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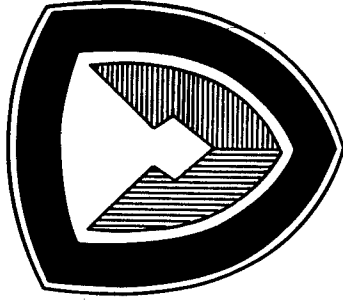
U S ARMY

MATERIEL DEVELOPMENT AND READINESS COMMAND

RIA-80-U1023

PROGRAM ACCOMPLISHMENTS

MANUFACTURING
METHODS
&
TECHNOLOGY



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MANUFACTURING TECHNOLOGY DIVISION
U S ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY
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, 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 Commands with emphasis on illustration of the types of projects pursued. The format of this brochure has been somewhat modified for this issue in accordance with the increased emphasis on implementation. Projects that have anticipated benefits and implemented efforts with actual benefits have been placed in separate sections to provide a clear distinction between them. A summary has been provided as the first section of the document to provide an overview.
3. Further information on the projects illustrated in this brochure should be obtained from the MM&T representatives, project officers shown, or from Mr. James Carstens, Chief, Manufacturing Technology Division, AV 793-5113.

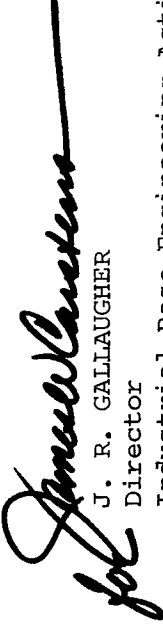

J. R. GALLAUGHER
Director
Industrial Base Engineering Activity

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INTRODUCTION

The Army Manufacturing Methods and Technology (MMT) Program was begun in 1964. The purpose of the program is to develop new manufacturing processes that can 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.

Much literature has been written concerning the transfer of technology from the "laboratory" to actual production. It is often difficult to make this transition; however, the full benefits of new technology can be obtained only if this transition has been made. The Army is placing more emphasis on technology transfer to attain greater project benefits. This brochure is widely distributed throughout the Army in order to publicize the results and disseminate knowledge to potential users. Other methods of accomplishing this transfer are 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 once the new technology is implemented.

MMT POINTS OF CONTACT

<u>COMMAND CODE</u>	<u>REPRESENTATIVE</u>	<u>PHONE</u>
1	Mr. Robert Vollmer US Army Aviation R&D Command ATTN: DRDAV-EXT 12th & Spruce Streets St. Louis, MO 63166	AV 698-6476 (314) 268-6476
2 or F	Mr. Al Feddeler US Army Communications R&D Command ATTN: DRDCO-PPA-TP Building 2700 Fort Monmouth, NJ 07703	AV 995-4017 (201) 544-4017
2 or H	Mr. Joseph Key US Army Electronics R&D Command ATTN: DELET-DS Fort Monmouth, NJ 07703	AV 995-4258 (201) 544-4258
3 or R	Mr. Ray Farison US Army Missile Command ATTN: DRSMI-ET Redstone Arsenal, AL 35898	AV 746-1835 (205) 876-1835
4 or T	Dr. James Chevalier US Army Tank-Automotive R&D Command ATTN: DRDTA-RCK Warren, MI 48090	AV 273-2065 (313) 573-2065

MMT POINTS OF CONTACT

<u>COMMAND CODE</u>	<u>REPRESENTATIVE</u>	<u>PHONE</u>
5	Mr. Donald Fischer US Army Armament R&D Command Attn: DRDAR-PML Dover, NJ 07801	AV 880 6714 (201) 328 6714
	Mr. Joseph Tagliarino US Army Munitions Production Base Modernization Agency Attn: SARPM-PBM Dover, NJ 07801	AV 880 6708 (201) 328 6708
6	Mr. August Zahatko US Armament Materiel Readiness Command Attn: DRSAR-IRB Rock Island Arsenal Rock Island, IL 61299	AV 793 4485/3730 (309) 794 4485/3730
7 or E	Mr. Sydney Newman US Army Mobility Equipment R&D Command Attn: DRDME-UPE Ft. Belvoir, VA 22060	AV 354 5530 (703) 664 5530
0	Mr. Grover Shelton US Army Test & Evaluation Command Attn: DRSTE-AD-M Aberdeen Proving Ground, MD 21005	AV 283 3677 (301) 278 3677

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SECTION I

SUMMARY OF BENEFITS

ACCOMPLISHMENTS SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
7 72 3501		INCREASED CAPABILITY			AVAILABLE FOR IMPLEMENTATION
7 74 3567		REDUCED TEST TIME			TWO PROTOTYPE SIMULATORS WERE BUILT
2 76 9773	\$2 MILLION				SOFTWARE IS AVAILABLE FOR IMPLEMENTATION
2 74 9523	\$175/UNIT	INCREASED LIFE & PERFORMANCE			
2 75 9525		REDUCED LABOR & INCREASED PROCESS YIELD			A PRODUCTION RATE OF 200/MONTH WAS ACHIEVED
H 75 9665	\$700,000/YEAR				LASER TRIMMING FOR FINAL TUNING
2 75 9738	\$1.7 MILLION				IMPROVED PROCESSING
2 73 9741		REDUCED DESIGN VERIFICATION TIME			AVAILABLE FOR IMPLEMENTATION
4 75 4561		REDUCED DIE DESIGN TIME			INTERACTIVE COMPUTER ASSIST
T 77 4589		ASSURES INTEGRITY OF DESIGNS			COMMAND CONVERSION PLAN WILL IMPLEMENT
4 77 5019	\$3.0 MILLION	LOWER MAINTENANCE			FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT
1 76 7055	\$225,000	LIGHTER & LESS EXPENSIVE UNIT			FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT
1 72 8036	NONE				UNDESIRABLE SIDE EFFECTS
1 74 8091		80% REDUCTION IN PROCESSING COSTS			
1 74,75,76 8109	\$14 MILLION	MORE ENVIRONMENTALLY TOLERANT UNIT			
3 76 3147	\$4.7 MILLION	REDUCES UNDESIRABLE CHEMICAL DISCHARGES			FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT
R 77 3168	\$10 MILLION	INCREASED PERFORMANCE			PRODUCTION RATE OF 50/HOUR ACHIEVED
3 76 3224	\$1.5 MILLION	REDUCED FIELD FAILURES			ADDITIONAL EFFORT IS PROPOSED
3 76 3225	\$760,000/YEAR				FOLLOW-ON EFFORTS ARE REQUIRED
3 76,7T 3228		ELIMINATES BATCH OPERATIONS			FOLLOW-ON PROJECT IS COMPLETING THIS EFFORT

ACCOMPLISHMENTS SUMMARY (CONT)

PROJECT NUMBER	ANTICIPATED BENEFITS		ACTUAL BENEFITS		REMARKS
	\$ SAVINGS	OTHER	\$ SAVINGS	OTHER	
5 73 1139		REDUCED EXPLOSIVE HAZARD			TWO MACHINES WERE FITTED WITH FLUIDIC CONTROLS
5 73,75 1248		SAFETY ENHANCEMENT			AIR VENTILATION SYSTEMS DESIGN CRITERIA
5 74 1261		INCREASED CAPABILITY			PROTOTYPE SYSTEMS ARE IN USE
5 7T,77 1337		PROVIDED PRODUCTION CAPABILITY			PILOT PLANT WAS CONSTRUCTED
5 74 3049 & 3 76 3141	\$200,000/YEAR				LAMINATED FLUIDIC DEVICE
5 73 3051	\$250,000/YEAR	INCREASED TESTING CAPABILITY			
5 71,74 4041		AUTOMATED LINE			FOLLOW-ON PROJECTS ARE COMPLETING THIS EFFORT
5 73,74,77,78 4139	\$2.9 MILLION/YR	INCREASED CAPABILITY			FOLLOW-ON PROJECTS ARE ENHANCING CAPABILITIES
5 74 4162	\$1.29 MILLION/YR				CONTINUOUS AUTOMATED PROCESSING
5 71,72 4171	\$2.0 MILLION/YEAR				MINI PILOT PLANT WAS CONSTRUCTED
5 72,73 4220		INCREASED PRODUCTION CAPABILITY			AUTOMATED BATCH EQUIPMENT WAS CONSTRUCTED
5 74 4255		INCREASED PRODUCTION & TEST CAPABILITY			INSUFFICIENT PRODUCTION REQUIREMENTS
5 76,77 4280		AUTOMATED FINAL ASSY & CALIBRATION			MACHINES ARE BEING INTEGRATED INTO PRODUCTION
5 7T 4288		SAFETY STANDARDS			WILL BE INCORPORATED INTO SAFETY REGULATIONS
5 76 4288		SAFETY STANDARDS			WILL BE INCORPORATED INTO SAFETY REGULATIONS
5 77 4288		SAFETY STANDARDS			WILL BE INCORPORATED INTO SAFETY REGULATIONS
5 76 4291		EXPLOSION RESISTANT STRUCTURES			WILL BE INCORPORATED INTO SAFETY REGULATIONS
5 77 4341	\$1.2 MILLION/YR				CONTINUOUS PURIFICATION PROCESS
5 77 4416	\$1.6 MILLION/YR				SIMPLER AND LESS EXPENSIVE FABRICATION

ACCOMPLISHMENTS SUMMARY (CONT)

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS	OTHER	ACTUAL BENEFITS \$ SAVINGS	OTHER	REMARKS
5 7T 4457	\$1.5 MILLION/YEAR				INCREASED THE CAPABILITY OF EXISTING HARDWARE
5 72 6335		IMPROVED MATERIAL PROPERTIES			COMMERCIAL EFFORTS ARE IMPLEMENTING
5 71 6388		PURCHASE DESCRIPTION			ADDITIONAL EFFORTS ARE NEEDED
5 73 6550		REDUCED PERSONNEL & ELECTRICAL POWER REQUIREMENTS			NO REQUIREMENT
6 72,73 6681		LIGHTER CANNON TUBE			INSUFFICIENT PRODUCTION REQUIREMENTS
6 72 6786	\$450,000/100K BBLs	REDUCED OPERATOR REQUIREMENTS			IMPLEMENTATION WILL BE UNDER PROJECTS 6 XX 7419
6 72 6838		IMPROVED PROPERTIES & DECREASED COST			UNIT IS NOW A REPAIRABLE ITEM
6 73 7056		DOUBLED THE OPERATIONAL LIFE			PROCESS SPECIFICATIONS ARE AVAILABLE
6 73 7124		IMPROVED & MORE CONSISTENT PROPERTIES			USED PRIMARILY FOR PROTOTYPING
6 72 7220		REDUCED TAPE PREPARATION COSTS			LASER OPTICAL SYSTEM
6 72 7226		INCREASED MEASURING CAPABILITY			
6 76 7236	\$57/TUBE	REDUCED FURNACE TIME FROM 70 TO 20 HOURS			
6 73 7242			\$110,000/YEAR	PARTIAL IMPLEMENTATION	ADDITIONAL IMPLEMENTATION IN PROCESS
6 73 7261		LOW COST MIRRORS			INSUFFICIENT REQUIREMENTS
6 73 7265			\$19,000		FACILITY CLOSURE TERMINATED IMPLEMENTATION
6 74 7411		INCREASE PERFORMANCE UNIFORMITY			PROCESS DATA IS AVAILABLE
6 74,75 7419	\$85,000/YEAR				INSUFFICIENT REQUIREMENTS
6 74 7495		PROCESS INFORMATION			END ITEM NO LONGER IN PRODUCTION
6 74 7524		7% SAVINGS IN LABOR & TOOL COST			BORIDE COATED TOOLS
6 74,75 7550	\$500/TUBE				NO REQUIREMENT
6 75 7571		50% REDUCTION IN REQUIRED TESTS			SHOCK TEST METHODS & SPECIFICATIONS
6 75 7572		50% REDUCTION IN PRODUCTION TESTS			DETAILED ENG. SPECIFICATIONS

IMPLEMENTATION SUMMARY

PROJECT NUMBER	ANTICIPATED BENEFITS		REMARKS
	\$ SAVINGS	OTHER	
7 7X 3524			EQUIPMENT AT USE IN TWO FACILITIES
2 74 9744			REPLACED HAND PRODUCED ITEMS
2 74 9750	\$3.2 MILLION		EQUIPMENT UPGRADING
2 75 9836	\$2.45 MILLION		QUALITY ASSURANCE POLICIES AND PROCEDURES
T 7X 4329			JOINING OF DIFFERENT TYPES & HARDNESSES OF ARMOR
1 XX 7103			TURBINE ENGINE MACHINING
1 77 7112			KAMAN AEROSPACE CORP IS IMPLEMENTING
1 7X 8046			IMPLEMENTED AT GE
1 75 8154			INTERACTIVE COMPUTER SYSTEM
3 75 3157	\$10.24 MILLION		HIGH RATE PRODUCTION CAPABILITY
R 7X 3170			IMPLEMENTED AT LONGHORN
3 7X 3232			COMPUTERIZED PROCESS PLANNING
5 7X 1248			INSTALLED AT SEVERAL LOCATIONS
5 7X 1260			IMPLEMENTATION AT PINE BLUFF ARSENAL
5 7X 1277			IMPLEMENTED AT TOOELE ARMY DEPOT
5 7X 4032			IMPLEMENTED AT HONEYWELL FOR THE M739
5 XX 4114-P06			INSTALLED AT RADFORD, OTHERS PLANNED
5 74 4205			IMPLEMENTED AT HOLSTON
5 73 6522			SEVERAL APPLICATIONS
6 7X 7248	\$176,000/YEAR		IMPLEMENTED AT WATERLIET ARSENAL
6 73 7305	\$21,000/YEAR		IMPLEMENTED AT ROCK ISLAND ARSENAL

IMPLEMENTATION SUMMARY (CONT)

PROJECT NUMBER	ANTICIPATED BENEFITS \$ SAVINGS OTHER	ACTUAL BENEFITS \$ SAVINGS OTHER	REMARKS
6 74 7481		\$1.3 MILLION	
6 74 7484		FASTER & LESS EXPENSIVE N/C TAPE VERIFICATION	IMPLEMENTED AT WATERVILLE ARSENAL

SECTION II

RECENTLY COMPLETED OR ACTIVE PROJECTS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

RESIDUAL STRESS MEASUREMENT

PROJECT NO: 772 3501

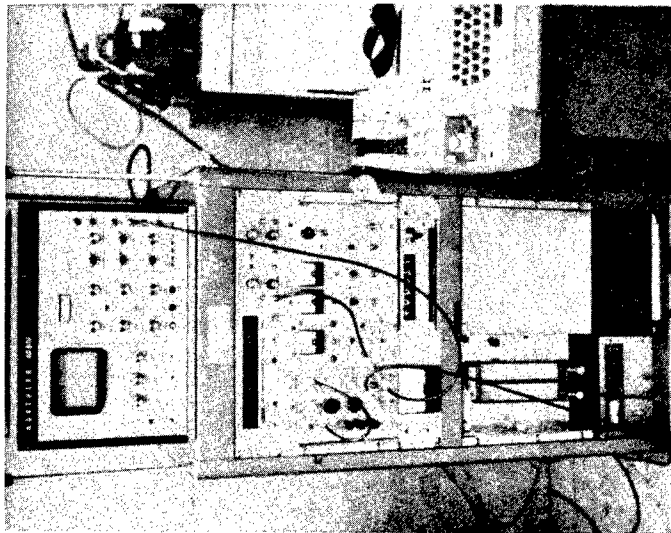
TITLE: DEVELOP TECHNOLOGY TO NON-DESTRUCTIVELY MEASURE RESIDUAL STRESSES IN LARGE COMPLEX STEEL WELDMENTS VIA THE MOSS BAUER EFFECT.

COST: \$161,000

RESULTS

RESIDUAL STRESS MEASURING EQUIPMENT FOR USE IN TESTING RIBBON BRIDGE COMPONENTS WAS FABRICATED. A PRECISION LEVEL OF ± 5 KSI WAS ACHIEVED WHICH IS ACCEPTABLE AND EXCEEDS THE CAPABILITIES OF OTHER TECHNIQUES.

THE EQUIPMENT DESIGN IS AVAILABLE FOR APPLICATION.



STRESS ANALYZER
EQUIPMENT

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT MINE DETECTOR TEST SET

PROJECT NO: 7 74 3567

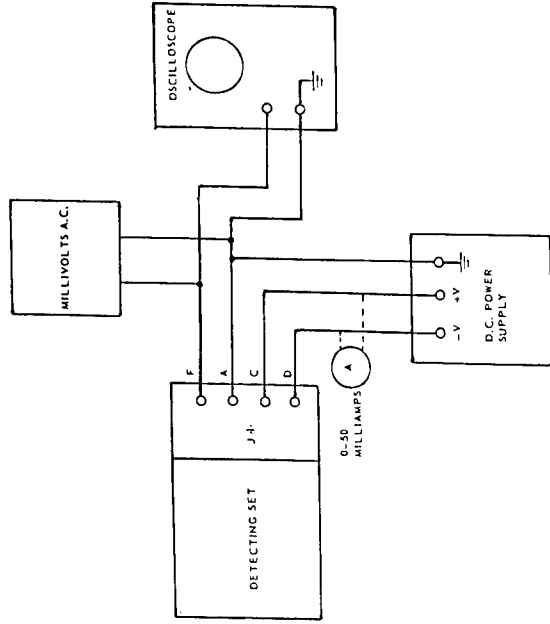
TITLE: TEST EQUIPMENT, AN/PRS-7
MINE DETECTOR

COST: \$180,000

RESULTS

TWO PROTOTYPE TEST SIMULATORS WERE DESIGNED AND FABRICATED. A CYLINDRICAL SECTION CONTAINS THE TARGET AND INCORPORATES CONTROLS FOR PRECISE ADJUSTMENT OF THE TARGET POSITION RELATIVE TO THE MINE DETECTOR UNDER TEST.

USE OF THIS EQUIPMENT PROVIDES ACCURATE AND REPRODUCIBLE TESTING. IMPLEMENTATION OF THIS METHODOLOGY IS ESTIMATED TO REDUCE TEST TIME FROM ONE HOUR TO 20 MINUTES.



TEST SET SCHEMATIC

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

AUTOMATED TEST EQUIPMENT

PROJECT NO: 2 76 9773

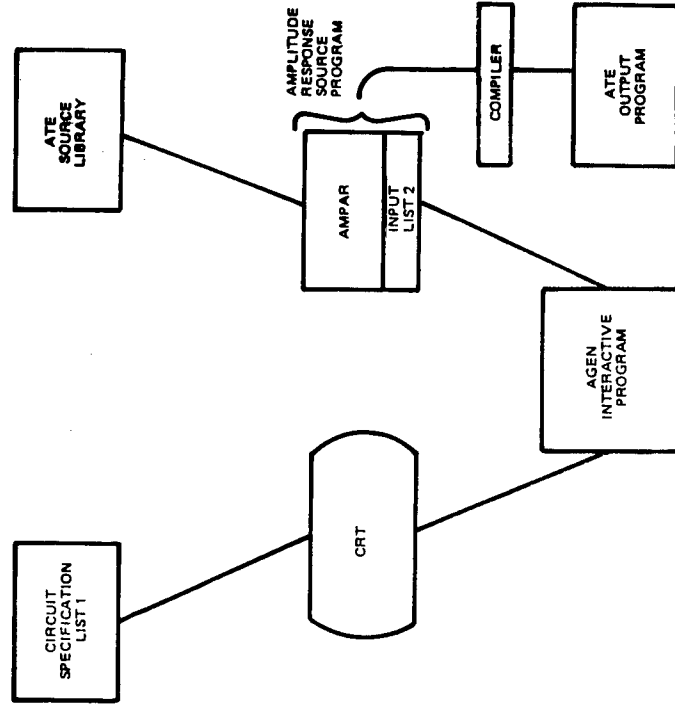
TITLE: MMT COMPUTER PROGRAM AID
FOR PREPARATION OF AUTOMATIC
ANALOG CIRCUIT PRODUCTION
TEST PROGRAM

COST: \$193,313

RESULTS

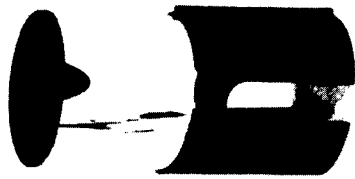
AN OVERALL SOFTWARE SYSTEM WAS DESIGNED FOR AUTOMATICALLY GENERATING TEST PROGRAMS FOR LINEAR ANALOG CIRCUITS. THE SOFTWARE WAS PROVEN BY GENERATING PROGRAMS FOR TWELVE CIRCUIT CHARACTERISTICS AND DEMONSTRATED ON THE AUTOMATIC TEST EQUIPMENT.

ESTIMATED SAVINGS UPON IMPLEMENTATION OF THIS PROJECT ARE \$2 MILLION.



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

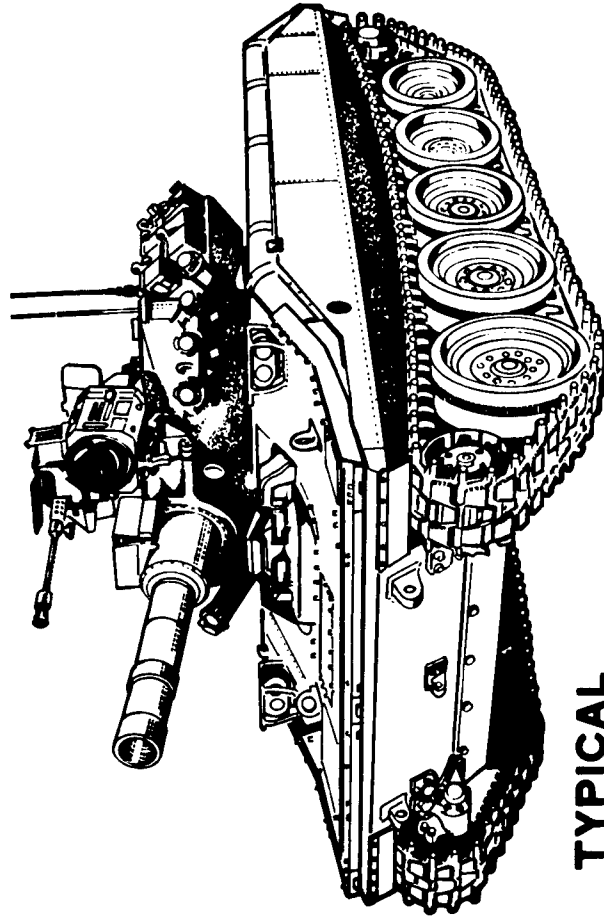
COST: \$43,552

RESULTS

THE CONTRACTOR, METAVAC, DEVELOPED A MANUFACTURING PROCESS THAT SUBSTANTIALLY REDUCED THE NUMBER OF PINHOLES IN THE FILTER COATING FOR SEARCHLIGHTS. REDUCTION IN PINHOLES REDUCES THE CHANCE OF DETECTION BY THE ENEMY.

PRODUCTION YIELD WAS INCREASED CONSIDERABLY AND FILTER LIFE WAS INCREASED FROM 300 TO 800 HOURS.

UNIT PRICE WAS REDUCED FROM \$400 TO \$225.



