PROJECT AND THE FOLLOW-ON COULD RESULT IN SAVINGS OF \$330.000 PER YEAR.

DARCOM MMT ACCOMPLISHMENTS

AVIATION RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 1 78 7086

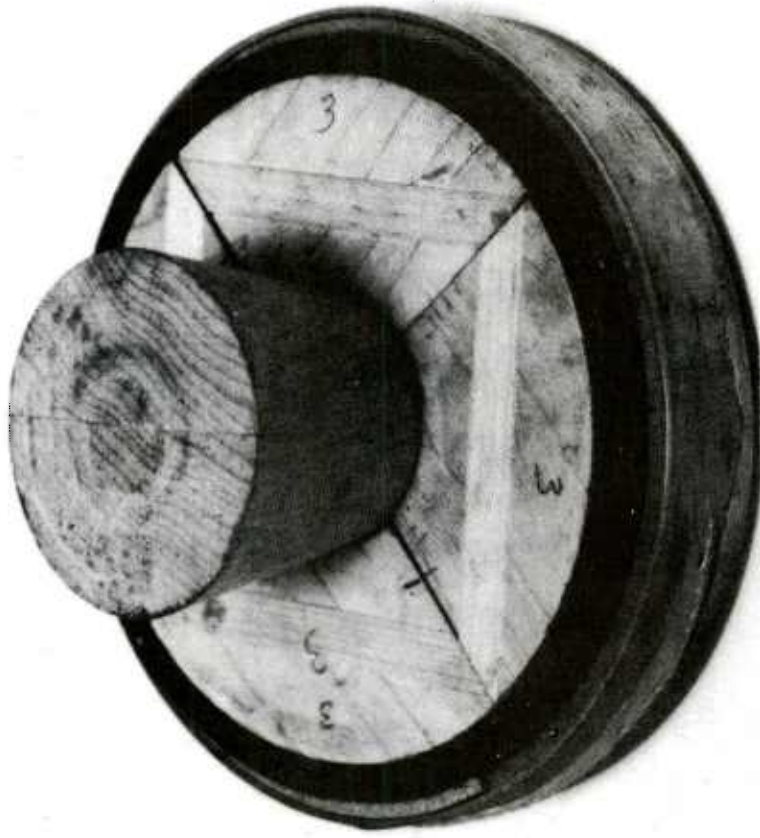
TITLE: ABRADABLE SEALS FOR COMPRESSOR
BLADE TIP

COST: \$91,000

GOAL: ESTABLISH A FASTER, LESS COSTLY
METHOD OF ATTACHING AN ABRADABLE
SEAL TO SMALL GAS TURBINE ENGINES.

RESULTS

- AN INHIBITED CHEM-BRAZE PROCESS WAS SUCCESSFUL WITH TITANIUM, STEEL AND NICKEL-BASE ALLOY ENGINES.
- AN INEXPENSIVE CHEMICAL STRIPPING TECHNIQUE FOR REFURBISHING ABRADABLE SEALS WAS DEVELOPED.
- IMPLEMENTATION OF THIS PROJECT AND ITS FOLLOW-ON PROJECT COULD RESULT IN A \$1.7 MILLION PER YEAR SAVINGS.



SEAL POSITIONED IN
SIMULATED ENGINE HARDWARE

DARCOM MMT ACCOMPLISHMENTS

AVIATION RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 1 79 7086

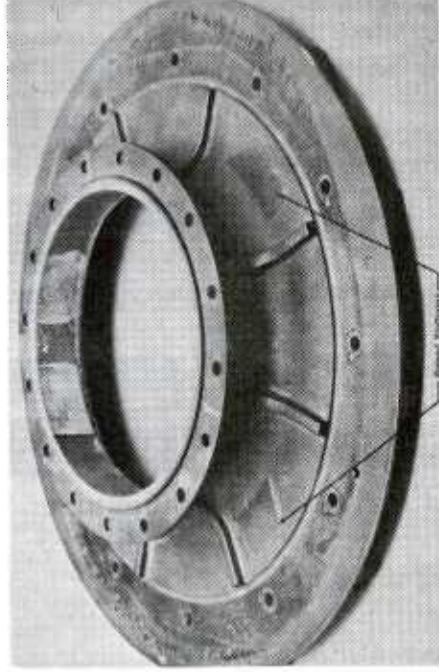
TITLE: ABRADABLE SEALS FOR COMPRESSOR BLADE TIP

COST: \$100.000

GOAL: OPTIMIZE THE CHEM BRAZE BONDING SYSTEM FOR ABRADABLE SEALS FOR TURBINE ENGINE HARDWARE.

RESULTS

- NON-DESTRUCTIVE TESTING TECHNIQUES TO IDENTIFY VOIDS, DISBONDS, AND DELAMINATIONS WERE TESTED AND SELECTED.
- LASER HOLOGRAPHY AND PULSE-ECHO NDI TECHNIQUES WERE UTILIZED FOR TESTING PROTOTYPE SEALS.
- IMPLEMENTATION OF THIS PROJECT AND ITS PREDECESSOR COULD RESULT IN AN ESTIMATED ANNUAL SAVINGS OF \$1.7 MILLION.



ENGINE HARDWARE

DARCOM MMT ACCOMPLISHMENTS

AVIATION RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 1 78 7121

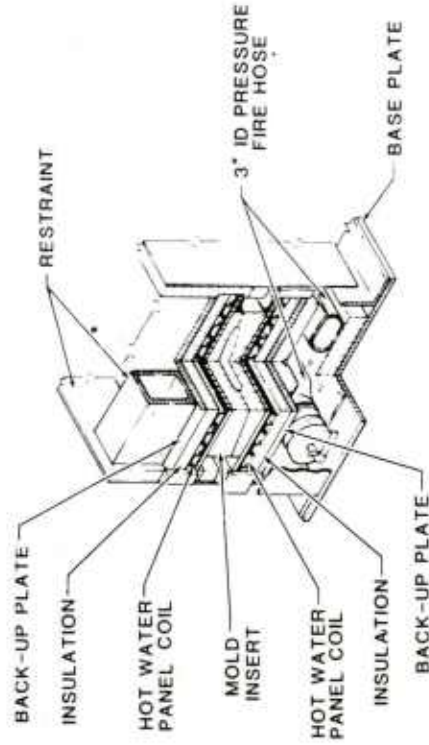
TITLE: INTEGRALLY HEATED AND PRESSURIZED
TOOLING FOR ROTOR BLADES.

COST: \$229.784

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

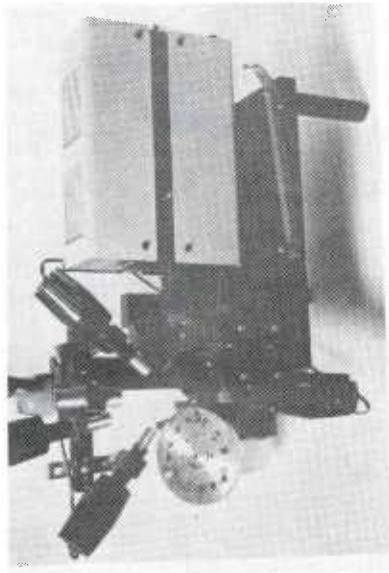
- THIS PROJECT EVALUATES THE HIGH ENERGY COSTS INCURRED IN AUTOCLAVE CURING OF COMPOSITE COMPONENTS.
- A MOLD ASSEMBLY WAS DESIGNED WITH HOT WATER PANEL COIL HEATING AND COOLING AND PNEUMATIC PRESSURIZATION.
- THE IMPROVED PROCESS COULD PROVIDE SAVINGS OF \$257.000 FOR 1000 BLADES.



TOOLING - CUTAWAY VIEW

DARCOM MMT ACCOMPLISHMENTS

AVIATION RESEARCH AND DEVELOPMENT COMMAND



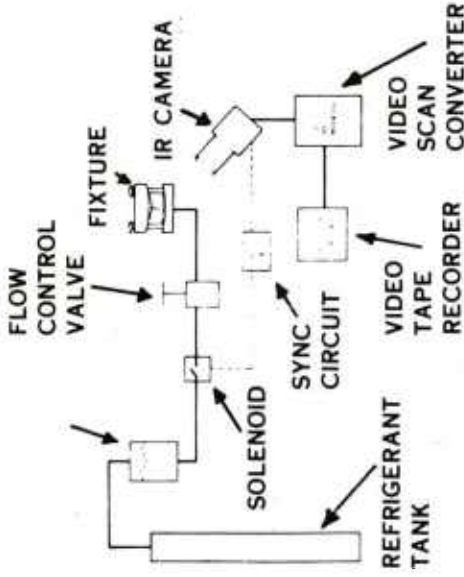
IR TECHNIQUE
CONFIGURATION

PROJECT NO: 1 77.78 7144

TITLE: TURBINE ENGINE NOZZLE IN PROCESS
INSPECTION.

COST: \$141,000

GOAL: MEASURE AIR FOIL COOLING FLOW RATES USING
A COMPUTERIZED INFRARED TECHNIQUE AND
NOZZLE ASSEMBLY EXIT AREAS USING A COM-
PUTERIZED OPTICAL IMAGING TECHNIQUE.



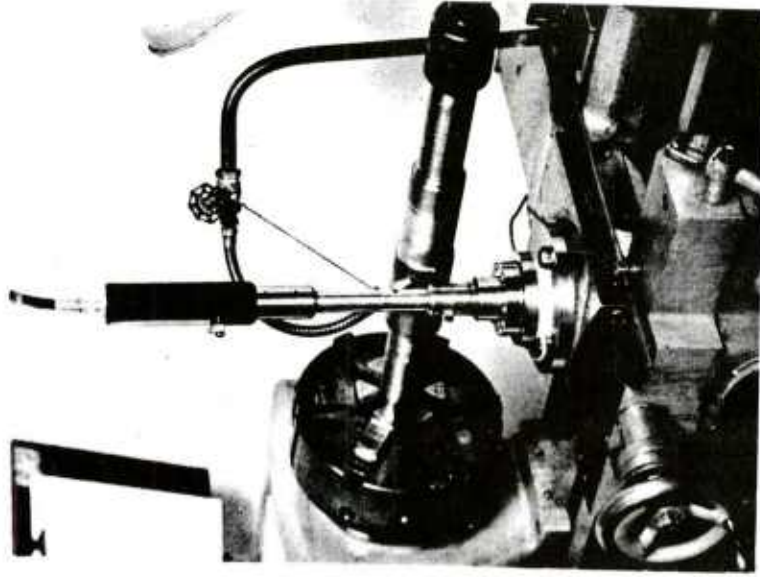
OPTICAL IMAGING FIXTURE

RESULTS

- THE EFFORT DEMONSTRATED THE PRACTICALITY OF USING INFRARED INSPECTION TECHNIQUE FOR DETECTION OF AIRFOIL BLOCKED HOLES.
- THE OPTICAL IMAGING TECHNIQUE PROVED TO BE A PRACTICAL ALTERNATIVE TO THE CHOKED FLOW SYSTEM AND IS BEING CONSIDERED FOR IMPLEMENTATION BY GENERAL ELECTRIC CO.

DARCOM MMT ACCOMPLISHMENTS

AVIATION RESEARCH AND DEVELOPMENT COMMAND



**ULTRASONIC TOOL POST
ON AN ENGINE LATHE**

PROJECT NO: 1 76.80 7156

**TITLE: ULTRASONICALLY ASSISTED MACHINING FOR
SUPERALLOYS**

COST: \$355,000

**GOAL: REDUCE THE TIME REQUIRED FOR MACHINING
SUPERALLOYS**

RESULTS

- **ULTRASONICS WAS FOUND TO ALLOW A SUBSTANTIAL INCREASE IN CUTTING SPEEDS AND FEEDS.**
- **MATERIAL REMOVAL RATES WERE INCREASED UP TO 700% AND TOOL CHATTER WAS ELIMINATED.**
- **THIS TECHNOLOGY WILL BE INSTALLED AT CORPUS CHRISTI ARMY DEPOT.**

DARCOM MMT ACCOMPLISHMENT

AVIATION RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 1 76 7164

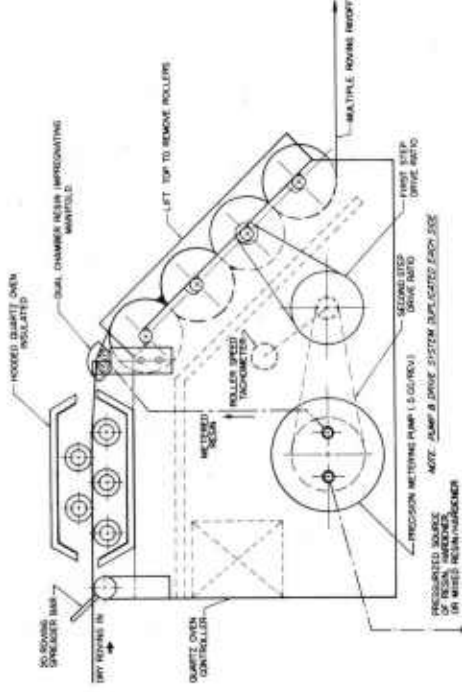
TITLE: FILAMENT WINDING RESIN
IMPREGNATION SYSTEM

COST: \$89,200

GOAL: IMPROVE THE PROCESS FOR RESIN
IMPREGNATION

RESULTS

- THE IMPROVED PROCESS REDUCES THE RESIN-TO-FIBER VARIATION FROM 4% TO 2%. THIS WAS ACHIEVED BY INJECTING THE RESIN AND HARDENER SEPARATELY ONTO THE HEATED ROVING WITH METERED PUMPS.
- THE RESIN AND HARDENER ARE MIXED BY PASSING THE IMPREGNATED ROVING THROUGH A ROLLER SYSTEM.
- IMPLEMENTATION OF THIS PROCESS WILL ALLOW THE REDUCTION OF THE CURRENT 4-1 DESIGN MARGIN FOR SAFETY. WEIGHT AND COST REDUCTIONS WILL RESULT.



ROLLER IMPREGNATOR SCHEMATIC

DARCOM MMT ACCOMPLISHMENTS

AVIATION RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 1 74.75 8035

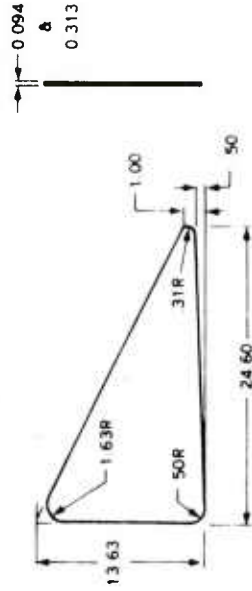
TITLE: PRODUCTION OF TRANSPARENT FORMS OF POLY-OLEFINS FOR LIGHTWEIGHT ARMOR APPLICATIONS

COST: \$250.000

GOAL: DEVELOP BALLISTICALLY TOLERANT TRANSPARENT ARMOR

RESULTS

- THIS EFFORT PROVIDED PRODUCTION TECHNOLOGY TO PRODUCE ORIENTED POLYPROPYLENE FILM.
- THE MATERIAL PROVIDES RESISTANCE TO BALLISTIC PENETRATION GREATER THAN ACRYLIC OR POLYCARBONATE WINDOWS.
- WINDOWS ARE CAPABLE OF SUSTAINING MULTIPLE-HITS AND ARE COMPLETELY NON-SHATTERING.



TRIANGULAR WINDOW

DARCOM MMT ACCOMPLISHMENTS

COMMUNICATIONS AND ELECTRONICS COMMAND

PROJECT NO: 2 78 9773

TITLE: COMPUTER PROGRAM AID FOR
PREPARATION OF ANALOG CIRCUIT TEST
PROGRAMS

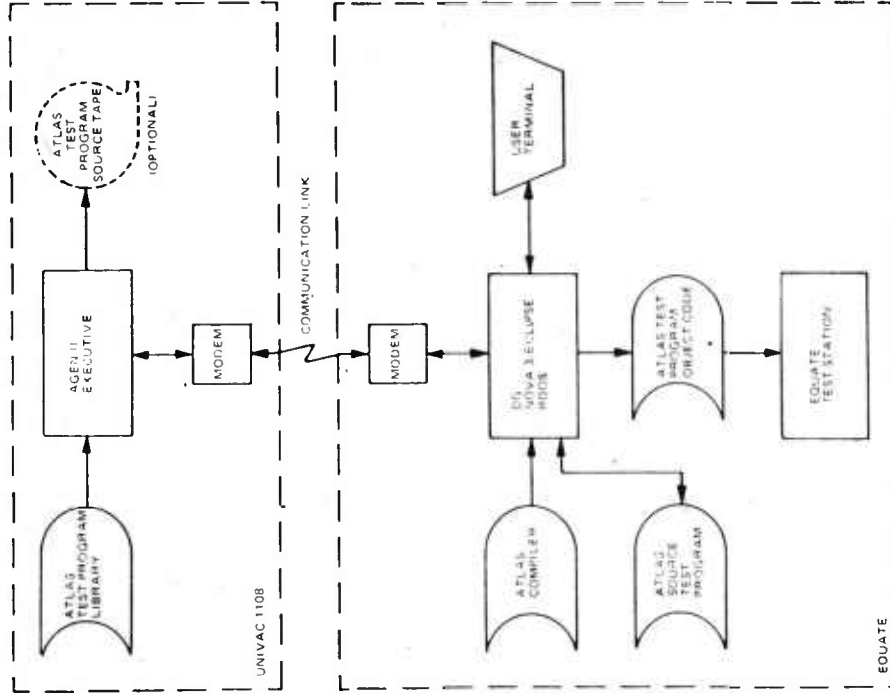
COST: \$500.000

GOAL: DEVELOP A COMPUTER AIDED SYSTEM
TO GENERATE TEST PROGRAMS FOR
SIMPLE LINEAR ANALOG CIRCUITS

RESULTS

- PROGRAMS WERE GENERATED USING THE ABBREVIATED TEST LANGUAGE FOR ALL SYSTEMS. THE 5 BASIC ANALOG UNITS UNDER TESTS WERE ANALOG AMPLIFIERS, OSCILLATORS, POWER SUPPLIES, MIXERS AND FILTERS.
- THE TIME REQUIRED TO DEVELOP A TEST PROGRAM FOR ONE OF THE 5 CIRCUITS WAS REDUCED BY 70%.
- THE RESULTS OF THIS PROJECT WERE NOT SUCCESSFUL BUT TECHNOLOGICAL ADVANCEMENTS REQUIRE A FOLLOW ON PROJECT TO ENHANCE THE SYSTEM.

