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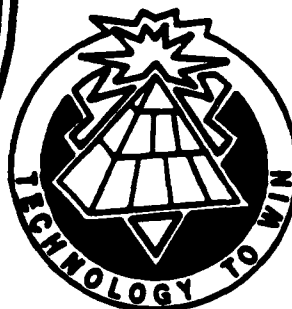
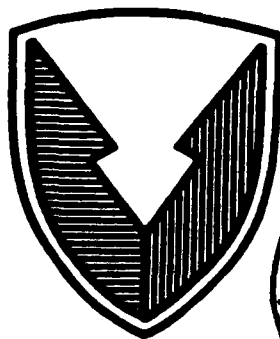
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PROCEEDINGS

for the

**ADVANCE PLANNING
BRIEFING FOR INDUSTRY**

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JUL 12 1990
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**US ARMY
LABORATORY COMMAND**
HARRY DIAMOND LABORATORIES

at
U.S. Army Adelphi Laboratory Center
Adelphi, Maryland
23-24 January 1990

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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6c. ADDRESS (City, State, and ZIP Code) 2800 POWDER MILL ROAD ADELPHI, MD 20783-1197			7b. ADDRESS (City, State, and ZIP Code)		
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13a. TYPE OF REPORT FINAL		13b. TIME COVERED FROM 900123 TO 900124		14. DATE OF REPORT (Year, Month, Day) 900124	
15. PAGE COUNT 337					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	Advanced Field Artillery System, Artificial Intelligence, Acousto-Optic, APBI-Advance Planning Briefing for Industry, APCP-Army Potential Contractor Program (see continuance)		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) The objective of the Advance Planning Briefing for Industry (APBI) was to: a. Present technologies in which the U.S. Army Laboratory Command (LABCOM) and Harry Diamond Laboratories (HDL) have interest in and are planning to pursue for the mid- and long-term. b. Show the private sector a preview in order to assure that industry research and development investments coincide with the needs of the Army. HDL performs and provides basic and applied research, explanatory and advanced development, technology leadership and evaluation and initial procurement to support the following mission areas: Nuclear Survivability, High-Power Microwave Survivability and Source Technology, Electronic Fuzing and Smart Munitions, Radar Technology, Anti-Radiation Missile Countermeasures and Information/Signal Processing. <i>Key words.</i> The proceedings for the APBI provides advance planning information in the following areas: Global Position System, Fuzing, Battlefield Automation, (see continuance)					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL MELVYN J. SHICHTMAN			22b. TELEPHONE (Include Area Code) (202)394-3880		22c. OFFICE SYMBOL AMSLC-CM

18. SUBJECT TERMS - continued

ATACMS - Army TACTical Missile System
Broad Agency Announcement
Electronic Countermeasures
Electronic Counter-Countermeasures
EMP - ElectroMagnetic Pulse
Electronic Safing and Army Guidance Integrated Fuzing
Global Positioning System
HDL - Harry Diamond Laboratories
LABCOM
LB/TS - Large Blast/Thermal Simulator
Liquid Crystal Display
MMIC - Monolithic Millimeter wave Integrated Circuit
Multi-Option Fuze for Artillery
NSAT - Nuclear Survivability Assessment Team
OEIC - OptoElectronic Integrated Circuits
RDTE
RSTA - Reconnaissance, surveillance and Target Acquisition
SADBU - Small and Disadvantaged Business Utilization
SAR - Synthetic Aperture Radar
Standing Acoustic Wave
TILO - Technical and Industrial Liaison Office

19. ABSTRACT - continued

Nuclear Survivability and Nuclear Weapons Effects Technology,
Radiation Simulation, Domestic Technology Transfer, Radar
Technology, Signal Processing Technology, Automated Assembly of
Electronics Circuits, LABCOM Small Business Programs and
Industrial Liaison Programs.



DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY LABORATORY COMMAND
2800 POWDER MILL RD., ADELPHI, MD 20783-1145

REPLY TO
ATTENTION OF

AMSLC-CM (70-35)

5 July 1990

MEMORANDUM FOR Administrator, Defense Technical Information
Center, ATTN: DTIC-FDAC, Building 5, Cameron
Station, Alexandria, VA 22304-6145

SUBJECT: Advance Planning Briefing for Industry Proceedings.

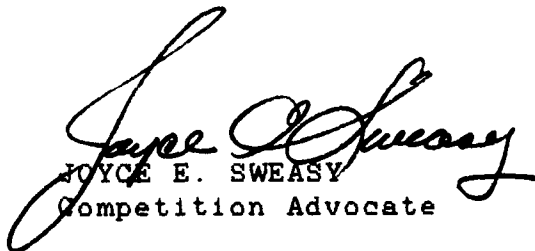
1. Enclosed are two (2) copies of the Proceedings for the
U.S. Army Laboratory Command (LABCOM), Harry Diamond Laboratories
(HDL) Advance Planning Briefing for Industry (APBI), held at the
Adelphi Laboratory Center on 23-24 January 1990. This publication
is unclassified and approved for public release; distribution
unlimited.

2. Point of contact is Mr. Melvyn J. Shichtman, LABCOM Technical
and Industrial Liaison Officer, (202) 394-3883.

FOR THE COMMANDER:

2 Encls

1. 2 copies of proceedings
2. DD Form 1473


JOYCE E. SWEASY
Competition Advocate

CF (wo/encls):

AMSLC-PA (Ms. Singleton)
AMSLC-MI-SS (Ms. Richeson)

SLCHD-D-PA (Ms. Coleman)
SLCHD-PO-P (Mr. Polimadei)

Headquarters, Laboratory Command
and
Harry Diamond Laboratories
present

**1990 Advance Planning Briefing
for Industry (APBI)**



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Melvyn J. Shichtman,
Technical and Industrial
Liaison Officer,
Headquarters, Laboratory Command

and

Mary S. Binseel
and
Dorothy J. Aldrich,
Plans Branch,
Harry Diamond Laboratories

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American Defense
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DEPARTMENT OF THE ARMY
UNITED STATES ARMY LABORATORY COMMAND
HARRY DIAMOND LABORATORIES
2800 POWDER MILL RD., ADELPHI, MD 20783-1197

REPLY TO
ATTENTION OF

Office of the Director

Ladies and Gentlemen:

I am excited about the opportunity the next two days will bring to everyone participating in this session of advance planning.

The future is full of challenges for all of us who are concerned with the defense of our nation. The recent events around the world have kept us on the edges of our seats, wondering what will happen next. In many ways, it's a whole new world out there, and we are going to be tested on our flexibility, and on the vigor with which we respond to these new challenges.

I have immense confidence, not only in the talents and dedication of the people of Harry Diamond Laboratories and all of Laboratory Command, but also in the abilities of our counterparts in the private sector.

As we exchange information during these days, I hope that the synergism created here will inspire all of us to rededicate ourselves to ensuring that our armed forces have the highest quality equipment. Even with the reduced tensions that appear to lie ahead, the people who have committed themselves to protecting our country and our world deserve the best we can give them.

Welcome to all of you. Harry Diamond Laboratories is pleased to host these two days, and we look forward to a pleasant and productive interchange and constructive future relationships with you.


JERRY L. REED
Director

ACKNOWLEDGMENTS

The organizers of this Advance Planning Briefing for Industry wish to acknowledge and thank the following personnel:

Ms. Jackie Richeson, LABCOM Office of the Deputy Chief of Staff for Intelligence, Security/Counterintelligence Division, for her advice and assistance regarding conference security concerns;

Ms. Sherrie Curtis and Mrs. Maryann Biggins, ISA Physical Security Office, for their advice and assistance regarding visitor control;

Ms. Marian Singleton, LABCOM Public Affairs Office, for her advice and assistance in clearing the LABCOM briefings for public release; and

Ms. Cathy Coleman, HDL Public Affairs Officer, for her advice and assistance in clearing the HDL briefings for public release.

Further, the organizers of this event wish to thank MG Jerry Harrison, Commander, LABCOM; Mr. Richard Vitali, LABCOM Director of Corporate Laboratories; Mr. Jerry Reed, Director, Harry Diamond Laboratories; Dr. John Scully, Deputy Director, Harry Diamond Laboratories; and Dr. Joseph Sattler, Chief Scientist, Harry Diamond Laboratories for their support which ensured the success of the Advance Planning Briefing for Industry and to Mr. David Overman, Chief, Mechanical Systems Branch, Harry Diamond Laboratories, and Mr. Raymond Femenias, Plans Branch, Harry Diamond Laboratories for their assistance in the initial planning phases of this event.