TYPICAL
SEARCHLIGHT/
INSTALLATION

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

PIEZOELECTRIC TRANSFORMERS

PROJECT NO: 2 75 9525

TITLE: HOT PRESSING OF PIEZOELECTRIC ELEMENTS FOR HIGH VOLTAGE TRANSFORMERS

COST: \$229,000

RESULTS

- HONEYWELL INC. ESTABLISHED IMPROVED PRODUCTION TECHNIQUES FOR PIEZOELECTRIC TRANSFORMERS (PET) USED IN OPERATING 18MM NIGHT VISION IMAGE INTENSIFIER TUBES.
- A DOUBLE ACTION HOT PRESS DIE PRODUCED SLUGS THREE TIMES THE INITIAL LENGTH, REDUCED HOT PRESSING LABOR BY 60 PERCENT AND INCREASED SLICED ELEMENT YIELD FROM 90 PERCENT TO 96 PERCENT.
- SEMIAUTOMATIC SILK SCREENING OF DISK ELECTRODES, SEMIAUTOMATIC DISK POLARIZATION AND INJECTION MOLDING OF DISK PACKAGE WERE OPTIMIZED.
- A PRODUCTION LINE RATE OF 200 PER MONTH WAS ACHIEVED.

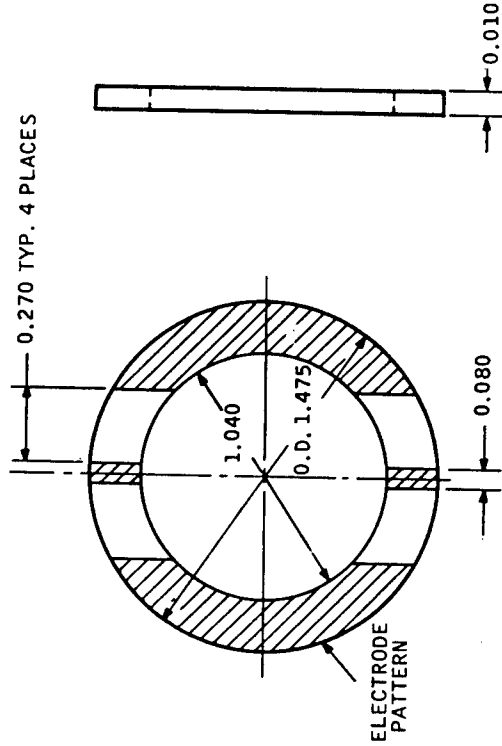


Figure 1 - 18MM ELEMENT

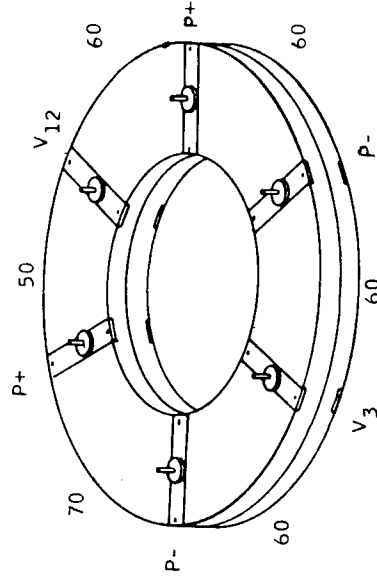


Figure 2
18MM PACKAGE CASE

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT AUTOMATED TESTING

PROJECT NO: H 75 9665

TITLE: MANUFACTURING METHODS
FOR THE PRODUCTION OF
ELECTRONIC COMPONENTS
UNDER DYNAMIC STRESS

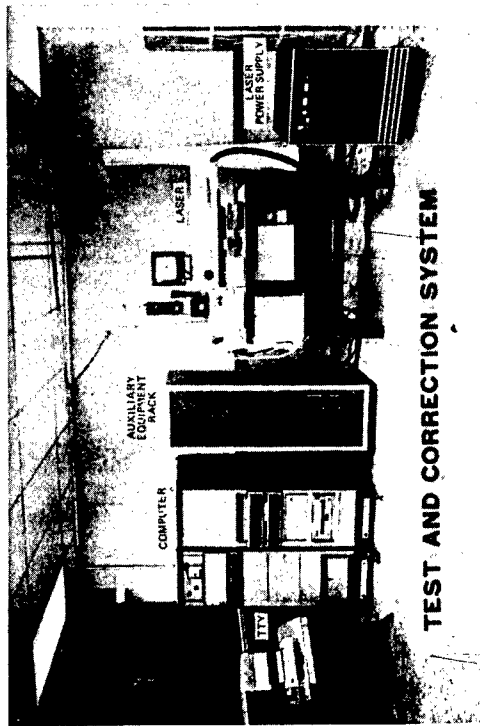
COST: \$735K

RESULTS

THIS PROJECT DEVELOPED A PROCESS FOR LASER TRIMMING OF COMPONENTS FOR FINAL TUNING OF FUZES.

LASER TRIMMING IS PRESENTLY BEING USED ON THE THICK FILM RATIONMETER IN THE M732 AND ON THE AMPLIFIER SECTION OF THE M734.

ESTIMATED YEARLY SAVINGS AS A RESULT OF IMPLEMENTATION OF THIS PROJECT ARE \$700,000 PER YEAR.



TEST AND CORRECTION SYSTEM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

GALLIUM ARSENIDE (Ga As) IMPATT DIODES

PROJECT NO: 275 9738

TITLE: EPITAXIAL AND METALLIZATION
PROCESS FOR Ga As READ IMPATT
DIODE.

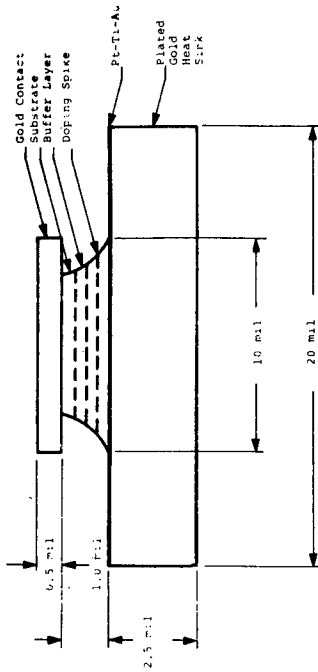
COST: \$503,000

RESULTS

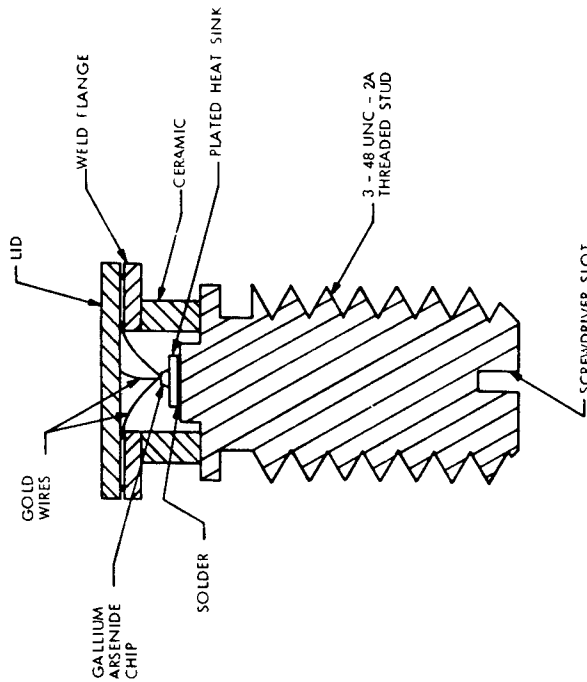
READ WAFERS WERE PRODUCED BY EPITAXIAL DEPOSITION OF SUITABLY DOPED Ga As LAYERS ON A HIGHLY CONDUCTIVE SINGLE CRYSTAL Ga As SUBSTRATE.

THE SCHOTTKY METALLIZATION BARRIER WAS CREATED BY SEQUENTIALLY SPUTTERING PLATINUM, TITANIUM, AND GOLD.

IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED SAVINGS OF \$1.7 MILLION.



READ IMPATT CHIP



PLATED HEAT SINK DESIGN

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

COMPUTER AIDED ELECTRONICS DESIGN

PROJECT NO: 2 73 9741

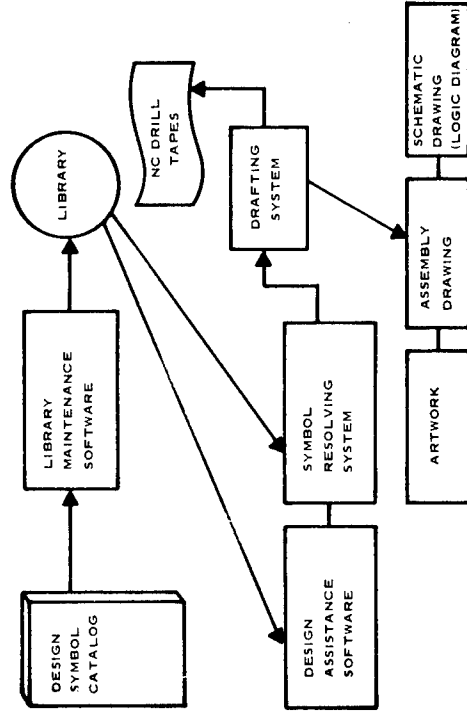
TITLE: MMT ENGINEERING MEASURE FOR
CAD/CAM SYSTEM: DRAWING
SYMBOL LIBRARY

COST: \$167,794

RESULTS

THIS SOFTWARE WAS DEVELOPED FOR DESIGN VERIFICATION OF AN INTEGRATED PRINTED CIRCUIT SYSTEM AND VALIDATION OF MASTER PLATES FOR SEVERAL PRINTED CIRCUIT BOARDS. THE SYSTEM WAS DESIGNED AS A LOW COST ALTERNATE TO A STAND-ALONE CAD/CAM SYSTEM.

THE SOFTWARE IS AVAILABLE FOR USE IN A DESIGN SYMBOL LIBRARY.



DRAWING SYMBOL LIBRARY

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT COMPUTER AIDED DIE DESIGN

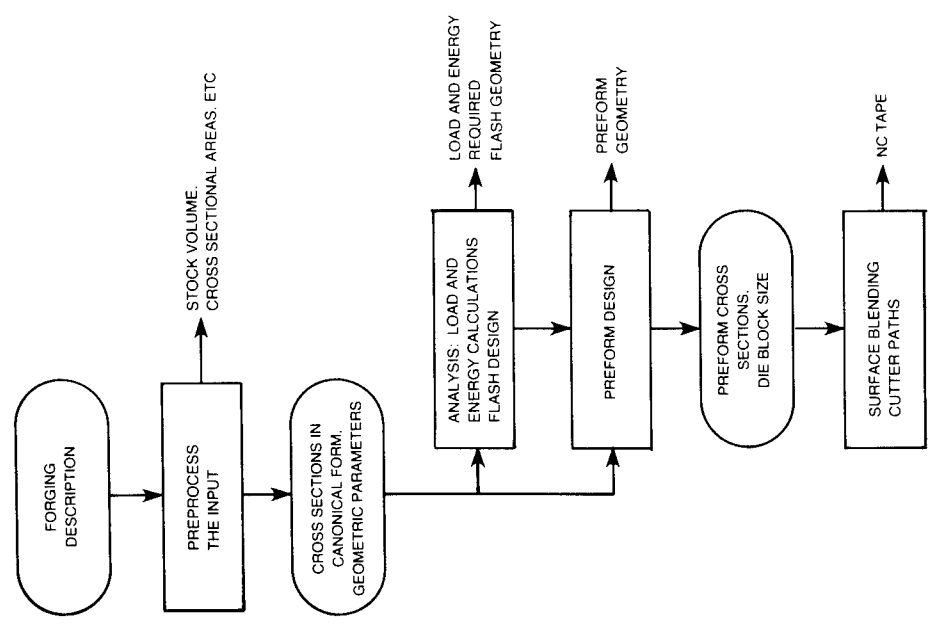
PROJECT NO: 4 75 4561

TITLE: COMPUTER AIDED DIE DESIGN
AND COMPUTER AIDED MAN-
UFACTURING FOR FORGING
OF TRACK SHOES AND LINKS

COST: \$135,000

RESULTS
A COMPUTERIZED SYSTEM FOR
DESIGNING AND MANUFACTURING
TRACK SHOE DIES. THIS SYSTEM,
KNOWN AS "TRACKS," IS A TOTALLY
INTERACTIVE SYSTEM TO ASSIST
DIE DESIGNERS.

THE SYSTEM CALCULATES GEOMETRIC
PROPERTIES, PERFORMS STRESS
CALCULATIONS, AND PREPARES AN
NC TAPE FOR MACHINING A MODEL
OR EDM ELECTRODE. IMPLEMEN-
TATION OF THIS PROJECT WILL
SPEED UP THE DIE MANUFACTURING
PROCESS AND ENSURE
REPRODUCIBILITY.



PROCEDURAL OUTLINE
OF THE TRACK SYSTEM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

METRICATION

PROJECT NO: T77 4589

TITLE: METRICATION

COST: \$271,000

RESULTS

THIS PROJECT PREPARED PRODUCTION AND PROCUREMENT PLANS TO ASSURE INTEGRITY OF COMPONENTS AND VEHICLE HARDWARE SYSTEMS UNDER INTERNATIONAL METRIC STANDARDS.

A METRICATION ENGINEERING/DESIGN GUIDE MANUAL AND AN EXPERIMENTAL FABRICATION CONVERSION PLAN WAS IMPLEMENTED AS PART OF THE TOTAL COMMAND CONVERSION PLAN.

STANDARD INTERNATIONAL (SI) UNITS

<u>QUANTITY</u>	<u>UNIT</u>
ACCELERATION	METRE PER SECOND SQUARED
AREA	SQUARE METRE
DENSITY, MASS	KILOGRAM PER CUBIC METRE
ELECTRIC FIELD STRENGTH	VOLT PER METRE
LUMINANCE	CANDELA PER SQUARE METRE
MOLAR ENERGY	JOULE PER MOLE
MOMENT OF FORCE	NEWTON METRE
RADIANCE	WATT PER SQUARE METRE STERADIAN
SPECIFIC HEAT CAPACITY	JOULE PER KILOGRAM KELVIN
SPECIFIC ENERGY	JOULE PER KILOGRAM
SPECIFIC VOLUME	CUBIC METRE PER KILOGRAM
THERMAL CONDUCTIVITY	WATT PER METRE KELVIN
VELOCITY	METRE PER SECOND
VOLUME	CUBIC METRE

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT LOW MAINTENANCE BATTERY

PROJECT NO: 477 5019

TITLE: STORAGE BATTERY,
MAINTENANCE FREE (DRY-CHARGED,
CALCIUM ALLOY GRID, PLASTIC
CONTAINER)

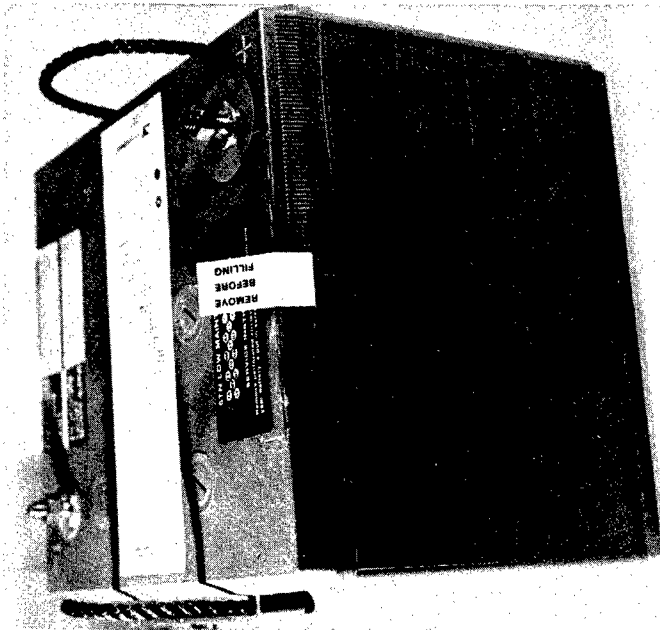
COST: \$139,000

RESULTS

A CALCIUM ALLOY GRID BATTERY WAS DEVELOPED AS A LOW MAINTENANCE REPLACEMENT FOR THE STANDARD LEAD-ANTIMONY GRID BATTERY.

THE BATTERY PROVIDED SOME OF THE FEATURES NECESSARY TO MEET MIL REQUIREMENTS AND A FOLLOW-ON PROJECT WILL COMPLETE THE EFFORT.

COMPLETION AND IMPLEMENTATION OF THIS EFFORT WILL RESULT IN AN ESTIMATED \$3.0 MILLION SAVINGS.



STORAGE BATTERY

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

ULTRASONIC WELDING

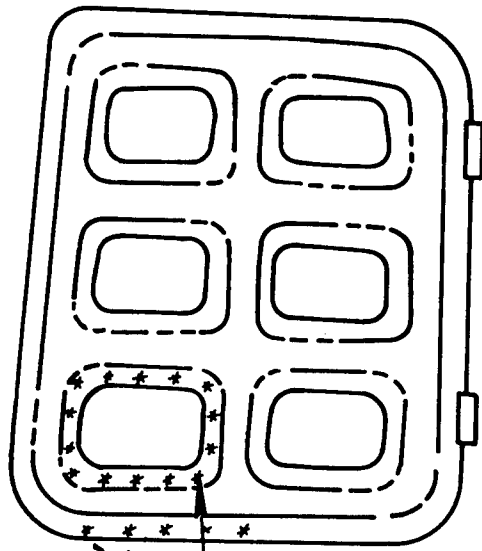
PROJECT NO: 176 7055

TITLE: ULTRASONIC WELDING OF
HELICOPTER SECONDARY
FUSELAGE STRUCTURE

COST: \$180,000

RESULTS

- TENSILE SHEAR STRENGTH OF SAMPLE ULTRASONIC SPOT WELDS WERE 2.5 TIMES THOSE OF RESISTANCE SPOT WELDS AND ABOUT 4 TIMES THE MINIMUM AVERAGE REQUIRED.
- FOUR PORT SIDE ELECTRONICS ACCESS DOORS WERE ULTRASONICALLY WELDED RESULTING IN A LIGHTER AND LESS EXPENSIVE UNIT.
- IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED SAVINGS OF \$225,000.



14 WELDS

ELECTRONIC ACCESS DOOR
ULTRASONIC WELD SPACING

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

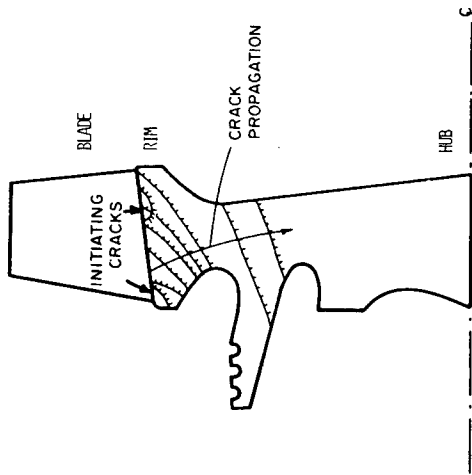
CONTROLLED GRAIN TURBINE BLADES

PROJECT NO: 172 8036
TITLE: PROCESS FOR CONTROLLED
GRAIN SIZE IN THIN WALLED
TURBINE BLADES

COST: \$185,000

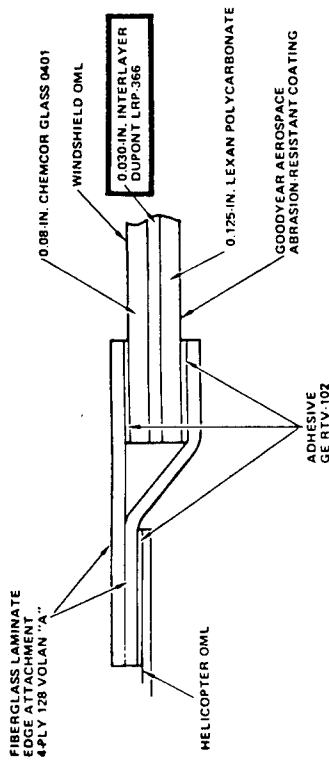
RESULTS

CHANGES WERE MADE IN THE CASTING
PROCESS FOR TURBINE ROTORS IN
ORDER TO ALTER THE GRAIN REFINEMENT.
THE GRAIN REFINED ROTORS SHOWED
SUPERIOR FATIGUE PROPERTIES AND
RETAINED ADEQUATE STRESS
PROPERTIES; HOWEVER, THE YIELD AND
CREEP STRENGTH WERE DEGRADED
AND PROCESSING TIME WAS INCREASED.

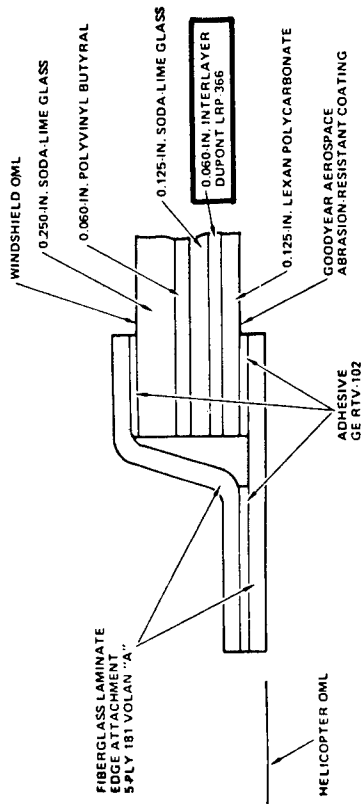


TURBINE ROTOR INDICATING INITIATING CRACKS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT IMPROVED PERFORMANCE WINDSHIELD



(A) TYPE I



(B) TYPE II

Prototype UH-1 Windshield Designs.

PROJECT NO: 1 74 8091

TITLE: ADVANCED ADHESIVES FOR
TRANSPARENT ARMOR
FOR ARMY AIRCRAFT

COST: \$202,000

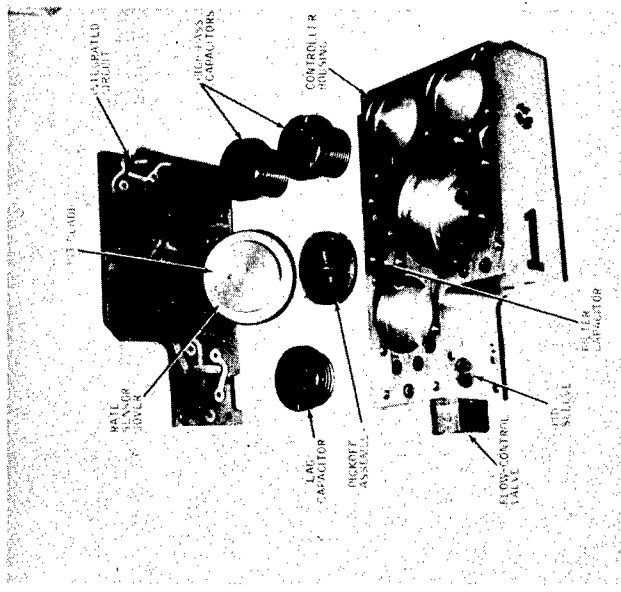
RESULTS

THIS PROJECT DEVELOPED A METHOD OF PRODUCING TRANSPARENT ARMOR USING FILM ADHESIVES RATHER THAN THE CURRENTLY USED CAST-IN-PLACE ADHESIVES. THE LRP-366 INTERLAYER PROVIDED LIGHT TRANSMISSION THAT WAS WELL WITHIN THE REQUIREMENTS FOR GLASS/PLASTIC COMPOSITES.

IMPLEMENTATION OF THIS TECHNIQUE WILL RESULT IN AN ESTIMATED 80% REDUCTION IN THE PROCESSING COST OF TRANSPARENT ARMOR.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

FLUIDIC DEVICE



PROJECT NO: 174 8109, 175 8109 & 176 8109
TITLE: FLUIDIC DEVICES FOR AIRCRAFT STABILITY AUGMENTATION SYSTEM
COST: \$574,000

RESULTS

- YAW CONTROLLERS WERE SUCCESSFULLY PRODUCED USING THE ELECTROFORM CONDUCTIVE WAX (ECW) PROCESS IN CONJUNCTION WITH CONVENTIONAL PROCESSING.
- A PILOT PRODUCTION LINE USING THE ECW PROCESS WAS DEFINED.
- PRODUCTION YIELDS OF 95% SHOULD BE POSSIBLE IN LARGE QUANTITIES.
- IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED COST SAVINGS OF \$14 MILLION.