37



THE INTEGRATED TEST SYSTEM -
WITH COMMUNICATION LINK

DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND

PROJECT NO: R 80 1021

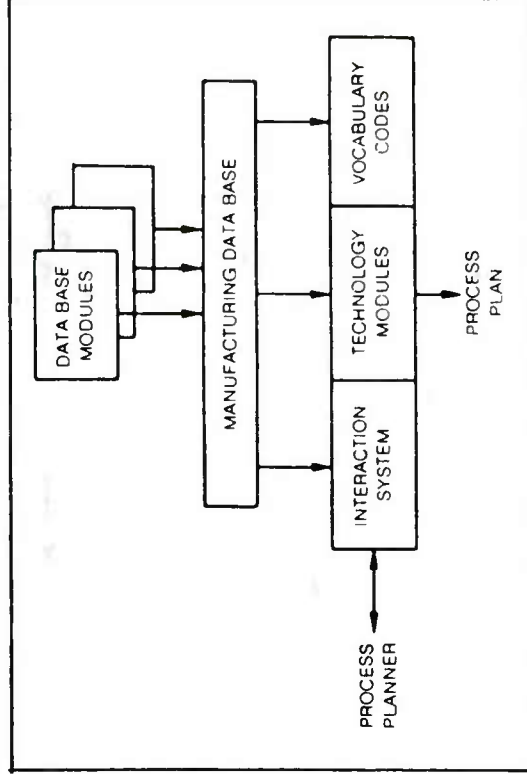
TITLE: COMPUTERIZED PRODUCTION PROCESS
PLANNING MACHINING CYLINDRICAL PARTS
(CAM)

COST: \$240,000

GOAL: PRODUCE AN INDEPENDENT COMPUTER
MANAGED PROCESS PLANNING (CMPP)
SYSTEM FOR MACHINED CYLINDRICAL
PARTS.

RESULTS

- THIS PROJECT COMPLETED THE BASIC PROGRAM IN THE DEVELOPMENT OF A CMPP.
- THE SYSTEM IS PARTIALLY IMPLEMENTED AT PRATT-WHITNEY, SIKORSKY AIRCRAFT, AND HAMILTON STANDARD. UTILIZATION OF THE SYSTEM BY 15% OF THE INDUSTRY PRODUCING MACHINED CYLINDRICAL MISSILE COMPONENTS, COULD PROVIDE ANNUAL COST SAVINGS OF \$720,000.



CMPP SYSTEM OVERVIEW

DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND

PROJECT NO: R 77. 78 3121

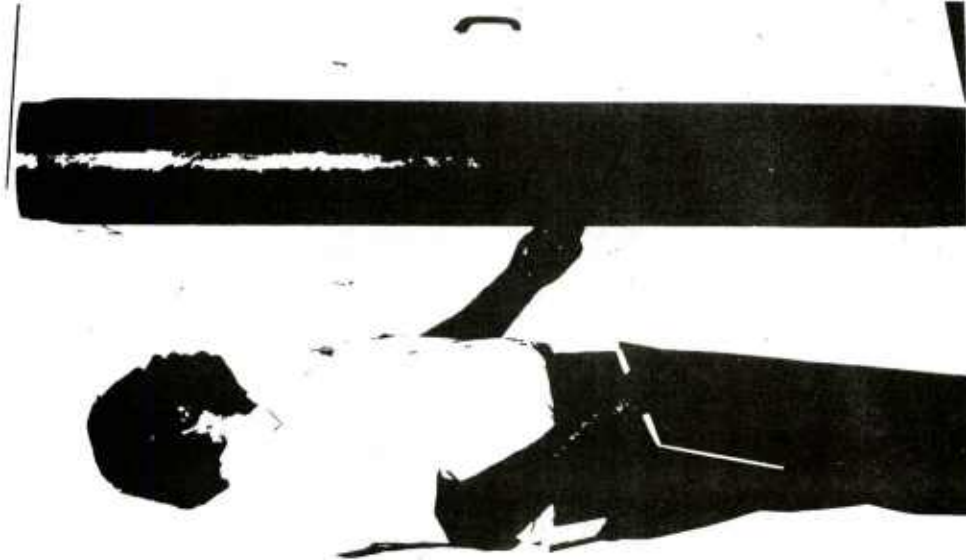
TITLE: LINE PIPE FOR MOTOR COMPONENTS

COST: \$265,000

GOAL: DEVELOP A TECHNIQUE FOR MANUFACTURING
ROCKET MOTOR COMPONENTS FROM LINE PIPE

RESULTS

- A PROCESS FOR MANUFACTURING ROCKET MOTOR CASES FROM HIGH QUALITY ERW AISI 1035 STANDARD STEEL TUBING WAS DEVELOPED
- THE DESIRED UNIFORM MECHANICAL PROPERTIES WERE ACHIEVED BY HEAT TREATING. HYDROSTATIC TESTING SHOWED A 2:1 SAFETY FACTOR OVER THE CHAMBER PRESSURE REQUIRED BY THE DESIGN.
- AN ESTIMATED SAVINGS OF \$80 PER CASE FOR THE MULTIPLE LAUNCH ROCKET SYSTEM (MLRS) COULD ACCRUE. ANNUAL SAVINGS COULD REACH \$2.4 MILLION.



FINISHED FULL SCALE MOTOR CASE

DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND

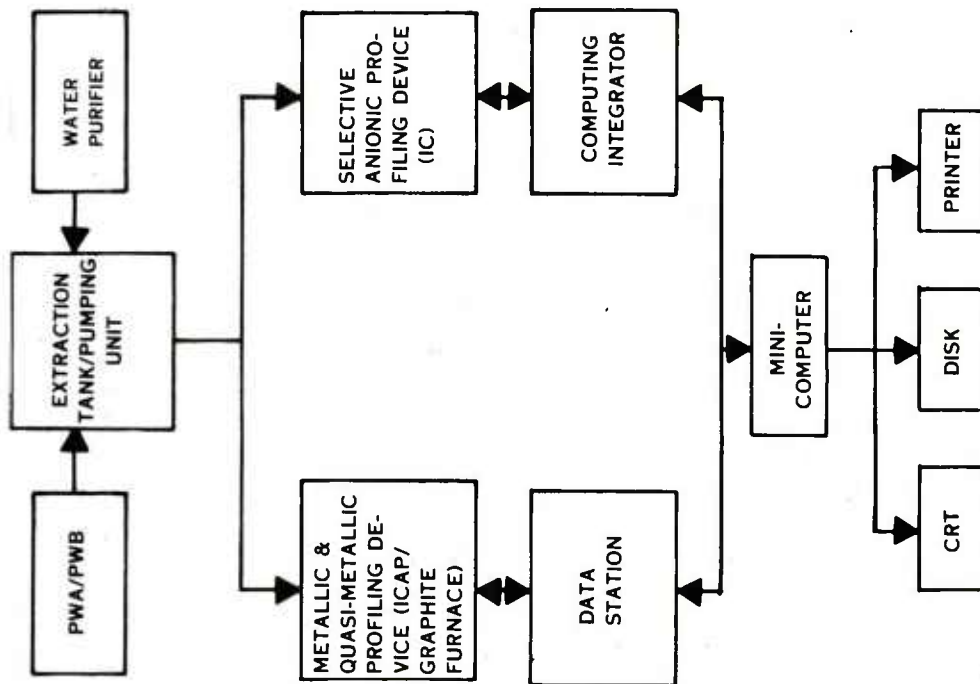


DIAGRAM OF MINI COMPUTER-CONTROLLED
CONTAMINANT PROFILING SYSTEM

PROJECT NO: R 77.79 3160

TITLE: PRODUCTION CLEANLINESS CRITERIA AND
PROCESSES FOR PRINTED WIRING BOARDS

COST: \$363.000

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- THIS EFFORT PROVIDED THE ABILITY TO DETECT PRINTED WIRING BOARD (PWB) CONTAMINANTS AND MEASURE THEIR CONCENTRATION.
- A PWB CONTAMINANT PROFILING (C/P) SYSTEM WAS ESTABLISHED THAT FURNISHED COMPLETE CAUSE/EFFECT FAILURE CORRELATION AND IDENTIFICATION.
- ESTIMATED SAVINGS, AVERAGED OVER A 10 YEAR PERIOD, ARE \$965.702 PER YEAR.
- THE C/P SYSTEM HAS BEN IMPLEMENTED AT MARTIN-MARIETTA, OCALA, FL.

DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND

PROJECT NO: R 77.80 3169

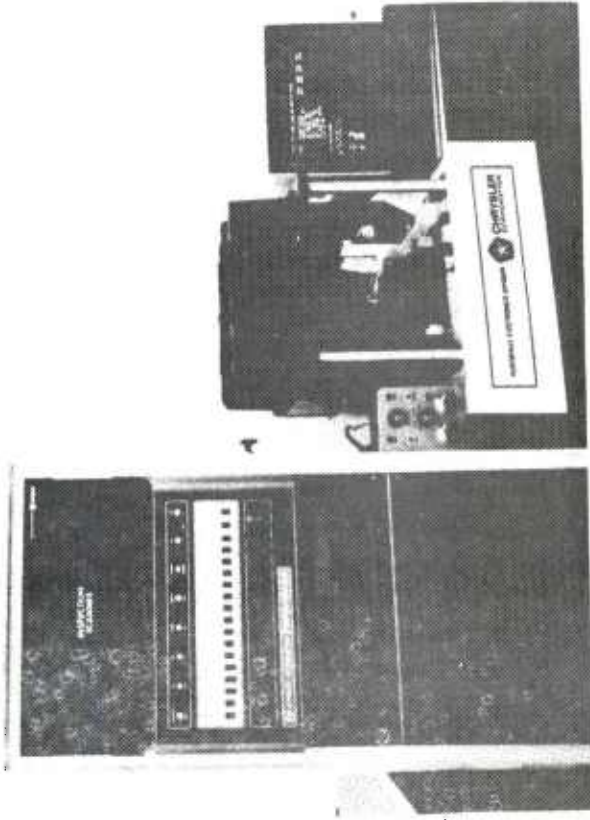
TITLE: AUTOMATIC OPTICAL INSPECTION OF
PRINTED CIRCUIT BOARDS AND
COMPONENTS

COST: \$365.000

GOAL: AUTOMATE THE INSPECTION PROCESS

RESULTS

- A LASER SCANNER FOR EVALUATION OF PRINTED WIRING BOARDS WAS DEVELOPED AND COMMERCIALIZED BY CHRYSLER ELECTRONICS DIVISION, HUNTSVILLE.
- THE SCANNER WILL CHECK BARE BOARDS FOR PROPER HOLE LOCATION, POPULATED BOARDS FOR CORRECT LEAD CLINCH, AND SOLDERED BOARDS FOR BRIDGES AND OPENS.
- ONE LASER SCANNER IS IN USE AT CHRYSLER ELECTRONICS TO CHECK SEVERAL TYPES OF CIRCUIT BOARDS



LASER INSPECTION SCANNER

DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND

PROJECT NO. R 78 3171

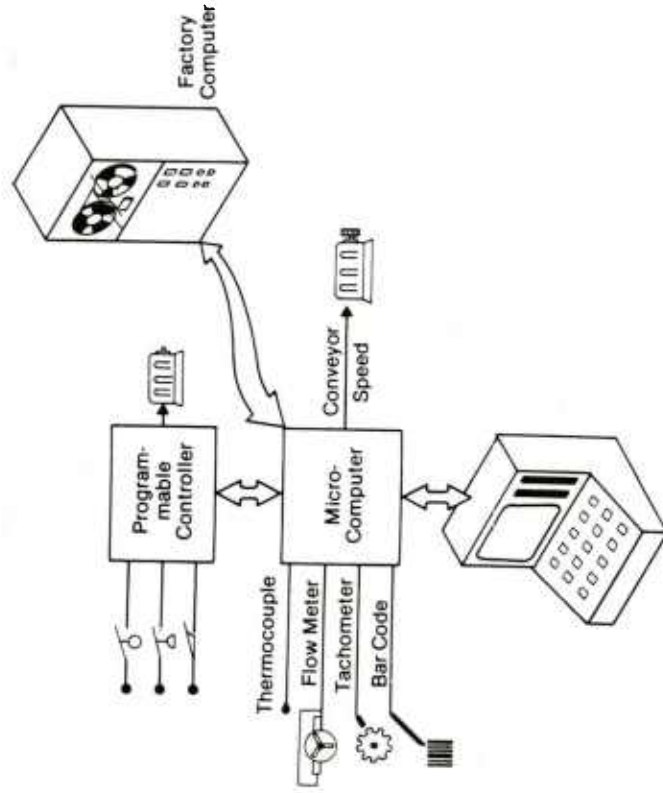
TITLE: DEVELOPMENT OF AUTOMATIC MONITORING
AND CONTROL FOR WAVE SOLDERING
MACHINES.

COST: \$450,293

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- AN AUTOMATIC WAVE SOLDERING SYSTEM WAS DEVELOPED, VIRTUALLY ELIMINATING ALL THE MANUAL DUTIES PERFORMED BY THE WAVE SOLDER OPERATOR. THE NUMBER OF PROCESS CONDITIONS THAT CHANGE WITH BOARD STYLE WAS REDUCED TO ONE.
- THE SYSTEM IS APPLICABLE TO A NUMBER OF MILITARY PRINTED WIRING ASSEMBLIES.
- THE SYSTEM WAS INSTALLED AT WESTINGHOUSE ELECTRIC COMPANY, BALTIMORE, MD. ESTIMATED ANNUAL COST SAVINGS FOR INSPECTIONS AND TOUCH-UP WILL EXCEED \$1 MILLION.



CONTROL SCHEMATIC

DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND

PROJECT NO. R 78.79 3242

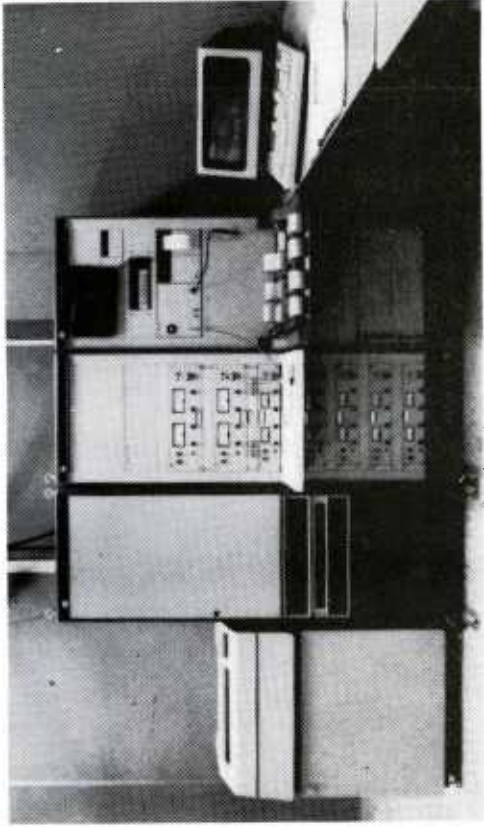
TITLE: DIGITAL FAULT ISOLATION OF PRINTED
CIRCUIT BOARDS

COST: \$850.000

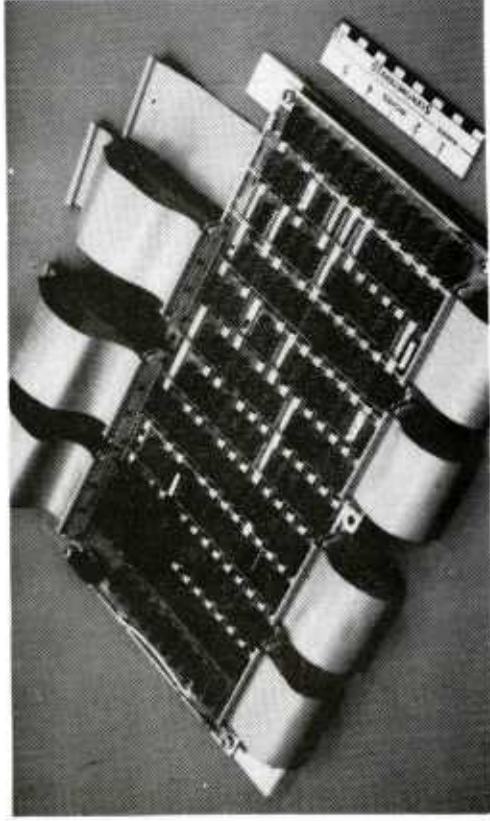
GOAL: IMPROVE TESTING OF PRINTED CIRCUIT
BOARDS

RESULTS

- A DTS-70 SYSTEM WITH SIGNATURE ANALYSIS PROVIDED THE ABILITY TO TEST COMPLEX DIGITAL BOARDS WITHIN 95 PERCENT COMPLETION. HARDWARE AND SOFTWARE ENHANCEMENTS DETECTED AND IDENTIFIED DIGITAL FAULTS IN BOARDS HAVING MIXED LOGIC, LSI, AND MICROPROCESSOR DEVICES.
- DIAGNOSTIC CAPABILITY WAS EXTENDED FROM THE CIRCUIT NODE TO THE COMPONENT LEVEL, WHICH DECREASED BOARD TESTING TIME AND REDUCED COSTS.
- THE SYSTEM IS NOW USED FOR TESTING ARMY AN/TPQ-36 RADAR AND NAVY HMD-22 ADGE RADAR DISPLAYS.