GLOSSARY OF ACRONYMS

A/C - Aircraft

AFAS - Advanced Field Artillery System

AI - Artificial Intelligence

AMC - Army Materiel Command

AMCCOM - Armaments, Munitions and Chemical COMmand

AO - Acousto-Optic

APBI - Advance Planning Briefing for Industry

APCP - Army Potential Contractor Program

ASL - Atmospheric Sciences Laboratory

ATACMS - Army TACTical Missile System

ATM - Anti-Tactical Missile

BAA - Broad Agency Announcement

BRL - Ballistic Research Laboratory

CBD - Commerce Business Daily

CM - Configuration Management

DSREDS - Digital Storage and Retrieval Engineering Data System

DLA - Defense Logistics Agency

DNA - Defense Nuclear Agency

DSSP - Defense Standards and Specifications Program

DTIC - Defense Technical Information Center

ECM - Electronic Countermeasures

ECCM - Electronic Counter-Countermeasures

EMP - ElectroMagnetic Pulse

ERA II - Extended Range ARtillery Projectile II

ESA - Electronic Safing and Arming

ETDL - Electronic Technology and Devices Laboratory

FAADS-LOS-F-H - Forward Area Air Defense - Line Of Sight -

Forward - Heavy

GIF - Guidance Integrated Fuzing

GPS - Global Positioning System

HDL - Harry Diamond Laboratories

HEL - Human Engineering Laboratory

HEMP - High altitude ElectroMagnetic Pulse

HIMADS - High to Medium Altitude Air Defense System

ILS - Integrated Logistic Support

INR - Initial Nuclear Radiation

IRAD - Independent Research And Development

LABCOM - Laboratory Command

LB/TS - Large Blast/Thermal Simulator

LCD - Liquid Crystal Display

LICRS - Low Intensity Conflict Rocket System

LOS - Line Of Sight

LPI - Low Probability of Intercept

LSAA - Long-Standoff Anti-Armor

MIL-STD - Military Standard

MLRS - Multiple Launch Rocket System

MMAAWS - Multimode Antiarmor Weapon System

MMIC - Monolithic Millimeter wave Integrated Circuit

MMT - Manufacturing Methods and Technology

MOB - MOBilization

MOFA - Multi-Option Fuze for Artillery

MSAM - Medium range Surface to Air Missile

NAVAID - NAVigational AID

NC - Numerical Control

NDI - Non-Developmental Item

NSAT - Nuclear Survivability Assessment Team

OEIC - OptoElectronic Integrated Circuits

PM-AAWS-M - Program Manager, Advanced Antitank Weapon Systems -
Medium

PM-AFAS - Program Manager, Advanced Field Artillery System

PM-TOW - Program Manager, Tube launched Optically tracked Wire
guided missile

POC - Point of Contact

RDTE - Research, Development, Test and Evaluation

RSTA - Reconnaissance, Surveillance and Target Acquisition

SADBU - Small And Disadvantaged Business Utilization

SAR - Synthetic Aperture Radar

SAW - Standing Acoustic Wave

SLMs - Surface Launched Missiles

TACAWS - The Army Counter-Air Weapon System

TDP - Technical Data Package

TILO - Technical and Industrial Liaison Office

TOD - Technical Objective Documents

TSR - Tactical Source Region

UAV - Unmanned Aerial Vehicle

UGT - UnderGround nuclear Test

AGENDA

TUESDAY, 23 JANUARY 1990

0700- Late Registration and Security Check-in.
0830 Lobby - Building 205, U.S. Army Adelphi Laboratory Center, 2800 Powder Mill Road, Adelphi, Maryland

OPENING SESSION

0830 Administrative Remarks, Melvyn J. Shichtman, Technical and Industrial Liaison Officer, U.S. Army Laboratory Command
0840 Security Considerations, Office of the Deputy Chief of Staff for Intelligence
0845 Welcome Remarks, Major General Jerry C. Harrison, Commander, U.S. Army Laboratory Command
0855 Symposium Purpose and Overview, Richard Vitali, Director of Corporate Laboratories
0905 User Requirements, James F. Fox, Scientific Advisor, Combined Arms Combat Development Activity, U.S. Army Training and Doctrine Command
1000 Overview of Harry Diamond Laboratories, Jerry L. Reed, Director, Harry Diamond Laboratories
1030 Break

SESSION I TECHNOLOGY APPLICATIONS

Session Chairman:

Philip F. Ingersoll

Director, Technology Applications Laboratory

1100 Introduction, Philip F. Ingersoll, Session Chairman
1105 Global Positioning System, John S. Eicke, Electronics Engineer, Tactical Systems Branch
1135 Fuzing, William L. Konick, Fuzing Manager
1210 Battlefield Automation, Dr. Philip J. Emmerman, Chief, Advanced Sensor Systems
1240 Lunch, Cafeteria

SESSION II NUCLEAR SURVIVABILITY

Session Chairman:

Dr. John C. Ingram

Deputy Director, Nuclear Survivability Laboratory

1350 Overview, Dr. John C. Ingram, Session Chairman
1405 Nuclear Survivability Technology, James H. Gwaltney, Chief, Nuclear Survivability Program Office
 • High-Altitude EMP
 • Blast/Thermal Radiation
 • Tactical Source Region
1505 Break
1540 Nuclear Weapons Effects Hardening Technology, John J. Corrigan, Nuclear Survivability Program Office
 • Hardness Assurance/Hardness Maintenance
 • Nondevelopmental Items (NDI)
 • Defense Standards and Specifications Program
 • Large Blast/Thermal Simulator

1635 Nuclear Survivability Assessments, Roland A. Polimader, Nuclear Survivability Program Office

- Nuclear Effects Support Team
- Nuclear Survivability Assessment Team

1655 Aurora/Radiation Simulation Technology, Dr. Forrest J. Agee, Chief, Simulation Technology Branch

1705 Adjourn

1800- Reception, Holiday Inn - Calvert, 4805 Powder Mill Road, Beltsville, MD

WEDNESDAY, 24 JANUARY 1990

0730- Security Check-in, Lobby - Building 205, U.S. Army Adelphi Laboratory Center, 2800 Powder Mill Rd., Adelphi, MD

0830 Opening Session

0830 Administrative Remarks, Melvyn J. Shichtman, Technical and Industrial Liaison Officer, U.S. Army Laboratory Command

0835 Domestic Technology Transfer Opportunities, Clifford E. Lanham, Army Domestic Technology Transfer Manager

SESSION III

TARGET SENSORS AND SIGNAL PROCESSING

Session Chairman:

Peter B. Johnson

Director, Target Sensors and Signal Processing Laboratory

0900 Introduction, Peter B. Johnson, Session Chairman
0905 Radar Technology, John M. David, Chief, Radar Branch
0935 Fuzing Technology, Dr. Z. G. Sztankay, Chief, Sensor Physics Branch
1005 Signal Processing Technology, Dr. John M. Pellegrino, Chief, Optical Processing Technology Branch
1035 Break

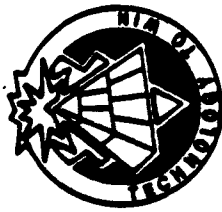
SESSION IV ENGINEERING AND TECHNICAL SUPPORT

Session Chairman:

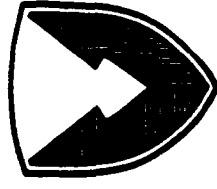
Ira R. Marcus

Associate Director, Engineering and Technical Support Division

1100 Introduction, Ira R. Marcus, Session Chairman
1105 Automated Assembly of Electronics Circuits, George K. Lucey, Jr., Chief, Systems Engineering Branch
1135 U.S. Army Laboratory Command Small Business Programs, Thomas K. Rogers, Chief Small and Disadvantaged Business office
1205 Industrial Liaison Programs, Melvyn J. Shichtman, Technical and Industrial Liaison Officer, U.S. Army Laboratory Command
1230 Symposium Wrap-Up, Jerry L. Reed, Director, Harry Diamond Laboratories
1235 Adjourn



HARRY DIAMOND LABORATORIES



**U. S. ARMY
LABORATORY COMMAND**

OVERVIEW OF HARRY DIAMOND LABORATORIES

**ADVANCE PLANNING BRIEFING FOR INDUSTRY
23 JANUARY 1990**

PRESENTED BY

**MR. JERRY L. REED
DIRECTOR**

HARRY DIAMOND LABORATORIES
2800 Powder Mill Road
Adelphi, Maryland 20783-1197

OFFICE OF THE DIRECTOR

DIRECTOR	X1281
Mr. J. Flood	
Secretary	
SLCHD-D	X1282
Mount Pleasant	
SLCHD-DD	X1288
SLCHD-CE	X1289
Mount Pleasant	
SLCHD-D-DA	X1291
PUBLIC AFFAIRS OFFICE	
Colin D. Coleman	

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SLCHD-NW X2269
William L. Yeard, Director
Dr. John C. Ingram, Deputy Director (SLCHD-NW)

**Fordham Hunter Marine
Branch
Dr. Stewart Moore
CL 6202-104-70 12200**

Peptide Effects Payable
Branch
Dr. James M. Mackenzie
8,228-475-27 12-1-69

Louis J. Jasper
Branch
SLAND-100-03 10010

THE / GOSPEL GROUP
Joseph J. Nappa
SLC800-498-13 NEWS

**NUC SURVIVABILITY
PROGRAM OFFICE
James M. Gurelney,
SLCHS-NW-P
X2086**

TECHNOLOGY APPLICATIONS LABORATORY
K2400
MCHD-TA

Philip F. Ingersoll, Director
Joseph W. Miller, Jr., Deputy Director

**Advanced Sensors System
Branch**
Dr. Philip J. Ennen
SLCWD-7A-A3 12000

**Trusted Systems
Branch
John M. Miller
BLOND-1A-75 12929**

Engineering Technology
Branch
John Q. Wood, Jr.
SLCND-TA-ET EBN77

**Systems Engineering
Branch**
William H. Webster Jr., Asst
SLCWD-1A-SE H7708

**FAST/DEMO
PROGRAM OFFICE
Dr. Carl J. Campagnolo
SLCHD-TA-FO
X3103**

TECHNICAL SUPPORT LABORATORY
ALCHD-78
Dr. R. Marcus, Director

**ENGINEERING
SUPPORT OFFICE**
John M. Martech

Electronics
Testbenches **Probed**

Technology Trend

SIGNATURE

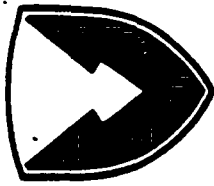
Approved: *[Signature]*
Jerry L. Reed, Director