FLUIDIC YAW CONTROLLER

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

PRINTED WIRING BOARD ADDITIVE PROCESS

PROJECT NO: 376 3147

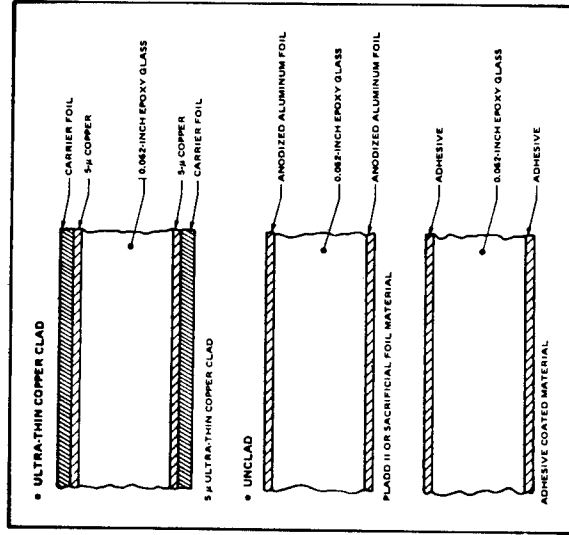
TITLE: ADDITIVE PROCESS FOR
FABRICATION OF PRINTED
CIRCUIT BOARDS.

COST: \$250,000

RESULTS

DEVELOPED THE DESIGN FOR AN AUTOMATED
PRODUCTION LINE USING THE ADDITIVE
PROCESS FOR FABRICATION OF PRINTED
CIRCUIT BOARDS. THE PROCESS WAS
VERIFIED IN A PILOT PRODUCTION LINE BY
FABRICATING 90 BOARDS USING THE ULTRA
THIN COPPER CLAD PROCESS.

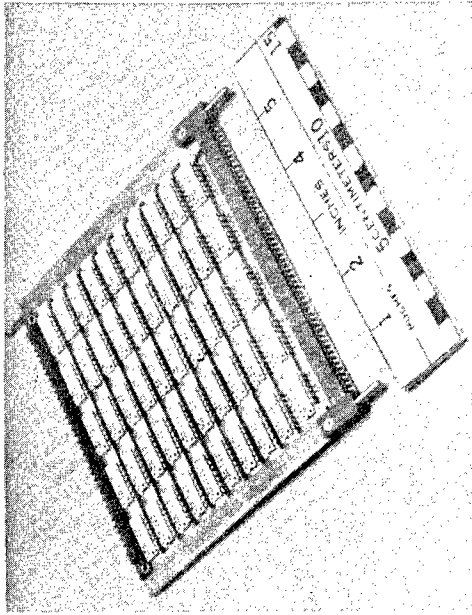
WHEN IMPLEMENTED, AN ESTIMATED
SAVINGS OF \$2.7 MILLION WILL RESULT.



TYPES OF LAMINATES

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

HEAT PIPES FOR CIRCUIT CARDS



PROJECT NO: R77 3168

TITLE: METHODS FOR MANUFACTURING
HEAT PIPES FOR CIRCUIT CARDS

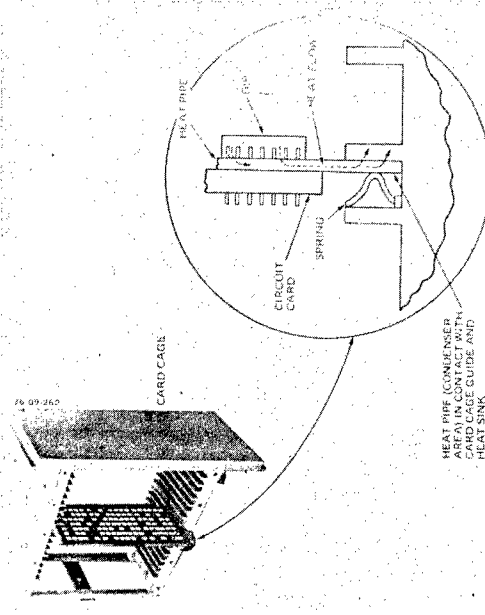
COST: \$172,000

RESULTS

A PRODUCTION TECHNIQUE WAS DEVELOPED FOR FABRICATING INTEGRATED HEAT PIPES FOR PRINTED CIRCUIT BOARDS. A RATE OF 50 PER HOUR WAS ACHIEVED. THE TECHNIQUE IS APPLICABLE TO A VARIETY OF HEAT PIPE CONFIGURATIONS.

IMPLEMENTATION OF THIS PROJECT COULD RESULT IN ESTIMATED BENEFITS OF OVER \$10 MILLION.

HEAT PIPE CARD WITH DIPS INSTALLED



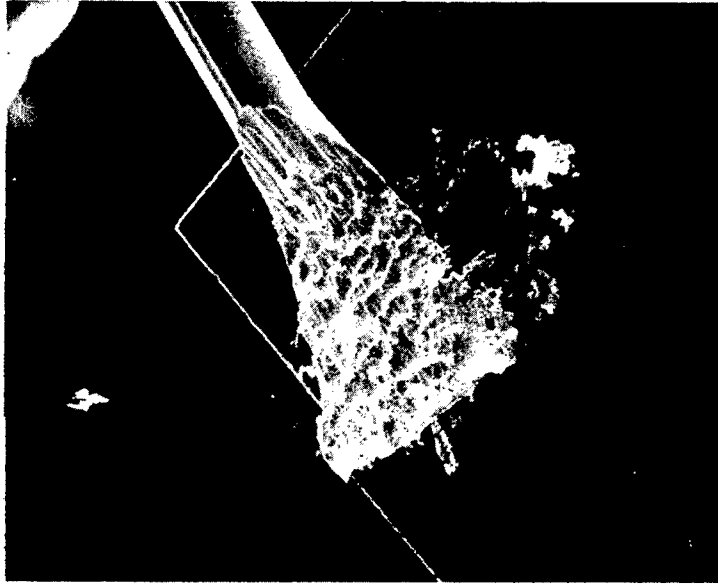
REPRESENTATIVE HEAT PIPE APPLICATION

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT COMPONENT SCREENING

PROJECT NO: 3 76 3224

TITLE: SCREENING OF ELECTRONIC
COMPONENTS

COST: \$299,234



OVER BONDED LEAD

RESULTS

MIL-STD-883 SCREENING TESTS ARE INADEQUATE TO DETECT MARGINAL BONDING. THREE NEW TESTS WERE IDENTIFIED AND EVALUATED.

NO CORRELATION WAS FOUND BETWEEN DEVICE FAILURES AND MOISTURE CONTENT WITHIN THE DEVICE. ADDITIONAL EFFORT IS REQUIRED TO EXPLAIN THIS UNEXPECTED RESULT.

SEVERAL OTHER SCREENING TESTS WERE DEVELOPED FOR MOS/LSI DEVICES. IMPLEMENTATION OF THIS PROJECT WILL RESULT IN ESTIMATED SAVINGS OF \$1.5 MILLION.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

LOCASERTS

PROJECT NO: 3 76 3225

TITLE: PRODUCTION METHODS FOR
MOUNTING NON-AXIAL LEAD
COMPONENTS

COST: \$195,000

RESULTS

- MARTIN-MARIETTA CORP. ENHANCED AUTOMATIC INSERTION METHODS FOR NON-AXIAL LEAD ELECTRONIC PACKAGES: DUAL-IN-LINE, (DIP), PIN THROUGH HYBRIDS, AND TO-TYPE CANS.
- THEY DEVELOPED A PLASTIC, INJECTION MOLDED, LOCATOR-INSERTER (LOCASERT) PAD AND A COMPONENT INSERTION MACHINE TO POSITION THIS PAD.
- LOCASERTS REDUCE PRINTED CIRCUIT BOARD (PCB) ASSEMBLY TIME AND COST ON ALL LEVELS FROM MANUAL TO COMPLETE AUTOMATION.
- IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED SAVINGS OF \$760,000 PER YEAR.

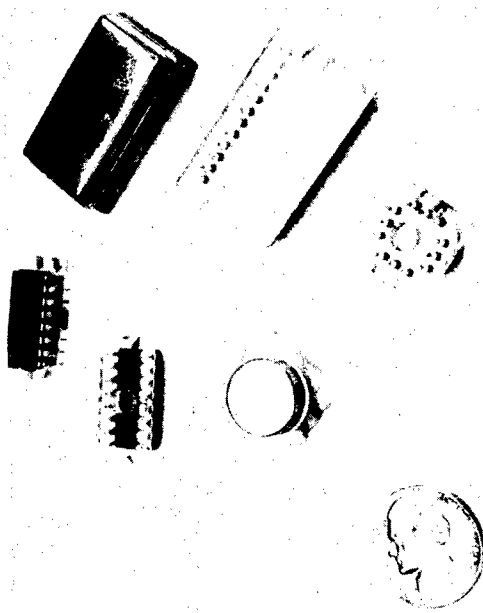


Figure 1
COMPONENTS IN LOCASERTS

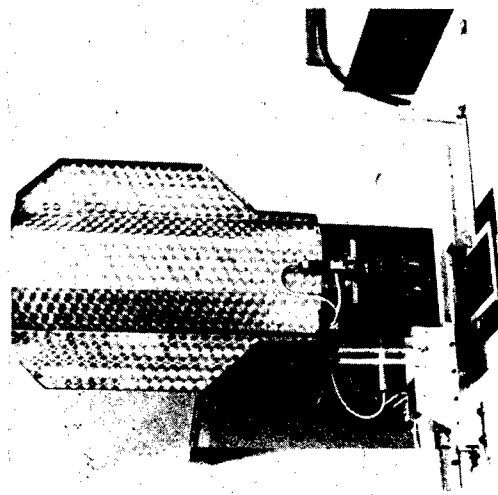


Figure 2 - INSERTION MACHINE

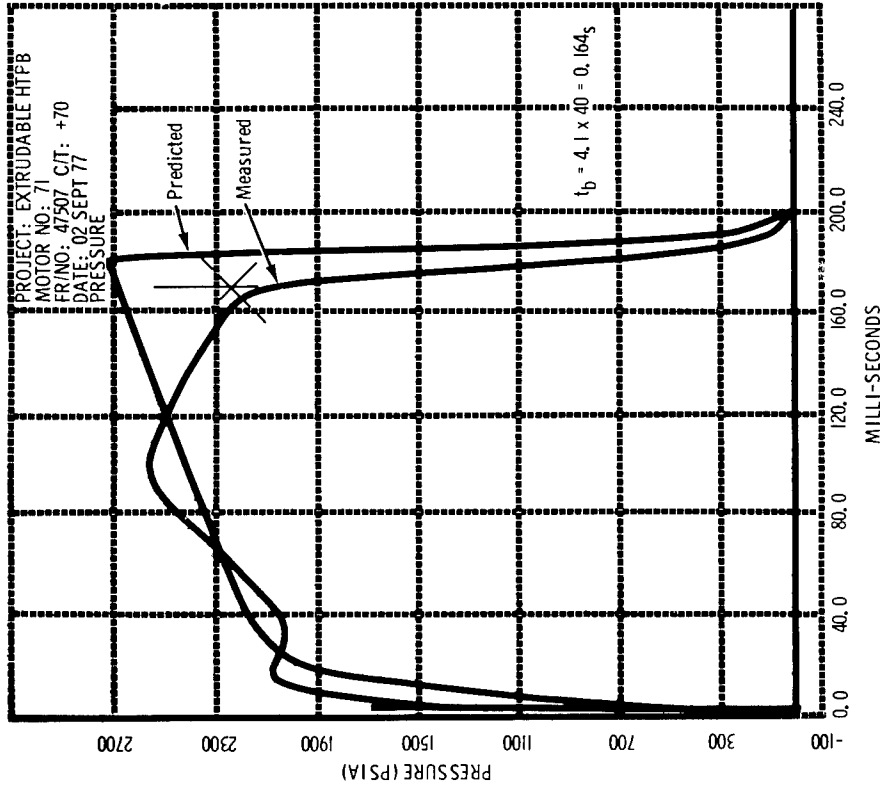
DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT EXTRUSION OF PROPELLANTS

PROJECT NO: 376 3228 AND 37T 3228
TITLE: PRODUCTION METHODS FOR
EXTRUDABLE HTPB PROPELLANT
COST: \$95,000

RESULTS

AN AUTOMATED MISSILE PROPELLANT
LOADING AND ASSEMBLY SYSTEM WAS
DEVELOPED. TEMPERATURE AND
CATALYST LEVELS WERE DETERMINED
TO OPTIMIZE THE PROPELLANT QUICK
CURE. NO PRODUCT QUALITY
DEGRADATION WAS NOTED.

ANTICIPATED BENEFITS INCLUDE
LOWER PRODUCTION COSTS THROUGH
THE ELIMINATION OF BATCH OPERA-
TIONS. A FOLLOW-ON PROJECT WILL
LOAD 50 VIPER MOTORS BY THE NEW
MANUFACTURING METHODS.



PREDICTED AND MEASURED PRESSURE TRACES

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT FLUIDIC CONTROLS

PROJECT NO: 5 73 1139

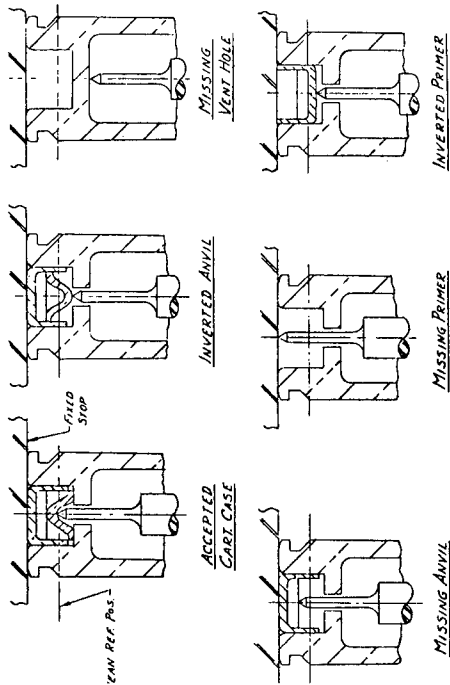
TITLE: APPLICATION OF FLUID LOGIC
CONTROL CIRCUITRY TO
PYROTECHNIC LOADING

COST: \$100,000

RESULTS

TWO MACHINES WERE SUCCESSFULLY INSTRUMENTED WITH THE FLUIDIC LOGIC CONTROL CIRCUITRY. THEY WERE THE BINARY FILLING AND CLOSING MACHINE AND THE NOSE CLOSURE REMOVAL AND BURSTER SENSING MACHINE.

THE PRIMARY ADVANTAGE OF FLUIDIC DEVICES IS THAT THEY DO NOT PRODUCE SPARKS THAT ARE HAZARDOUS IN AN EXPLOSIVE ENVIRONMENT.



FLUIDIC CONTROLLED CARTRIDGE INSPECTION

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

GAS FILTERING

PROJECT NO: 573 1248 AND 575 1248

TITLE: EVALUATION OF EXHAUST FILTER SYSTEMS TO ESTABLISH DESIGN CRITERIA TO MEET AIR POLLUTION STANDARDS

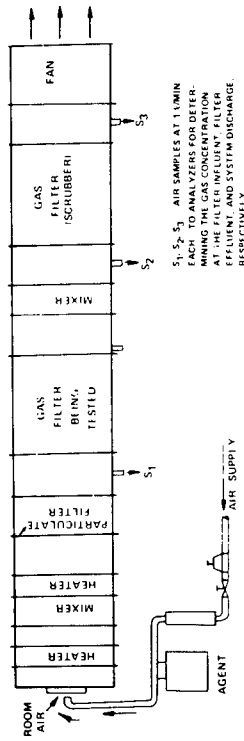
COST: \$444,000

RESULTS

A TEST APPARATUS FOR DETERMINING THE PERFORMANCES OF GAS FILTERS WAS DEVELOPED.

SIX GAS FILTERS WERE TESTED AND ALL WERE DETERMINED TO PERFORM SATISFACTORILY WHEN USED TO FILTER NERVE GAS SIMULANT, NERVE AGENT, PHOSGENE AND CYANOGEN CHLORIDE.

SAFETY WILL BE ENHANCED WITH THE APPLICATION OF THIS EFFORT IN ENGINEERING DESIGN REQUIREMENTS FOR FUTURE AIR VENTILATION SYSTEMS.



TEST APPARATUS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT LEVEL AND FLOW MEASUREMENTS

PROJECT NO: 5 74 1261

TITLE: PROVISION OF PROTOTYPE
EQUIPMENT FOR
DETERMINATION OF LEVEL IN
WHITE PHOSPHORUS
STORAGE TANKS

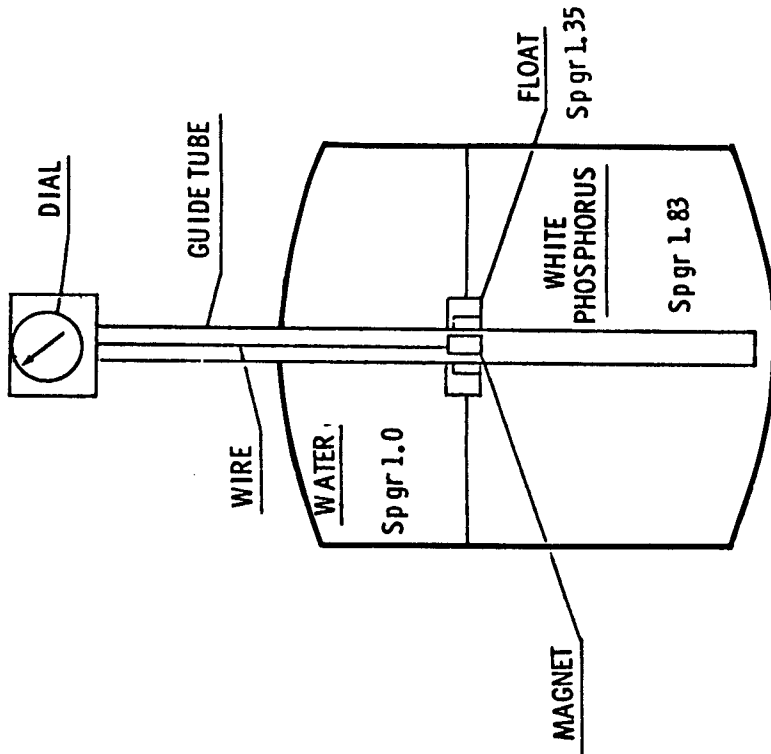
COST: \$40,000

RESULTS

TWO PROTOTYPE SYSTEMS WERE DEVELOPED TO SOLVE THE WHITE PHOSPHORUS MEASURING PROBLEMS. ONE SYSTEM MEASURES THE LEVEL IN THE TANKS AND THE OTHER MEASURES THE FLOW RATE AND TOTAL PUMPAGE.

THE LEVEL MEASURING SYSTEM UTILIZES MAGNETIC COUPLING BETWEEN THE FLOAT AND THE REACTANT TO MINIMIZE CONTACT WITH THE CORROSIVE MATERIALS.

THE FLOWMETER UTILIZES ULTRASONIC WAVES AGAIN MINIMIZING THE AMOUNT OF EQUIPMENT IN CONTACT WITH THE CORROSIVE MATERIALS.



LEVEL GAUGING SYSTEM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT RED PHOSPHOROUS GRENADES

PROJECT NO: 5 7T 1337 & 5 77 1337

TITLE: ENGINEERING STUDIES FOR
ADAPTIVE TRANSFER OF
UNITED KINGDOM TECHNOLOGY:
RP/BUTYL GRENADES

COST: \$604,000



M239 LAUNCHER/L8A1 GRENADE

RESULTS

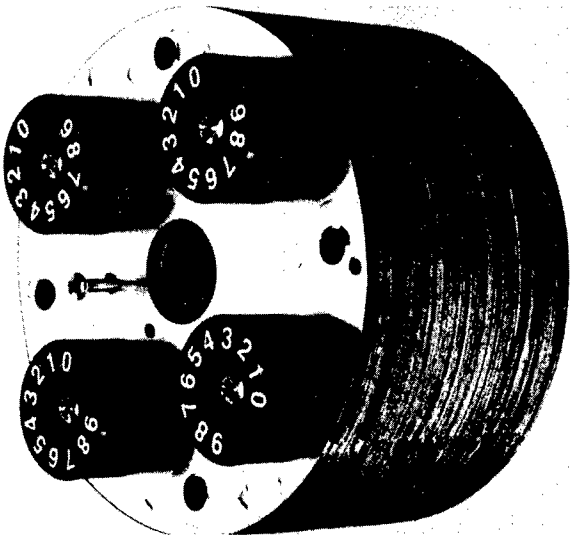
THIS PROJECT PROVIDED THE TECHNOLOGY REQUIRED TO PRODUCE THE UNITED KINGDOM'S RED PHOSPHOROUS GRENADE IN THE US. A PILOT PLANT WAS CONSTRUCTED AND THE PROCESSES WERE DEVELOPED. GRENADES WERE PRODUCED AND FIELD TESTED SUCCESSFULLY, THEREBY VERIFYING THE PROCESSES. THE TECHNICAL DATA PACKAGE WAS COMPLETED; THE FACILITIES PROJECT TO IMPLEMENT THIS EFFORT IS PENDING.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT FLUIDICS

PROJECT NO: 574 3049 AND 376 3141

TITLE: FLUIDIC MANUFACTURING AND
ASSEMBLY PROCESSES

COST: \$440,000



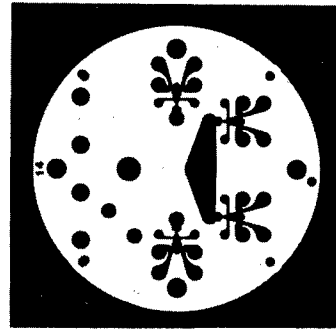
COMPLETED PDM UNIT

RESULTS

FLUIDIC PULSE DURATION MODULATORS (PDM) WERE FABRICATED USING AN ALUMINUM STRUCTURE.

THE ETCHING PROCESS PRODUCED HIGH QUALITY LAMINATES WITH CONSISTENT REPRODUCIBLE RESULTS FOR STOCK THICKNESSES TO 15 MILS.

DIFFUSION BONDING OF UNCOATED ALUMINUM ALLOY SHIMS WAS OBTAINED WITH HIGHLY CONSISTENT RESULTS. IMPLEMENTATION OF THIS PROJECT WOULD RESULT IN ESTIMATED SAVINGS OF \$200,000 PER YEAR.