DST 70 SYSTEM



LHMD-22 BOARD

DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND

PROJECT NO: R79 3287

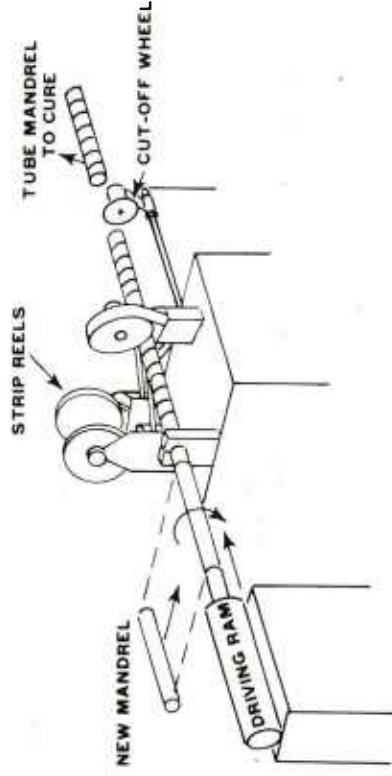
TITLE: LOW COST STRIP LAMINATE MOTOR CASES

COST: \$250,000

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- THE TECHNOLOGY REQUIRED TO DESIGN, FABRICATE AND OPERATE A TRANSLATING MANDREL MOTOR WINDING MACHINE WAS DEVELOPED.
- 40,000 CASES PER YEAR CAN BE PRODUCED WITH THE TRANSLATING MANDREL. THIS IS TWICE THE RATE FOR THE ROTATING MANDREL METHOD.
- COST REDUCTIONS OF 19% ARE FEASIBLE FOR THE CHAPARRAL MOTOR CASE WITH NO PENALTIES.



DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND

PROJECT NO: 3 78 3376

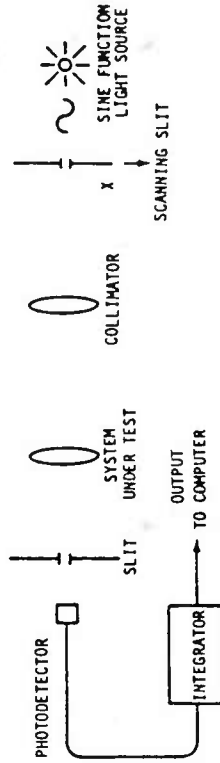
TITLE: PRODUCTION TESTING OF ELECTRO-
OPTICAL COMPONENTS

COST: \$205.000

GOAL: SURVEY CURRENT OPTICAL TESTING
METHODS

RESULTS

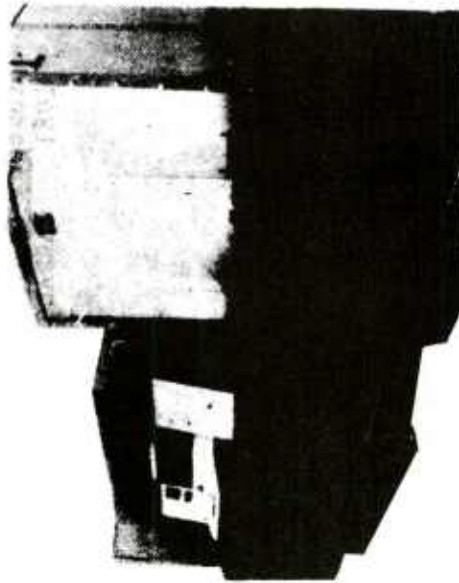
- THE SURVEY CONCLUDED THAT AN OPTICAL TEST FACILITY WAS REQUIRED TO PERFORM SPECIFIC OPTICAL TESTS AT THE SYSTEM AND COMPONENT LEVEL.
- IT WAS DETERMINED THE FACILITY SHOULD HAVE THE CAPABILITY TO MEASURE FOCAL LENGTH. OPTICAL TRANSFER FUNCTION. LARGE AREA SCATTER. AND OTHER SPECIAL CHARACTERISTICS.
- PHASE II OF THIS EFFORT IS UNDERWAY AND IS DEVELOPING THE PROTOTYPE ELECTRO OPTICAL TESTING FACILITY.



SETUP FOR MEASURING
OPTICAL TRANSFER FUNCTION

DARCOM MMT ACCOMPLISHMENTS

MISSILE COMMAND



PROJECT NO: 3 78 3440

TITLE: GUIDED WEAPONS CONTROL SYSTEM
PRODUCTION TESTING

COST: \$547,000

GOAL: IMPROVE TECHNIQUES FOR TESTING GUIDED
WEAPONS

RESULTS

- THIS PROJECT DEVELOPED A MODULAR AUTOMATED INSPECTION SYSTEM WITH THE CAPABILITY TO VERIFY ALTITUDE AND TRAJECTORY PERFORMANCE OF THE GAS OPERATED CONTROL ACTIVATION SYSTEM.
- THE SYSTEM CONSISTS OF TWO TEST BEDS. ONE FOR COPPERHEAD AND THE OTHER FOR THE NAVY 5" SYSTEM. INTEL ISBC 80/30 COMPUTER CONTROLS BOTH TEST BEDS.
- THE USE OF THE SYSTEM HAS REDUCED THE INSPECTION TIME BY 87%. A SECOND GENERATION SYSTEM HAS BEEN ORDERED BY CHANDLER EVANS.

DARCOM MMT ACCOMPLISHMENT

TANK/AUTOMOTIVE COMMAND

PROJECT NO: T 79 5054

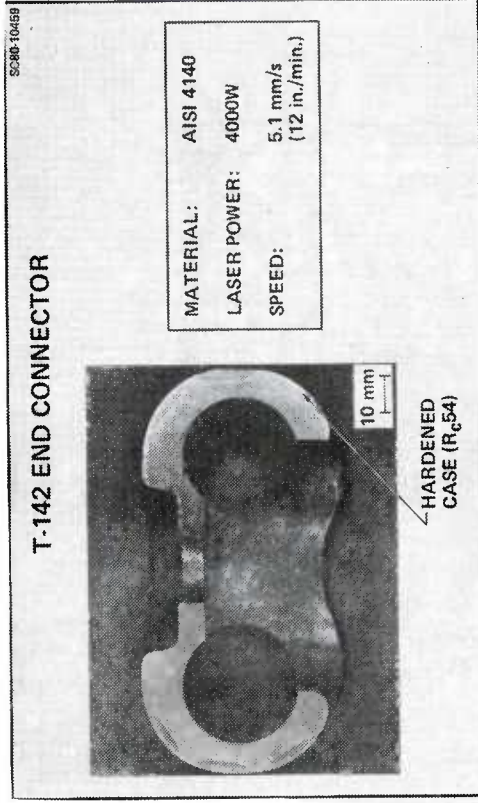
TITLE: LASER SURFACE HARDENED COMBAT
VEHICLE COMPONENTS (PHASE I)

COST: \$175,000

GOAL: DEVELOP PROCEDURES FOR LASER
SURFACE HARDENING

RESULTS

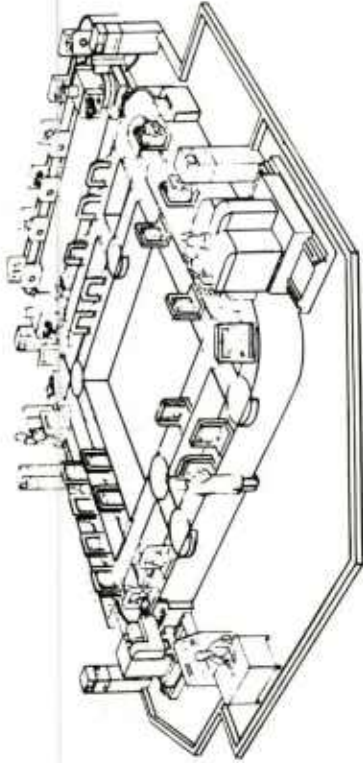
- PRECISION PLACEMENT OF AREAS TO BE HARDENED WILL INCREASE WEAR LIFE AND RELIABILITY THEREBY REDUCING MAINTENANCE COSTS.
- HARDNESS IN EXCESS OF RC50 WAS ACHIEVED WITH NO SURFACE MELTING OR CRACKING.



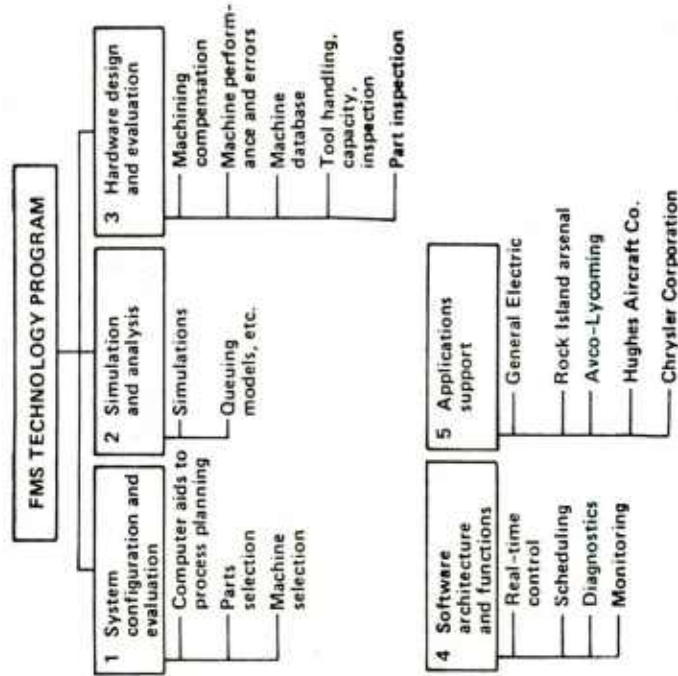
CROSS-SECTIONAL VIEW OF LASER
HEAT TREATED T-142 END CONNECTOR

DARCOM MMT ACCOMPLISHMENTS

TANK/AUTOMOTIVE COMMAND



CONCEPTUAL FMS



PROJECT NO: T 79 5082

TITLE: FLEXIBLE MACHINING SYSTEM PILOT LINE

COST: \$904.077

GOAL: EVALUATE AND ADAPT FLEXIBLE MACHINING TECHNIQUES TO THE MANUFACTURE OF COMBAT VEHICLES

RESULTS

- THIS PROJECT WAS THE FIRST PHASE OF AN EFFORT TO ADAPT FLEXIBLE MACHINING TECHNIQUES TO ARMY APPLICATIONS. POTENTIAL ARMY USERS WERE IDENTIFIED; FEASIBILITY STUDIES WERE INITIATED; AND, DEVELOPMENT OF SUPPORTING COMPUTER SOFTWARE WAS INITIATED. DRAPER LABORATORIES SERVED AS THE CONTRACTOR.
- THE GROUND WORK FOR CARRYING OUT AN ARMY FMS PROGRAM WAS FORMULATED.

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 75.76 3062

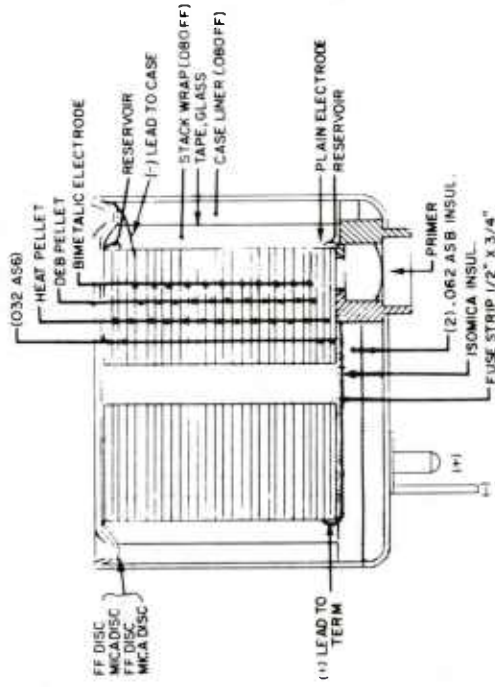
TITLE: PELLET THERMAL POWER SUPPLY TECHNOLOGY

COST: \$300.000

GOAL: REDUCE THE MANUFACTURING COSTS

RESULTS

- THE PROCESSES, TECHNIQUES AND EQUIPMENT FOR PRODUCING BATTERIES AT RATES TO 500,000 PER YEAR WERE DEFINED.
- A 12 CELL STACK AND A HIGH DENSITY PELLET WERE FOUND TO PROVIDE THE MOST CONSISTENT SPECIFICATION PERFORMANCE.
- THE BATTERIES PRODUCED ARE SATISFACTORY FOR LOW SPIN APPLICATIONS SUCH AS THE 2.75" ROCKET FUZE. IMPLEMENTATION OF THIS TECHNOLOGY SHOULD REDUCE THE BATTERY COST FROM ITS PRESENT \$7 TO APPROXIMATELY \$4.

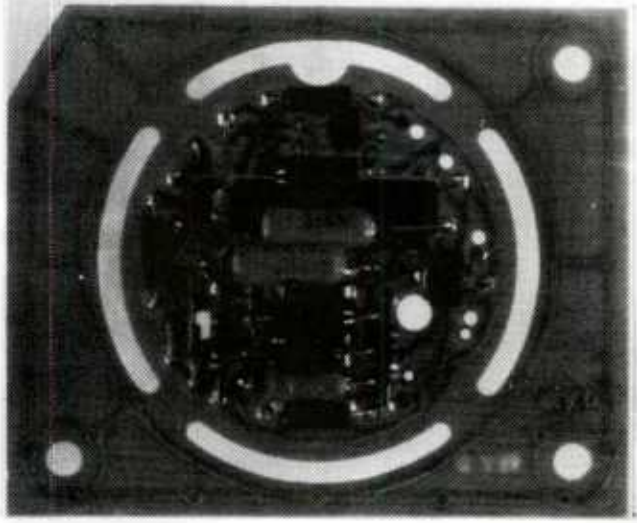


PROTOTYPE THERMAL BATTERY FOR ROCKET POWER SUPPLY
(OVERALL SIZE ABOUT 1 1/4" X 1 1/4")

THERMAL BATTERY
FOR 2.75" ROCKET

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND



INERTIA SWITCH ON
M732 FUZE CIRCUIT BOARD

PROJECT NO: 5 76 3110

TITLE: AUTOMATED SWITCH ASSEMBLY MACHINE

COST: \$90.000

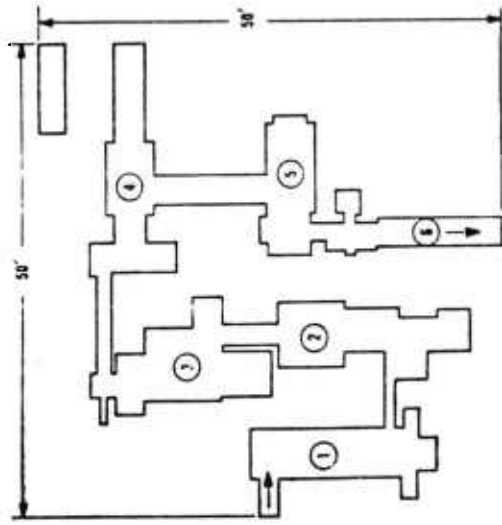
GOAL: REDUCE ASSEMBLY COSTS

RESULTS

- AN AUTOMATIC ASSEMBLY MACHINE FOR AN IMPACT SWITCH WAS DESIGNED AND A TECHNICAL DATA PACKAGE COMPLETED. THIS MACHINE HAS THE CAPABILITY OF PRODUCING 160.000 SWITCHES PER MONTH AND UTILIZES ONLY ONE OPERATOR.
- THE PROCESS DESIGN INCLUDES PROVISIONS FOR INCORPORATING AUTOMATIC TEST AND PACKAGING FEATURES.
- IMPLEMENTATION OF THIS PROJECT WOULD RESULT IN AN ESTIMATED SAVINGS OF \$380.000 PER YEAR.

DARCOM MMT ACCOMPLISHMENT

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND



PROJECT NO: 5 74,75,76 4009

TITLE: AUTOMATION OF EQUIPMENT FOR PACKAGING
SMALL SHAPED CHARGE ROCKETS

COST: \$2,414,000

GOAL: DEVELOP EQUIPMENT FOR AUTOMATIC
PACKAGING OF SMALL SHAPED CHARGES
THEREBY REDUCING LABOR IN HAZARDOUS
AREAS.

RESULTS

- LAW PACKOUT SYSTEM LAYOUT
- MODULES
1. CLUSTER ASSEMBLY
 2. CARTONING
 3. BAGGING
 4. BOXING
 5. PALLETIZING
 6. STRAPPING
- SYSTEM WAS BUILT OF MODULES, EACH
CAPABLE OF OPERATING SEPARATELY OR AS A
TOTAL SYSTEMS.
 - THE SYSTEM IS CAPABLE OF PACKING VARIOUS
MUNITIONS OF SIMILAR CONFIGURATION WITH
LITTLE MODIFICATION.

DARCOM MMT ACCOMPLISHMENT

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 75,76,78 4041

TITLE: AUTOMATED EQUIPMENT FOR MORTAR COMPONENTS

COST: \$1,661,000

GOAL: DEVELOP AUTOMATED LOAD, ASSEMBLE AND INSPECTION EQUIPMENT

RESULTS

● A SYSTEM WAS DEVELOPED CONSISTING OF SEVEN AUTOMATED STATIONS THAT OPERATE IN A POWER AND FREE (NON-SYNCHRONOUS) MODE AND ONE SEMI AUTOMATED STATION FOR PACKAGING.

● THE PROTOTYPE SYSTEM ACHIEVED 87% OF THE PRODUCTION RATE GOALS. ENHANCEMENTS WERE IDENTIFIED FOR INCORPORATION IN THE PRODUCTION SYSTEM.

● IMPLEMENTATION OF THIS SYSTEM IS PLANNED AT MILAN AAP. SAVINGS ARE EXPECTED TO EXCEED \$4.8 MILLION.

Table 1. Test critical values

Station	Parts per minute Machine rate	Test rate	Length of test (min)	Critical value* obtained	Critical value* required	Requirement obtained (%)
Empty-weigh	26.3	28.3	30	0.660	0.713	92
Powder-weigh-and-fill	4.3	4.8	30	0.686	0.713	96
Tab-seal	8.0	4.8	30	0.631	0.713	88
Final-weigh	26.3	7.5	30	0.662	0.713	93
Overall system	4.3	4.8	240	0.376	0.429	87

*Critical value (CV) is defined as the total number of acceptable (N) items divided by the product of the production rate (R) of the station or system and the length of time (T) of test run, or $CV = N/RT$.