As of 31 January 1990



OVERVIEW

U. S. ARMY
LABORATORY COMMAND

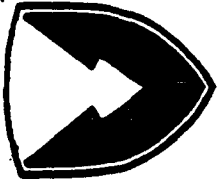


HARRY DIAMOND LABORATORIES

- Organization
- Mission
- FY 90 Funding Profile

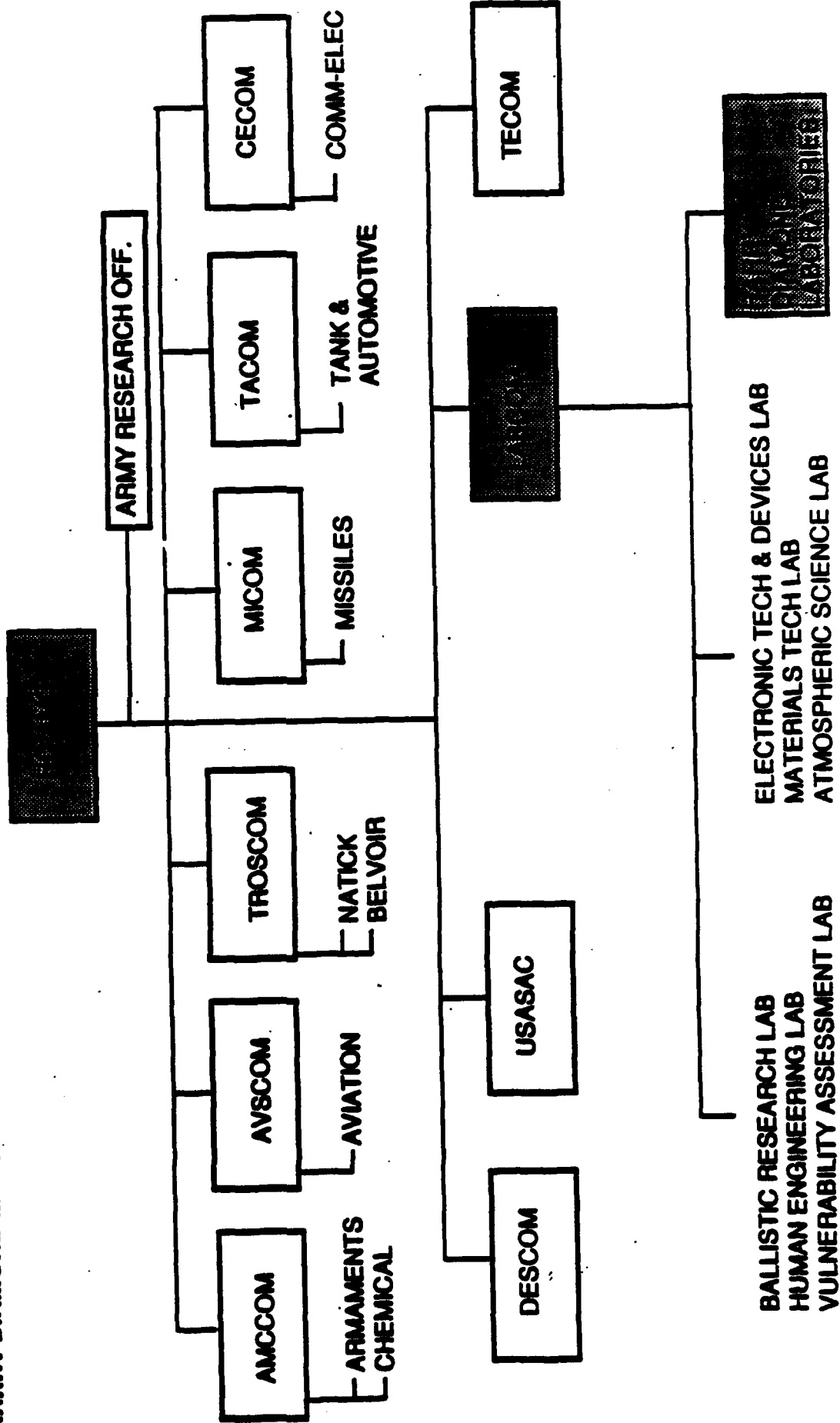


AMC RDA ORGANIZATION



U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES





LABCOM CORPORATE LABORATORIES

U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

**Atmospheric
Sciences Lab**
*Weather measurement
Atmospheric effects*

Ballistic Research Lab
*Lethality
Survivability
Vulnerability/lethality
assessment*

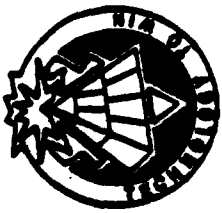
**Electronics Technology
& Devices Lab**
*Electronic devices
Power sources*

**Harry
Diamond
Labs**

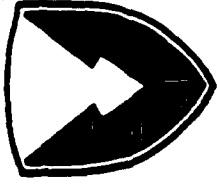
**Human
Engineering Lab**
*Human factors
Robotics*

**Materials
Technology Lab**
Multi-disciplinary materials

**Vulnerability
Assessment Lab**
Electronic warfare

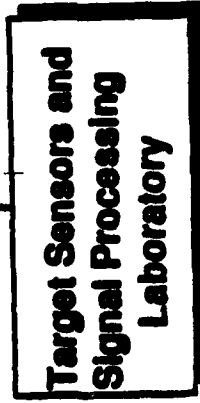
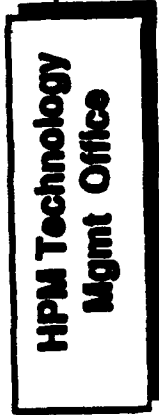
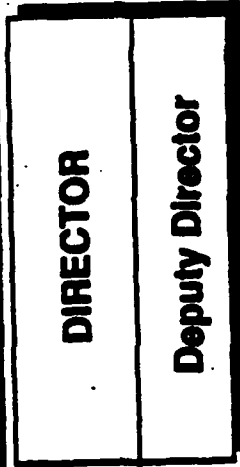


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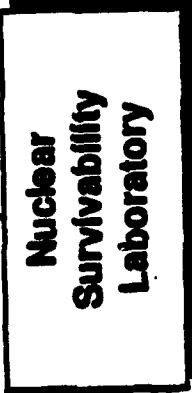


U. S. ARMY
LABORATORY COMMAND

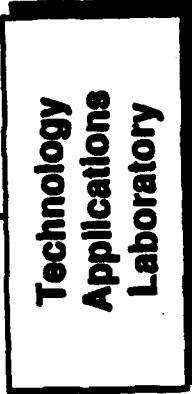
HARRY DIAMOND LABORATORIES



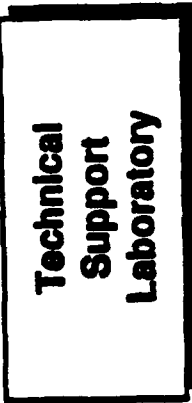
- Anti-Radiation Missile Countermeasures
- Physics Research: Optics & GaAs
- Optical & Digital Signal Processing
- Radar & Sensor Technology
- Fuze Technology



- Nuclear Radiation Effects Survivability
- Electromagnetic Effects Survivability
- Nuclear Survivability Program Office
- Aurora (DNA)
- EMP Testing



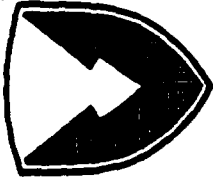
- Technology Demos
- Fuze Research & Development
- Battlefield Information Fusion Technology
- Reserve Power Supplies
- FAST Office



- Electronic & Mechanical Fabrication
- Environmental, Field, & Demo Testing
- S&E Computing Services
- Productibility Studies
- Quality Assurance & ILS



HDL MISSION



U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

HDL performs and provides basic and applied research, exploratory and advanced development, technology leadership and evaluation and initial procurement to support the following mission areas:

Nuclear Survivability

High-Power Microwave Survivability and Source Technology

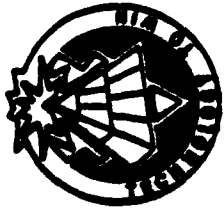
Electronic Fuzing and Smart Munitions

Radar Technology

ARM/CM

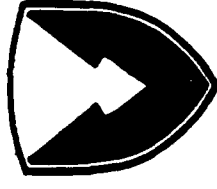
Information/Signal Processing

As agents for Program Executive Officers, Project Managers and Research, Development and Engineering Centers, HDL implements transfer of mission area technologies.



HDL MAJOR FIELDS OF TECHNICAL ENDEAVOR

**U. S. ARMY
LABORATORY COMMAND**



HARRY DIAMOND LABORATORIES

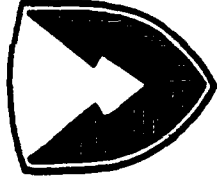
- **Sensor Technology**
- **Signal Processing**
- **Information Processing & Sensor Fusion**
- **Fuze Applications**
- **Nuclear Survivability**
- **Radio Frequency Directed Energy
Weapons Technology**
- **Producibility Technology**