TYPICAL ACTIVE ELEMENT
SHIM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT AUTOMATED FUZE TESTING

PROJECT NO: 5 73 3051

TITLE: ENGINEERING AND FABRICATION
OF ELECTRONIC AND ELECTRO-
MECHANICAL INSPECTION TEST
EQUIPMENT FOR FUZE
PROCUREMENT PROGRAMS

COST: \$250,000

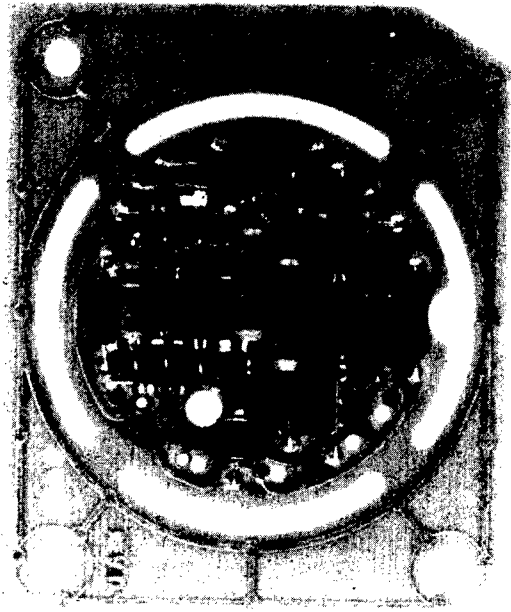
RESULTS

THE FUZE ACCEPTANCE TESTER WAS
MODERNIZED WITH THE LATEST
CIRCUITRY FOR HIGH VOLUME
PRODUCTION OF M732 FUZES.

THE USABLE LIFE OF THE TARGET
SIGNAL SIMULATOR WAS INCREASED
BY TEN YEARS.

THE IMPROVED POWER SUPPLY
TELEMETRY SYSTEM IS BEING USED IN
SUPPORT OF THE M728 AND M732
PROGRAM.

COST SAVINGS ARE ESTIMATED TO
BE \$250,000 PER YEAR.



M732 CIRCUIT BOARD

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT AUTOMATED ASSEMBLY

PROJECT NO: 5 71 4041 & 5 74 4041

TITLE: DEVELOPMENT OF AUTOMATED
EQUIPMENT FOR ASSEMBLY
OF MORTAR COMPONENTS

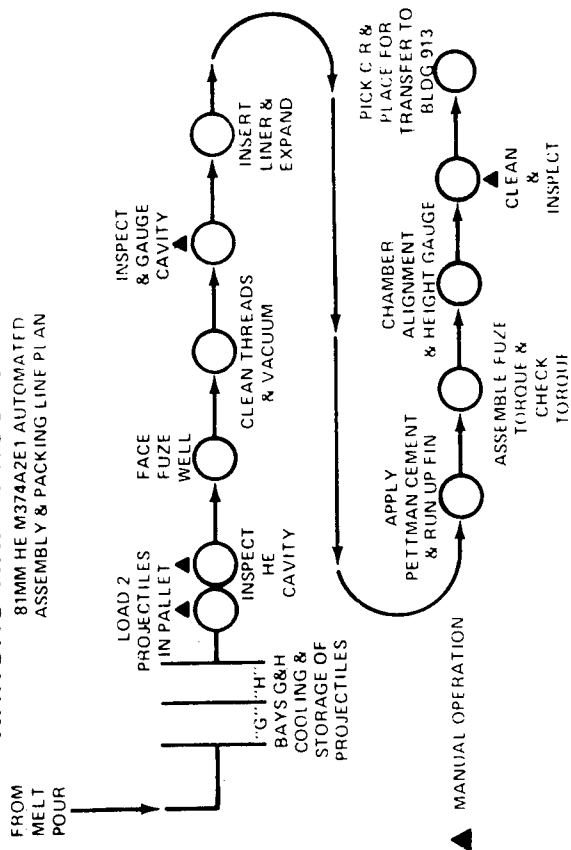
COST: \$260,000

RESULTS

THESE PROJECT YEARS OF EFFORT ESTABLISHED THE OPTIMUM SEQUENCE OF OPERATIONS FOR THE AUTOMATED EQUIPMENT REQUIRED TO LOAD, ASSEMBLE, AND PACK THE 60MM AND 81MM PROPELLING CHARGES AND IGNITION CARTRIDGES. THE FINAL PLANS FROM THESE PROJECTS WERE USED FOR THE FOLLOW-ON PROJECTS.

UPON COMPLETION AND IMPLEMENTATION OF THE ENTIRE EFFORT, AN AUTOMATED LINE WILL BE AVAILABLE.

KANSAS AAP-PROJECT 5722163
81MM HE M374A2E1 AUTOMATED
ASSEMBLY & PACKING LINE PLAN



81MM HE M374A2E1 AUTOMATED
ASSEMBLY AND PACKING LINE PLAN.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ARTILLERY ACCEPTANCE TESTING

PROJECT NO: 573 4139, 574 4139, 577 4139,
AND 578 4139

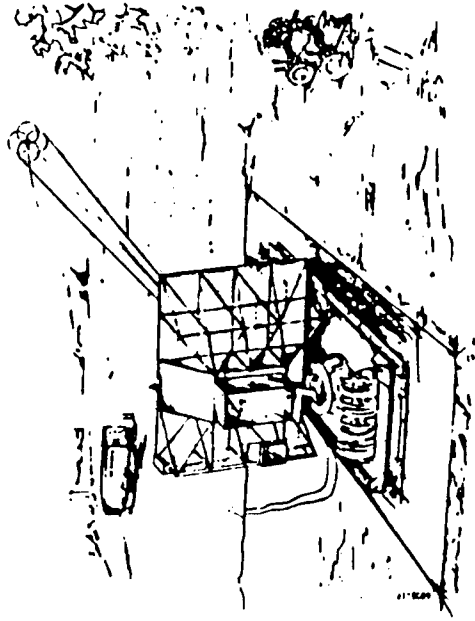
TITLE: APPLICATION OF RADAR TO BALLISTIC
TESTING OF AMMUNITION (ARBAT)

COST: \$3,022,000

RESULTS

A PHASED ARRAY RADAR SYSTEM WAS DEVELOPED AND CONSTRUCTED THAT CAN ACCURATELY TRACK ARTILLERY ROUNDS, MORTAR ROUNDS, AND ROCKETS FROM LAUNCH TO IMPACT. VITAL CHARACTERISTICS SUCH AS SPACE POSITION, TRUE VELOCITY, ACCELERATION, DRAG, AND RADAR CROSS SECTION IS NOW AVAILABLE IN REAL OR NEAR REAL TIME. FURTHER ENHANCEMENTS OF THIS SYSTEM ARE BEING DEVELOPED UNDER FOLLOW-ON PROJECTS.

COMPLETION AND IMPLEMENTATION OF THESE PROJECTS WILL RESULT IN ESTIMATED ANNUAL SAVINGS OF \$2.9 MILLION.



SYSTEM CONFIGURATION

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

MELT POUR OF HIGH EXPLOSIVES

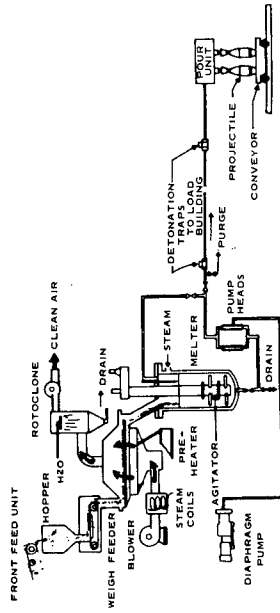
PROJECT NO: 574 4162

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

COST: \$1,759,400

RESULTS

- A MELT METHOD CAPABLE OF SUSTAINING CONTINUOUS OPERATION WAS DEMONSTRATED.
- A 1/10th SCALE AUTOMATED CONTINUOUS MELT POUR PILOT PLANT WAS CONSTRUCTED.
- AN AUTOMATED EXPLOSIVE INSPECTION SYSTEM WAS FABRICATED AND TESTED. WILL RESULT IN ESTIMATED ANNUAL SAVINGS OF \$1,290,000.



CONTINUOUS MELT-POUR
PROCESS FLOW SHEET

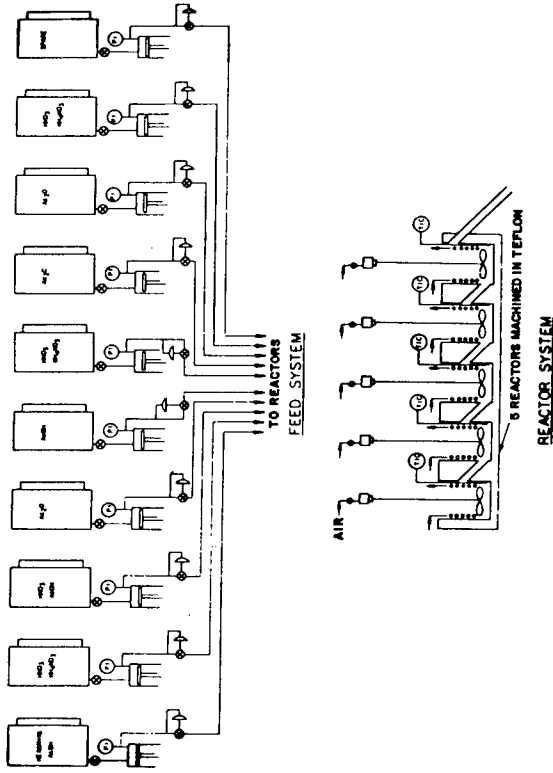
DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

NITROLYSIS OF HEXAMINE

PROJECT NO: 5 71 4171 & 5 72 4171

TITLE: INVESTIGATION OF PARAMETERS
AFFECTING THE NITROLYSIS
OF HEXAMINE

COST: \$348,907



RESULTS

A MINI PILOT PLANT WAS CONSTRUCTED FOR THE CONTINUOUS PRODUCTION OF HMX.

FEATURES OF THE PLANT INCLUDED:
A VARIABLE FEED SYSTEM.

TEMPERATURE CONTROLS FOR EACH REACTOR.

SMALL REACTORS THAT MAINTAINED THE PROPER HEAT TRANSFER RATES.

FEED RATES ADEQUATE TO CONDUCT MATERIAL BALANCES AND DETERMINE YIELDS.

IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED SAVINGS OF \$2 MILLION PER YEAR.

CONTINUOUS HMX REACTOR SYSTEM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT RECRYSTALLIZATION

PROJECT NO: 572 4220 & 573 4220

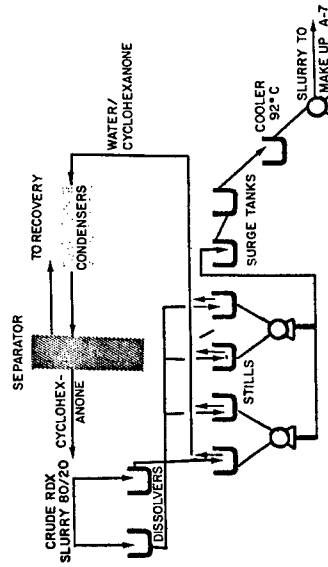
TITLE: CONTINUOUS RDX
RECRYSTALLIZATION
PROTOTYPE FACILITY

COST: \$1,560,000

RESULTS

THE CONTINUOUS RDX RECRYSTALLIZATION PROCESS THAT WAS DEVELOPED AT THE START OF THIS PROJECT WAS FOUND TO PRODUCE SMALL AMOUNTS OF ALPHA HMX. THIS MATERIAL IS TOO SENSITIVE TO SAFELY HANDLE; THEREFORE, THE PROJECT WAS REDIRECTED TO AUTOMATE THE BATCH PROCESS. THE AUTOMATED BATCH EQUIPMENT WAS DESIGNED, INSTALLED, AND PROVEN OUT.

IMPLEMENTATION OF THIS PROCESS WILL RESULT IN AN ESTIMATED PRODUCTION CAPABILITY OF 7.5 MILLION POUNDS OF COMP B PER MONTH.



AUTOMATED BATCH PROCESS

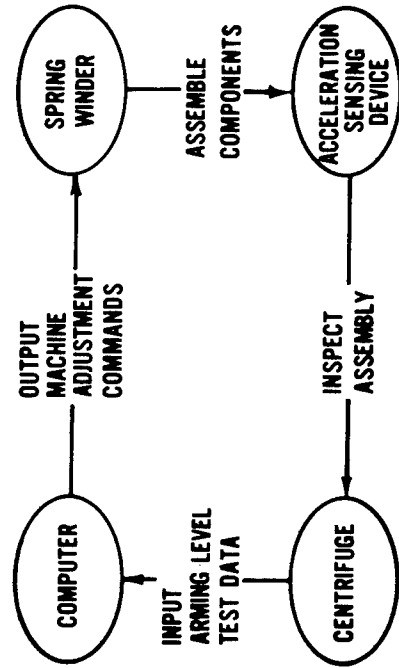
DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

COMPUTER AIDED MANUFACTURING

PROJECT NO: 5 74 4255

TITLE: MMT PRODUCTION CONTROL OF
ACCELERATION SENSING DEVICES
(CAM RELATED)

COST: \$50,000



WORK FLOW FOR PROCESS
CONTROL OF SPRING
WINDERS

RESULTS

A CONCEPT WAS DEVELOPED FOR LINKING A CENTRIFUGE TEST WITH THE SPRING WINDER IN FUZES. THE NEXT STEP WILL BE FABRICATION OF A FULLY AUTOMATIC LOAD TESTER AND A MINICOMPUTER CONTROLLED SPRING WINDER.

ECONOMIC FEASIBILITY OF THIS CONCEPT IS DEPENDENT ON PRODUCTION REQUIREMENTS, AND DESIGN CONSIDERATIONS FOR FUZES, SPRINGS AND AUTOMATIC FUZE ASSEMBLY EQUIPMENT.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT FUZE ASSEMBLY

PROJECT NO: 576 4280 & 577 4280

TITLE: M577 FUZE AUTOMATIC PROCESS
CONTROL PROTOTYPE EQUIPMENT

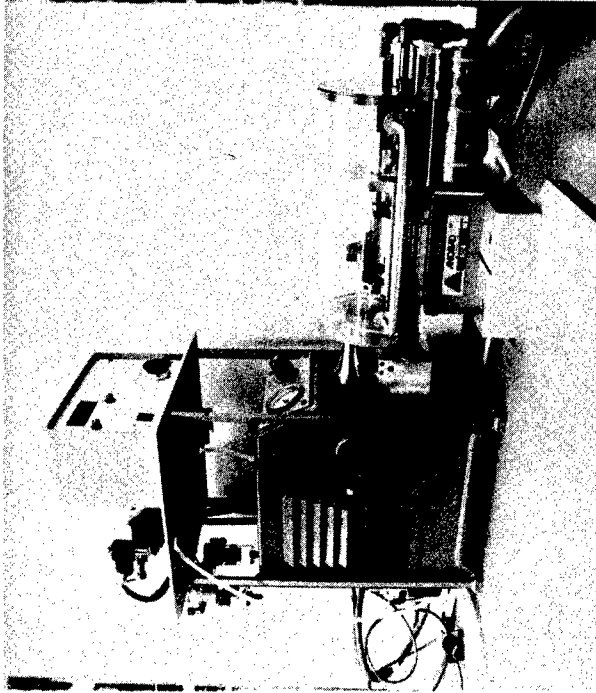
COST: \$1,108,000

RESULTS

TWO MACHINES WERE DEVELOPED UNDER THESE PROJECTS THAT AUTOMATICALLY BALANCE THE BALANCE WHEEL ASSEMBLY AND ADJUST THE BEAT RATE OF THE TIMER.

THE BALANCING MACHINE AUTOMATICALLY DETERMINES THE POINT OF UNBALANCE AND, BY MEANS OF A LASER, REMOVES MATERIAL.

THE BEAT RATE IS AUTOMATICALLY ADJUSTED BY SEQUENTIALLY SHORTENING THE HAIR SPRING (USING ULTRASONIC WELDING) UNTIL SPECIFICATIONS ARE MET. THE MACHINES HAVE BEEN FURNISHED A SUPPLIER FOR INTEGRATION INTO THE FUZE MANUFACTURING.



**AUTOMATIC REGULATION
MACHINE**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT EXPLOSIVES SAFE SEPARATION

PROJECT NO: 57T 4288

TITLE: EXPLOSIVE SAFE SEPARATION AND
SENSITIVITY CRITERIA

COST: \$139,261

RESULTS

A MINIMUM NON-PROPAGATING DISTANCE FOR 8-INCH M106 HE PROJECTILES IS ONE FOOT IF 3 INCH DIAMETER ALUMINUM SHIELDING RODS THE SAME HEIGHT AS THE PROJECTILES ARE POSITIONED VERTICALLY BETWEEN THE PROJECTILES.

THIS INFORMATION WILL BE INCORPORATED INTO SAFETY REGULATORY DOCUMENTS.



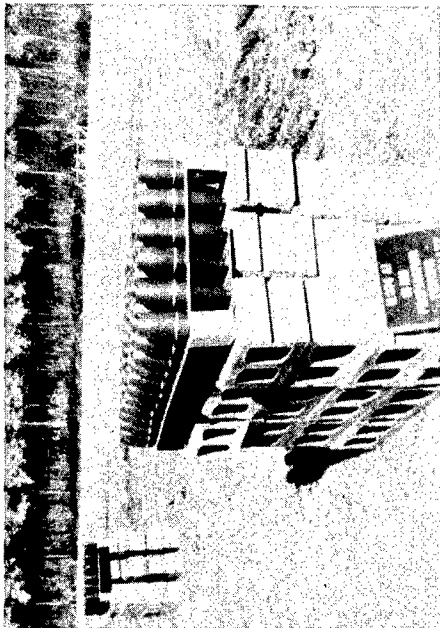
SHIELDED CONFIRMATORY
TEST SET-UP

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT EXPLOSIVES SAFE SEPARATIONS

PROJECT NO: 576 4288

TITLE: EXPLOSIVE SAFE SEPARATION AND
SENSITIVITY

COST: \$592,814



TEST CONFIGURATION
PRIOR TO IGNITION

RESULTS

THE PROJECT ANALYZED AND IDENTIFIED APPROPRIATE SEPARATION DISTANCE FOR SAFE LOADING AND HANDLING OF AMMUNITION. A VARIETY OF PROJECTILES WERE CONSIDERED. AS AN EXAMPLE, THE SAFE DISTANCE FOR LOADING SEPARATE 81MM PROJECTILES WAS 18 INCHES AND FOR A PALLET OF LOADED 81MM PROJECTILES WAS 30 FEET.

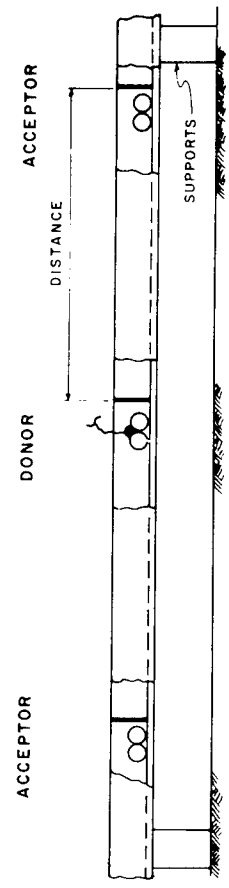
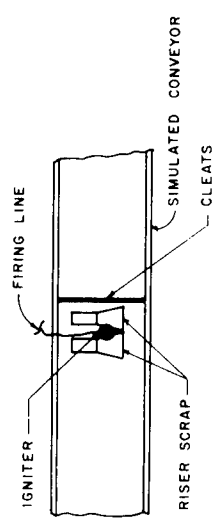
THE RESULTS WILL BE INCORPORATED INTO THE APPROPRIATE SAFETY REGULATIONS.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT SAFETY

PROJECT NO: 5 77 4288
 TITLE: EXPLOSIVE SAFE
 SEPARATION AND SENSITIVITY
 CRITERIA
 COST: \$566,669

RESULTS

- THIS PROJECT DETERMINED THE SAFE SEPARATION DISTANCES BETWEEN 105MM M1 PROJECTILE COMPOSITION B RISER SCRAP.
- TEST SERIES WERE PERFORMED WITH THE ZAMAC FUNNELS AND WITHOUT THE FUNNELS FOR TWO AND FOUR RISER UNITS.
- RESULTS OF THIS PROJECT WERE APPLIED TO THE MODERNIZATION OF THE LONE STAR ARMY AMMUNITION PLANT.



TEST SET-UP FOR CONVEYOR
RISER SCRAP PROGRAM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT BLAST EFFECTS

PROJECT NO: 5 76 4291

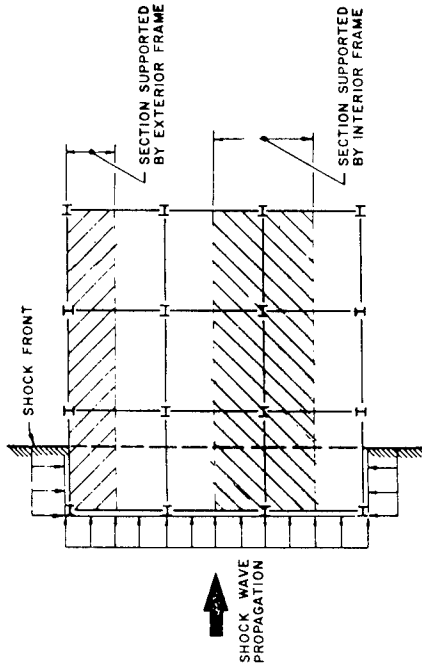
TITLE: BLAST EFFECTS IN THE
MUNITION PLANT
ENVIRONMENT

COST: \$699,619

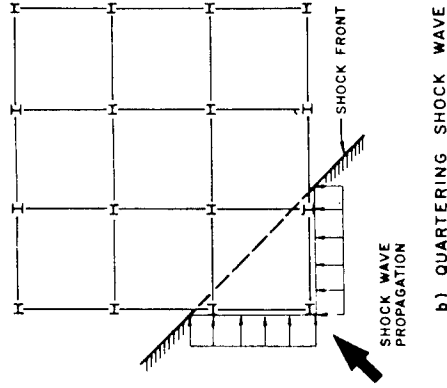
RESULTS

SEVERAL AREAS OF CONCERN WERE COVERED BY THIS PROJECT. THEY INCLUDED BLAST CAPACITY EVALUATION OF BARRICADES, EFFECTS OF SIMULTANEOUS DETONATIONS, BLAST CAPACITY OF WINDOWS AND FRAMES, GROUND SHOCK EFFECTS FROM EXPLOSIONS, AND A COMPUTER PROGRAM THAT CAN SIMULATE THE EFFECTS OF BLAST OVERPRESSURES ON FRAME STRUCTURES.

THE RESULTS OF THIS PROJECT WILL BE INTEGRATED INTO SAFETY REGULATORY DOCUMENTS.



a) NORMAL SHOCK WAVE



b) QUARTERING SHOCK WAVE

LOADING CONDITIONS FOR BI-AXIAL BENDING

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT NITROCELLULOSE (NC) PURIFICATION

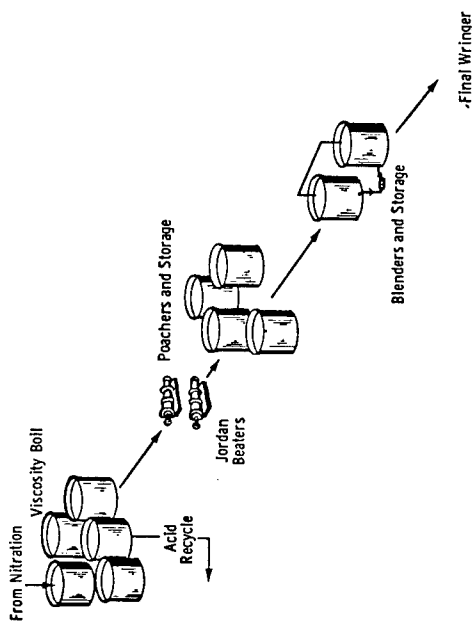
PROJECT NO: 5 77 4341

TITLE: IMPROVED NITROCELLULOSE
PURIFICATION PROCESS

COST: \$165,000

RESULTS

THIS PROJECT INVESTIGATED EXISTING METHODS FOR APPLICATION TO NITROCELLULOSE PURIFICATION. THE "CONICELL" SYSTEM MANUFACTURED BY MOSER PROCESSING WAS SELECTED FOR THE CONTINUOUS PURIFICATION DESIGN. THE DESIGN ALLOWS FOR ACID BOILING FOLLOWED BY SODA-ASH INJECTION AND POACHING. THE UNIT WILL CARRY A 10% NC SLURRY WITH A RESIDENCE TIME OF 45 MINUTES AT A RATE OF 2000 POUNDS PER HOUR. COMPLETION AND IMPLEMENTATION OF THIS PROCESS CAN RESULT IN ESTIMATED SAVINGS OF UP TO \$1.2 MILLION PER YEAR.