DARCOM MMT ACCOMPLISHMENT

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 79.80 4137

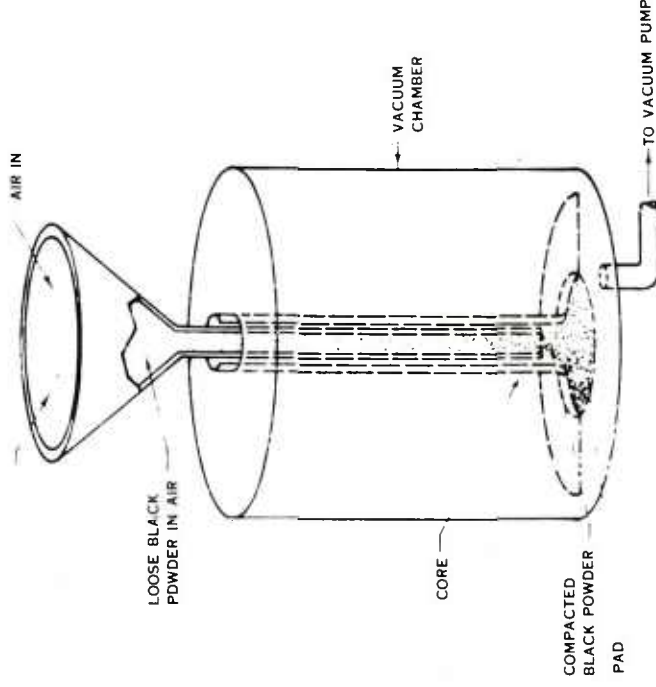
TITLE: AUTOMATED LOADING OF CENTER CORE
IGNITERS

COST: \$254,500

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- A LOADING CONCEPT WAS DEVELOPED WHICH IS 9 TIMES AS FAST AS THE MANUAL METHOD.
- RETURN ON INVESTMENT OF 13% CAN BE ACHIEVED WHEN IMPLEMENTED.



SCHEMATIC OF VACUUM FILL METHOD

DARCOM MMT ACCOMPLISHMENT

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 78 4143

TITLE: ADVANCED TECHNOLOGY FOR MANUFACTURING ROCKET WARHEAD COMPONENTS

COST: \$160,000

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- A PRODUCTION METHOD USING LOCK SEAMED TUBES WITH CRIMPED END CAPS WAS DEVELOPED.
- ESTIMATED COST SAVINGS OF \$273,000 WOULD BE REALIZED FROM EACH 300,000 UNIT PRODUCTION RUN.



THREE DIFFERENT PROTOTYPE BODIES
PRIOR TO FILLING

DARCOM MMT ACCOMPLISHMENT

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 76.77 4211

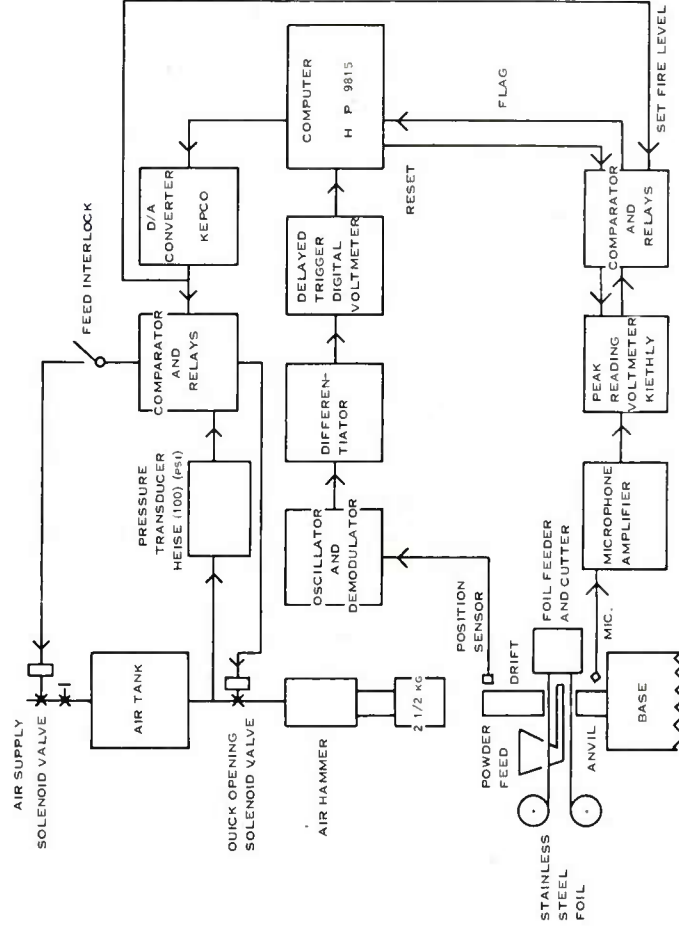
TITLE: PROCESS CONTROL OF EXPLOSIVE COMPOSITIONS

COST: \$622,000

GOAL: IMPROVE PROCESS CONTROLS

RESULTS

- AN AUTOMATED IMPACT TESTER WAS DEVELOPED FOR DETERMINING THE SENSITIVITY OF EXPLOSIVES. THE TESTER IS FASTER AND MORE PRECISE THAN THE EXISTING METHOD.
- A COMPOSITION ANALYZER AND AUTOMATIC LEVEL CONTROL SYSTEM WERE DESIGNED AND DEVELOPED FOR PROCESSING AND LOADING MOLTEN EXPLOSIVES. THESE SYSTEMS REDUCED OPERATOR EXPOSURE TO PROCESS HAZARDS, WHILE MAINTAINING PROCESS INTEGRITY.



RDX/TNT ANALYZER
SYSTEM

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT READINESS COMMAND

PROJECT NO: 5 7T.78 4249

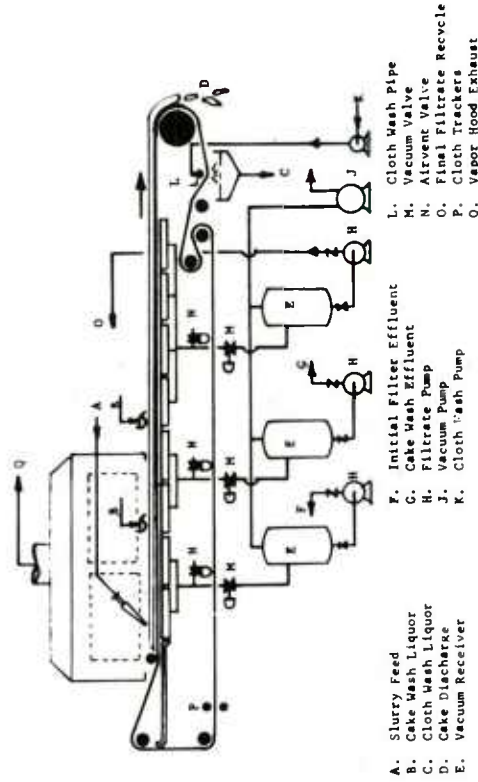
TITLE: SEPARATION OF FINE EXPLOSIVES FROM
SPENT ACID AND WATER SLURRIES

COST: \$810,000

GOAL: IMPROVE PROCESS OUTPUT

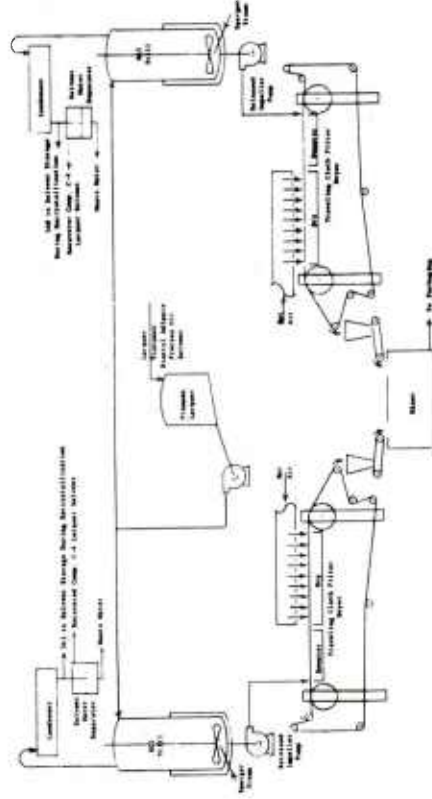
RESULTS

- HORIZONTAL BELT FILTER WAS DEVELOPED FOR SEPARATION OF RDX/HMX EXPLOSIVES FROM SLURRIES.
- THE USE OF THE NEW FILTER SYSTEM INCREASED PRODUCTION WITHOUT INCREASING FACILITY REQUIREMENTS AND IMPROVED THE SAFETY FACTOR.
- THIS FILTER HAS BEEN INSTALLED IN THE PRODUCTION FACILITIES AT HOLSTON AAP.



SCHEMATIC DIAGRAM OF THE HORIZONTAL
BELT FILTER

DARCOM MMT ACCOMPLISHMENTS



DUAL PRECOAT PROCESS FOR COMPOSITION C-4

PROJECT NO: 5 77 4252

TITLE: MANUFACTURE OF RDX AND HMX

COST: \$884,200

GOAL: IMPROVE THE MANUFACTURING PROCESS

RESULTS

- A DUAL PRECOAT PROCESS WAS DEVELOPED FOR COMPOSITION C-4 WHICH INCREASED PRODUCTION CAPACITY.
- AN ALTERNATE LACQUER SOLVENT, N-OCTANE WAS SHOWN SUCCESSFUL WHEN SUBSTITUTED FOR TOLUENE, A SUSPECTED CARCINOGEN.
- THE DUAL PRECOAT PROCESS WILL BE EVALUATED AS A PILOT PLANT IN A FOLLOW ON PROJECT.

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 78 4252

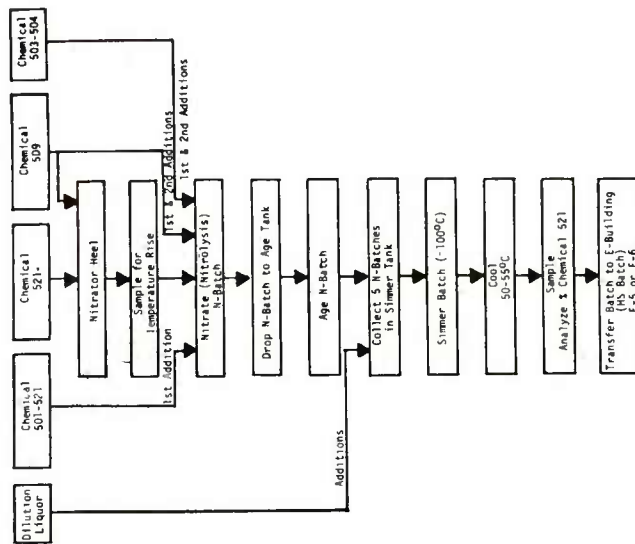
TITLE: MANUFACTURE OF RDX AND HMX

COST: \$281,000

GOAL: IMPROVE THE MANUFACTURING PROCESS

RESULTS

- BENCH SCALE STUDIES WERE RUN AND INDICATED THAT THE SIMMER TIME FOR PRODUCTION OF HMX COULD BE REDUCED.
- PILOT PLANT STUDIES INDICATED THAT ADDITION OF EXTRA HEXAMINE TO THE INITIAL REACTION HEEL INCREASED HMX YIELDS.
- REDUCTION OF SIMMER TIME FROM 6 HOURS TO 2 HOURS HAS BEEN APPLIED AT HOLSTON AAP.



PROCESS FLOW SHEET
FOR PRODUCTION OF HMX

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 76 4285

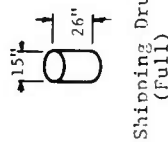
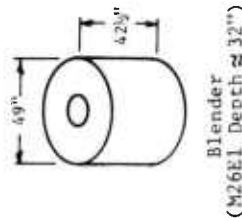
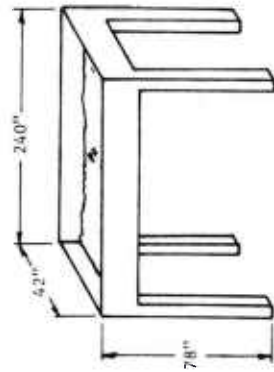
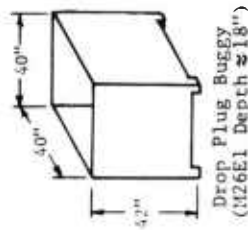
TITLE: TNT EQUIVALENCY TEST FOR SAFETY
ENGINEERING OF AMMUNITION PLANTS

COST: \$325,000

GOAL: IMPROVE AMMUNITION PLANT SAFETY

RESULTS

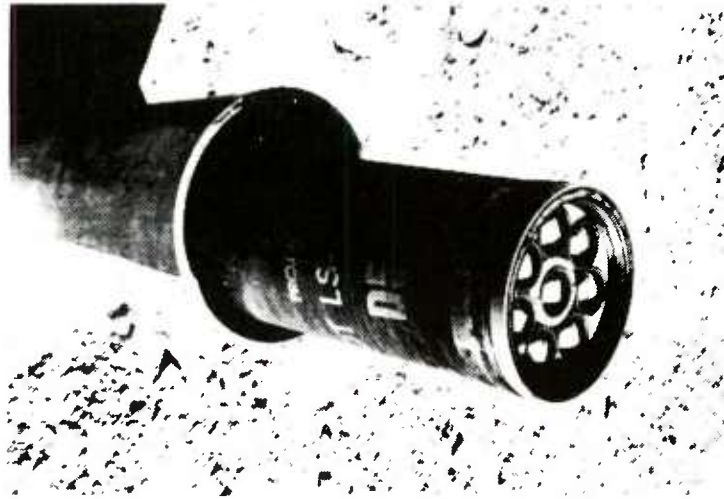
- TESTS WERE CONDUCTED TO DETERMINE THE TNT EQUIVALENCIES OF M26E1 PROPELLANT, B5-NACO PROPELLANT, COMPOSITION A-5, AND M10 PROPELLANT.
- THIS DATA COMBINED WITH DMC R 385-100 AND TM 5-1300 WILL AID IN THE DESIGN OF PROTECTIVE FACILITIES TO RESIST BLAST EFFECTS.



TEST CONFIGURATION

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND



SIMULATED PALLET WITH
TEST PROJECTILE

PROJECT NO: 5 /8 4288

TITLE: SAFE SEPARATION AND SENSITIVITY
CRITERIA FOR EXPLOSIVES

COST: \$604.000

GOAL: IMPROVE SAFETY

RESULTS

- THIS PROJECT PROVIDED SAFETY CRITERIA FOR SAFE SEPARATION OF EXPLOSIVES. ITEMS IN-PROCESS AND ESTABLISHED SENSITIVITY OF EXPLOSIVES.
- ITEMS TESTED WERE THE 155MM M483 HE. NITROGUANIDINE. AND FLAKED TNT.
- THE SAFE SEPARATION DISTANCE DATA DEVELOPED WAS APPLIED TO THE LAP LINE AT IOWA AAP AND THE COMPOSITION B LINE AT HOLSTON AAP.

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 78 4322

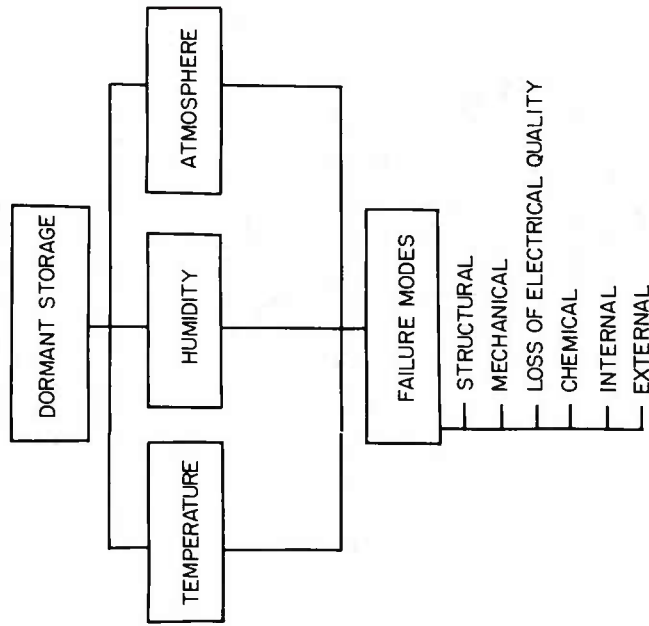
TITLE: DESIGN CRITERIA AND SYSTEMS CHARACTERIZATION OF ELECTRONICALLY CONTROLLED PRODUCTION FACILITIES

COST: \$185.000

GOAL: ESTABLISH CRITERIA FOR REACTIVATING ELECTRONIC COMPONENTS

RESULTS

- REACTIVATION DOCUMENTATION WAS PREPARED FOR THE INDUSTRIAL ELECTRONIC CONTROL SYSTEM FOR A TNT LINE AT JOLIET ARMY AMMUNITION PLANT. A TEST AND EVALUATION PLAN, USER ADAPTED START-UP MANUAL, TESTING AND CALIBRATION MANUAL, AND A METHODOLOGY FOR CROSS REFERENCING AND INDEXING THE DOCUMENTATION WERE DEVELOPED.
- FAILURE ANALYSIS WAS PERFORMED ON FAILED ELECTRONIC COMPONENTS. FAILURE MODES AND MECHANISMS WERE IDENTIFIED.
- GUIDELINES WERE ESTABLISHED FOR SIMILAR DOCUMENTATION OF ELECTRONIC CONTROL SYSTEMS AT 8 OTHER ARMY AMMUNITION PLANTS.