ACCOMPLISHMENTS

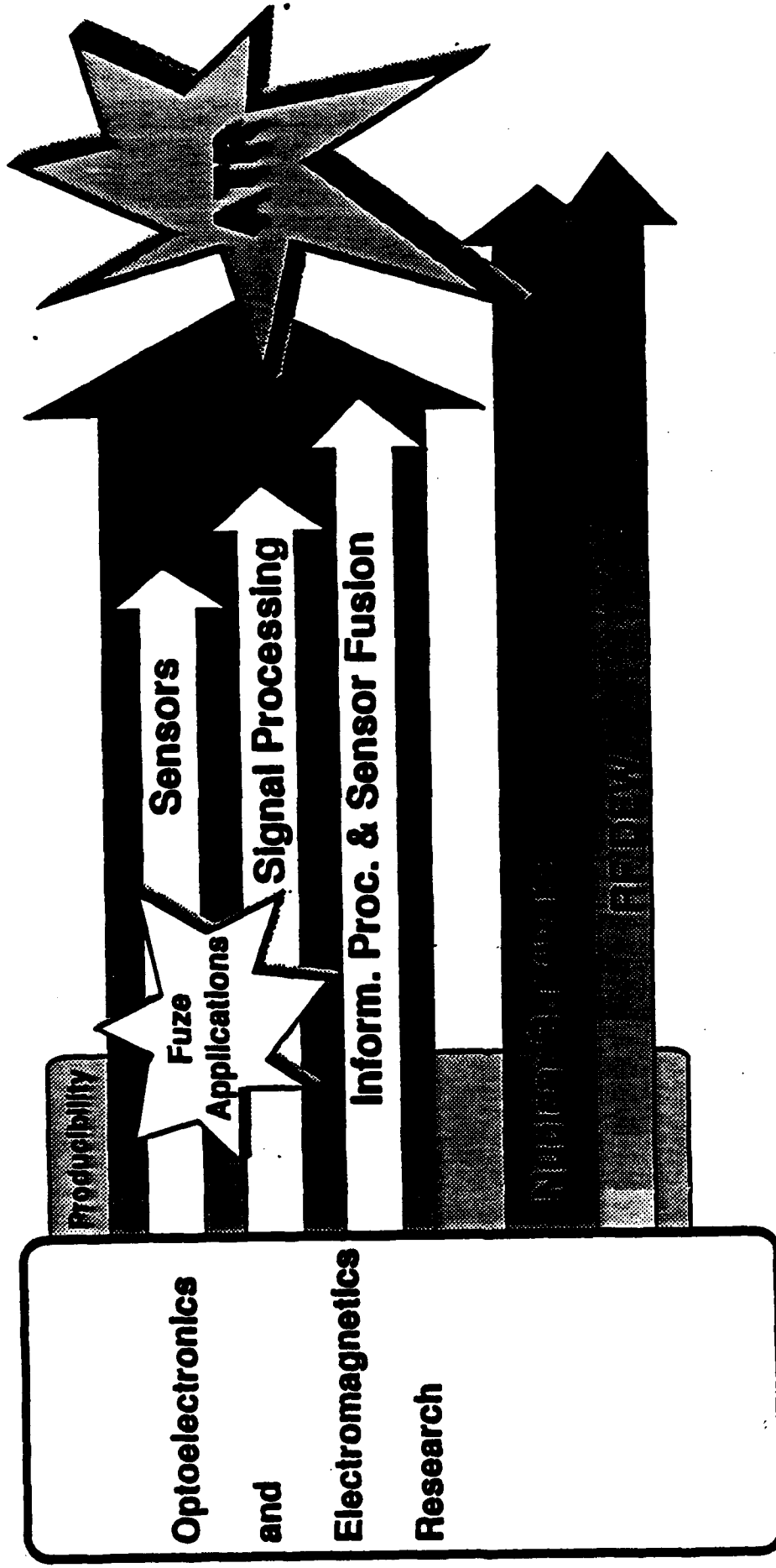
(LAST 5 YEARS)

U. S. ARMY
LABORATORY COMMAND

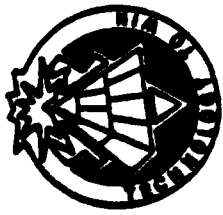


HARRY DIAMOND LABORATORIES

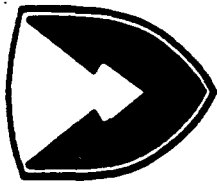
- Developed the Patriot fuze, Chaparral target detecting device, a nuclear artillery fuze, a mortar fuze, and the MLRS time fuze.
- Fuze technology (LSAA, electrostatics...)
- Created and demonstrated a combat information processor.
- Constructed and fielded two test bed acousto-optic based processing systems for wide band signal detection and analysis.
- Demonstrated MTI radar for UAV.
- Completed PIP for high altitude EMP protection.
- Developed hardened electrical/electronic shelters for nuclear survivable C3I tactical systems.
- Basic R&D for HPM (World's record for pulsed power)
- ARM/CM
- Signature simulations and modeling



HARRY DIAMOND LABORATORIES
Technology for the Future



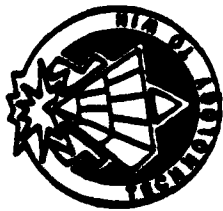
SENSOR TECHNOLOGY THRUSTS



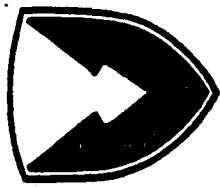
U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- Guidance Integrated Fuzing
- Multi-static radar
- Wideband (impulse) radar
- Radar target models
- ARM-threat simulations



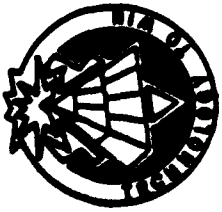
SIGNAL PROCESSING THRUSTS



U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- High dynamic range optical signal processing
- Optoelectronics
- Neural nets



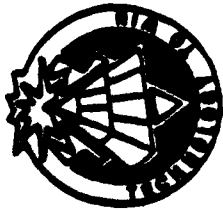
INFORMATION PROCESSING & SENSOR FUSION THRUSTS

U.S. ARMY

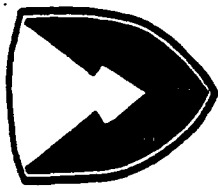
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- Radar, electro-optical SIGINT, and other sensor information integration, with terrain knowledge
- Advanced multi-sensor fusion algorithm & expert systems
- Target acquisition theory



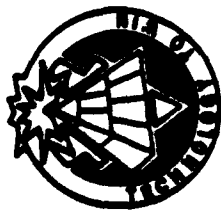
FUZE APPLICATION THRUSTS



U. S. ARMY
LABORATORY COMMAND

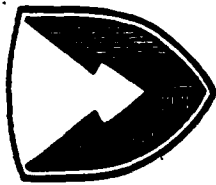
HARRY DIAMOND LABORATORIES

- XM450 Medium Altitude Proximity/Time MLRS Binary Chemical Fuze
- Multi-Option Fuze for Artillery (MOFA)



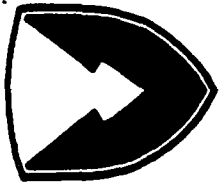
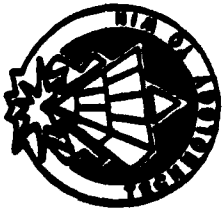
PRODUCIBILITY TECHNOLOGY THRUST

U. S. ARMY
LABORATORY COMMAND



HARRY DIAMOND LABORATORIES

- Near term emphasis on resolving soldering problems and establishing meaningful inspection criteria
- Broad interest in automated assembly of electronics
- Specific interest in novel assembly concepts and circuit assembly of future circuits such as photonic information processing systems

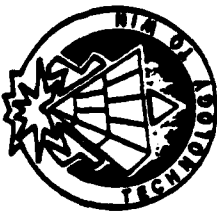


**U. S. ARMY
LABORATORY COMMAND**

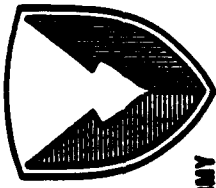
HARRY DIAMOND LABORATORIES

FUNDING PROFILE

FY 90

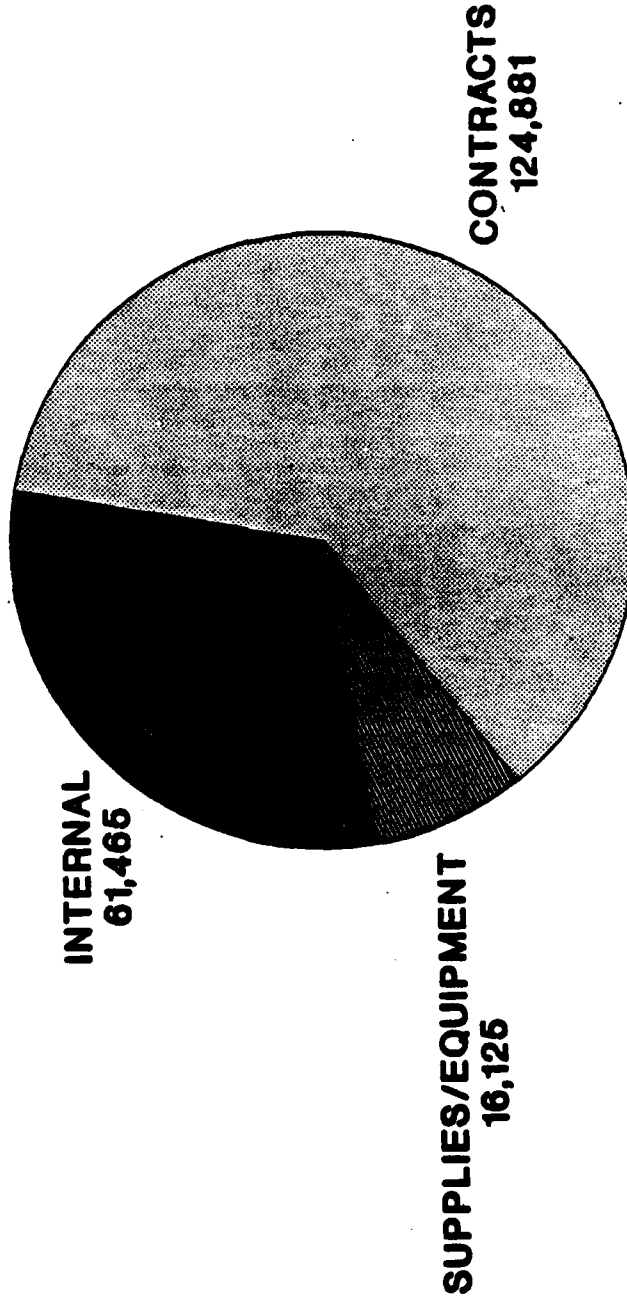


FY90 TOTAL OBLIGATIONS (\$K)