PRINCIPAL OPERATIONS
IN THE BATCH PROCESS
FOR NC PURIFICATION

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT DIE CAST HOUSINGS

PROJECT NO: 5 77 4416

TITLE: DEVELOP AND PROVEOUT OF
ALTERNATE MANUFACTURING
PROCESSES FOR S + A

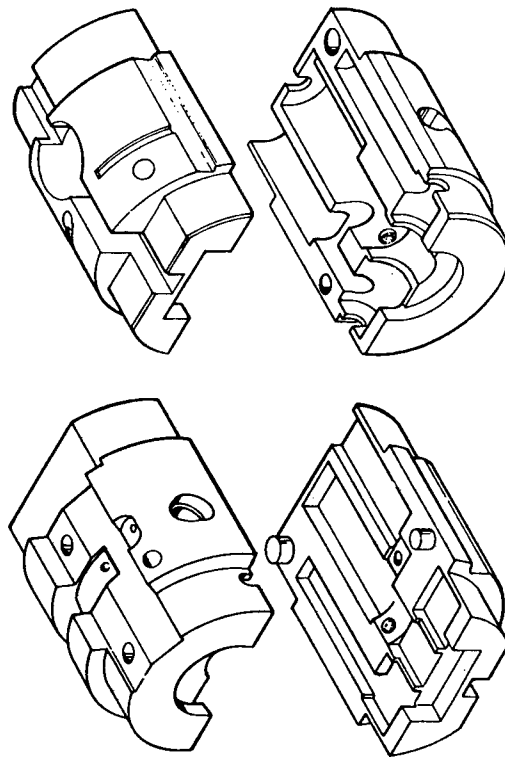
COST: \$120,000

RESULTS

THIS PROJECT PROVIDED THE FAB-
RICATION AND VERIFICATION TESTING
OF AN ALTERNATE SAFE AND ARMING
HOUSING FOR USE IN THE GEMSS
MINE SYSTEM. OTHER APPLICATIONS
OF THIS HOUSING ARE GATOR AND
MOPMS.

THIS DIE CAST PART IS CONSIDERABLY
SIMPLER AND LESS EXPENSIVE THAN
THE BAR STOCK FABRICATED PART.

IMPLEMENTATION OF THIS PROJECT
WILL RESULT IN ESTIMATED SAVINGS
OF \$1.6 MILLION PER YEAR.



INPUT CABLE SIDE

CLEARING CHARGE PORT SIDE

TWO-PIECE GEMSS S&A DIE-CAST HOUSING

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT DETONATOR LOADING

PROJECT NO: 5 7T 4457

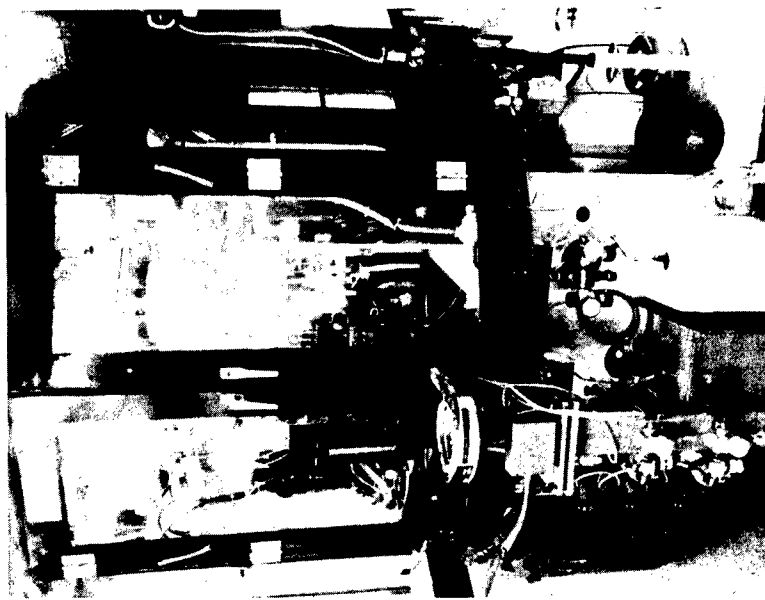
TITLE: MULTI-TOOLED IOWA
DETONATOR LOADING
MACHINE

COST: \$332,000

RESULTS

THE OBJECTIVE OF THIS PROJECT WAS TO INCREASE THE OUTPUT OF AN IOWA DETONATOR LOADER TO 150 UNITS/MINUTE. THE GOAL WAS ACCOMPLISHED BY RETROFITTING AN EXISTING LOADER WITH A SET OF MULTIPLE LEVEL TOOLING. QUAD TOOLING WAS DETERMINED TO BE OPTIMUM.

IMPLEMENTATION OF THIS PROJECT WILL RESULT IN AN ESTIMATED COST SAVINGS OF \$1.5 MILLION DOLLARS AT THE PEACETIME RATE.



X4 SERIES IOWA LOADER

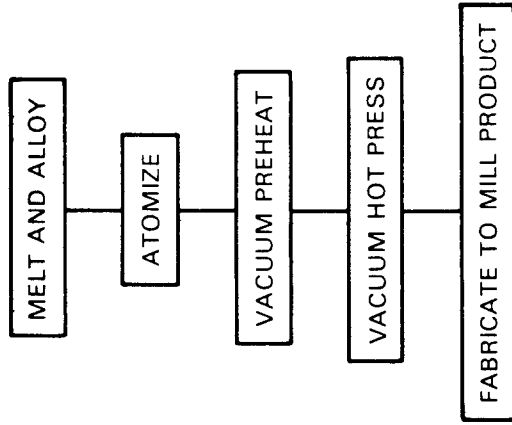
DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

ALUMINUM ALLOY POWDER METALLURGY

PROJECT NO: 5 72 6335

TITLE: HIGH STRENGTH ALUMINUM ALLOY
SHAPES BY POWDER METALLURGY

COST: \$440,000



POWDERED METAL PROCESS

RESULTS

POWDERED METAL PLATE WAS PRODUCED AND SHOWED HIGHER TENSILE STRENGTH AND NOTCHED FATIGUE STRENGTH, SUPERIOR CORROSION CRACKING RESISTANCE, AND TOUGHNESS EQUAL TO COMMERCIAL INGOT METALLURGY ALLOYS. POWDERED METAL EXTRUSIONS AND DIE FORGINGS EXPERIENCED SIMILAR IMPROVEMENTS IN PROPERTIES. THE IMPROVEMENT IN PROPERTIES FROM THIS PROCESS HAS RESULTED IN SEVERAL COMMERCIAL EFFORTS BEING UNDER TAKEN TO MORE FULLY EXPLOIT THE DEVELOPMENT.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT TUNGSTEN FRAGMENTS

PROJECT NO: 5 71 6388

TITLE: PRODUCTION OF HIGH DENSITY
TUNGSTEN BASE PREFORMED
FRAGMENTS

COST: \$88,000

Composition by weight:

Nickel - $5.0 \pm 0.2\%$
Iron - $5.0 \pm 0.2\%$
Impurity Elements - 0.005% max each
0.1% max total
Tungsten - remainder

Density: 17.00 ± 0.10 gm/cc

Mechanical Properties:

Compressive Yield Strength

80,000 psi at 0.2% offset with no
visible cracks after testing.

Hardness

Average Rockwell C 24 to 26.

Ultimate Tensile Strength

123,000 psi Min

Elongation

15% min in one inch

RESULTS

THIS PROJECT RESULTED IN A PURCHASE
DESCRIPTION FOR THE MANUFACTURE
OF TUNGSTEN BASED PREFORMED
FRAGMENTS. THE DESCRIPTION WAS
VERIFIED BY PROCURING 250,000 CUBE
PENETRATORS. THE INITIAL PURCHASE
POINTED OUT A NEED FOR MORE
TECHNICAL GUIDANCE TO OBTAIN
ACCEPTABLE FRAGMENTS.

MAJOR REQUIREMENTS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT METAL PARTS

PROJECT NO: 5 73 6550

TITLE: ENGINEERING IN SUPPORT OF
ARTILLERY METAL PARTS
MODERNIZATION PROGRAM

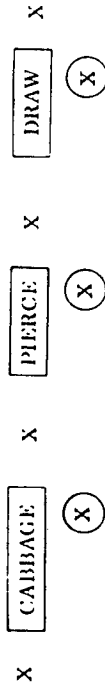
COST: \$480,187

RESULTS

AMMUNITION METAL PARTS PLANTS
WERE SURVEYED FOR MANUFACTURING
IMPROVEMENTS. TYPICAL FINDINGS
RESULTED IN:

DEVELOPING AN AUTOMATIC LOADER
FOR FORGING PRESSES, THEREBY
REDUCING PERSONNEL REQUIREMENTS
FROM 8 TO 1.5.

DEVELOPING INDIVIDUAL HYDRAULIC
TRANSFER UNITS TO REPLACE A
CONSTANT HEAD SYSTEM THEREBY
REDUCING THE HORSEPOWER
REQUIREMENT BY 1650.

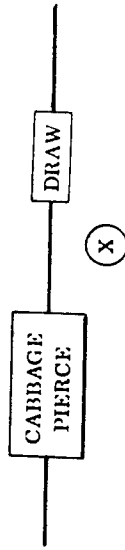


X Transfer Man - Load & Unload

(X) Press Operator

(X) Relief Man

PREVIOUS METHOD - 8 PERSONS



(X) Operator

(X) Relief Man Part Time

IMPROVED METHOD - 1 1/2 PERSONS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT FILAMENT WOUND CANNON TUBE

PROJECT NO: 672 6681 AND 673 6681

**TITLE: APPLICATION OF FILAMENT
WINDING TO CANNON AND
CANNON COMPONENTS**

COST: \$200,000

RESULTS

**A FILAMENT WINDING MACHINE WAS
PURCHASED THAT HAS THE FLEXI-
BILITY FOR HANDLING A VARIETY OF
GEOMETRIC SHAPES.**

**NUMEROUS LINERS FOR 106MM TEST
CYLINDERS WERE FABRICATED AND
THEN WOUND WITH A STEEL FILA-
MENT/EPOXY JACKET.**

**THE COMPOSITE TUBE 30% LIGHTER
THAN A CONVENTIONAL TUBE.**



**WINDER AND WOUND
COMPOSITE TUBE**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT BARREL PLATING

PROJECT NO: 6 72 6786

TITLE: AUTOMATION OF GUN BARREL
BORE CHROMIUM PLATING
PROCESS

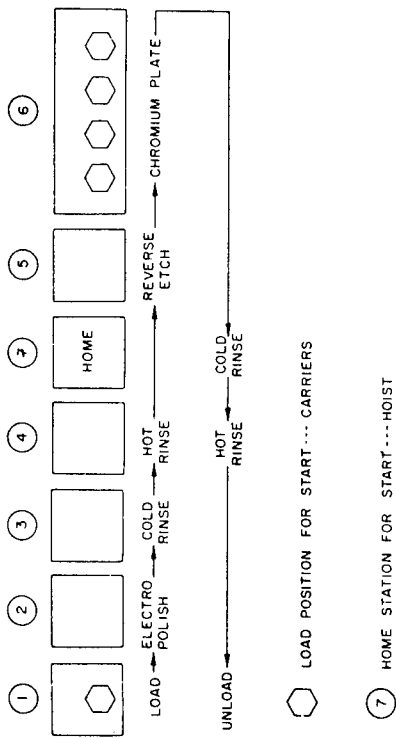
COST: \$70,000

RESULTS

• AN AUTOMATED PLATING SYSTEM WAS PURCHASED AND THE PROCESSES TO PLATE 5.56MM BARRELS WERE DEVELOPED. A ROTATING ELECTRODE IS USED IN THE PLATING PROCESS TO ELIMINATE THE REQUIREMENT FOR OPERATOR ALIGNMENT.

• THE EQUIPMENT CAN BE SWITCHED TO A MANUAL MODE OF OPERATION FOR SPECIAL PROCESSING.

• IMPLEMENTATION OF THIS PROCESS WILL RESULT IN AN ESTIMATED \$250,000 SAVINGS FOR EACH 100,000 BARRELS.



AUTOMATED PLATING LINE OPERATION

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT SMALL ARMS PARTS MOLDING

PROJECT NO: 6 72 6838

TITLE: MANUFACTURING SIMPLIFICATION AND COST REDUCTION IN THE MANUFACTURE OF PLASTIC COMPONENTS OF SMALL ARMS AND AIRCRAFT ARMAMENT

COST: \$50,000

RESULTS

THE PROCESSES DEVELOPED UNDER THIS PROJECT WILL SIMPLIFY MANUFACTURING TECHNIQUES, LOWER COSTS, AND IMPROVE THE PROPERTIES OF SMALL ARMS NON-METALLIC PARTS. INJECTION MOLDING IS APPROXIMATELY SIX TIMES FASTER THAN COMPRESSION MOLDING.

THIS PROJECT WILL BE IMPLEMENTED UNDER PROJECT'S 6XX 7419.

	Phenolics		Epoxies		Polyesters	
	CM*	IM**	CM	IM	CM	IM
Mold Temperature	315°F	330°F	315°F	330°F	280°F	280°F
Molding Pressure	3Kpsi	18Kpsi	2Kpsi	15Kpsi	2Kpsi	15Kpsi
Total Cycle Time	6 min	60 sec	6 min	75 sec	6 min	60 sec

* CM - Compression Molding

** IM - Injection Molding

SELECTED PARAMETERS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT DEWAR PROCESS IMPROVEMENTS

PROJECT NO: 6 73 7056

TITLE: DEWAR MATERIALS AND
MANUFACTURE

COST: \$195,000

RESULTS

A METAL DEWAR THAT CAN BE
REPAIRED AND RESEALED WAS
DESIGNED TO HOUSE THE LINEAR
ARRAY.

A HIGH VACUUM CAN NOW BE
MAINTAINED FOR OVER A YEAR
WITHOUT ACTIVE PUMPING.

THIS DESIGN DOUBLED THE
OPERATIONAL LIFE OF THE
ASSEMBLY.



SEALED METAL DEWAR

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ELECTROLESS NICKEL PLATING

PROJECT NO: 673 7124

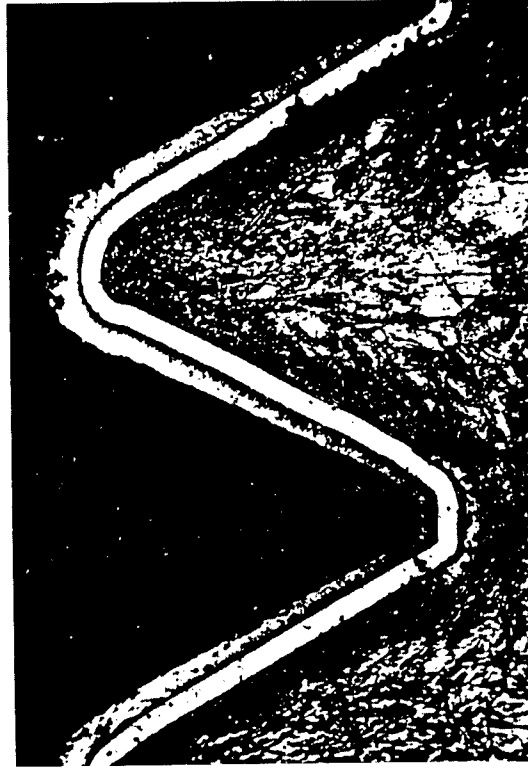
TITLE: EFFECT OF ELECTROLESS
NICKEL PROCESS VARIABLES
ON QUALITY REQUIREMENTS

COST: \$40,000

RESULTS

PROCEDURES FOR PLATING GUN
BORES WITH ELECTROLESS NICKEL
WERE DETERMINED. A RANGE OF
HARDNESSES CAN BE PREDICTED BY
TAKING INTO CONSIDERATION THE
PHOSPHORUS CONTENT AND USING
THE PROPER THERMAL TREATMENT
ON THE ITEM.

FOR HEAVY BUILDUP, CONSTANT
MONITORING OF THE BATH
PARAMETERS IS NECESSARY.
PROCESS SPECIFICATIONS ARE
AVAILABLE.



BRASS BOLT PLATED WITH
ELECTROLESS NICKEL AND
OVERPLATED WITH NICKEL

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

NUMERICAL CONTROL PART PROGRAMMING

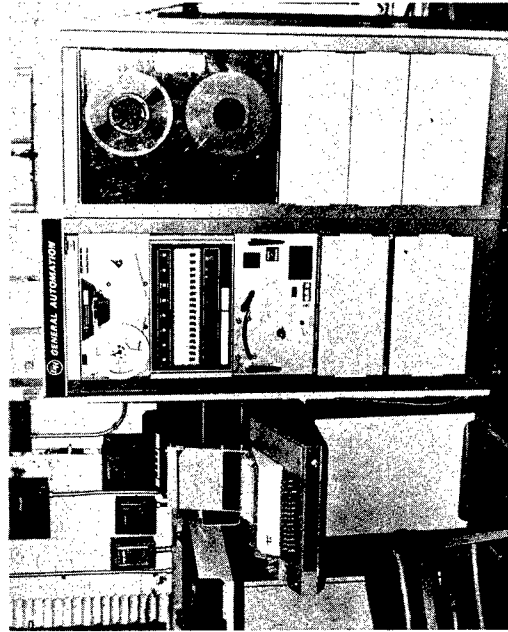
PROJECT NO: 6 72 7220

TITLE: MMT APPLICATION AND UTILIZATION
OF MINI-COMPUTERS TO DIRECT
NUMERICAL CONTROL FOR GENERAL
PURPOSE MACHINE TOOLS

COST: \$140,000

RESULTS

A "UNIAPT" MINICOMPUTER BASED PART PROGRAMMING SYSTEM WITH 3-DIMENSIONAL CONTOURING WAS OBTAINED FOR NC LATHES AND MACHINING CENTERS. THE NC TAPE PREPARATION SYSTEM WAS INTERFACED WITH THE "TRIDEA" DRAFTING AND DIGITIZING SYSTEM FOR CUTTER LOCATION PATH DISPLAY AND VERIFICATION. A COMPUTER NUMERICAL CONTROL "WADELL" LATHE WAS LINKED WITH THE COMPUTER SYSTEM TO ALLOW DIRECT TRANSMISSION OF PART PROGRAMS. LABOR SAVINGS IN TAPE PREPARATION AND INCREASE IN THE WORKLOAD HANDLING CAPABILITY OF THE NC MACHINE TOOLS WERE ACHIEVED.



DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT INSPECTION USING LASERS

PROJECT NO: 672 7226

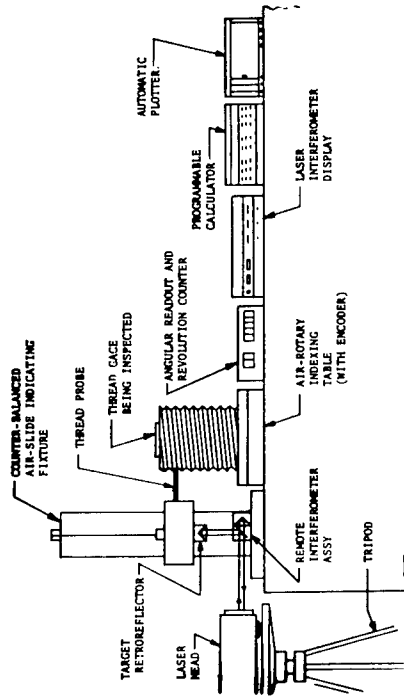
TITLE: DEVELOPMENT AND PREPARATION
OF MULTI-PURPOSE ULTRA-HIGH
PRECISION LASER QUALITY INSPECTION
APPLICATIONS

COST: \$150,000

RESULTS

A LASER THREAD MEASURING SYSTEM
WAS DEVELOPED TO INSPECT THREAD
PITCH, LEAD, AND DEVIATION FROM TRUE
HELICAL PATH OF LARGE THREAD PLUG
GAGES.

A LASER OPTICAL MEASURING SYSTEM
WAS DEVELOPED WITH THE CAPABILITY
TO DETERMINE OPTICAL GLASS DENSITY,
GRADE, CURVATURE, FLATNESS, AND
SCRATCH AND DIG CHARACTERISTICS.



THREAD MEASURING SYSTEM

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT CANNON TUBE PROCESSING

PROJECT NO: 676 7236

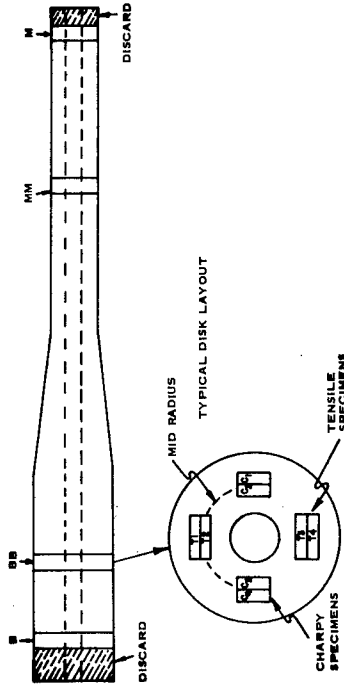
TITLE: APPLICATION OF RAPID HEAT
TREATING TO CANNON TUBES

COST: \$190.000

RESULTS

EIGHT CANNON TUBES WERE SUBJECTED TO SHORTENED AUSTENITIZING CYCLES. TESTING OF TENSILE AND CHARPY IMPACT SAMPLES DEMONSTRATED THAT ACCEPTABLE PROPERTIES COULD BE OBTAINED.

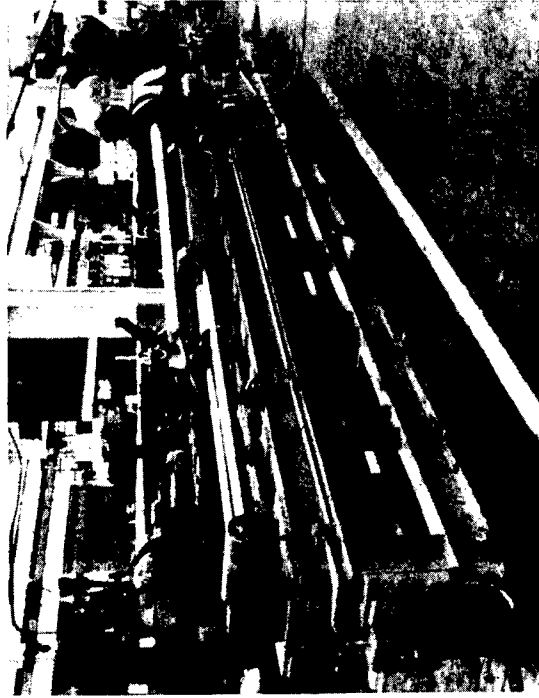
FURNACE TIME HAS BEEN REDUCED FROM 70 TO 20 HOURS WITH SAVINGS AVERAGING \$57 PER TUBE. USE OF FOSSIL FUEL HAS ALSO BEEN REDUCED.