FAILURE MODES FROM LONG PERIODS
OF DORMANT STORAGE

DARCOM MMT ACCOMPLISHMENT

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 79 4332

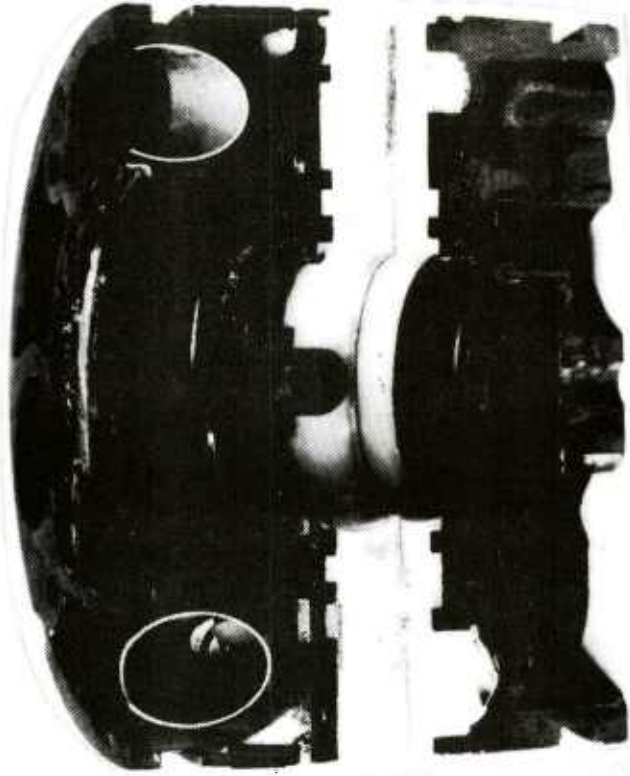
TITLE: POTTING ELECTRONIC ASSEMBLIES FOR
THE GATOR MINE

COST: \$83,000

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- A NEW INTEGRAL ENCAPSULATION METHOD WAS DEVELOPED FOR BLU92/B GATOR MINE.
- CONFORMAL COATING OF THE ELECTRONICS, POTTING OF THE SENSOR HOUSING, AND MOLD ASSEMBLY AND CLEANING OPERATIONS WERE ALL ELIMINATED.
- PREPARATION AND HANDLING TIME WAS REDUCED FROM 180 MINUTES TO 20 MINUTES.
- COST REDUCTION BASED ON CURRENT PRODUCTION IS \$173,000.



GATOR MINE - SECTIONED BODY ASSEMBLY

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 78 4454

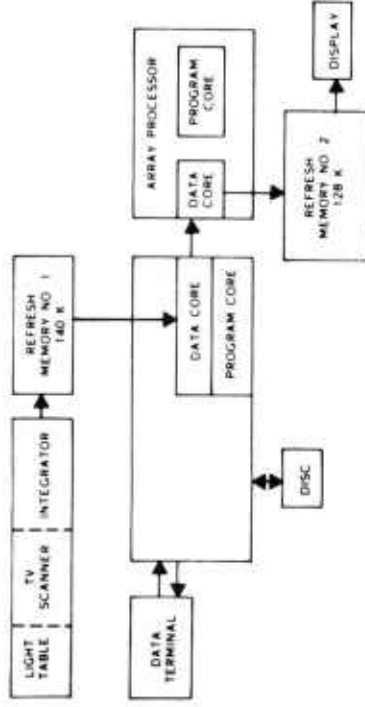
TITLE: AUTOMATIC X-RAY INSPECTION SYSTEM
(AXIS)

COST: \$491.000

GOAL: AUTOMATE THE INSPECTION OF ARTILLERY SHELLS BY EMPLOYING A COMPUTER TO ANALYZE AN X-RAY IMAGE OF EACH SHELL.

RESULTS

- A SYSTEM USING THE LATEST COMPUTER VISION AND IMAGE UNDERSTANDING TECHNOLOGY WAS DEVELOPED.
- THE SYSTEM HAS THE CAPABILITY TO EXAMINE ONE SHELL RADIOGRAPHICALLY EVERY TEN SECONDS.
- COMPLETION OF THE EFFORT AND IMPLEMENTATION AT MILAN AAP WILL ELIMINATE THE HUMAN SUBJECTIVITY IN THE ANALYSIS OF SHELL X-RAY FILM.



DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 78 4508

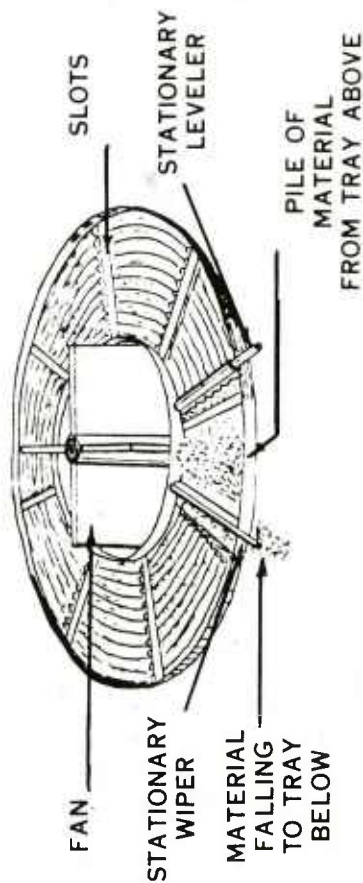
TITLE: PROCESS IMPROVEMENT OF PRESSABLE
RDX COMPOSITIONS

COST: \$300,000

GOAL: IMPROVE METHODS OF COATING THE "A"
COMPOSITIONS

RESULTS

- A SOLVENT/WAX METHOD WAS DEVELOPED THAT IMPROVED COATING AND IMPACT SENSITIVITY WHILE MEETING OTHER SPECIFICATIONS FOR THE A3 AND A4 COMPOSITIONS.
- A LESS EXPENSIVE PROCESS FOR PRODUCING COMPOSITION A5 WAS DEVELOPED BY ADDING CYCLOHEXANONE/STEARIC ACID SOLUTION AND REMOVING THE CYCLOHEXANONE BY DISTILLATION.
- THESE IMPROVEMENTS ARE BEING IMPLEMENTED AT HOLSTON AAP.



WYSSMONT TURBO DRYER TRAYS

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 76 6640

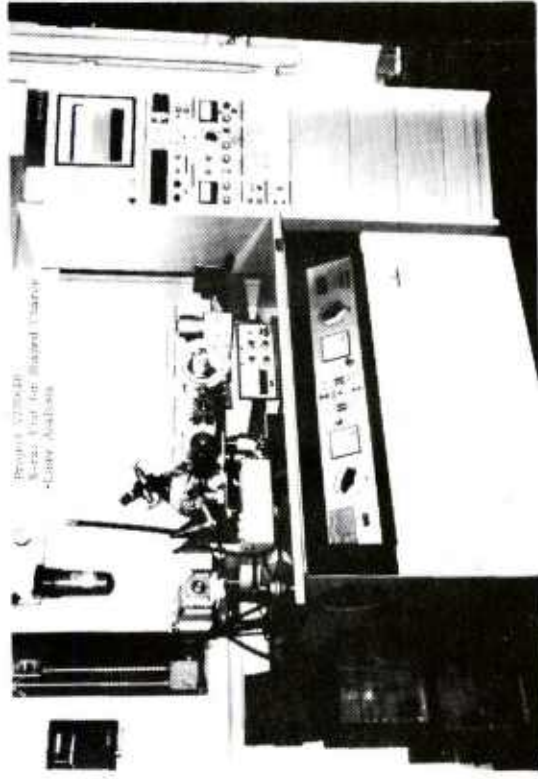
TITLE: PRODUCTION CONTROL AND QUALITY ASSURANCE OF SHAPED CHARGE LINERS BY AUTOMATED X-RAY ANALYSIS

COST: \$300,000

GOAL: ESTABLISH A COMPUTER CONTROLLED OFF-LINE X-RAY TEST OF COPPER SHAPED CHARGE LINERS USED IN TANK AMMUNITION

RESULTS

- THIS PORTION OF THE EFFORT FABRICATED AND BALLISTICALLY TESTED SHAPED CHARGE LINERS UNDER CONTROLLED CONDITIONS. PROCESS VARIABLES WERE RAW MATERIAL, MANDREL SPEED, AND FEED RATE.
- CORRELATION WAS ESTABLISHED BETWEEN OFF-LINE X-RAY TEST RESULTS AND BALLISTIC TESTS. BALLISTIC PENETRATION RESULTS INDICATE THAT CONDITION OF RAW MATERIAL HAS A MEASURABLE EFFECT ON ITEM PERFORMANCE.
- IMPROVED PRODUCT QUALITY AND RELIABILITY OF LINERS IN AMMUNITION WILL RESULT WHEN THIS OFF-LINE TESTING SYSTEM IS USED.



DARCOM MMT ACCOMPLISHMENT

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 79 6716

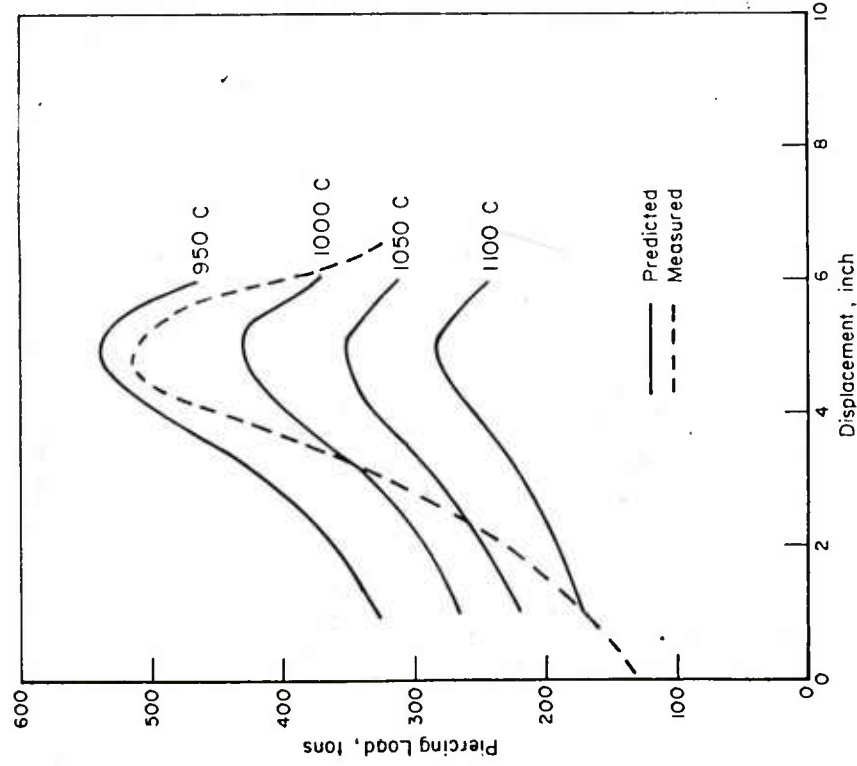
TITLE: FORMING OPERATIONS FOR CURRENT AND
FUTURE ARTILLERY METAL PARTS

COST: \$306.000

GOAL: DEVELOP A MATH MODEL FOR OPTIMIZING
DESIGN OF FORMING OPERATIONS

RESULTS

- MATHEMATICAL MODELS OF THE BLOCKING, CABBAGING, AND PIERCING OPERATIONS OF SHELL MANUFACTURING WERE DEVELOPED AND VALIDATED. PREVIOUSLY DEVELOPED MATHEMATICAL MODELS FOR THE OPTIMIZATION OF THE SHELL NOSING PROCESS WERE VALIDATED.
- IMPLEMENTATION OF THESE MODELS WILL RESULT IN A FOUR MONTH REDUCTION IN LEAD TIMES, IMPROVED TOOL LIFE, AND A REDUCTION IN SCRAP.



DARCOM MMT ACCOMPLISHMENTS

ARMAMENT READINESS COMMAND

PROJECT NO.: 6 78.80 3901

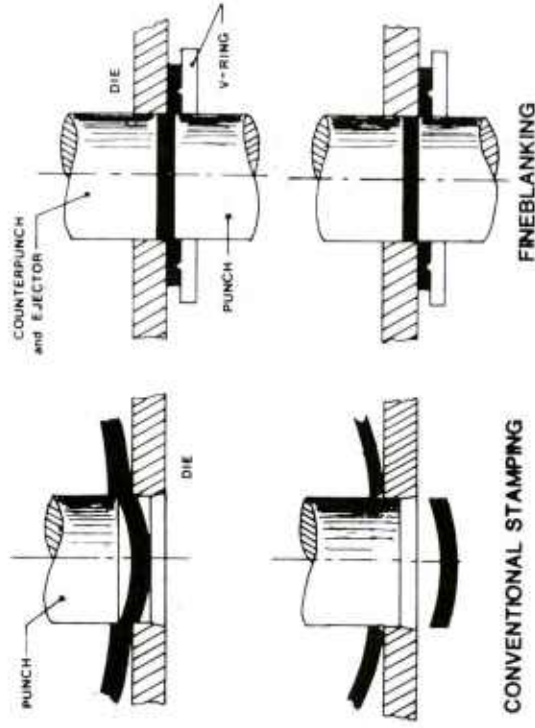
TITLE: COLD FORMING OF FLUIDIC AMPLIFIERS

COST: \$349,000

GOAL: REDUCE MANUFACTURING COSTS

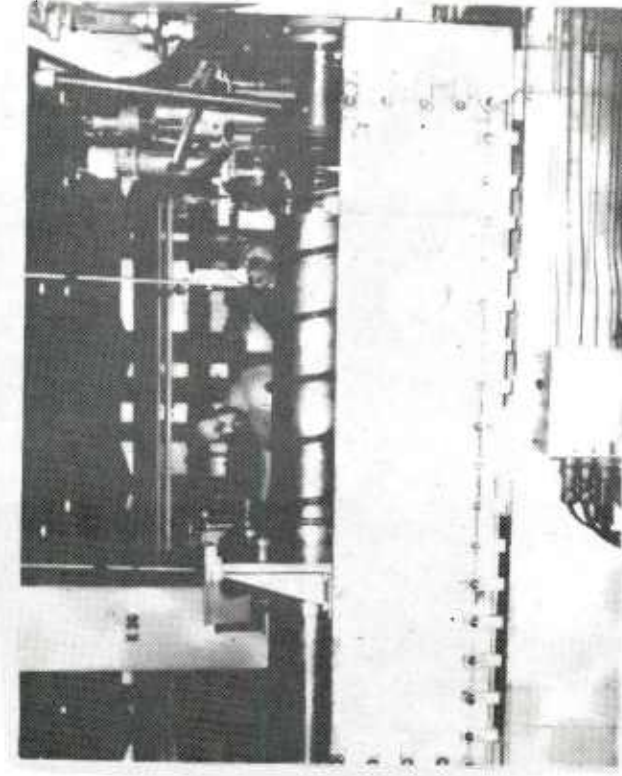
RESULTS

- A TECHNIQUE WAS DEVELOPED FOR COLD FORMING FLUIDIC AMPLIFIER PLATES THAT REDUCES FABRICATION COSTS BY 60%. THE PLATES EXHIBIT GOOD INTERNAL SHEAR SURFACE QUALITY AND EXCELLENT DIMENSIONAL REPEATABILITY.



DARCOM MMT ACCOMPLISHMENTS

ARMAMENT READINESS COMMAND



HOT SPRING WINDING

PROJECT NO: 6 73 7087

TITLE: APPLICATION OF HIGH FREQUENCY INDUCTION HEATING METHOD FOR HOT COILING OF SPRINGS

COST: \$532,000

GOAL: DEVELOP A MORE EFFICIENT PROCESS FOR SPRING WINDING

RESULTS

- AN IMPROVED SPRING MANUFACTURING TECHNIQUE WAS DEVELOPED THAT IS ACCURATE AND REPEATABLE WHILE REDUCING HEAT TIME AND MATERIAL DECARBURIZATION.
- THE WINDING TIME HAS BEEN REDUCED BY 11%.
- IMPLEMENTATION WILL BE AT ROCK ISLAND ARSENAL ON THE RECOIL SPRINGS FOR THE M1 TANK.

DARCOM MMT ACCOMPLISHMENT

ARMAMENT READINESS COMMAND

PROJECT NO: 6 77.79 7213

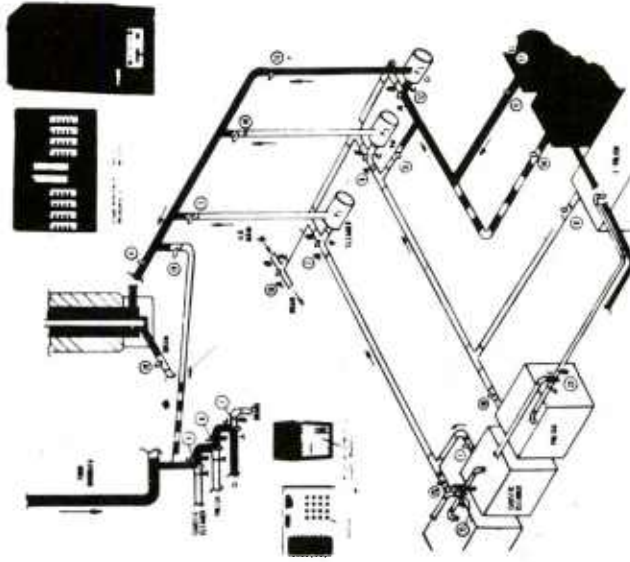
TITLE: HIGH SPEED CHROMIUM PLATING TECHNIQUE

COST: \$465,000

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- A CHROMIUM PLATING TECHNIQUE WAS DEVELOPED THAT ALLOWS THREE TIMES FASTER PLATING RATES AT HIGHER CURRENT DENSITIES.
- THE PROCESS PROVIDES MORE ACCURATE PROCESS CONTROL THEREBY PRODUCING LESS AIR AND WATER CONTAMINANTS.
- THE NEW TECHNIQUES ELIMINATES THE NEED FOR LARGE TANKS, DEEP PITS, AND OVERHEAD CRANES.