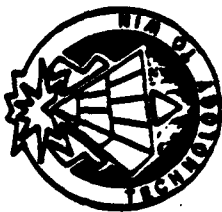


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



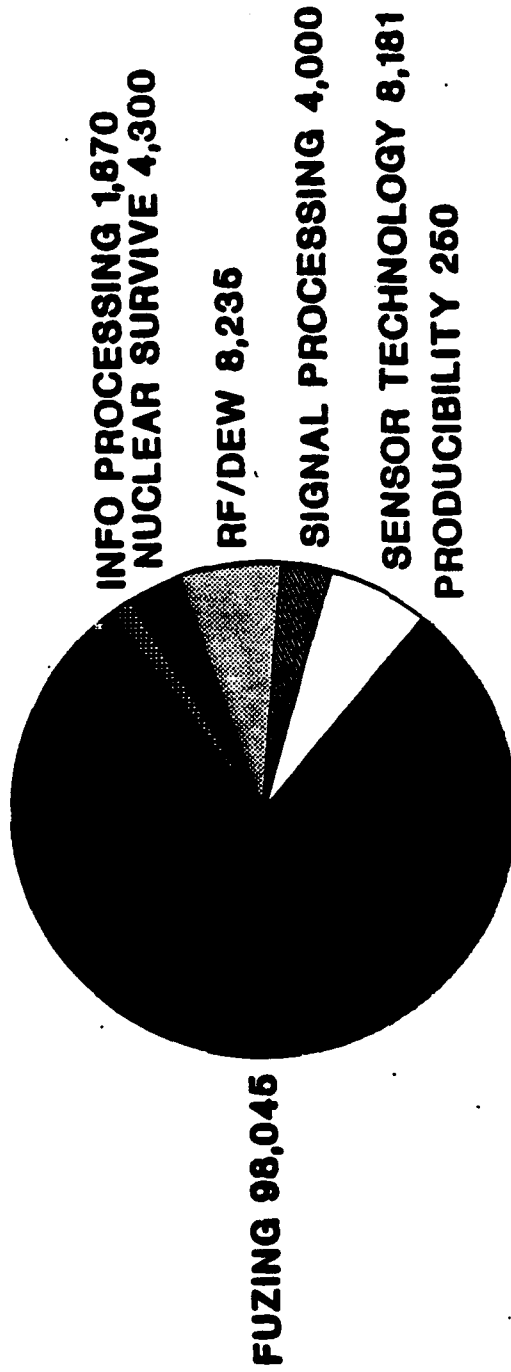
TOTAL: \$202,471 K



FY90 CONTRACT OBLIGATIONS TOTAL (\$K)

HARRY DIAMOND LABORATORIES

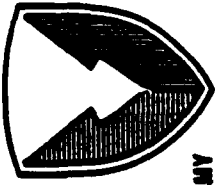
US ARMY
LABORATORY COMMAND



TOTAL: \$124,881 K

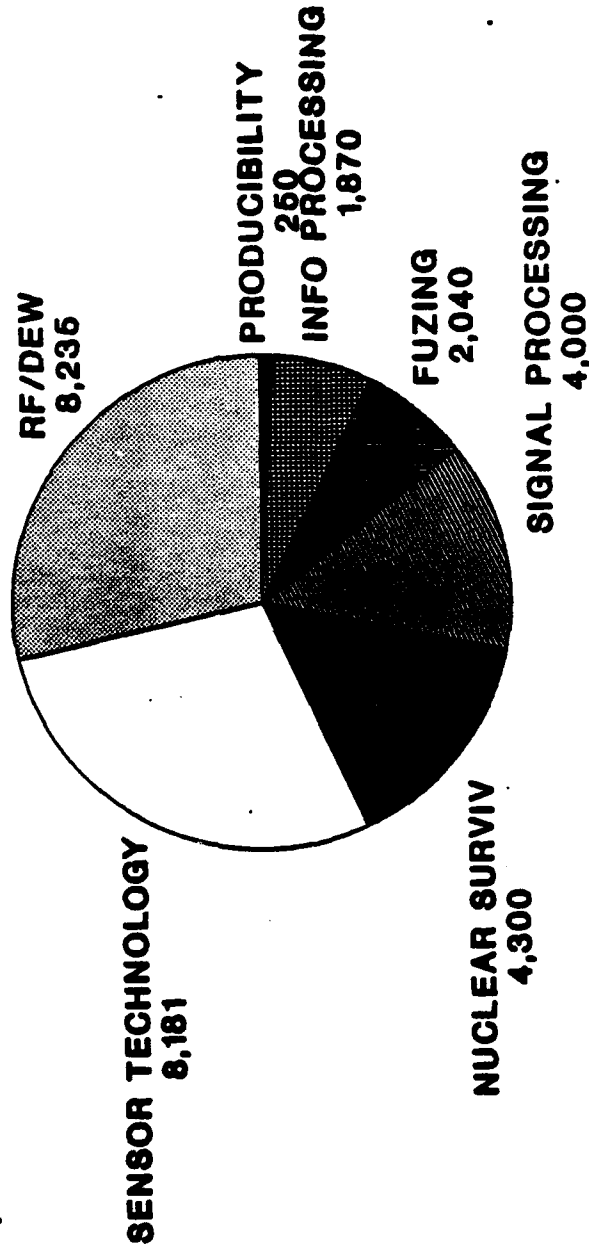


FY90 CONTRACT OBLIGATIONS (\$K)



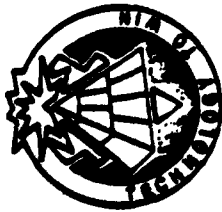
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

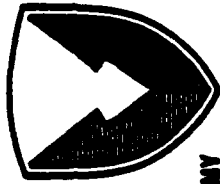


TOTAL: \$28,876 K

EXCLUDES \$96,005 K FUZE PRODUCTION

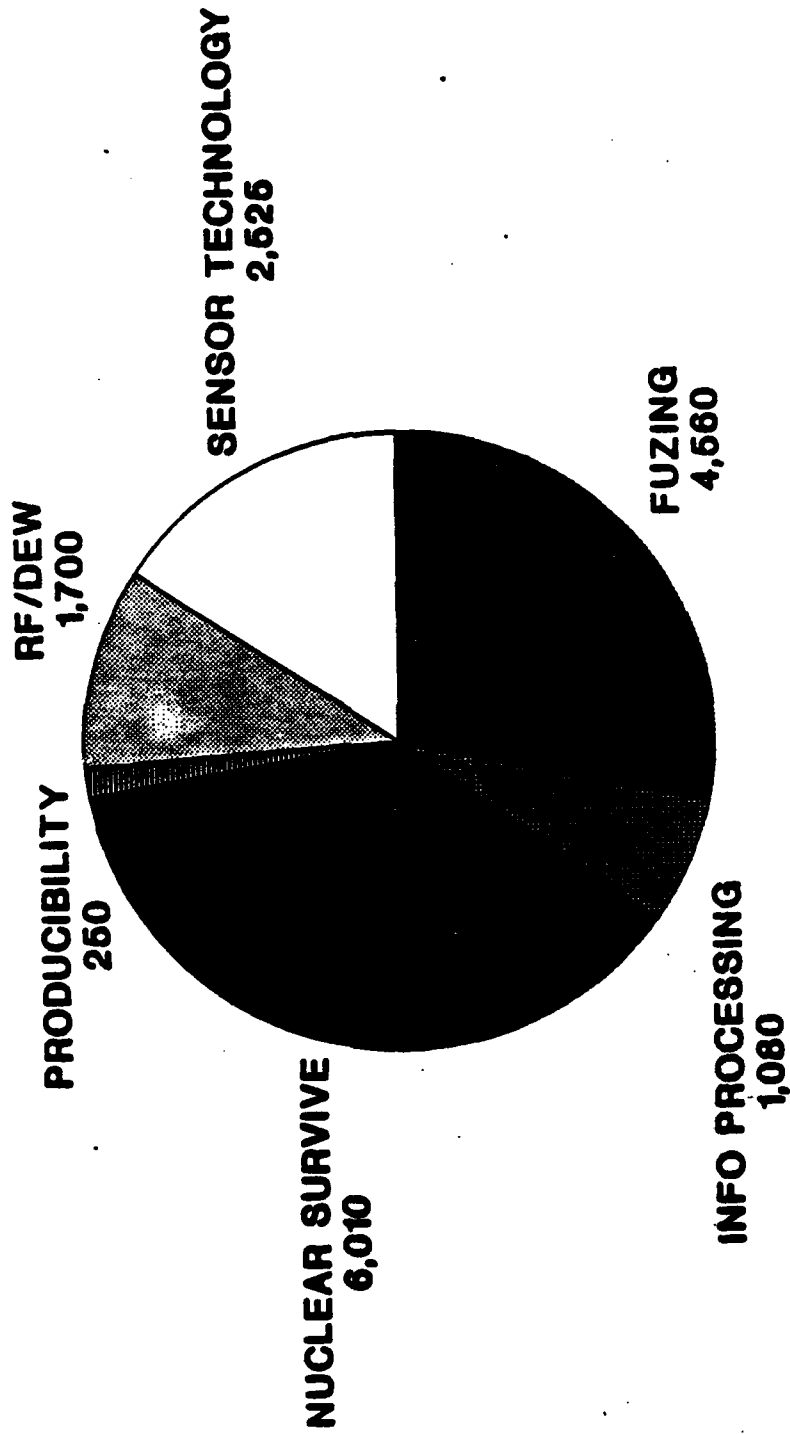


FY90 SUPPLIES/EQUIPMENT (\$K)