MECHANICAL PROPERTY SAMPLING PLAN

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

GUN TUBE IMPROVEMENTS



PROJECT NO: 673 7242

**TITLE: GUN TUBE MANUFACTURE BY
AUTOMATION**

COST: \$195,000

RESULTS

**SEVERAL IMPROVEMENTS TO THE
MACHINING OPERATIONS WERE MADE
INCLUDING:**

- **CONSOLIDATING THE M68 AND M185
PROCESSING.**
 - **APPLYING A 3-AXIS N/C MACHINING
CENTER TO THE BREECH FACE
EXTRACTOR DETAIL.**
 - **GRINDING THE POWDER CHAMBER
FOR THE M68 TUBE.**
- IMPLEMENTATION OF THIS PROJECT
HAS RESULTED IN ESTIMATED
SAVINGS OF \$110,000 PER YEAR.**

**TUBE LOADING ASSEMBLY TO
THE POWDER CHAMBER GRINDER**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT OPTICAL REPLICATION

PROJECT NO: 6 73 7261

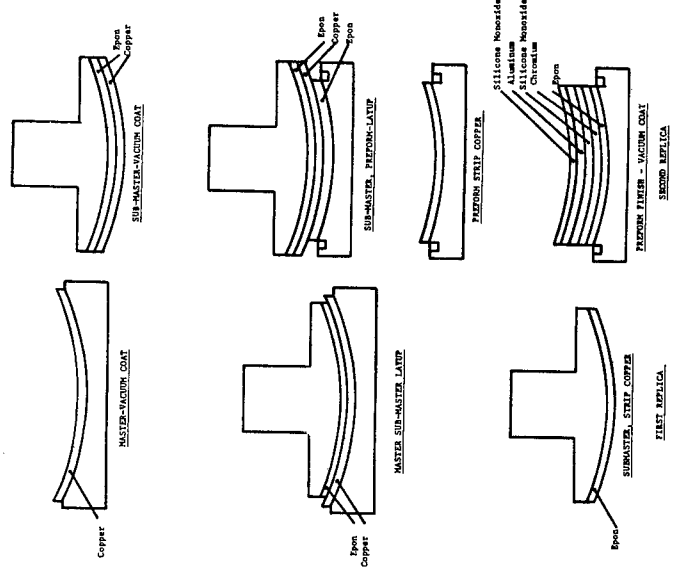
TITLE: THE IMPROVEMENT OF PROCESSES INVOLVED IN PLASTIC REPLICA COMPONENT MANUFACTURE

COST: \$79,718

RESULTS

AN IMPROVED PROCEDURE FOR THE MANUFACTURE OF SPHERICAL AND ASPHERIC MIRRORS BY THE DOUBLE REPLICATION PROCESS USING THIN FILM CAST EPOXY RESINS AS THE REPLICA WAS DEVELOPED.

WHILE THE PROCESS WILL NOT PROVIDE MIRRORS OF THE SAME OPTICAL QUALITY AS PRECISION GLASS MIRRORS, IT WILL PRODUCE LOW COST MIRRORS OF ACCEPTABLE QUALITY FOR MANY APPLICATIONS. IMPLEMENTATION IS DEPENDENT UPON SUFFICIENT QUANTITY REQUIREMENTS TO JUSTIFY SET UP OF A REPLICATION FACILITY.



DOUBLE REPLICATION PROCESS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT NUMERICAL CONTROL

PROJECT NO: 6 73 7265

TITLE: COMPUTER CONTROLLED
RETICLE ENGRAVING

COST: \$150,000

RESULTS

A COMPUTER CONTROLLED SCRIBING MACHINE WAS DEVELOPED THAT CAN SCRIBE 10 RETICLES AT ONCE.

SCRIBING TIME WAS REDUCED BY 60% AND SCRIBING DEFECTS REDUCED. THE NEW METHOD WAS IMPLEMENTED AT FRANKFORD ARSENAL AND HAD ACCUMULATED \$19,000 IN SAVINGS WHEN THE FACILITY WAS CLOSED. NO FURTHER PRODUCTION WORK IS PLANNED FOR THIS MACHINE.



TEN-POSITION COMPUTER
CONTROLLED OPTICAL
SCRIBING MACHINE

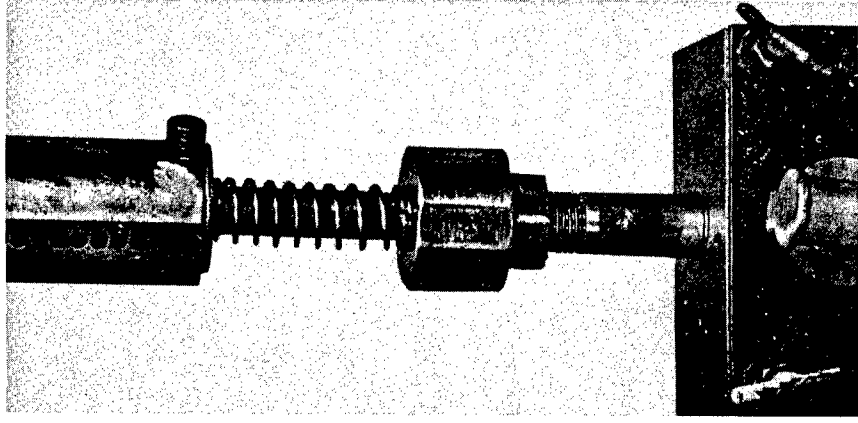
DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

HEAT SETTING SPRINGS

PROJECT NO: 6 74 7411

TITLE: HEAT SETTING PROCEDURES FOR
HELICAL COILED SPRINGS

COST: \$50,000



HEAT SET SPRING
INSTALLED ON
ENDURANCE TESTER.

RESULTS

THIS PROJECT INVESTIGATED A SERIES OF HEAT SETTING PARAMETERS FOR USE IN SMALL ARMS APPLICATIONS. HOT SETTING OF SPRINGS WILL RESULT IN MORE REPEATABLE PERFORMANCE WHERE THE OPERATING TEMPERATURE IS ELEVATED SUCH AS SPRINGS LOCATED ON OR NEAR THE BARREL OR BOLT OF AN AUTOMATIC WEAPON.

THE THREE MATERIALS TESTED WERE MUSIC WIRE, STAINLESS STEEL, AND CHROME VANADIUM WHICH ARE THE MATERIALS SPECIFIED IN 95% OF WEAPON APPLICATIONS.

PROCESS DATA IS NOW AVAILABLE TO SMALL ARMS DESIGNERS.

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT MOLDED M16 HANDGUARD

PROJECT NO: 6 74 7419 & 6 75 7419

TITLE: LOW COST RECIPROCATING
SCREW MOLDING OF
THERMOSETTING PLASTIC
WEAPONS COMPONENTS

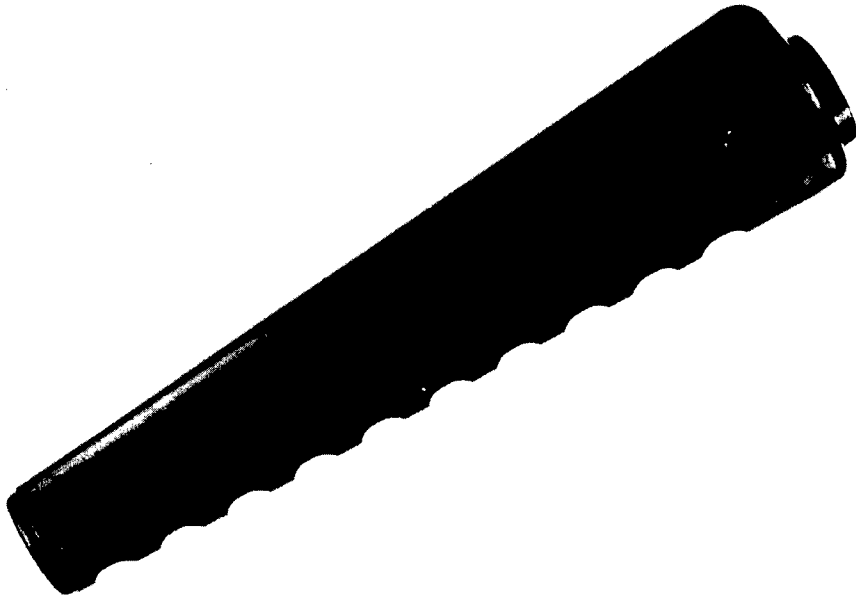
COST: \$110,000

RESULTS

A RECIPROCATING SCREW INJECTION
MOLDING MACHINE WAS PURCHASED
TO PRODUCE LOW-COST
THERMOSETTING PLASTIC
HANDGUARDS FOR THE M16 RIFLE.

A HOT RUNNER MOLDING PROCESS
WAS CHOSEN FOR THIS ITEM SINCE
THE MOLD FABRICATION AND DEBUG
TIME ARE CONSIDERABLY LESS
THAN FOR THE WARM MANIFOLD
METHOD. FIFTY HANDGUARDS WERE
PRODUCED AND SUBMITTED FOR
EVALUATION TESTING.

IMPLEMENTATION OF THIS PROJECT
WILL RESULT IN ESTIMATED COST
SAVINGS OF \$85,000 PER YEAR.



M16 HANDGUARD

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

POWDER METAL PARTS

PROJECT NO: 6 74 7495

TITLE: CLOSED DIE FORGING OF POWDER
METAL PREFORMS

COST: \$115,000

RESULTS

THIS PROJECT ESTABLISHED THE
POTENTIAL USEFULNESS OF EXISTING
FORGE SHOP EQUIPMENT FOR PRODUCING
PRECISION POWDER METAL FORGINGS.

THE MECHANICAL PRESS WAS FOUND TO
BE SUPERIOR TO EITHER THE HYDRAULIC
PRESS OR DROP HAMMER.

MILITARY WEAPON DESIGNERS HAVE
MORE INFORMATION WHICH TO
SPECIFY P/M FORGED PARTS.



SINTERED PREFORMS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

BORIDE COATED TOOLS

PROJECT NO: 674 7524

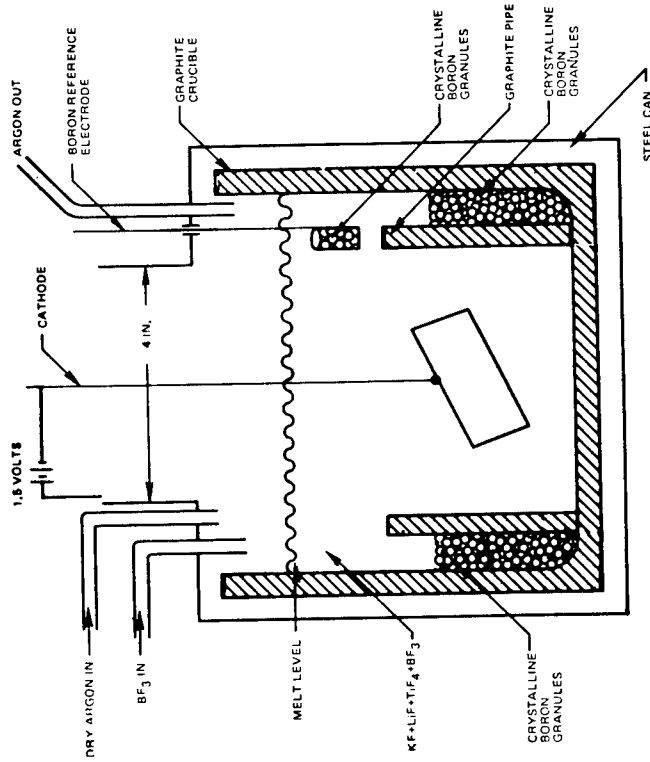
TITLE: ULTRA HARD BORIDE COATING TO
REDUCE TOOL WEAR

COST: \$105,000

RESULTS

A 0.3 MIL LAYER OF TiB₂ COATING WAS APPLIED TO STEEL TO FORM A TOUGH, VERY HARD, ADHERENT LAYER THAT IS RESISTANT TO SPALLING AND SURFACE WEAR.

THE COATING INCREASED TOOL LIFE, PARTICULARLY WHEN DRILLING FIBERGLASS. UP TO A 7% LABOR AND TOOL COST SAVINGS CAN BE ACHIEVED.



PLATING CELL SCHEMATIC

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

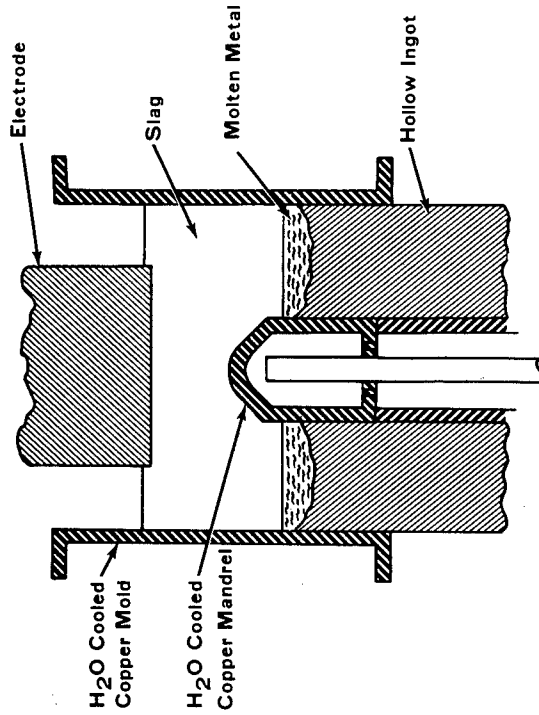
ARTILLERY TUBE PRODUCTION

PROJECT NO: 674 7550 & 675 7550
TITLE: DEVELOPMENT OF PROTOTYPE
PRODUCTION ESR FACILITIES.
COST: \$670,000

RESULTS

HOLLOW ELECTRO-SLAG REMELT
INGOTS WERE PRODUCED BY CABOT
CORPORATION. THE HOLLOWS WERE
THEN SATISFACTORILY FORGED INTO
GUN TUBES.

THE USE OF HOLLOWS ELIMINATED
TREPANNING AS A PRODUCTION
OPERATION. UPON IMPLEMENTATION;
SAVINGS OF \$500 OR MORE PER TUBE
IS ANTICIPATED.



HOLLOW ESR PROCES WITH
MANDREL

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT SIMULATED SHOCK TESTS

PROJECT NO: 675 7571

TITLE: SHOCK TEST SIMULATION FOR
FIRE CONTROL INSTRUMENTS

COST: \$148,000

RESULTS

ACCEPTABLE SIMULATED PRODUCTION TESTS WERE DEVELOPED FROM VALIDATION TEST PROCEDURES. THESE TESTS WERE PERFORMED ON COMMERCIALY AVAILABLE SHOCK MACHINES WHICH DID NOT REQUIRE EXOTIC PREPARATION.

THE WORK RESULTED IN IMPROVED SHOCK TEST METHODS AND SPECS.

UPON IMPLEMENTATION IT IS ESTIMATED THAT THE NUMBER OF SHOCK TESTS REQUIRED FOR QUALIFICATION WILL BE REDUCED BY 50%.

Weapon System	Fire Control Instrument	Axis	Recommended Half-Sine Shock Pulse (g's) (milliseconds)
M29 Mortar	M53 Sightunit	Vertical (45° to the dovebill axis in both directions)	250 1.
		Transverse (pulling the dovebill away from the sight)	325 0.5
M102 Howitzer	Direct Fire Control	Vertical (up)	175 2.
		Longitudinal (forward)	
		Transverse (backward)	75 2.
M551 Sheridan	Indirect Fire Control	Vertical (up)	50 2.
		Longitudinal (forward)	
		Longitudinal (left)	50 3.
M127 Telescope and M149 Mount	XM44 Periscope	Vertical (down)	150 1.
		Longitudinal (left)	
		Transverse (right to left)	50 3.
M127 Telescope and M149 Mount	XM44 Periscope	Vertical (up and down)	
		Longitudinal (left)	
		Transverse (right to left)	

Each instrument is to be shocked a total of 18 times, 6 times in each of the above directions.

SHOCK TEST SPECIFICATIONS

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT

FIRE CONTROL TESTING

PROJECT NO: 675 7572

TITLE: THREE-AXIS DYNAMICS SIMULATION OF HELICOPTER ANGULAR MOTION FOR TESTING FIRE CONTROL MATERIEL

COST: \$128,000

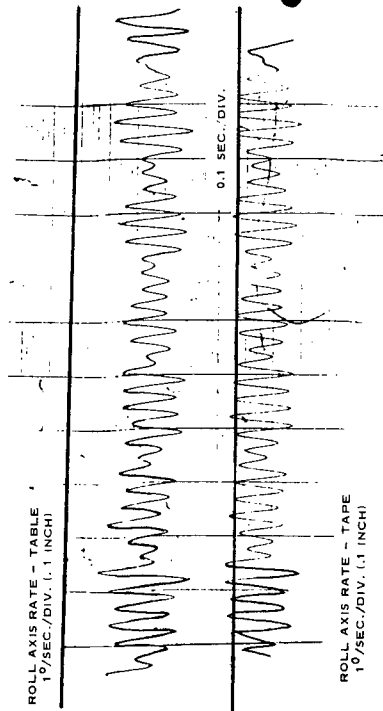
RESULTS

- THE THREE-AXIS FLIGHT MOTION SIMULATOR (FMS) WAS FOUND TO BE ABLE TO ACCURATELY SIMULATE FLIGHT TEST DATA TAKEN ON AN AH-1 COBRA HELICOPTER.

FSM TABLE OUTPUT
COMPARED TO FLIGHT
TEST DATA

- THE RESULTS ARE BEING INCORPORATED INTO DETAILED ENGINEERING SPECIFICATIONS.

- IT IS ESTIMATED THAT THIS PROJECT COULD RESULT IN A 50% REDUCTION IN THE COST OF HELICOPTER FIRE CONTROL PRODUCTION TESTING.



SECTION III

IMPLEMENTED EFFORTS

DARCOM PRIOR YEAR MM&T IMPLEMENTATION CAMOUFLAGE

EFFORT NO: 7 7X 3524

TITLE: MODULAR SYNTHETIC
CAMOUFLAGE SCREENS

COST: \$2,605,000

BENEFITS

PROJECT DEVELOPED MANUFACTURING METHODS AND EQUIPMENT FOR MASS PRODUCTION OF A NEW CAMOUFLAGE SCREEN. THE EQUIPMENT PRODUCES A RADAR SCATTERING GARNISH AND APPLIES THE GARNISH TO THE NETTING IN A PRESCRIBED PATTERN.

THE EQUIPMENT IS IN USE AT TWO CAMOUFLAGE MANUFACTURING FACILITIES:
(1) BRUNSWICK CORP IN DELAND, FL, AND
(2) DEVILS LAKE SIOUX MFG CO IN DEVILS LAKE, ND. SAVINGS PER UNIT FROM USING THE AUTOMATED EQUIPMENT IN LIEU OF HAND METHODS IS \$332/UNIT. WITH 40K SCREENS BEING PRODUCED EACH YEAR, YEARLY SAVINGS TOTAL \$13,280,000.



CAMOUFLAGE



REPAIR KIT

DARCOM PRIOR YEAR MM&T IMPLEMENTATION DETECTOR MODULES

EFFORT NO: 2 74 9744

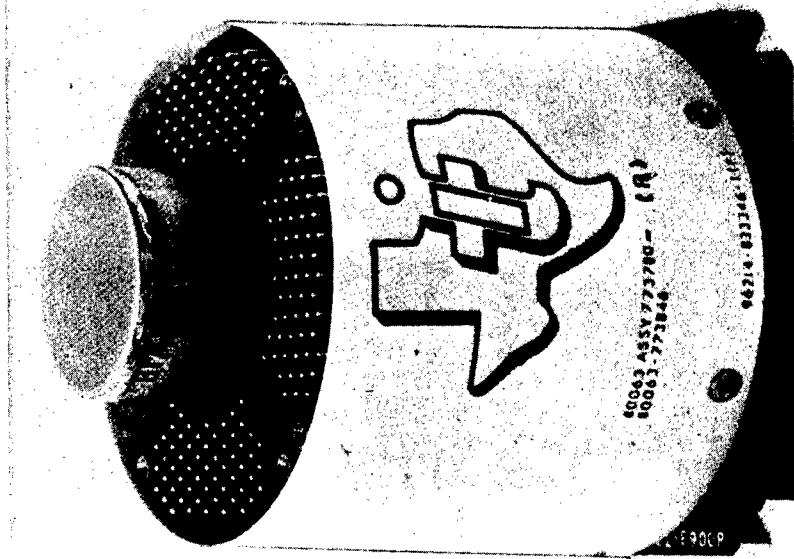
**TITLE: FABRICATION OF UNIVERSAL
DETECTOR MODULES**

COST: \$895,000

BENEFITS

**PROJECT ESTABLISHED A PILOT
PRODUCTION CAPABILITY TO PRODUCE
UNIVERSAL DETECTOR DEWAR MODULES
FOR HG-CD-TE PHOTODETECTOR ARRAYS.
PRIOR TO THIS PROJECT THE MODULES
WERE HAND PRODUCED.**

**TEXAS INSTRUMENTS IS USING THIS
PILOT LINE TO PRODUCE DETECTOR
MODULES FOR THE ARMY'S AN/VSG-2
TANK THERMAL SIGHT. THE MMT PILOT
LINE IS THE ONLY EQUIPMENT ON
WHICH THIS COMPONENT CAN BE MASS
PRODUCED.**



**UNIVERSAL DETECTOR
MODULE**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION IMAGE TUBES

EFFORT NO: 2 74 9750

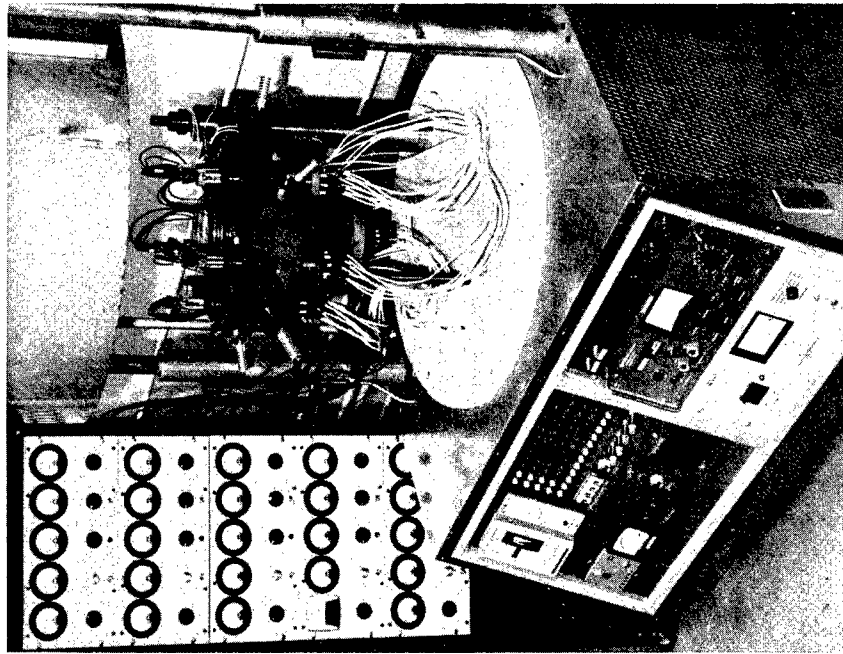
TITLE: FABRICATION OF 18MM WAFER
IMAGE TUBE BY BATCH
PROCESSING

COST: \$700,000

BENEFITS

LITTON HAD PREVIOUSLY DEVELOPED A 5-PORT VACUUM PROCESSOR FOR PRODUCING 18MM IMAGE TUBES. THIS PROJECT UPGRADED THIS EQUIPMENT TO INCLUDE ELECTRON GUNS FOR OUT-GASSING AND THE CAPABILITY TO MAKE AN INDIUM SEAL OF THE PHOSPHOR SCREEN TO THE TUBE WALL.