"PUMP THRU" CHROMIUM PLATING FACILITY

DARCOM MMT ACCOMPLISHMENT

ARMAMENT READINESS COMMAND

PROJECT NO: 6 75 7589

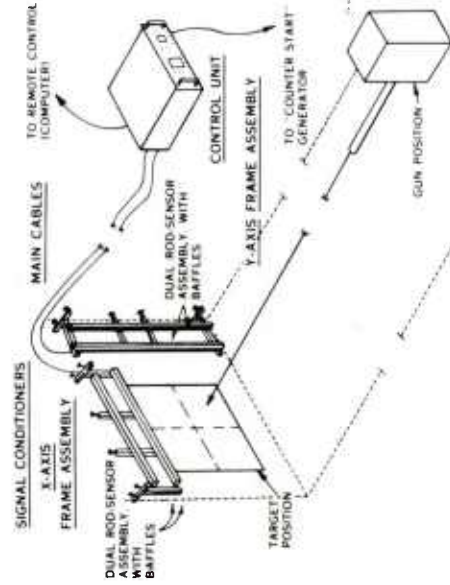
TITLE: AUTOMATED TARGETING SYSTEM FOR PRO-
DUCTION TESTING OF AUTOMATIC WEAPONS
AND AMMUNITION

COST: \$130,000

GOAL: DEVELOP AUTOMATED TARGETING SYSTEM

RESULTS

- A SYSTEM WAS DEVELOPED CAPABLE OF SCORING SMALL CALIBER TARGETS AUTOMATICALLY WITH MINIMAL RANGE TREATMENT.
- THE MAXIMUM FEASIBLE LENGTH, USING THE NEW ACOUSTIC SYSTEM WAS INCREASED FROM 20 ROUNDS TO 50 ROUNDS.
- AN ANNUAL COST SAVINGS OF \$15,000 WILL BE EXPERIENCED USING PRESENT CAPABILITY, WITH SAVINGS GROWING TO \$35,000 WHEN THE FULL CAPABILITY OF THE TARGETING SYSTEM IS REALIZED.



AUTOMATED TARGETING SYSTEM

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT READINESS COMMAND

PROJECT NO: 6 77 7644

TITLE: COLOR ANODIZING ALUMINUM

COST: \$150.000

GOAL: REDUCE THE COST OF COLOR ANODIZING
ALUMINUM



M16 A1 UPPER RECEIVER

RESULTS

- A ONE STEP PROCESS WAS DEVELOPED THAT PRODUCES A HARD COAT OF SUPERIOR PHYSICAL PROPERTIES AND COLOR. THE PROCESS ELIMINATES THE SECOND DYEING OPERATION THAT WAS REQUIRED TO ACHIEVE THE DESIRED COLOR.
- THE PROCESS WILL REDUCE MANUFACTURING COSTS BY 25%. AND MAINTENANCE AND SUPPLY REQUIREMENTS BY APPROXIMATELY 10-15%.
- FINISHING COSTS ON THE M16A1 UPPER RECEIVER ARE REDUCED \$.70 PER ITEM.

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT READINESS COMMAND

PROJECT NO: 6 77 7707

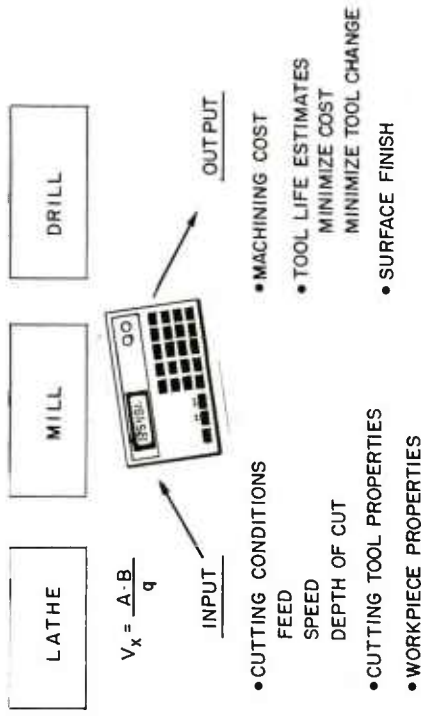
TITLE: AUTOMATED PROCESS CONTROL FOR MACHINING

COST: \$105.000

GOAL: IMPROVE THE SELECTION OF MACHINING PARAMETERS

RESULTS

- A METHODOLOGY FOR THE SELECTION OF METAL CUTTING CONDITIONS IN A TURNING OPERATION WAS ESTABLISHED. FORTRAN PROGRAMS WERE DEVELOPED FOR USE WITH A HAND CALCULATOR.
- GUIDELINES WERE IDENTIFIED FOR SELECTING THE PREFERRED CUTTING CONDITIONS. ADDITIONAL EFFORTS ARE PLANNED FOR MILLING AND DRILLING OPERATIONS.
- ESTIMATES FOR POTENTIAL COST SAVINGS AT ROCK ISLAND ARSENAL FOR ONE YEAR RANGE FROM \$1 MILLION TO \$2.5 MILLION.



DARCOM MMT ACCOMPLISHMENT

ARMAMENT READINESS COMMAND

PROJECT NO: 6 77 7715

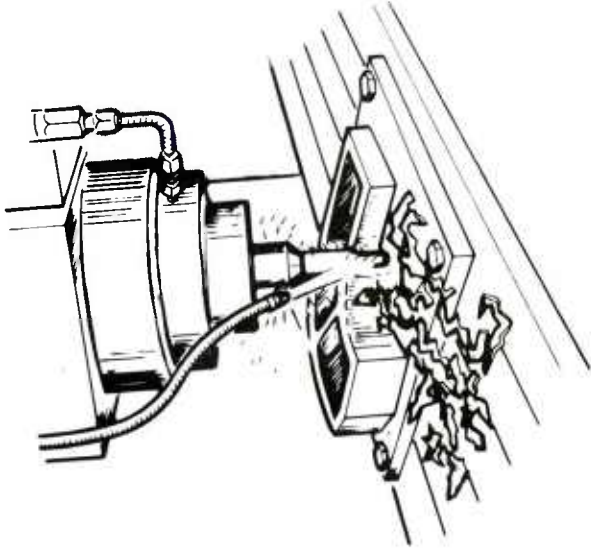
TITLE: APPLICATION OF CONTROLLED-
FORCE MACHINING

COST: \$64,000

GOAL: DEVELOP A SYSTEM FOR USING
POWER AND FORCE SENSING AND
CONTROL TO ESTABLISH OPTIMUM
FEEDS AND SPEEDS.

RESULTS

- AN ADAPTIVE CONTROL SYSTEM WAS
INSTALLED ON A MILLING MACHINE AT ROCK
ISLAND ARSENAL (RIA) AND PROVED
SUCCESSFUL.
- WHEN IMPLEMENTED AND APPLIED TO ALL
MILLING MACHINES, THIS TECHNOLOGY WILL
PRODUCE ANNUAL SAVINGS OF \$46,000
(FYDP) AND \$138,000 (MOBILIZATION) AT RIA.



MONITORING CUTTING FORCES

DARCOM MMT ACCOMPLISHMENT

ARMAMENT READINESS COMMAND

PROJECT NO: 6 77,78 7716

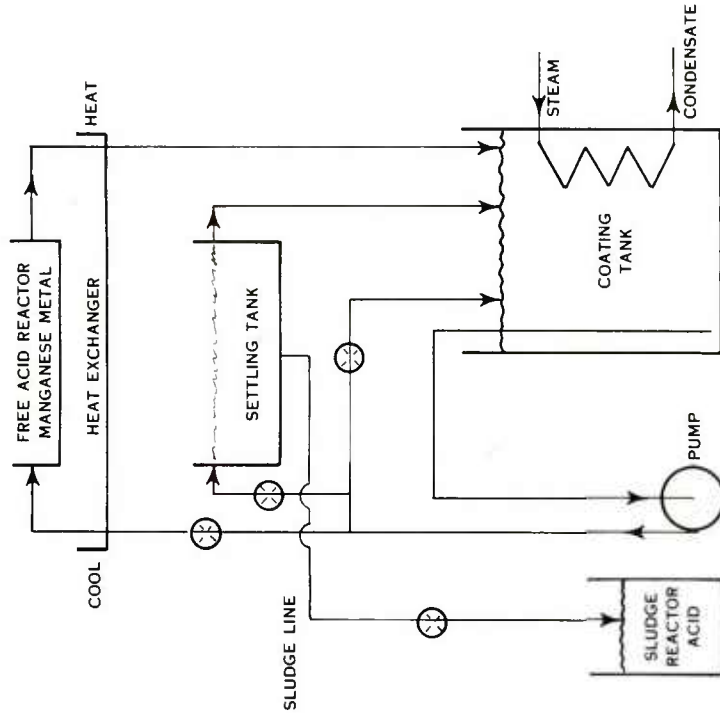
TITLE: PROTOTYPE PRODUCTION LINE
FOR PRESSURE PHOSPHATE
COATING

COST: \$192,000

GOAL: IMPROVE PROCEDURES FOR
PHOSPHATE COATING

RESULTS

- A PROCESS WAS DEVELOPED THAT IMPROVED THE HEAT AND CORROSION RESISTANCE IN MANGANESE PHOSPHATE COATING AND COULD CURRENTLY REPLACE HAZARDOUS CADMIUM PLATING IN SOME OPERATIONS.
- COST SAVINGS ACCRUE BY REDUCING MAINTENANCE AND REWORK COSTS ON ITEMS NOW SPECIFYING ORGANIC POST-TREATMENTS.



FLOW SHEET FOR COATING FERROUS METALS WITH MANGANESE PHOSPHATE AND REGENERATING THE SOLUTION

DARCOM MMT ACCOMPLISHMENTS

ARMAMENT READINESS COMMAND

PROJECT NO. 6 78 8045

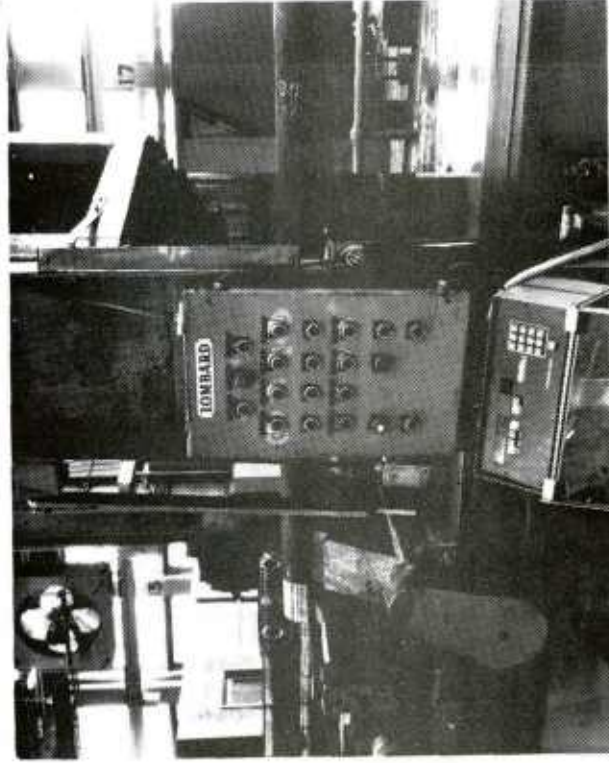
TITLE: IMPROVED TUBE STRAIGHTENING

COST: \$65.000

GOAL: REDUCE TUBE STRAIGHTENING COSTS

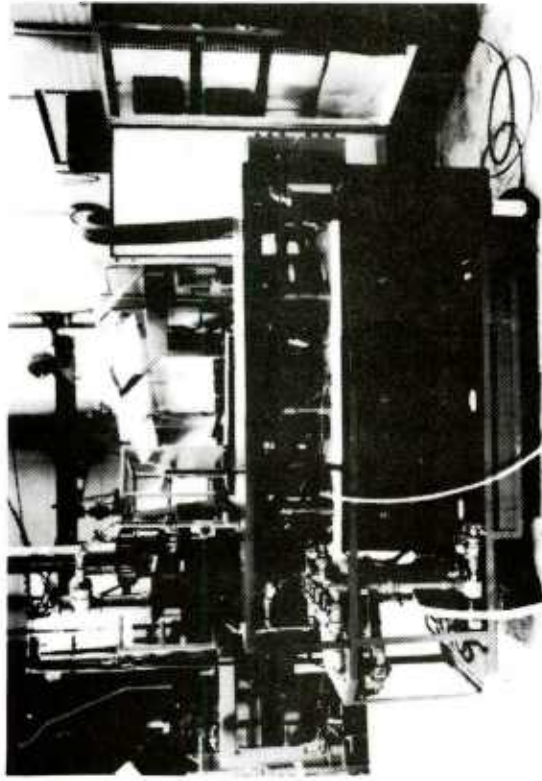
RESULTS

- THE PROJECT DEVELOPED A SIMPLER PROCEDURE FOR OPERATOR TRAINING AND PERFORMANCE IN STRAIGHTENING GUN TUBES.
- THE TIME REQUIRED TO PRESS A GUN TUBE WAS REDUCED BY 50 MINUTES THEREBY REDUCING PRESSING COSTS BY 12% OR \$8.500 ANNUALLY.
- SAVINGS WERE ALSO REALIZED BY PRESSING TUBES THAT OTHERWISE WOULD BE REJECTED DUE TO POOR STOCK DISTRIBUTION.



DARCOM MMT ACCOMPLISHMENTS

ARMAMENT READINESS COMMAND



PORTABLE PLATING FACILITY

PROJECT NO: 6 80 8059

TITLE: SALVAGE OF CANNON COMPONENTS BY
ELECTRO-DEPOSITION

COST: \$152.000

GOAL: REDUCE MANUFACTURING COSTS

RESULTS

- PREVIOUSLY REJECTED TUBES AND COMPONENTS CAN BE RECLAIMED BY THE USE OF ELECTRO-DEPOSITION OF METALS.
- AUTOMATIC CONTROLS WERE DEVELOPED FOR THE PLATING PARAMETERS.
- SAVINGS OF \$20.000 FOR AN 8" CANNON TUBE AND \$4.000 FOR A 105MM CANNON TUBE AND COMPONENTS ARE EXPECTED.

SECTION III

IMPLEMENTED EFFORTS

DARCOM MMT IMPLEMENTATION COMMUNICATIONS AND ELECTRONICS COMMAND

EFFORT NO: 2 9640

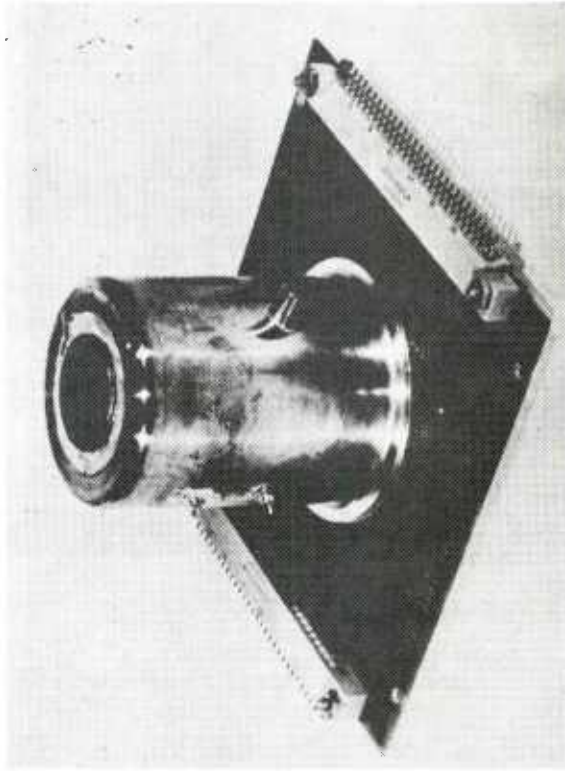
TITLE: MERCURY CADMIUM TELLURIDE
DETECTOR ARRAY MODULE

COST: \$2,070,000

GOAL: ESTABLISH A PRODUCTION CAPABILITY

BENEFITS

- A PRODUCTION CAPABILITY OF 10 ARRAY MODULES PER WEEK WAS DEMONSTRATED.
- THE NEW MODULES DEMONSTRATED INCREASED RELIABILITY, HIGHER PRODUCTION YIELD, AND A SIGNIFICANTLY INCREASED STORAGE LIFE.
- THE PILOT LINE WAS IMPLEMENTED AT THE HONEYWELL RADIATION CENTER AND IS EXPECTED TO PRODUCE SAVINGS OF \$3.7 MILLION.



DEWAR CAP AND BASE
AFTER FINAL ASSEMBLY

DARCOM MMT IMPLEMENTATION COMMUNICATIONS AND ELECTRONICS COMMAND

EFFORT NO: 2 9741

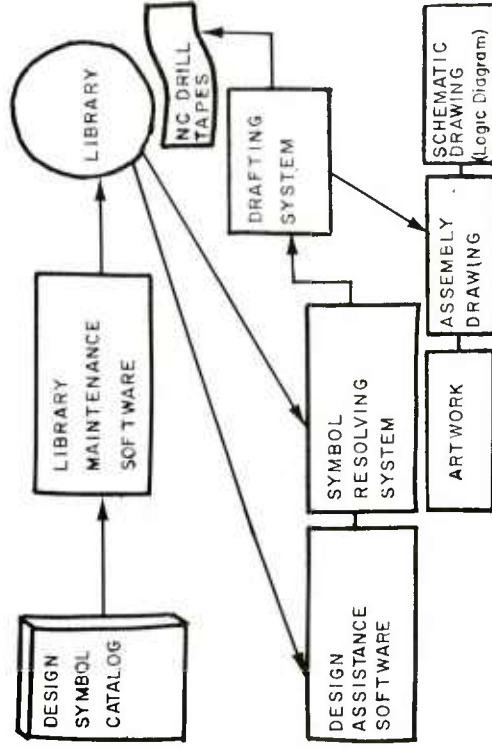
TITLE: CAD/CAM SYSTEM: DRAWING SYMBOL
LIBRARY

COST: \$168,000

GOAL: REDUCE PRODUCTION COSTS

BENEFITS

- A LOW COST ALTERNATE TO A STAND-ALONE CAD/CAM SYSTEM WAS DEVELOPED.
- THE SOFTWARE WAS DEVELOPED AND HAS BEEN USED FOR DESIGN VERIFICATION OF AN INTEGRATED PRINTED CIRCUIT SYSTEM AND FOR VALIDATION OF MASTER PLATES FOR SEVERAL PRINTED CIRCUIT BOARDS.
- IMPLEMENTATION OF THIS SOFTWARE AT FORT MONMOUTH HAS RESULTED IN AN ESTIMATED SAVINGS OF \$1 MILLION.