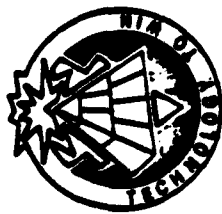


US ARMY
LABORATORY COMMAND

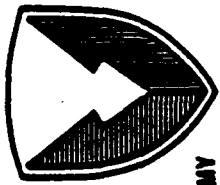
MARY DIAMOND LABORATORIES



TOTAL: \$16,125 K

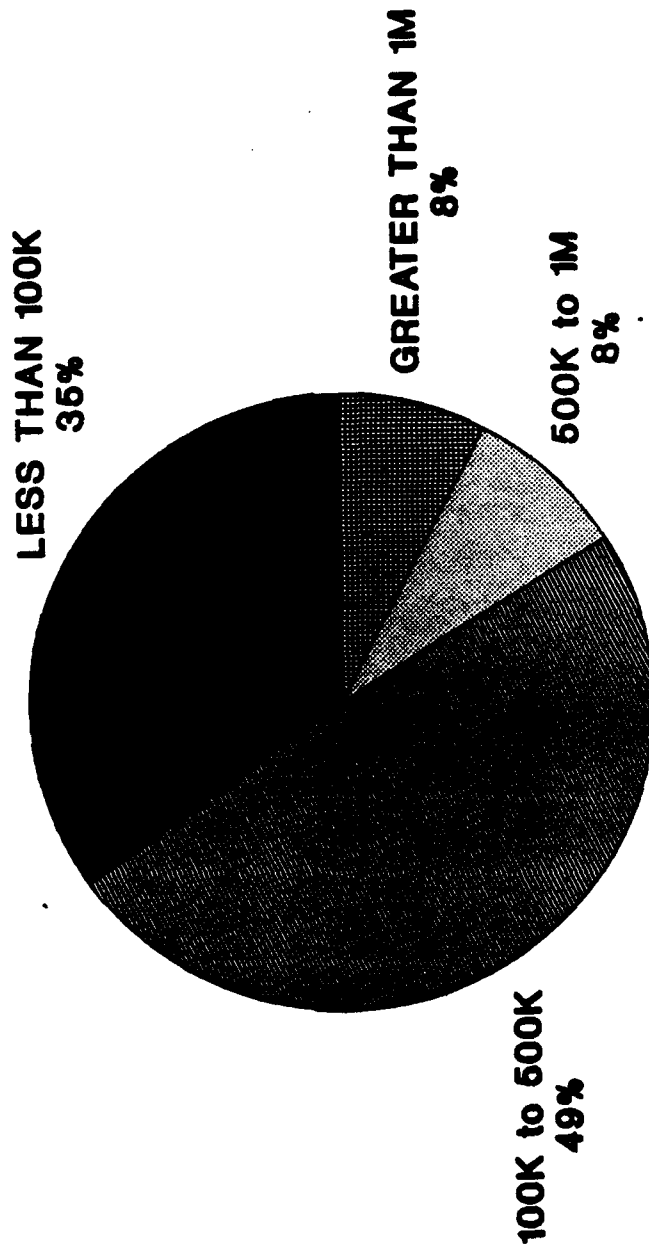


FY90 CONTRACT PLAN

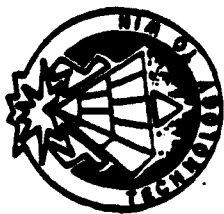


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



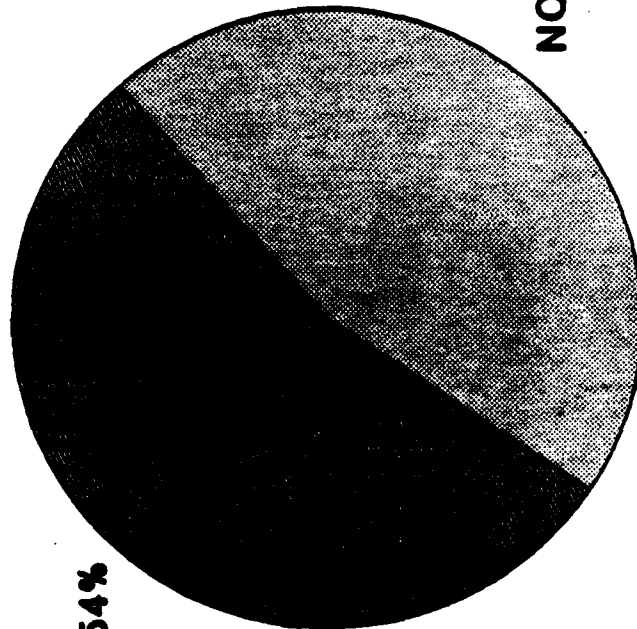
ACTIONS (273 TOTAL)



FY90 COMPETITIVE ACTIONS (\$K)

US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



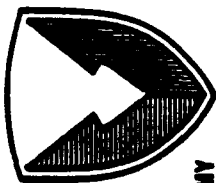
COMPETITIVE 54%
76,515

NON COMPETITIVE 46%
64,491

TOTAL: \$141,006 K

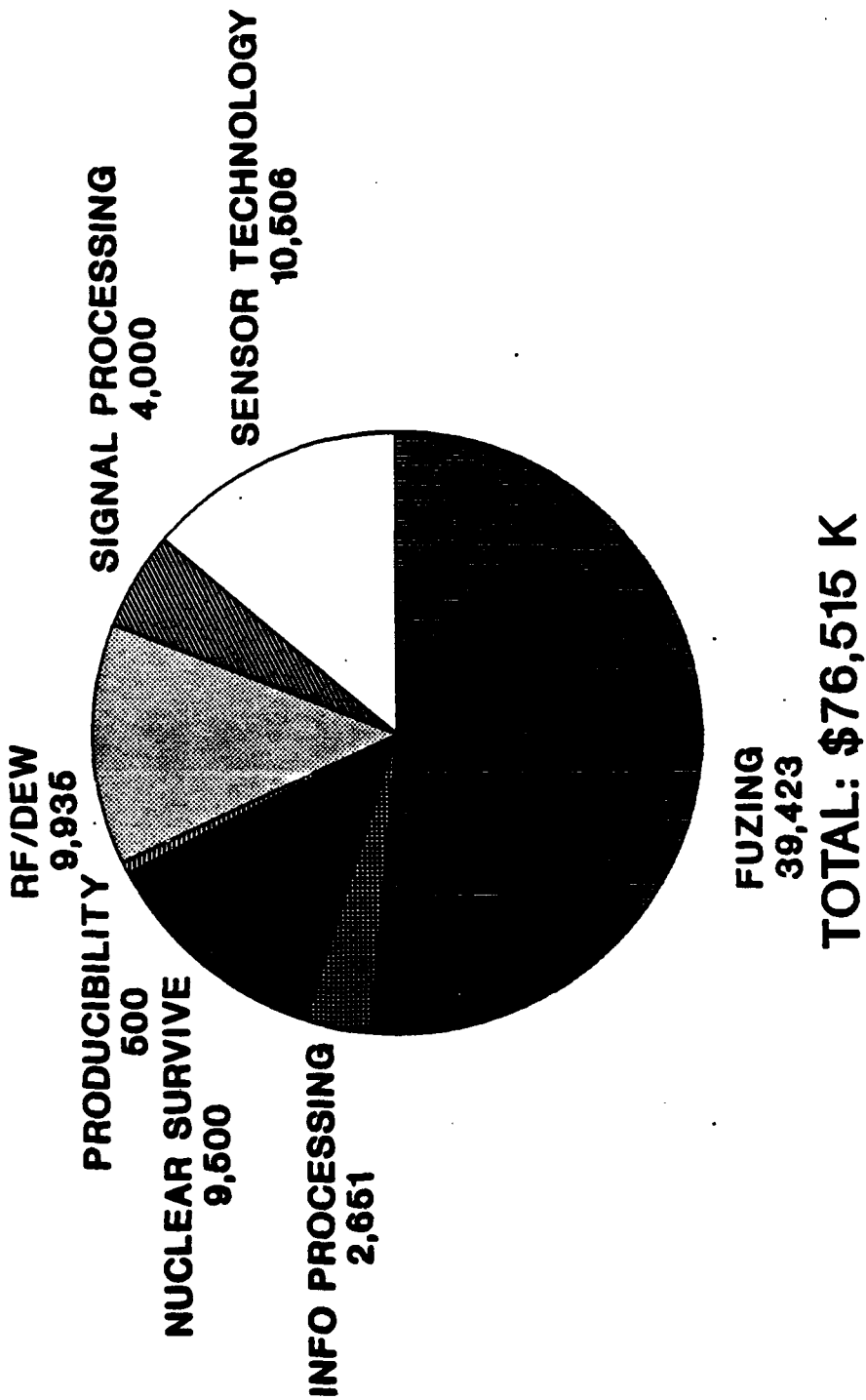


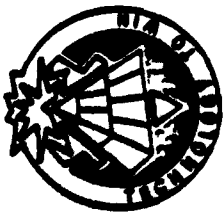
FY90 COMPETITIVE ACTIONS (\$K)



US ARMY
LABORATORY COMMAND

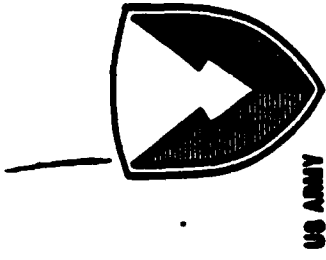
HARRY DIAMOND LABORATORIES



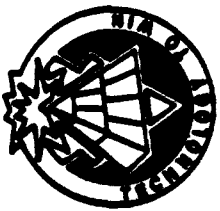


SERVICE CONTRACTS (APPROX \$20 M PER YEAR)