LITTON IS USING THIS TYPE EQUIPMENT IN PRODUCTION OF IMAGE TUBES FOR AN/PVS-5, NIGHT VISION GOGGLE. SAVINGS IS ESTIMATED TO BE \$3.2 MILLIONS ON TUBES PRODUCED DURING THE 1976-81 TIME FRAME.



5-PORT IMAGE TUBE
PROCESSOR

DARCOM PRIOR YEAR MM&T IMPLEMENTATION QUALITY CONTROL TECHNIQUES



EFFORT NO: 2 75 9836

TITLE: ESTABLISHMENT OF QC
TECHNIQUES FOR PDN OF
ETCHED COREMICROCHANNEL
PLATES

COST: \$276,000

BENEFITS

THIS PROJECT DEVELOPED QUALITY ASSURANCE POLICY AND PROCEDURES FOR MANUFACTURE OF 18MM AND 25MM MICROCHANNEL PLATES.

VARIAN ASSOCIATES, PALO ALTO, CA, ADOPTED THESE POLICIES AND PROCEDURES IN PRODUCTION OF MICROCHANNEL PLATES FOR IMAGE INTENSIFIER TUBES. IN ADDITION TO AN IMPROVEMENT IN PRODUCT QUALITY, THE YIELD OF THE PRODUCTION LINE HAS ALSO INCREASED. ESTIMATED SAVINGS FROM 1978-83 WILL BE \$2.45 MILLION.

QUALITY ASSURANCE POLICY MANUAL

October 20, 1976

I. Maltzer, General Manager
Light Sensing Emulating Division
Varian Associates

varian associates, 611 hansen way, palo alto, california 94303

DARCOM PRIOR YEAR MM&T IMPLEMENTATION

JOINING ARMOR

EFFORT NO: T 7X 4329

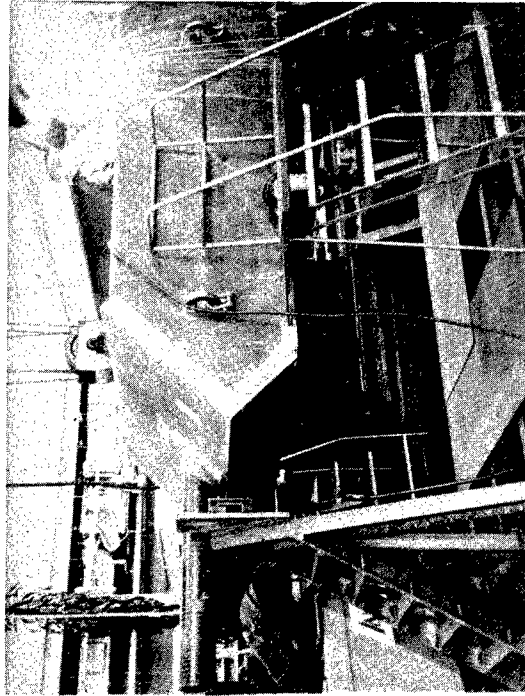
TITLE: JOINING OF STEEL ARMOR-
INTERMIX

COST: \$276,000

BENEFITS

PROJECT DEVELOPED PRODUCTION METHODOLOGY TO JOIN ARMORS OF DIFFERENT TYPES AND HARDNESS. THIS ALLOWS A MORE IMPACT RESISTANT ARMOR TO BE APPLIED TO AREAS PREVIOUSLY CONSIDERED VULNERABLE.

THE ARMOR WELDING SPEC, MIL-SPEC-W46086, WAS REVISED TO INCLUDE THE PROCESSES DEVELOPED IN THIS EFFORT. CHRYSLER IS USING THIS SPEC AND THESE PROCESSES FOR WELDING ARMOR ON THE XM1 TANK. THIS INCREASES THE BALLISTIC PROTECTION OF THE TANK.



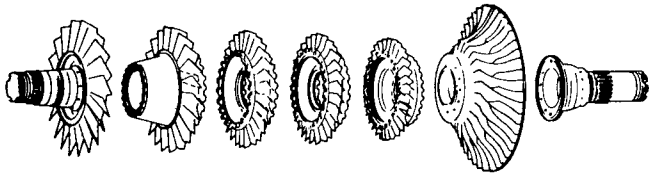
**MOCK TANK HULL
BEING WELDED**

DARCOM PRIOR YEAR MM&T IMPLEMENTATION TURBINE ENGINE COMPONENTS

EFFORT NO: 1 XX 7103

TITLE: IMPROVED MANUFACTURE OF TURBINE
ENGINE COMPRESSOR COMPONENTS

COST: \$740,000



BENEFITS

THIS PROJECT DEVELOPED MACHINERY AND PROCESSES FOR PRODUCTION OF TURBINE ENGINE COMPRESSOR COMPONENTS THAT HAD NEVER BEFORE BEEN MANUFACTURED. APPLICATION WAS SHOWN ON THE BLISK AND IMPELLER FOR THE T700 ENGINE.

IMPLEMENTATION
COST: \$14M

IMPLEMENTATION ON THE T700 PRODUCTION LINE AT THE GENERAL ELECTRIC PLANT WILL COST \$14 MILLION, BUT WILL SAVE \$16,000 PER ENGINE OR \$60 MILLION AT THE SCHEDULED PRODUCTION RATE.

DARCOM PRIOR YEAR MM&T IMPLEMENTATION ROTOR BLADES

EFFORT NO: 1 77 7112

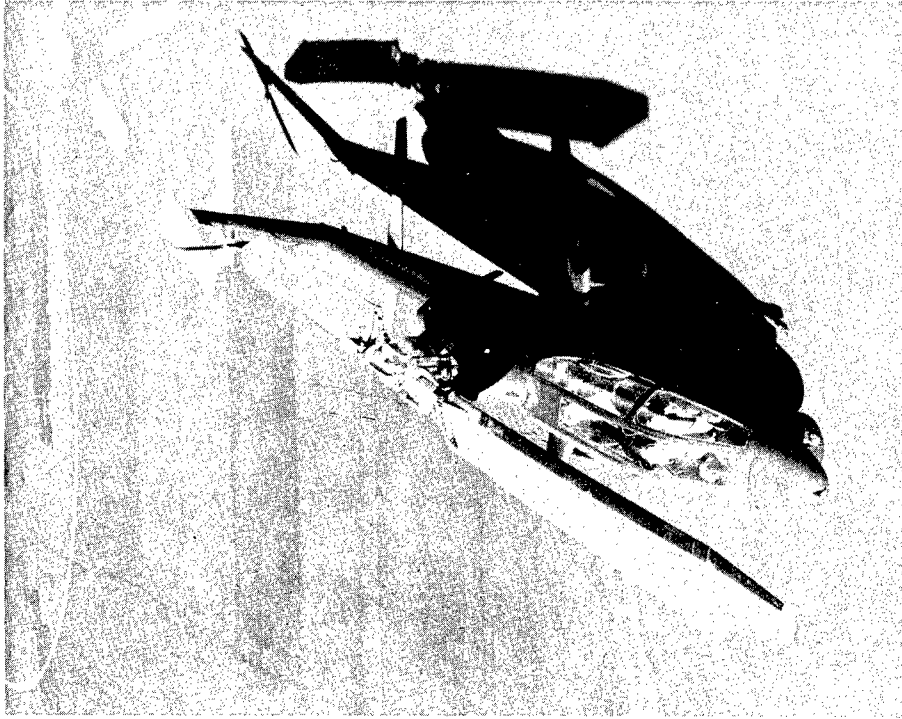
TITLE: COMPOSITE IMPROVED MAIN
ROTOR BLADES

COST: \$3,846,000

BENEFITS

PROJECT DEVELOPED AND TESTED A TDP FOR MASS PRODUCTION OF FILAMENT-WOUND ROTOR BLADES. IN ADDITION TO THE TDP, THE PROJECT PROVIDED TOOLING FOR FUTURE FABRICATION OF BLADES.

KAMAN AEROSPACE CORP. IS IMPLEMENTING THIS PROJECT THROUGH THEIR CONTRACT TO RETROFIT THE ENTIRE FLEET OF COBRA HELICOPTERS WITH COMPOSITE MAIN ROTOR BLADES. BENEFITS ARE COMBAT ORIENTED IMPROVEMENTS IN AIRCRAFT PERFORMANCE, SURVIVABILITY, MAINTAINABILITY, AND RELIABILITY.



COBRA HELICOPTER WITH
FILAMENT WOUND MAIN
ROTOR BLADE

DARCOM PRIOR YEAR MM&T IMPLEMENTATION

HOT ISOSTATIC PRESSING

EFFORT NO: 17X 8046

TITLE: SMALL COOLED AXIAL TURBINE
BLADE, VANE AND DISK
FABRICATION

COST: \$1,525,000

BENEFITS

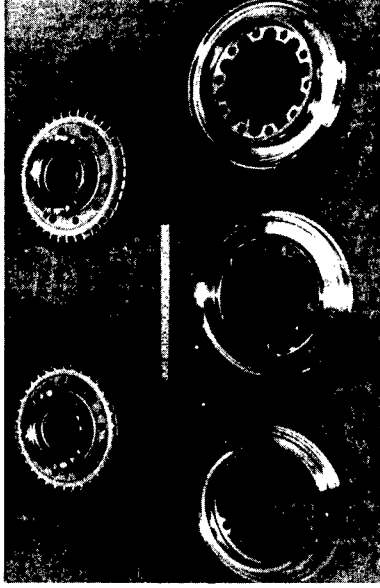
GENERAL ELECTRIC APPLIED HOT ISOSTATIC PRESSING (HIP) TO FORM TURBINE DISCS AND COOLING PLATES THAT REQUIRED A MINIMUM OF MACHINING.

HIPING ELIMINATES FORGING OF TURBINE DISKS AND COOLING PLATES.

IT REDUCES SUPERALLOY POWDER METAL QUANTITY BY 50 PERCENT.

THE AS-HIP RENE 95 PROCESS FOR TURBINE DISKS AND COOLING PLATES IS IN FULL PRODUCTION AT GENERAL ELECTRIC.

BASED ON CURRENT SAVINGS FROM USING THE PROCESS, GE ANTICIPATES AN AVERAGE SAVING OF APPROXIMATELY \$2 MILLIONS PER YEAR ON THE CURRENT T700 PRODUCTION ORDER.



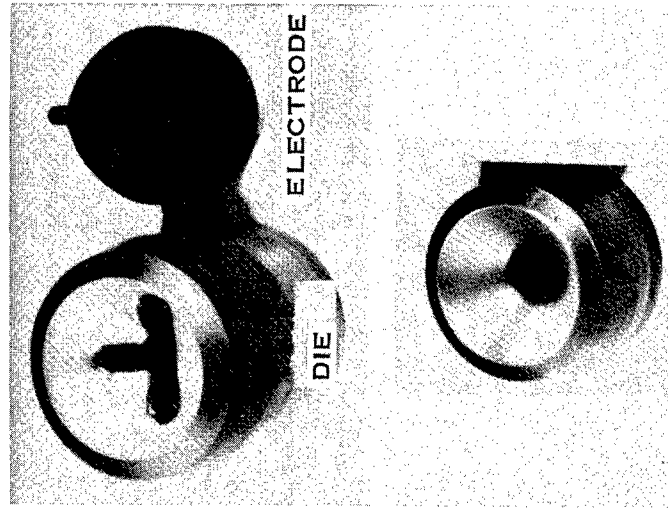
T700 DISKS AND COOLING
PLATES MACHINED FROM
AS-HIP PREFORMS

DARCOM PRIOR YEAR MM&T IMPLEMENTATION EXTRUSION DIES

EFFORT NO: 175 8154

TITLE: CADCAM OF EXTRUSION DIES FOR
ALUMINUM, TI, AND STEEL PARTS

COST: \$182,000



BENEFITS

DEVELOPED AN INTERACTIVE SYSTEM OF COMPUTER PROGRAMS FOR DESIGN AND MFG OF EXTRUSION DIES. UTILIZATION OF THIS SYSTEM PROVIDES FASTER DESIGN & MFG OF DIES, IMPROVED DIE TOLERANCES, AND IMPROVED YIELD VIA OPTIMUM EXTRUSION VARIABLES.

THE AIR FORCE MATERIALS LAB IS USING THE SYSTEM TO DESIGN AND GENERATE NC TAPES FOR ALL THEIR AL EXTRUSION DIES. THEY REPORT A \$10K PER YEAR SAVINGS. BECAUSE COPIES OF THE PROGRAMS WERE FURNISHED NUMEROUS CONTRACTORS, OTHER IMPLEMENTATION IS HIGHLY POSSIBLE BUT DIFFICULT TO TRACK.

EXTRUSION DIE

DARCOM PRIOR YEAR MM&T IMPLEMENTATION

EFFORT NO: 3 75 3157

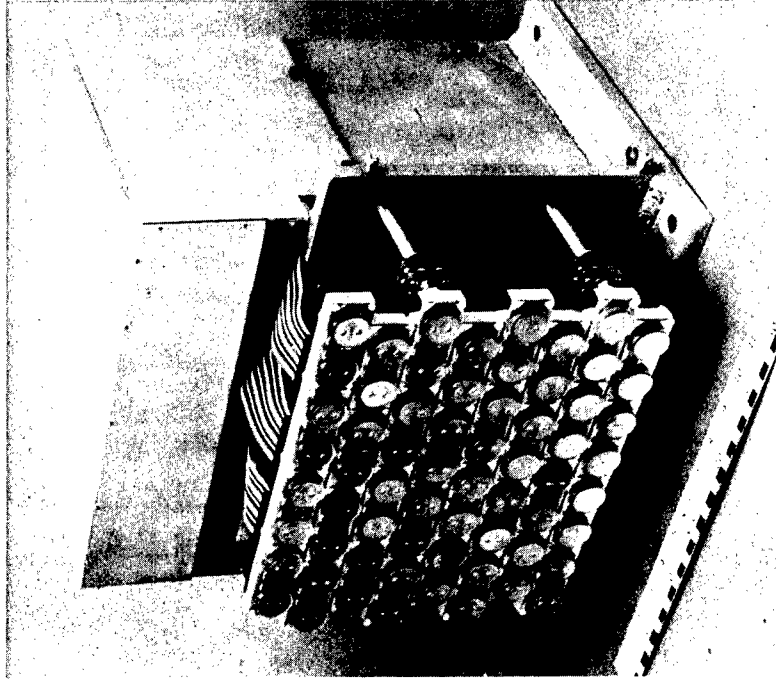
TITLE: PDN TECH FOR DIODE PHASE SHIFTER ELEMENTS

COST: \$650,000

BENEFITS

PROJECT DEVELOPED A HIGH RATE PRODUCTION METHOD FOR MANUFACTURING DIODE PHASE SHIFTER RADIATOR ELEMENTS BY A THICK FILM PROCESS IN LIEU OF A THIN FILM PROCESS IT ALSO INCORPORATED A DUAL INTEGRATED ELEMENT MODULE CONCEPT

THE MMT CONTRACTOR, HUGHES AIRCRAFT, TRANSFERRED THE TECHNOLOGY TO THEIR NEWPORT BEACH, CA DIVISION WHERE THE METHOD IS BEING USED IN PRODUCTION OF THE AN/TPG37 FIRE FINDER RADAR. HUGHES ESTIMATES A \$10,241K SAVINGS DURING THE 1978-82 TIMEFRAME. OTHER BENEFITS INCLUDE REDUCED WEIGHT AND INCREASED RELIABILITY. IMPLEMENTATION COST: \$200K



64 ELEMENT INTEGRATED SUBARRAY MODULE

DARCOM PRIOR YEAR MM&T IMPLEMENTATION ROCKET MOTOR PROPELLANTS

EFFORT NO: R 7X 3170

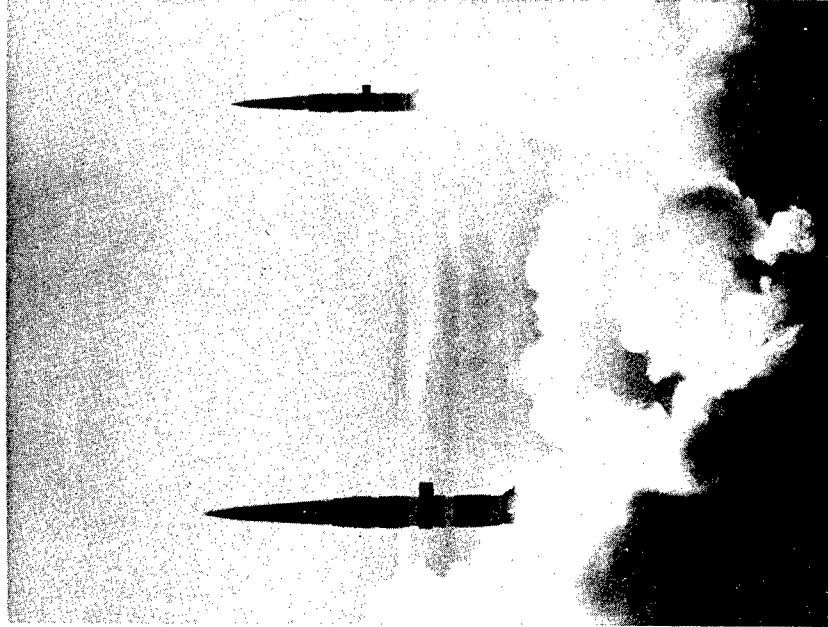
TITLE: REPLACEMENT OF TPH-8156
AND TPH-8159 PROPELLANT

COST: \$375,000

BENEFITS

IN 1974. COMMERCIAL SOURCES STOPPED PRODUCING TWO CURING AGENTS USED IN PROPELLANT FOR THE PERSHING ROCKET MOTORS. THIS PROJECT DETERMINED MIXING PROCEDURES FOR MANUFACTURING OF THE PROPELLANTS USING ALTERNATE CURING AGENTS.

LONGHORN AAP IS USING THE DEVELOPED PROCEDURES TO MANUFACTURE THE NEW PROPELLANTS FOR THE PERSHING MISSILE ALTHOUGH THE NEW PROPELLANTS EXHIBIT IMPROVED PERFORMANCE AND RELIABILITY, THE PRIMARY BENEFIT IS THE ABILITY TO PRODUCE A PROPELLANT FOR THE PERSHING.



PERSHING MISSILES

DARCOM PRIOR YEAR MM&T IMPLEMENTATION COMPUTERIZED PROCESS PLANNING

EFFORT NO: 3 7X 3232

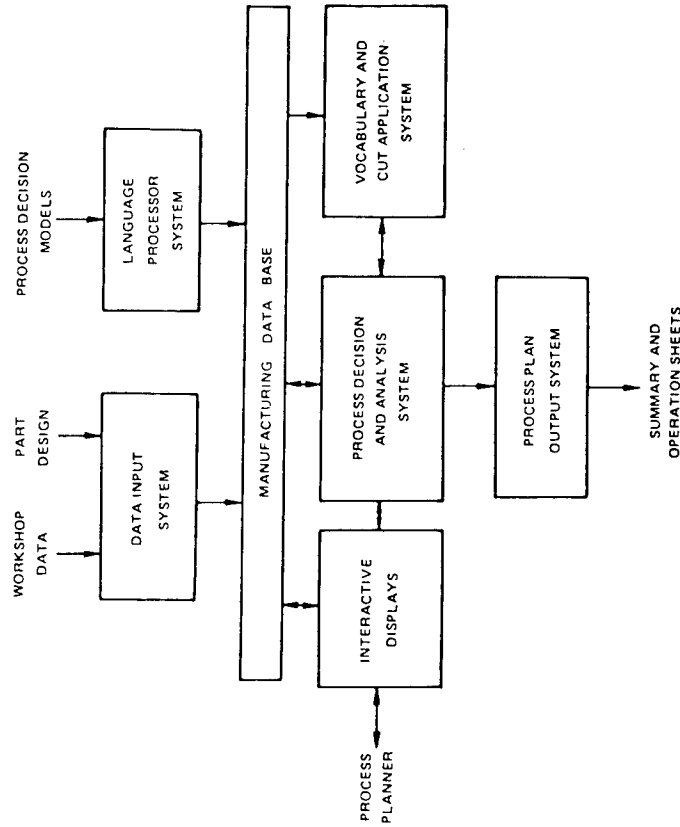
TITLE: COMPUTERIZED PRODUCTION
PROCESS PLANNING

COST: \$345,000

BENEFITS

PROJECT DEVELOPED A COMPUTERIZED PRODUCTION PROCESS PLANNING SYSTEM (CPPP) TO ASSIST PROCESS PLANNERS IN PLANNING THE FABRICATION OF CYLINDRICAL PARTS.

THE CPPP SYSTEM IS BEING USED BY HAMILTON STANDARD, PRATT & WHITNEY AND SIKORSKY. WHICH ARE ALL SUBSIDIARIES OF UNITED TECHNOLOGIES. APPROXIMATELY 50% OF THESE COMPANIES WORKLOAD IS FOR GOVERNMENT AGENCIES. HAMILTON STD ESTIMATES A 39% REDUCTION IN PROCESS PLANNING MANHOURS. OTHER BENEFITS INCLUDE PROCESS STANDARDIZATION AND MACHINE OPTIMIZATION.



CPPP SOFTWARE COMPONENTS

DARCOM PRIOR YEAR MM&T IMPLEMENTATION TOXIC HAZARDS

EFFORT NO: 5 7X 1248

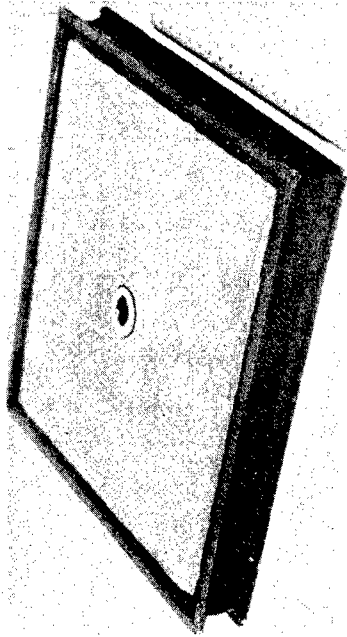
TITLE: EVALUATION OF EXHAUST
FILTER SYSTEM

COST: \$444,000

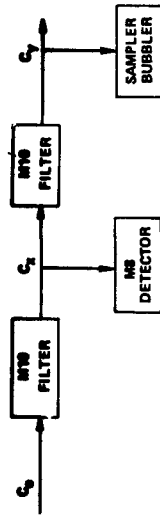
BENEFITS

THIS PROJECT EVALUATED SIX GAS FILTERS AND FOUND THEM SUITABLE FOR USE IN REDUCING TOXIC HAZARDS. THE PROJECT ALSO DETERMINED THAT A DUAL FILTER SYSTEM WITH AN AGENT DETECTOR BETWEEN THE FILTERS CAN INSURE THAT STACK EMISSIONS DO NOT EXCEED EPA REGULATIONS.

THE DUAL FILTER CONCEPT HAS BEEN INSTALLED AT THE CHEMICAL AGENT MUNITIONS DISPOSAL SYSTEM AT TOOLE ARMY DEPOT AND SEVERAL SMALL SCALE DEMIL OPERATIONS THROUGHOUT THE COUNTRY.