DRAWING SYMBOL LIBRARY

DARCOM MMT IMPLEMENTATION

COMMUNICATIONS AND ELECTRONICS COMMAND

PROJECT NO: 2.9746

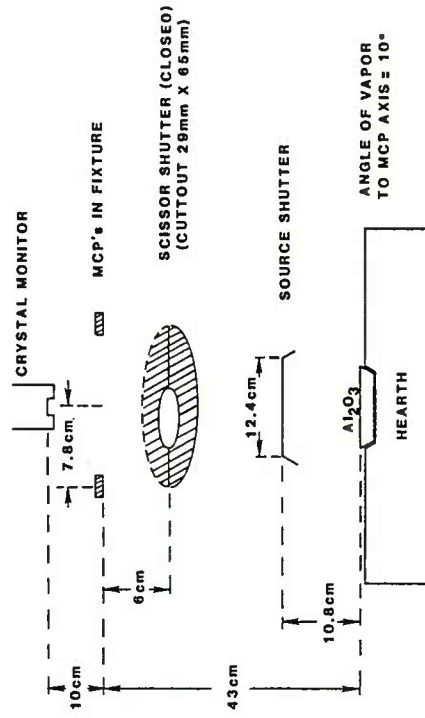
TITLE: THIN FILM ALUMINUM OXIDE ON MICRO-CHANNEL PLATES

COST: \$485,000

GOAL: REDUCE MANUFACTURING COSTS

BENEFITS

- A PROCESS WAS DEVELOPED FOR THE PLACEMENT OF A THIN (40 ANGSTROM) FILM OF ALUMINUM OXIDE ON THE INPUT SIDE OF A MICRO-CHANNEL PLATE.
- MORE RELIABLE DEVICES CAN NOW BE PRODUCED SINCE THE FILM PREVENTS DESTRUCTIVE ION FEEDBACK THAT REDUCES TUBE LIFE.
- AN ESTIMATED 10 YEAR COST SAVINGS OF \$12.6 MILLION COULD RESULT WHEN THIS TECHNOLOGY IS IMPLEMENTED ON THE AN/PVS-7 NIGHT VISION GOGGLE. THIS GOGGLE IS SCHEDULED TO START PRODUCTION IN 1984.



ESSENTIAL FIXTURES
IN A12O3 DEPOSITION

DARCOM MMT IMPLEMENTATION

COMMUNICATIONS AND ELECTRONICS COMMAND

PROJECT NO: 2 9842

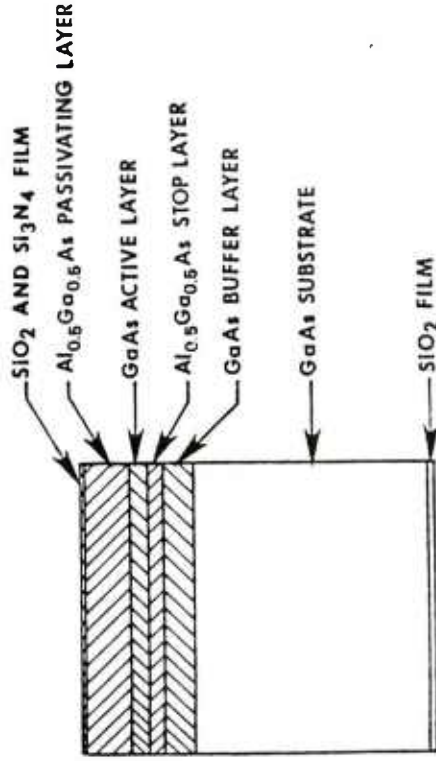
TITLE: THIRD GENERATION 0.9 MICRON
PHOTOCATHODE

COST: \$1,893,000

GOAL: REDUCE COSTS

BENEFITS

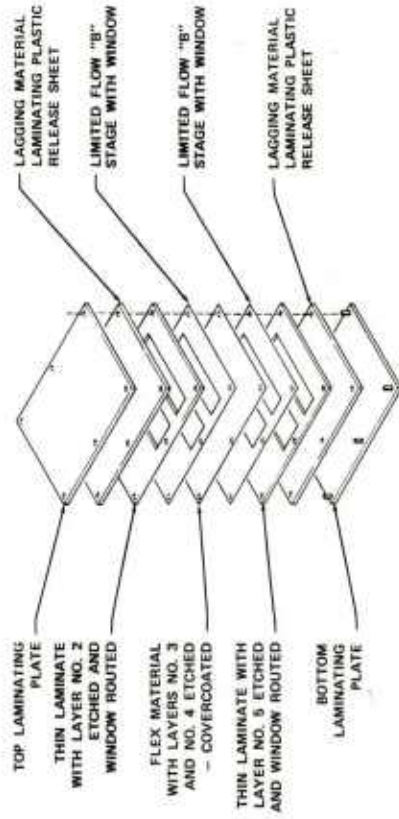
- AUTOMATED BONDERS AND PLASMA SPUTTER SYSTEMS WERE DEVELOPED FOR DEPOSITION OF ANTIREFLECTIVE COATINGS.
- A DEMOUNTABLE PHOTOEMISSION SYSTEM WAS DEVELOPED THAT ALLOWS TESTING OF PHOTO-CATHODES PRIOR TO FABRICATION INTO IMAGE TUBES.
- IMPLEMENTATION OF THIS TECHNOLOGY FOR THE AN/PVS-6 AND AN/PVS-7 WILL PROVIDE ESTIMATED 7-YEAR SAVINGS OF \$11.8 MILLION.



PHOTOCATHODE STRUCTURE

DARCOM MMT IMPLEMENTATION

MISSILE COMMAND



RIGID FLEX
LAMINATION LAYUP

PROJECT NO: R 3112

TITLE: MULTILAYER RIGID-FLEX HARNESS

COST: \$378,000

GOAL: REDUCE COSTS
BENEFITS

- THE REQUIREMENTS FOR A PRODUCTION LINE CAPABLE OF PRODUCING 750 UNITS PER DAY WERE DEFINED.
- THE COPPERHEAD BOARD USED FOR DEMONSTRATING THE PROCESS IS A SIX LAYER BOARD WITH ELEVEN RIGID SECTIONS INTERCONNECTED BY FLEXIBLE WIRING.
- THE BOARDS HAVE BEEN IMPLEMENTED FOR USE ON COPPERHEAD AND A COST SAVINGS OF \$6.4 MILLION IS ESTIMATED FOR 7 YEARS OF PRODUCTION AT FYDP RATES.

DARCOM MMT IMPLEMENTATION

MISSILE COMMAND

EFFORT NO: R 3135

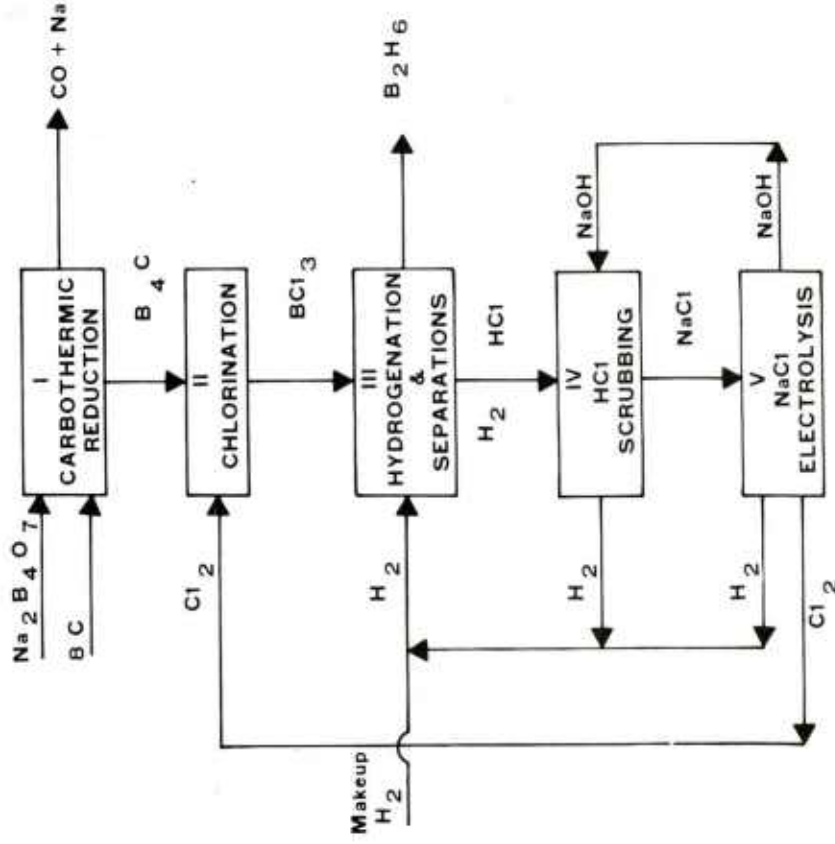
TITLE: PROCESS DEVELOPMENT FOR CARBORANE

COST: \$5,451,000

GOAL: REDUCE MANUFACTURING COSTS

BENEFITS

- A MODULAR FACILITY TO PRODUCE CARBORANE WAS DESIGNED AND THE PROCESS WAS DEMONSTRATED.
- AT PRESENT, SUFFICIENT MODULES HAVE BEEN PROCURED AT A COST OF \$5 MILLION AND INSTALLED TO PRODUCE 15,000 LB/YR. THE FULL DESIGN CAPACITY OF 30,000 LB/YR CAN BE ACHIEVED BY PURCHASING ADDITIONAL MODULES IF NECESSARY.
- THE COST WAS REDUCED BY APPROX. 50% AND SHOULD RESULT IN AN ESTIMATED \$30 MILLION COST SAVING FOR THE PLANNED 7 YEAR VIPER PRODUCTION. AT MOB RATES, THE SAVINGS ARE ESTIMATED AT \$72.5 MILLION.



LOW PRESSURE — HIGH CONVERSION
CYCLIC DIBORANE PROCESS

DARCOM MMT IMPLEMENTATION

MISSILE COMMAND

PROJECT NO: 3 3171

TITLE: AUTOMATED CONTROL OF WAVE
SOLDERING MACHINE

COST: \$450,000

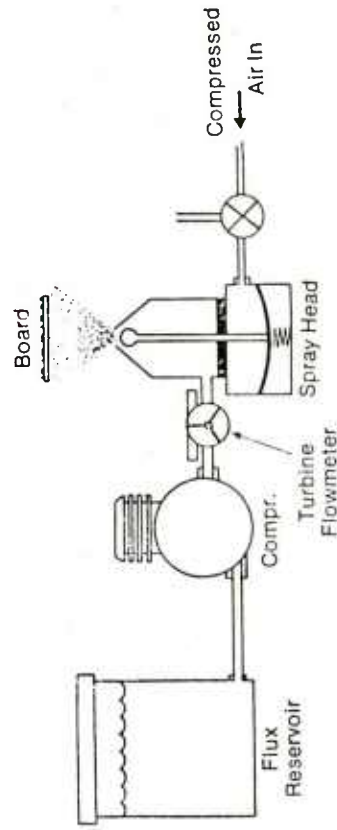
GOAL: REDUCE SOLDERING COSTS

BENEFITS

- THE CRITICAL PARAMETERS THAT AFFECT THE QUALITY OF WAVE SOLDERING WERE DETERMINED. THESE PARAMETERS WERE THEN INTEGRATED INTO EQUIPMENT WITH APPROPRIATE SENSORS FOR CONTINUOUS MONITORING. THE RESULTS ARE TRANSMITTED TO A CENTRAL COMPUTER SYSTEM AND AUTOMATICALLY CONTROLLED.

- THE SYSTEM WAS FULLY IMPLEMENTED AT WESTINGHOUSE (BALTIMORE) AND PARTIALLY AT ELECTROVERT.

- ESTIMATED YEARLY SAVINGS AT THE FYDP RATES ARE \$1.1 MILLION.



SPRAY FLUXER

DARCOM MMT IMPLEMENTATION

MISSILE COMMAND

EFFORT NO: 3 3230

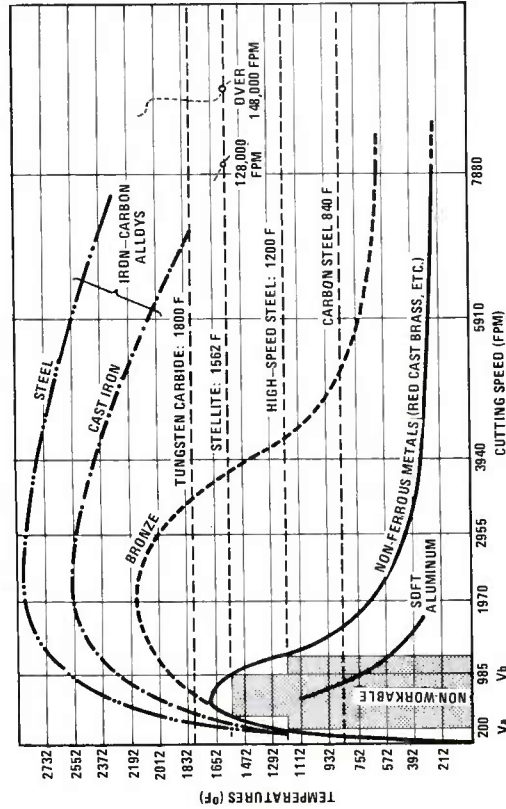
TITLE: HIGH SPEED MACHINING OF ALUMINUM

COST: \$306,000

GOAL: REDUCE MACHINING COSTS

BENEFITS

- TECHNIQUES WERE DEVELOPED TO MACHINE ALUMINUM AT SIGNIFICANTLY HIGHER SPEEDS.
- THE EFFECT OF CUTTING SPEEDS ON TEMPERATURE AND CUTTER LIFE WERE CONSIDERED IN ESTABLISHING THE PARAMETERS. FEED RATES AND THE METAL REMOVAL RATES WERE ABLE TO BE TRIPLED.
- IMPLEMENTATION AT GENERAL DYNAMICS CORP. SHOULD RESULT IN SAVINGS OF \$5.7 MILLION OVER A 10 YEAR PRODUCTION OF CRUISE MISSILES.



EFFECT OF CUTTING SPEED ON CUTTING TEMPERATURE

OCT 82

DARCOM MMT IMPLEMENTATION

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 1249

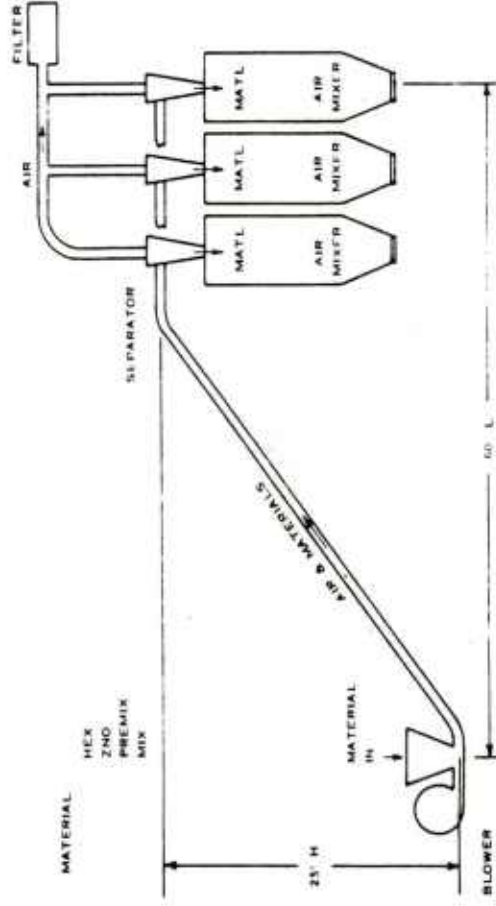
TITLE: ADVANCED TECHNOLOGY FOR PYRO-TECHNIC MIXTURES AND MUNITIONS

COST: \$2,300,000

GOAL: REDUCE PRODUCTION COSTS

BENEFITS

- QUALITY IMPROVEMENTS WERE MADE TO THE PROCESSES AND MATERIAL HANDLING IN THE MANUFACTURE OF THE M8 AND M18 SMOKE GRENADES.
- THE IMPROVEMENTS INCLUDED A JET AIR BLENDER, TWO METHODS OF PELLETIZING THE MIXTURE AND HAZARD CLASSIFICATION STUDIES.
- BASED ON CURRENT PRODUCTION RATES, THE IMPLEMENTATION OF THIS EFFORT HAS RESULTED IN AN ESTIMATED YEARLY SAVINGS OF \$112,000; AT MOBILIZATION RATES THE ESTIMATED YEARLY SAVINGS ARE \$840,000.



PNEUMATIC TRANSFER CONFIGURATION

OCT 82

DARCOM MMT IMPLEMENTATION

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 1339

TITLE: CHEMICAL AGENT DETECTOR DYE
PRODUCTION WASTE DISPOSAL

COST: \$240,000

GOAL: DEVELOP A SAFE ENVIRONMENTAL
PROCEDURE FOR THE DISPOSAL OF
SUSPECT MUTAGENIC DYES, WASTES,
AND END ITEMS RESULTING FROM THE
PRODUCTION OF CHEMICAL AGENT
DETECTOR PAPERS

BENEFITS

- INCINERATION OPERATING PARAMETERS WERE ESTABLISHED FOR THE DISPOSAL OF PRODUCTION WASTES OF PRESENT AND FUTURE DYE DETECTOR PAPERS.
- THE PROCESS DESCRIPTION HAS BEEN INCORPORATED INTO THE TECHNICAL DATA PACKAGE FOR THE M8 AND M9 CHEMICAL AGENT DETECTOR PAPERS.