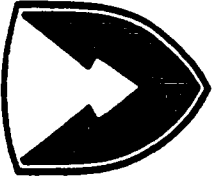
HANBY DIAMOND LABORATORIES



<u>EY</u>	<u>IN EFFECT</u>	<u>NEW</u>	<u>EXPIRING</u>
90	15	6	7
91	14	4	2
92	16	4	4
93	16	2	0
94	18	2	0

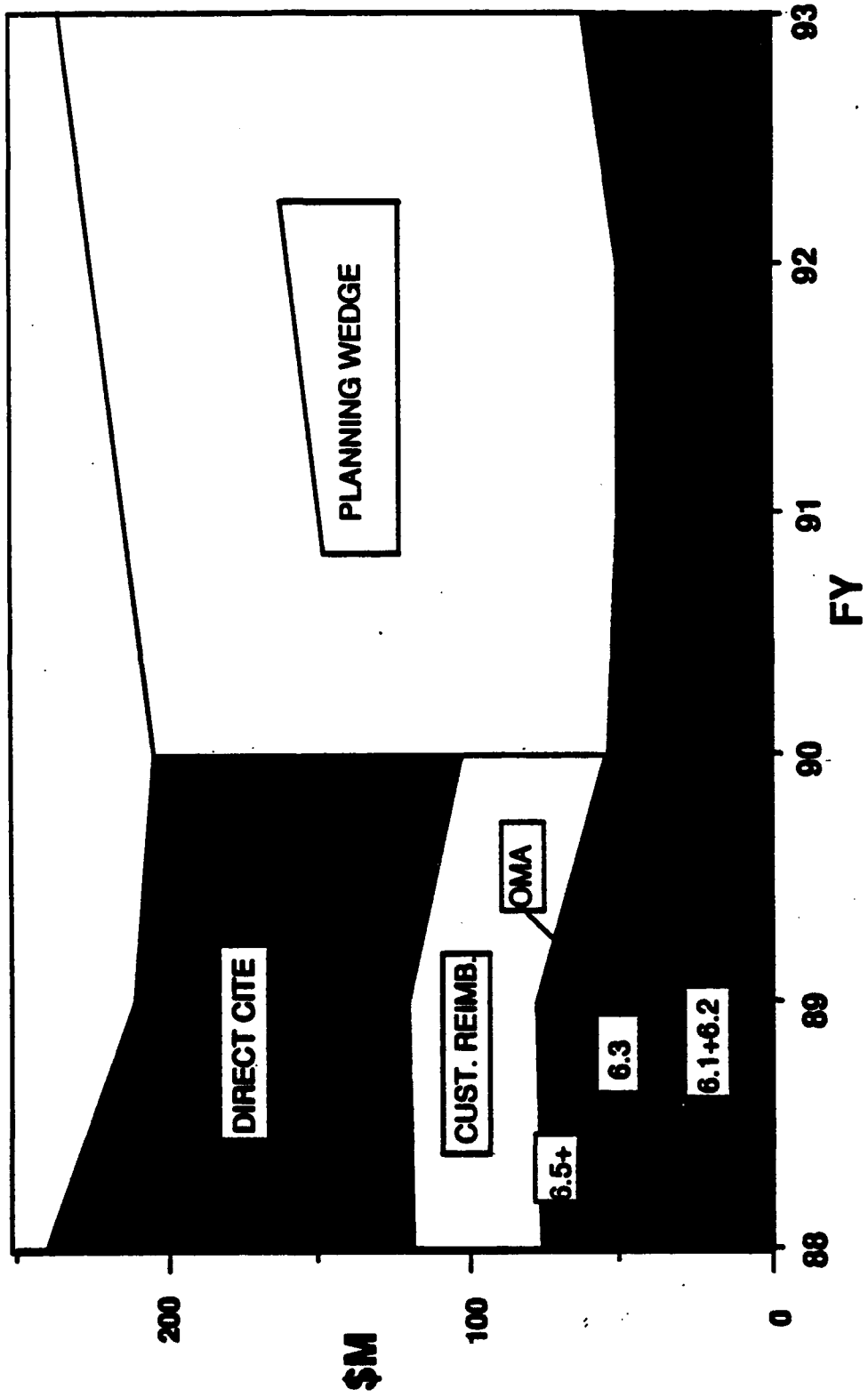


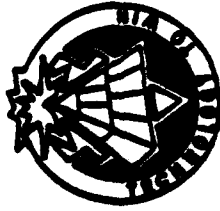
HDL FUNDING



U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES





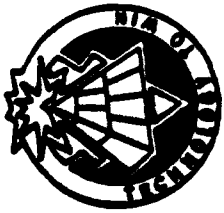
SUMMARY

U. S. ARMY

LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- HDL anticipates stable R&D funding for the future.
- Many business opportunities exist in several diverse technical areas.
- HDL advocates development of Government - Industry - Academia partnerships.



ACCOMPLISHMENTS

(LAST 5 YEARS)

U. S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- Developed the Patriot fuze, Chaparral target detecting device, a nuclear artillery fuze, a mortar fuze, and the MLRS time fuze.
- Fuze technology (LSAA, electrostatics...)
- Created and demonstrated a combat information processor.
- Constructed and fielded two test bed acousto-optic based processing systems for wide band signal detection and analysis.
- Demonstrated MTI radar for UAV.
- Completed PIP for high altitude EMP protection.
- Developed hardened electrical/electronic shelters for nuclear survivable C3I tactical systems.
- Basic R&D for HPM (World's record for pulsed power)
- ARM/CM
- Signature simulations and modeling