M10 GAS FILTER



DUAL FILTER SYSTEM
SCHEMATIC

DARCOM PRIOR YEAR MM&T IMPLEMENTATION GRENADE FILLING

EFFORT NO: 5 7X 1260

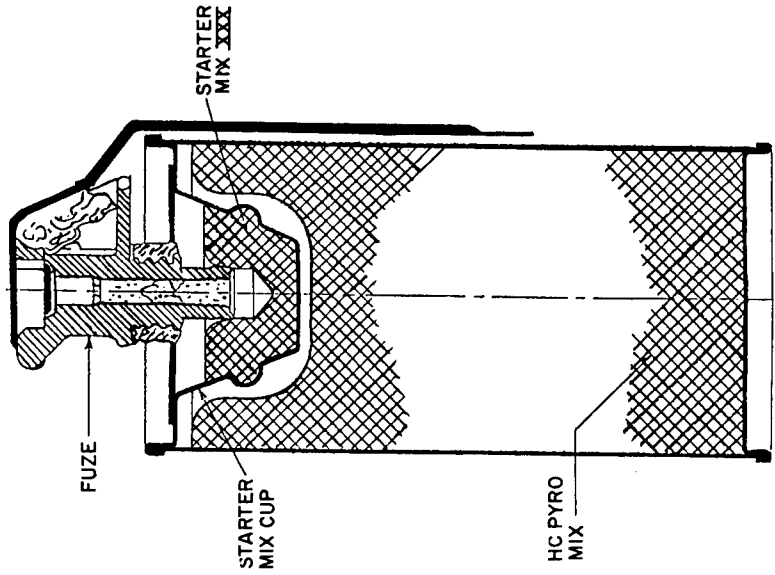
TITLE: AUTOMATED FORMING AND FILLING
OF STARTER CUP FOR M8 GRENADE

COST: \$105,000

BENEFITS

THIS EFFORT EVALUATED THE PRODUCTION OF A PREFORMED M8 GRENADE STARTER SLUG USING A TABLETING PRESS. THIS METHOD IS CURRENTLY BEING USED AT PINE BLUFF ARSENAL IN THE PRODUCTION OF M8 GRENADE STARTER MIX SLUGS. IT IS ALSO BEING UTILIZED TO MANUFACTURE STARTER MIX SLUGS FOR THE 105MM AND 155MM SMOKE CANISTERS.

THE BENEFIT IS AN IMPROVED PROCESS WHICH REDUCES MANPOWER BY 47% AND REDUCES COST OF THE END ITEM BY \$0.056 PER GRENADE. THE PROCESS ALSO IMPROVES SAFETY BY GREATLY REDUCING THE NUMBER OF PERSONNEL IN DIRECT CONTACT WITH A PYROTECHNIC MIX.



M8 GRENADE

DARCOM PRIOR YEAR MM&T IMPLEMENTATION CONTAMINANT MONITORS

EFFORT NO: 5 7X 1277

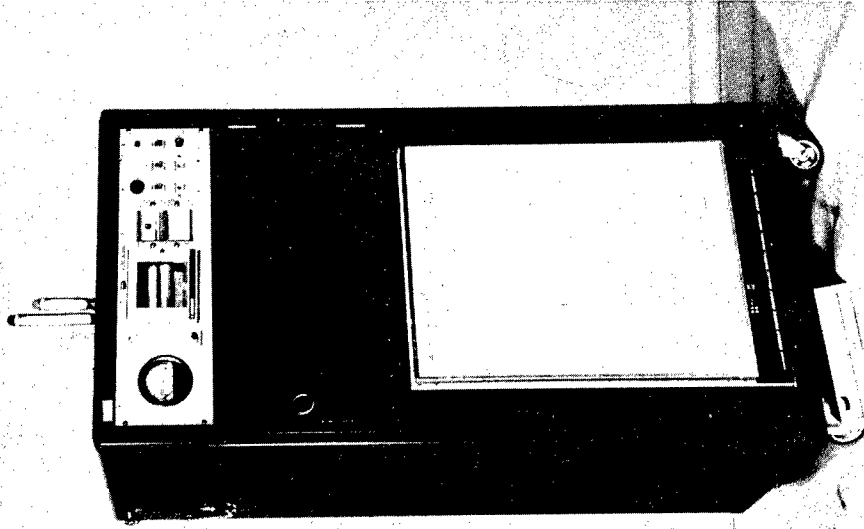
TITLE: HIGHLY SENSITIVE AND FAST
RESPONSE CONTAMINANT
MONITORS

COST: \$1,686,000

BENEFITS

THIS PROJECT DEVELOPED A REAL TIME
MONITOR ALARM FOR NERVE AGENTS
AND MODIFIED A COMMERCIAL SULFUR
ANALYZER TO MONITOR THE EMISSIONS
DURING THE DEMIL OF MUSTARD AGENT.

THESE MONITORS WERE INSTALLED IN
THE CHEMICAL DEMIL FACILITY AT
TOOLE ARMY DEPOT. THE MONITORS
PROVIDE IMPROVED SAFETY FOR PLANT
OPERATORS AND ASSIST PLANT
OPERATORS IN LOCATING FAILURES
OR MALFUNCTIONS.



REAL TIME MONITOR

DARCOM PRIOR YEAR MM&T IMPLEMENTATION FUZE ASSEMBLY AND INSPECTION

EFFORT NO: 5 7X 4032

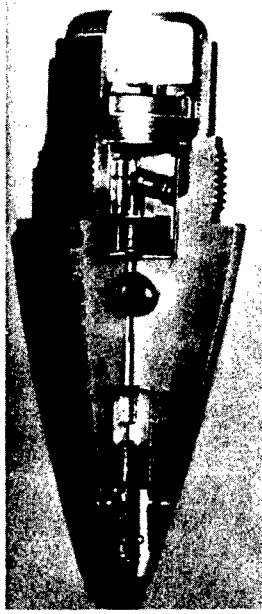
TITLE: AUTOMATED EQUIP FOR ASSEMBLY
OF M739 FUZE

COST: \$1,365,000

BENEFITS

PROJECT DEVELOPED A PROTOTYPE PRODUCTION LINE FOR AUTOMATED ASSEMBLY AND INSPECTION OF THE M739 FUZE.

THE PROTOTYPE PRODUCTION LINE WAS SUPPLEMENTED BY EQUIPMENT PURCHASED UNDER A FACILITIES PROJECT. THIS PRODUCTION LINE WAS PUT INTO USE AT HONEYWELL AND HAS PRODUCED OVER 2 MILLION M739 FUZES WITH A MINIMUM OF DEPENDENCE ON HUMAN JUDGEMENT AND SKILLED OPERATORS.



DARCOM PRIOR YEAR MM&T IMPLEMENTATION WASTE INCINERATION

EFFORT NO: 5 XX 4114/PO6

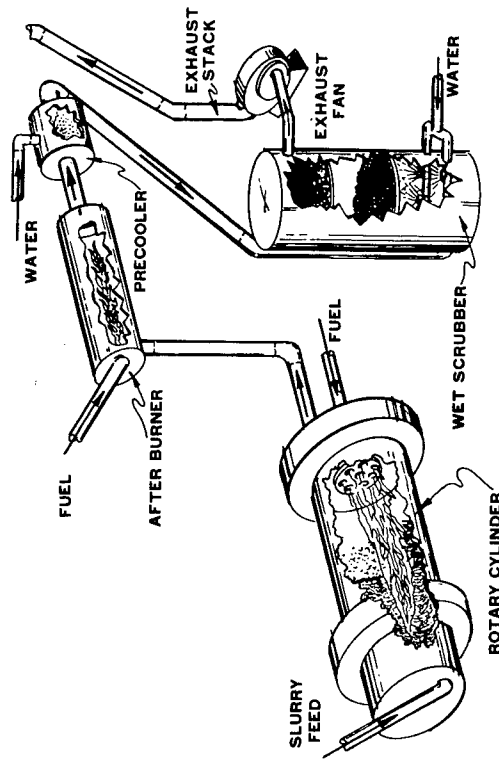
TITLE: PROPELLANT & EXPLOSIVE
WASTE INCINERATION

COST: \$2,450K

BENEFITS

THIS TASK DEVELOPED TWO ACCEPTABLE P&E INCINERATORS (ROTARY KILN & FLUIDIZED BED) TO REPLACE OPEN AIR BURNING. A ROTARY KILN IS INSTALLED AND OPERATING AT RADFORD AAP. INCINERATORS OF BOTH TYPES ARE SCHEDULED FOR INSTALLATION AT NUMEROUS AMMO PLANTS AND DEMIL FACILITIES.

ROTARY KILN SCHEMATIC



UTILIZATION OF THESE INCINERATORS HAS/WILL PROVIDE A SAFE METHOD FOR DISPOSAL OF P&E WASTE WITH A SIGNIFICANT REDUCTION IN POLLUTANTS.

DARCOM PRIOR YEAR MM&T IMPLEMENTATION DETONATION TRAPS

EFFORT NO: 5 7X 4134

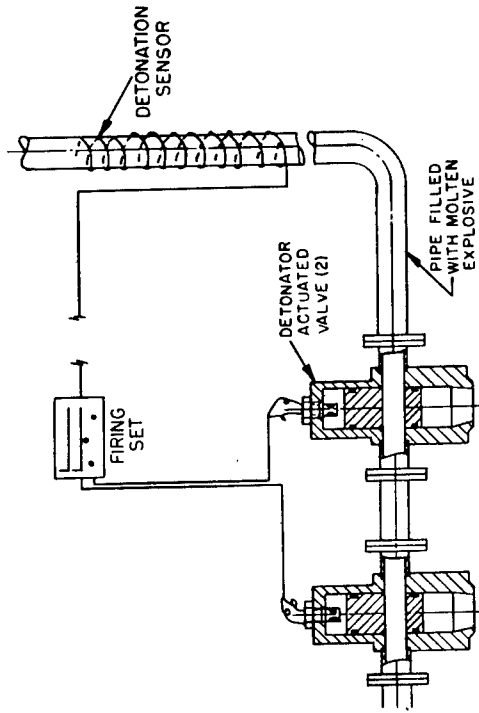
TITLE: DETONATION TRAPS FOR
IMPROVED SAFETY IN
MUNITIONS PLANTS

COST: \$623,000

BENEFITS

THIS PROJECT DEVELOPED DETONATION TRAPS WHICH CAN BE INSTALLED IN PIPELINES TO STOP PROPAGATION OF EXPLOSIVE DETONATIONS.

THESE TRAPS WERE INSTALLED IN THE ARRADCOM MELT-POUR PILOT PLANT BETWEEN THE MELT BUILDING AND THE LOADING BUILDING. IN THE EVENT OF AN EXPLOSION, THESE TRAPS WILL MINIMIZE THE LOSSES BY PREVENTING PROPAGATION FROM ONE BUILDING TO ANOTHER THROUGH THE PIPELINES.



DETONATION TRAP CONCEPT

DARCOM PRIOR YEAR MM&T IMPLEMENTATION EXPLOSIVE RECOVERY

EFFORT NO: 5 74 4205

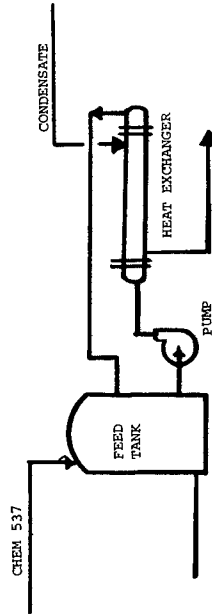
TITLE: PROCESSING SPENT ACID FROM
RDX/HMX REACTION FOR
RECOVERY OF EXPLOSIVES

COST: \$70,000

BENEFITS

THIS PROJECT INSTALLED A HEATING AND CIRCULATING LOOP ONTO THE PRIMARY EVAPORATOR FEED TANK IN THE SPENT ACID RECOVERY PROCESS AT HOLSTON AAP.

THIS HEAT EXCHANGER INCREASED THE SOLUBILITY OF RDX/HMX IN THE SPENT ACID, THUS DECREASING THE EXPLOSIVE LOAD LIMIT OF THE LINE. ADDED BENEFITS INCLUDE \$11,000/YEAR STEAM COST SAVINGS FROM RECOVERING CONDENSATE. ALSO, THE HOT FEED PREVENTS BUILDUP OF CRYSTALLIZED RDX ON PIPE WALLS.



**PRIMARY EVAPORATOR
FEED TANK**

DARCOM PRIOR YEAR MM&T ACCOMPLISHMENT ARTILLERY SHELL BANDING

EFFORT NO: 5 73 6522

TITLE: COMPUTER MONITOR OF ARTILLERY
SHELL BAND WELDING BY CLOSED
LOOP TECHNIQUES

COST: \$358,000

BENEFITS

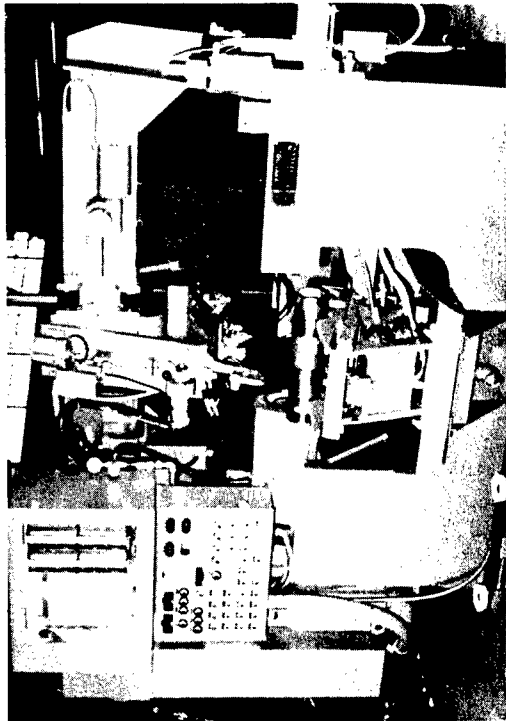
PROJECT ADAPTED A MINICOMPUTER AND
VARIOUS SENSING DEVICES TO WELDING
EQUIPMENT FOR DEPOSITING NONFERROUS
OVERLAYS.

THIS EQUIPMENT PLUS FUTURE GENERA-
TIONS OF THIS EQUIPMENT HAS BEEN
USED AT VARIOUS METAL PARTS
FACILITIES. BENEFITS ARE AS FOLLOWS:

- REQUIRES LESS SKILLED OPERATORS
- 50% INCREASE IN YIELD OVER PRIOR METHODS
- REDUCED REJECT RATE FROM 11% TO 2%

IMPLEMENTATION

<u>LOCATION</u>	<u>ITEMS SUPPORTED</u>
SCRANTON APP	M509
CHAMBERLAIN MFG New Bedford, MA	M483
Waterloo, IA	M329
NORRIS INDUSTRIES	M483, M509, M549
LOUISIANA AAP	M483



NEW WELDING EQUIPMENT

DARCOM PRIOR YEAR MM&T IMPLEMENTATION SHOP DATA COLLECTION

EFFORT NO: 6 7X 7248

TITLE: IMPROVED MFG CONTROL
THROUGH DATA AUTOMATION

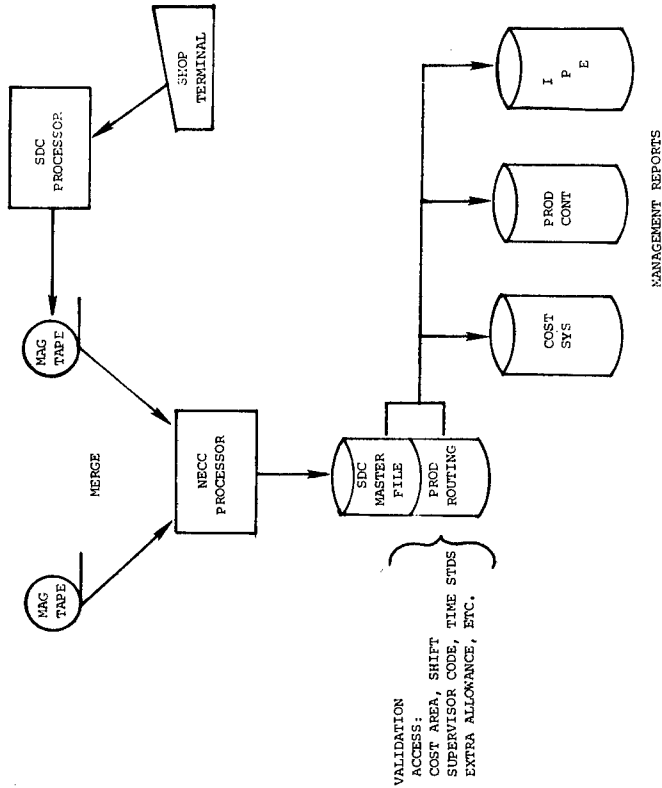
COST: \$396,000

BENEFITS

THIS PROJECT DEVELOPED, INSTALLED, AND IMPLEMENTED AN AUTOMATED SHOP DATA COLLECTION (SDC) SYSTEM AT WATERLIET ARSENAL. ALL PRODUCTION REPORTING BY SHOP LABOR IS ACCOMPLISHED THROUGH THIS SYSTEM. IN ADDITION, THE PROJECT DEVELOPED A WORKLOAD FORECASTING SYSTEM AND ESTABLISHED A COMMON COMPUTER DATA BASE FOR BILL OF MATERIALS AND PRODUCTION ROUTING.

USING THIS SYSTEM HAS INCREASED PRODUCTIVITY BY PROVIDING MORE ACCURATE AND TIMELY REPORTS TO SHOP MANAGERS. IN ADDITION, HARD SAVINGS WERE OBTAINED FROM THE ELIMINATION OF TIME CLERKS AND KEYPUNCH REQUIREMENTS. SAVINGS ESTIMATED AT \$176K PER YEAR.

SDC SYSTEM FLOW



DARCOM PRIOR YEAR MM&T IMPLEMENTATION

EPOXY RESIN MOLDS

EFFORT NO: 6 73 7305

TITLE: RESIN BONDED MOLD & DIE
.PRODUCTION TECHNOLOGY

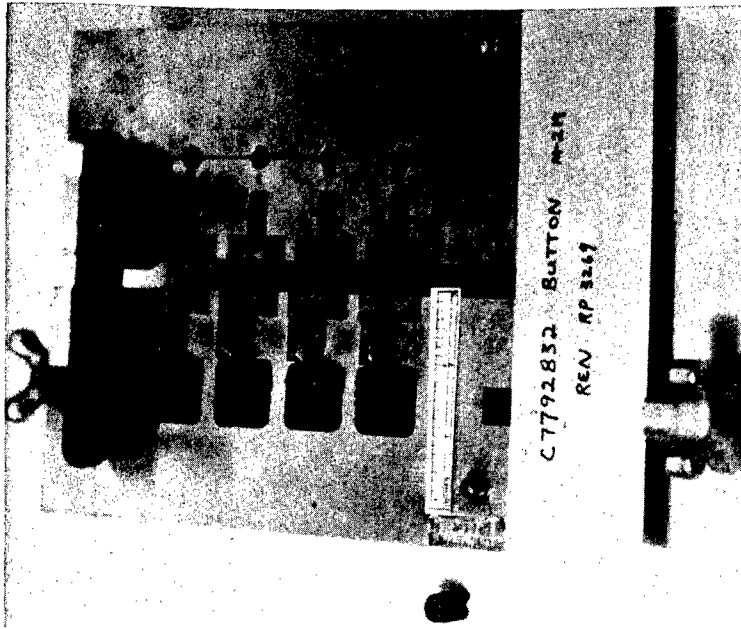
COST: \$35,000

BENEFITS

THIS PROJECT INVESTIGATED THE TECHNOLOGY REQUIRED TO PRODUCE EPOXY RESIN MOLDS FOR SHORT PRODUCTION RUNS OF (1) WAX INVESTMENT PATTERNS, (2) PLASTIC PARTS, AND (3) RUBBER PARTS.

RESIN BONDED MOLDS FOR PRODUCING SMALL INVESTMENT CASTING WAX MOLDS WAS INTRODUCED AT ROCK ISLAND

ARSENAL AN AVERAGE SAVINGS OF \$21,000 PER YEAR HAS ACCRUED FROM USING THIS PROCESS.



EPOXY MOLD, INVESTMENT WAX PATTERN AND CAST COMPONENT FOR BUTTON (M219)

DARCOM PRIOR YEAR MM&T IMPLEMENTATION HORIZONTAL QUENCHING

EFFORT NO: 6 74 7481

TITLE: HORIZONTAL SPRAY QUENCHING
FOR HEAT TREATMENT OF
CANNON TUBES

COST: \$100,000

BENEFITS

THIS PROJECT DEVELOPED A HORIZONTAL SPRAY METHOD FOR QUENCHING CANNON TUBES. THIS ELIMINATED THE REQUIREMENT FOR LARGE VERTICAL QUENCH TANKS WHICH COULD ONLY BE CONSTRUCTED WITH DEEP PITS OR HIGH BAYS.

A PRODUCTION SIZE HORIZONTAL SPRAY QUENCHING SYSTEM WAS PURCHASED UNDER A MODERNIZATION EFFORT AT WATERVLIET ARSENAL. THIS EQUIPMENT INCREASES GUN TUBE QUALITY BY REDUCING THE VARIABILITY OF YIELD STRENGTH IN THE TUBE. THE SYSTEM SAVES OVER \$1.3M PER YEAR DUE TO INCREASED PRODUCTIVITY IN THE HEAT TREAT CYCLE.



HORIZONTAL QUENCHING
SYSTEM

DARCOM PRIOR YEAR MM&T IMPLEMENTATION AUTOMATIC DRAFTING

EFFORT NO: 6 74 7484

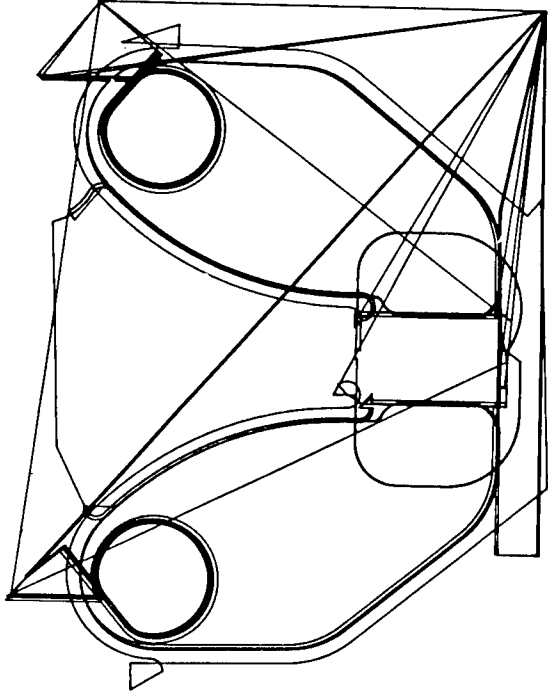
TITLE: APPLICATION OF
AUTOMATIC DRAFTING MACHINE

COST: \$100,000

BENEFITS

THIS PROJECT EXPANDED THE CAPABILITIES OF A PREVIOUSLY PURCHASED AUTOMATIC DRAFTING MACHINE.

THE PRIMARY BENEFIT WAS THE ABILITY TO VERIFY AND CORRECT N/C TAPES BY SIMULATION ON THE DRAFTING MACHINE RATHER THAN USING THE ACTUAL N/C MACHINE. THE SIMULATION IS A CONSIDERABLY FASTER AND LESS EXPENSIVE METHOD. REDUCTIONS IN ENGINEERING DESIGN, PROGRAMMING, DIRECT LABOR, AND N/C MACHINE TIME HAVE BEEN EXPERIENCED.



N/C VERIFICATION - CENTERLINE
OF CUTTING TOOL PATH.

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