FLUIDIZED BED (FOR LIQUIDS)

T(°F)	Time(Sec)	Conc(wt%)	Feed Rate(lb/hr)
B-1 DYE 1800	3	20	20

DYE MIXTURE

RED	1.10	
YELLOW	1.85	21
GREEN	2.00	

CHAINGRATE (FOR PAPER)

Load (lb)	Time (min)	Temp (°F)	After burner Time (Sec)	Afterburner Temp (°F)
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B-1 DYE	Up to 1260	60	1500	5	1800
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DYE MIXTURE

RED					
YELLOW	4	10	1500	5	1500
GREEN	(12)	(18)	(1500)	(5)	(1500)

INCINERATION PARAMETERS FOR DETECTOR KITS, KIT COMPONENTS, DYES AND DYE SLURRIES.

DARCOM MMT IMPLEMENTATION

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 3063

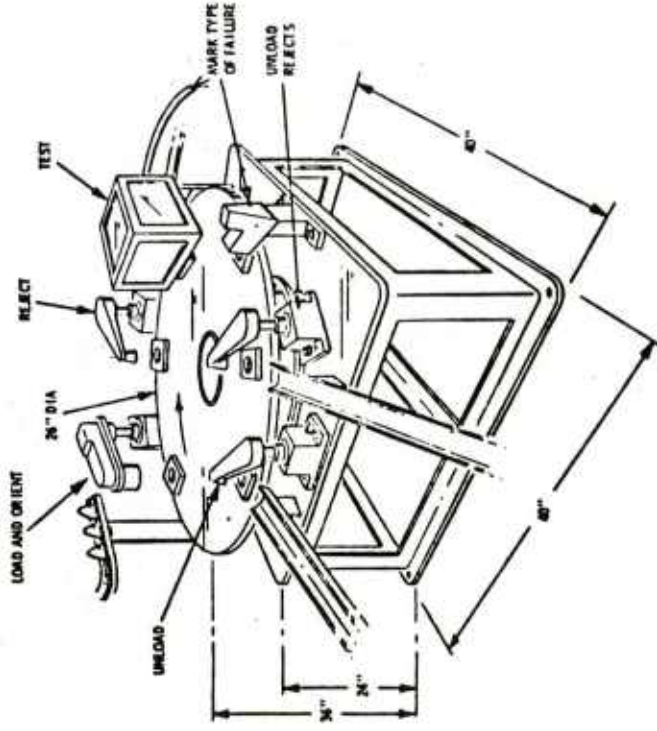
TITLE: FUZE LOT ACCEPTANCE EQUIPMENT

COST: \$299,000

GOAL: DEVELOP EQUIPMENT TO ACCEPTANCE
TEST FUZES

BENEFITS

- A REAL TIME COMPUTERIZED SYSTEM WAS DEVELOPED THAT ALLOWS MANY TESTING STATIONS PERFORMING DIFFERING TASKS TO BE OPERATED AND CONTROLLED SIMULTANEOUSLY.
- THE CALIBRATOR STATION PROVIDES A RAPID AND ACCURATE METHOD OF ASSURING THAT THE FUZES BEING PRODUCED ARE WITHIN SPECIFIED LIMITS.
- THE POWER SUPPLY INITIATOR PROVIDES THE CAPABILITY OF SIMULTANEOUSLY APPLYING SPIN AND SETBACK FORCES TO CHECK POWER SUPPLY INITIATION.
- IMPLEMENTATION OF THE SYSTEMS HAS RESULTED IN AN ESTIMATED SAVINGS OF \$1.25 MILLION.



ROTARY INDEXER

DARCOM MMT IMPLEMENTATION

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

EFFORT NO: 5 4005

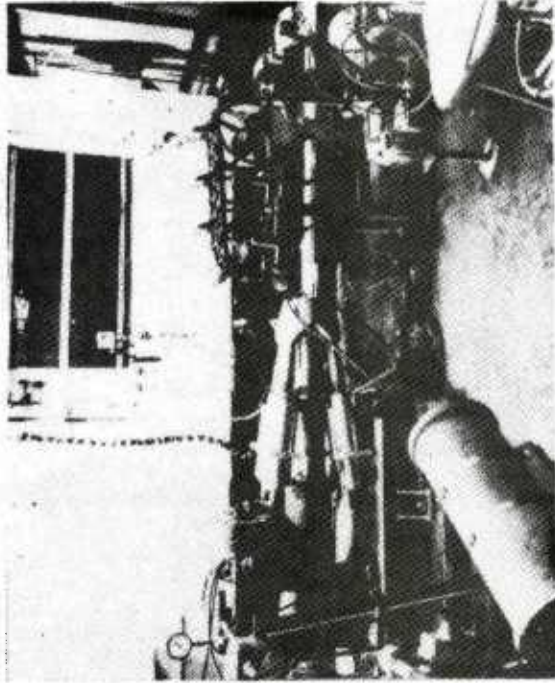
TITLE: EXTRUDING COMPOSITION C-4

COST: \$170,500

GOAL: REDUCE PRODUCTION COSTS

BENEFITS

- THE PROTOTYPE EXTRUDER DEVELOPED UNDER THIS PROJECT WAS USED AS A BASIS FOR PURCHASING TWO PRODUCTION MACHINES.
- THE QUALITY WAS IMPROVED AND THE REJECT RATES WERE SIGNIFICANTLY REDUCED.
- IMPLEMENTATION OF THESE EXTRUDERS ON THE "H" LINE AT LOUISIANA AAP HAS RESULTED IN A \$1.7 MILLION SAVING.



IMPROVED EXTRUDER

DARCOM MMT IMPLEMENTATION

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 4263

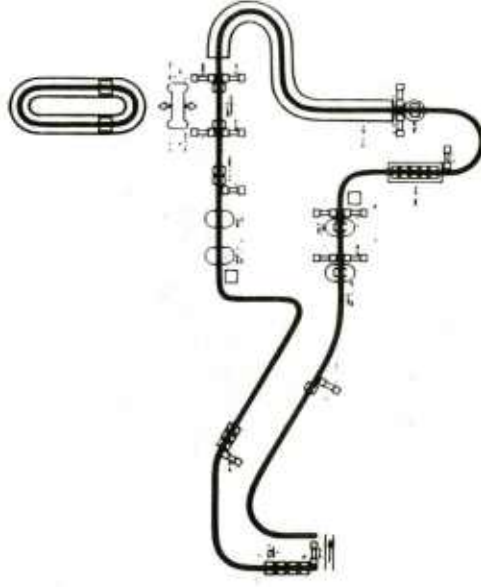
TITLE: CONTROLLED PRODUCTION LOADING SYSTEM
FOR THE 105MM HEAT-T M456A1

COST: \$491,000

GOAL: REDUCE THE CASTING REJECTS FROM THE
CURRENT 30 TO 50% TO 5% OR LESS

BENEFITS

- PROPELLANT CRACKING IS REDUCED BY
BALANCING THE BODY AND COPPER CONE
COOLING RATES. VIBRATION IMPROVED
CAST DENSITY AND QUALITY. STEAM PANELS
PREVENTED PIPING AND CAVITATION.
- A CONFIRMATORY TEST PRODUCED A 98%
ACCEPTANCE RATE.
- IMPLEMENTATION WILL BE AT MILAN AAP BY
MEANS OF AN FY84 FACILITIES PROJECT.



155MM M107, EXPLOSIVE

DARCOM MMT IMPLEMENTATION

ARMAMENT RESEARCH AND DEVELOPMENT COMMAND

PROJECT NO: 5 4280

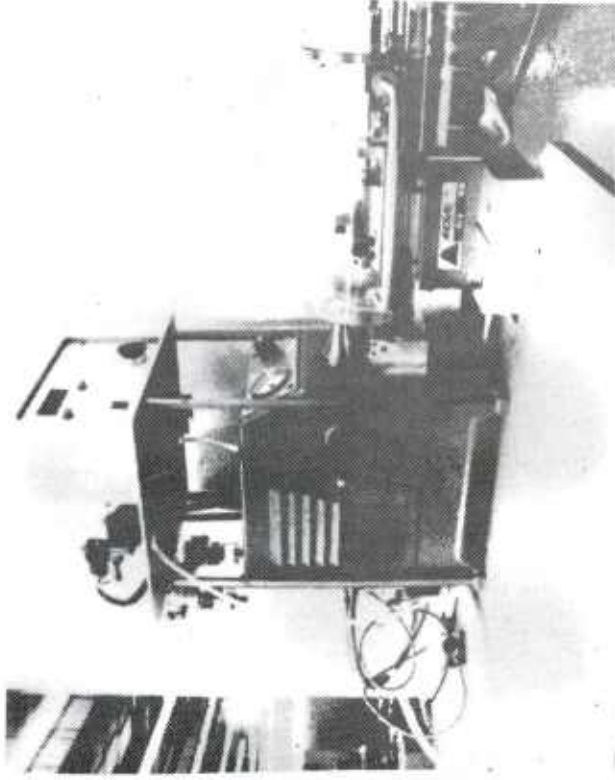
TITLE: AUTOMATIC PROCESS CONTROL
EQUIPMENT FOR FUZES

COST: \$1,102,000

GOAL: REDUCE CALIBRATION COSTS

BENEFITS

- TWO MACHINES WERE DEVELOPED THAT AUTOMATICALLY BALANCE AND ADJUST THE BEAT RATE OF THE TIMER.
- BALANCING IS ACCOMPLISHED BY AUTOMATIC LASER REMOVAL OF EXCESS MATERIAL. BEAT RATE IS ADJUSTED BY AUTOMATICALLY SHORTENING THE HAIR SPRING USING ULTRASONIC WELDING.
- THREE VENDORS HAVE IMPLEMENTED THESE MACHINES. AN ESTIMATED \$4.6 MILLION WILL BE SAVED FOR 6 YEARS OF M577 FUZE PRODUCTION.



AUTOMATIC REGULATION MACHINE

DARCOM MMT IMPLEMENTATION

ARMAMENT READINESS COMMAND

DIAL GAGE

PROJECT NO: 6 7191

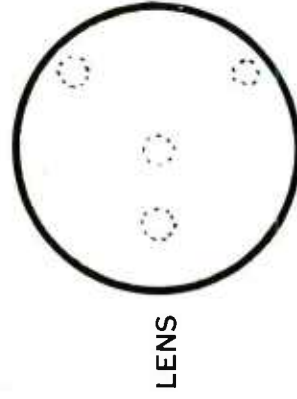
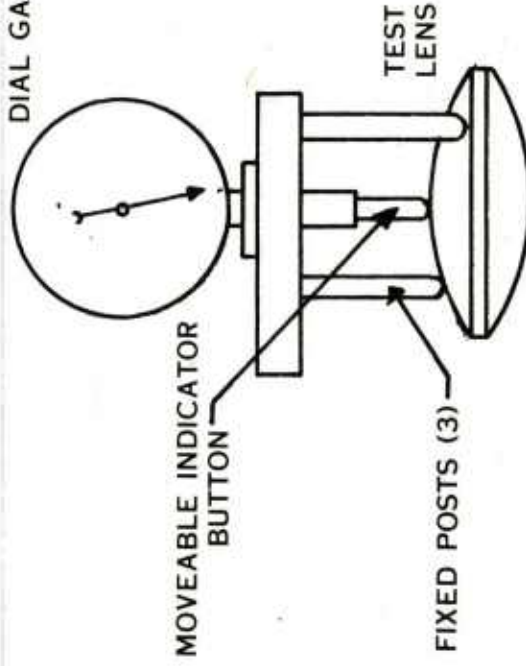
TITLE: OPTICAL FABRICATION TECHNIQUES

COST: \$525.000

GOAL: IMPROVE PROCEDURES FOR PRODUCING OPTICS

BENEFITS

- THIS EFFORT PROVIDED THE PROCEDURES FOR PROCURING AND EVALUATING THE QUALITY OF OPTICAL GRADE GERMANIUM.
- THE PROCESSES FOR HANDLING, CUTTING, AND MOUNTING GERMANIUM BLANKS FOR LENSE FABRICATION WERE DEFINED.
- TEST AND EVALUATION PROCEDURES FOR ASSURING PRODUCT QUALITY WERE DEFINED.
- THE PROJECT WAS IMPLEMENTED BY MEANS OF A MILITARY SPECIFICATION THAT IS USED FOR PROCUREMENT.



MECHANICAL SPHEROMETER

DARCOM MMT IMPLEMENTATION

ARMAMENT READINESS COMMAND

PROJECT NO: 6 7461

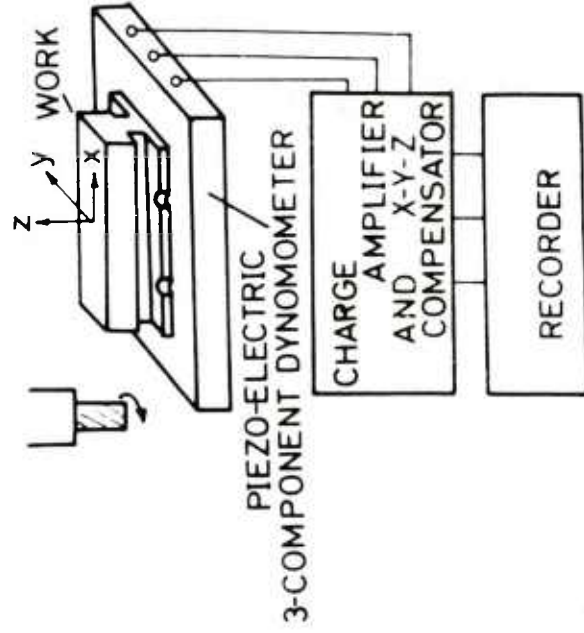
TITLE: SPECIAL TOOL AND PROCESS MACHINING
OF SINTERED POWDER METAL WEAPON
COMPONENTS

COST: \$34,000

GOAL: DEVELOP MACHINING PARAMETERS FOR
POWDER METAL PARTS

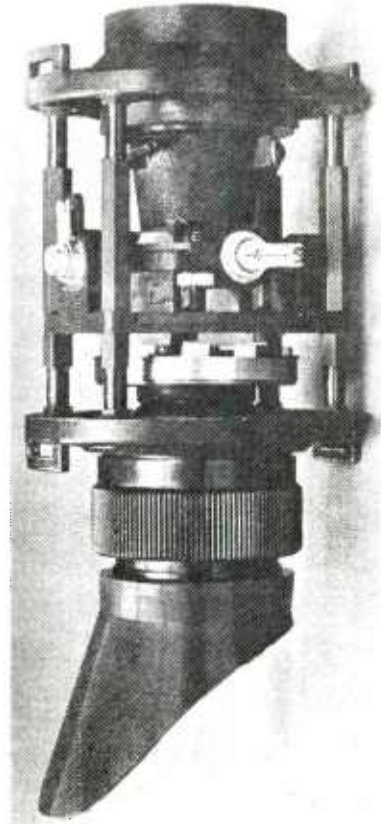
BENEFITS

- MACHINING PARAMETERS FOR LOW DENSITY AND HIGH DENSITY 4600 SERIES STEEL PARTS PRODUCED BY POWDERED METAL PROCESSES WERE ESTABLISHED.
- THE CHARACTERISTICS FOR TURNING, DRILLING, REAMING, BORING, AND TAPPING THESE PARTS WERE INCLUDED IN THE INVESTIGATION.
- A FINAL TECHNICAL REPORT SUMMARIZING THE FINDINGS HAS BEEN DISTRIBUTED TO THE APPROPRIATE ARMY, NAVY, AND AIR FORCE OFFICES.



DARCOM MMT IMPLEMENTATION

ARMAMENT READINESS COMMAND



MILITARIZED "STEDI-EYE MARK IIIa

PROJECT NO: 6 7479

TITLE: STABILIZED OPTICAL SIGHT

COST: \$50,000

GOAL: IMPROVE MANUFACTURING AND TESTING TECHNIQUES

BENEFITS

- THIS PROJECT DEVELOPED A STANDARDIZED PROCUREMENT DESCRIPTION FOR THE MANUFACTURE AND TESTING OF STABILIZED SIGHTS.
- THE PERFORMANCE DESCRIPTION INCLUDES OPTICAL, MECHANICAL, AND ELECTRICAL REQUIREMENTS AND THE TEST DESCRIPTION INCLUDES ENVIRONMENTAL, ELECTRICAL, OPTICAL AND OPERABILITY REQUIREMENTS.
- A SAVING OF OVER \$1 MILLION WAS REALIZED IN THE PROCUREMENT OF STEDI-EYE MARK 3A AND TRANS-LENS SIGHTS.

DARCOM MMT IMPLEMENTATION ARMAMENT READINESS COMMAND

EFFORT NO: 6 7578

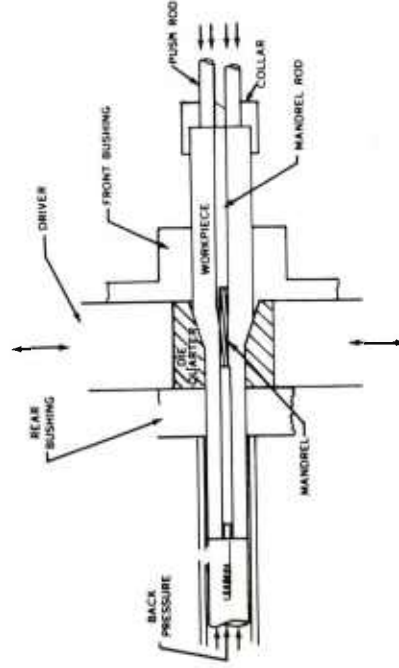
TITLE: MANUFACTURING TECHNIQUES FOR SNIPER
BARRELS

COST: \$190,000

GOAL: REDUCE MANUFACTURING COSTS

BENEFITS

- A PROCEDURE FOR ROTARY SWAGING 7.62 MM BARRELS TO SNIPER RIFLE QUALITY WAS DEVELOPED.
- THE PROCESS WAS OPTIMIZED FOR THE FABRICATION OF BARREL BLANKS WITH THE CHAMBERING AND TAPER FORGED CONCURRENT WITH THE RIFLING.
- THE ROTARY FORGE WAS TRANSFERRED TO PICATINNY ARSENAL FOR FURTHER EVALUATION.



CROSS-SECTION OF
THE SWAGING CYCLE

DRXIB-MT

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Cdr, Attn: DRDME-UE, Mr. R. Goehner
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