USER REQUIREMENTS

23 JANUARY 1990

ADVANCED PLANNING BRIEFING FOR INDUSTRY

LABCOM & HARRY DIAMOND LABS

JAMES F. FOX
COMBINED ARMS CENTER
ATZL-SCI
FT. LEAVENWORTH, KS 66027
AV 552-2962
COMM 913-684-2962

TOPICS

SPEAKER IDENTIFICATION

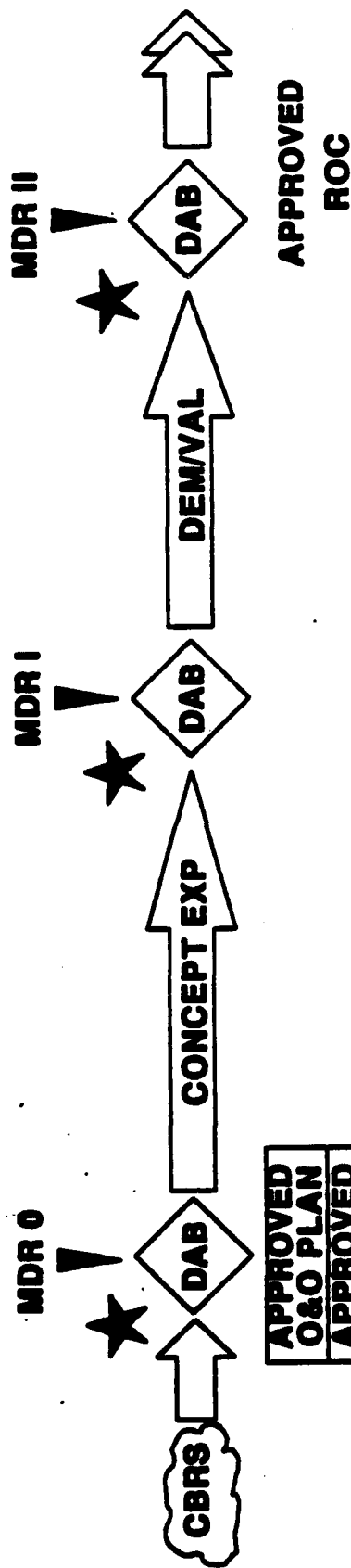
NEW CD PROCESS

OTHER INITIATIVES

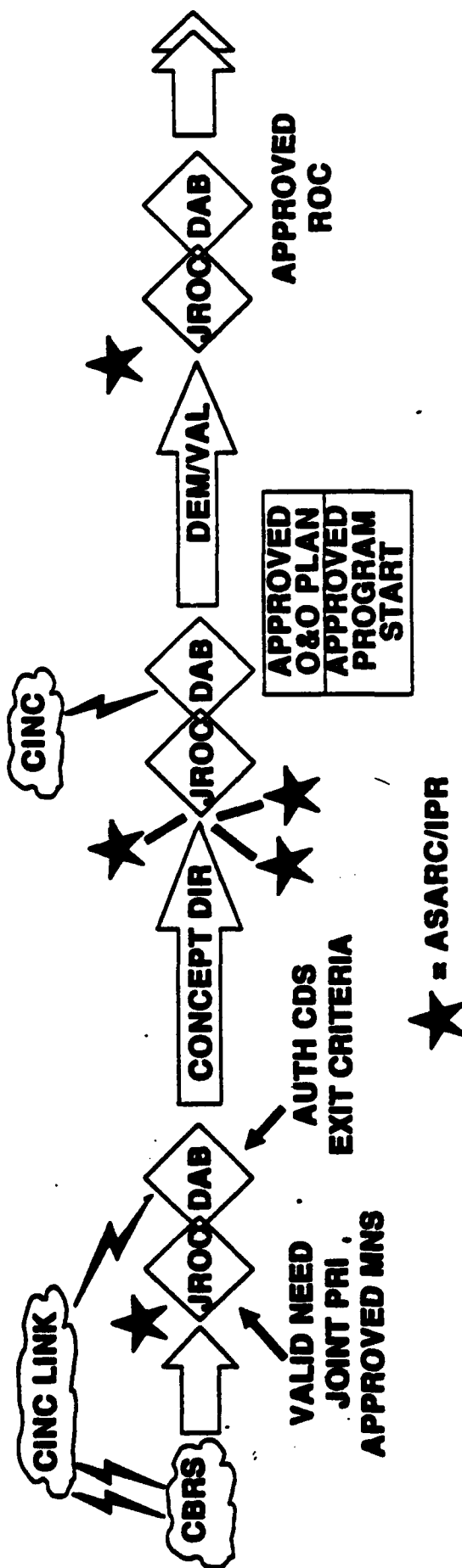
EXAMPLE REQUIREMENTS

ACQUISITION PROCESS

CURRENT



UNDER DMR



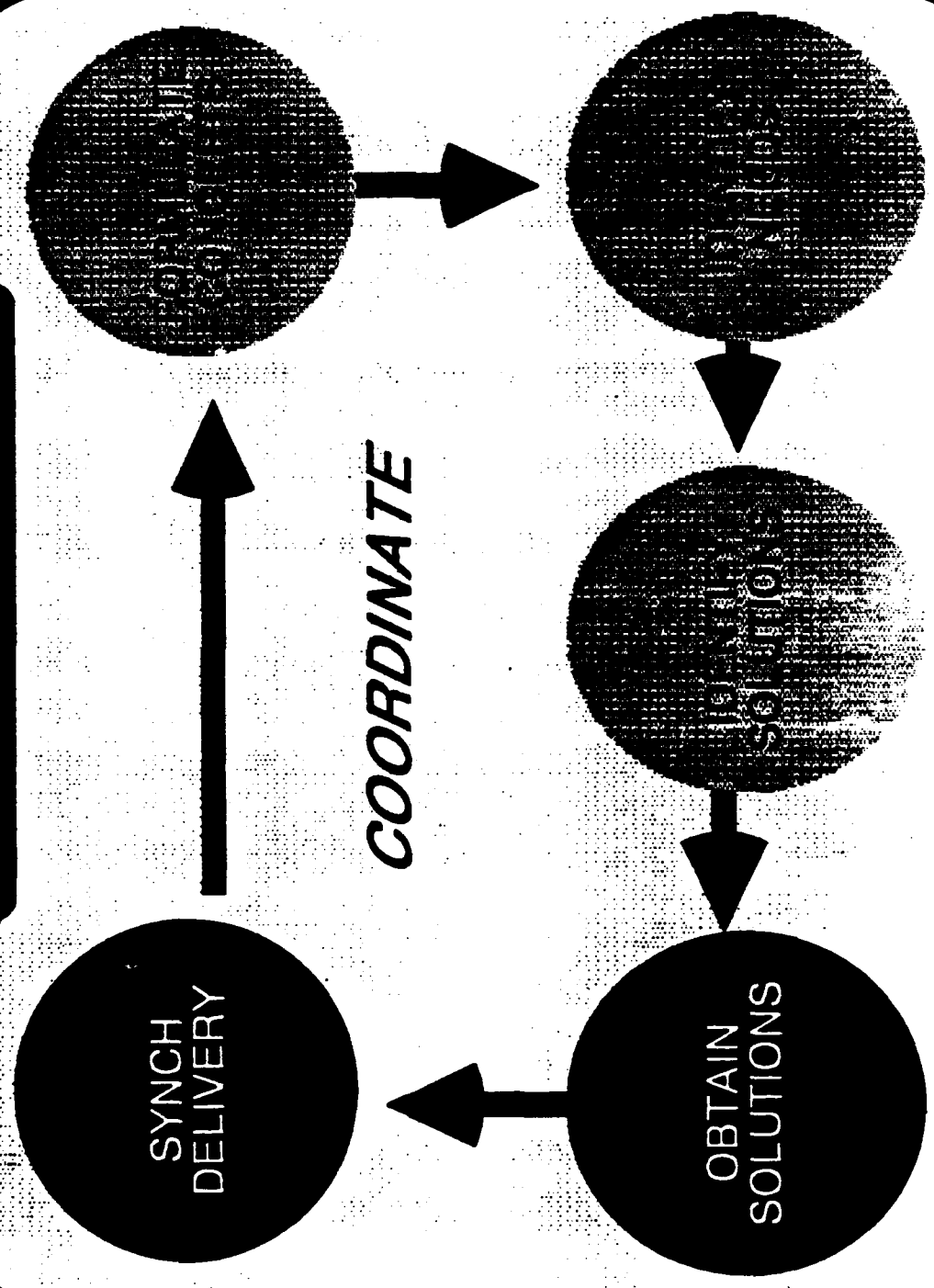
ACC/MACOM LINK

REVISE OUR TRADITIONAL APPROACH TO CBRS BY PROVIDING CONDUIT TO ARMY COMPONENT COMMANDERS (ACC) AND MACOM COMMANDERS

- **WORK WITH ACCs/MACOMs TO OBTAIN ARMY REQUIREMENTS**
- **INTEGRATE INPUT INTO CBRS**
- **COORDINATE CBRS PRODUCTS WITH ACCs/MACOMs**

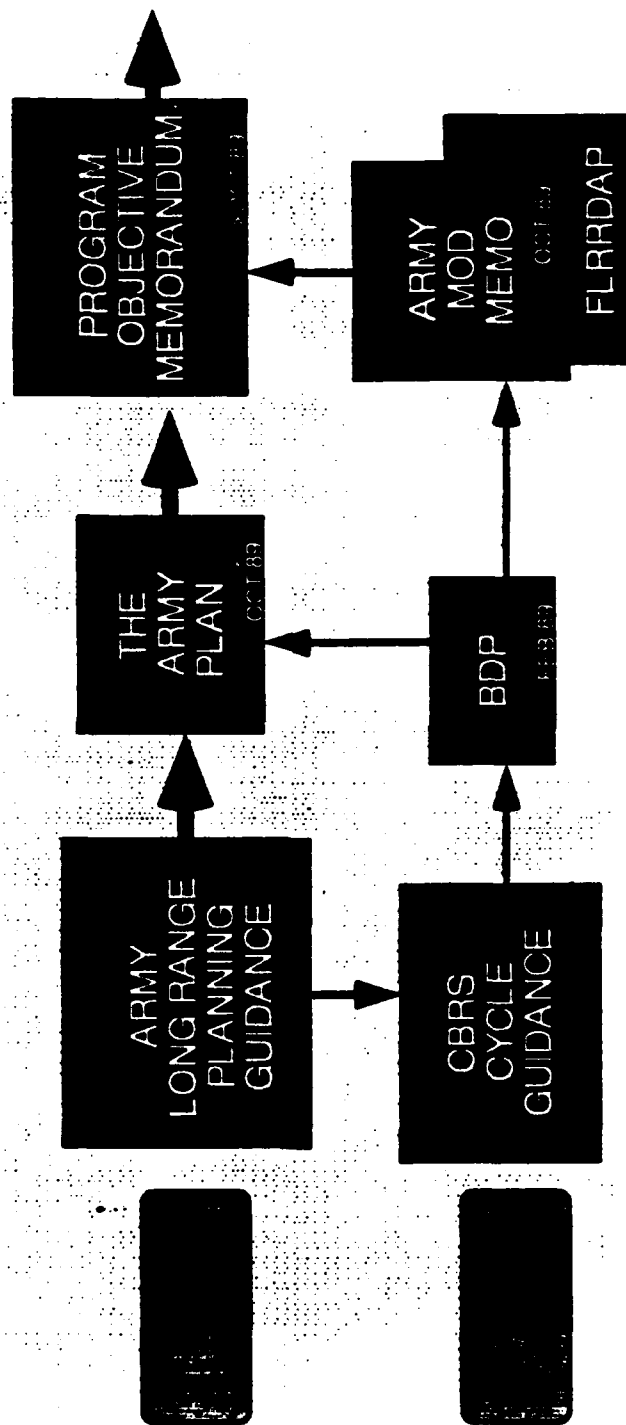


CD PROCESS



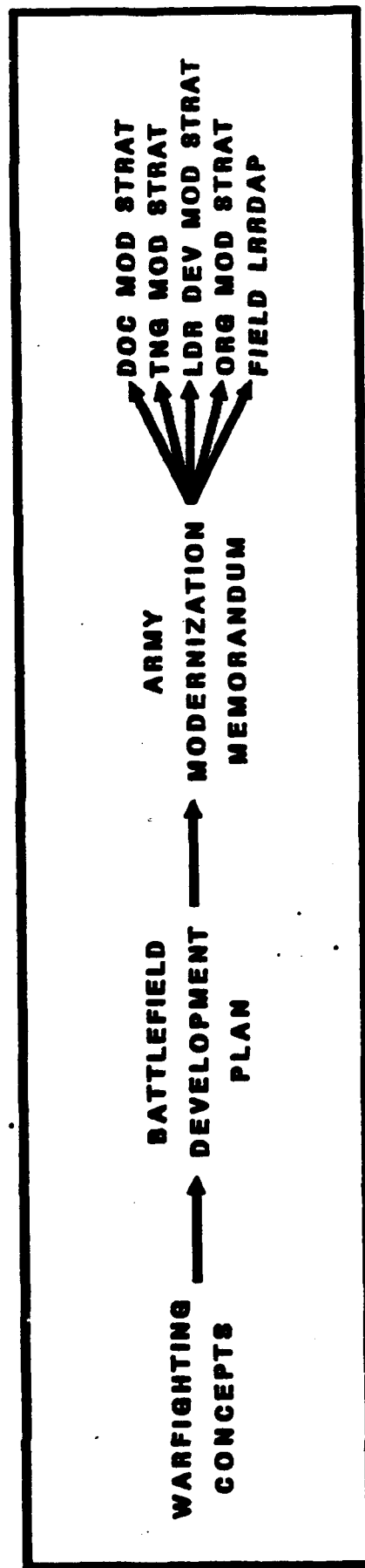


PLANNING PROCESS



• PLANNING, PROGRAMMING, BUDGETING, AND EXECUTION SYSTEM

CAC CBRS RESPONSIBILITIES



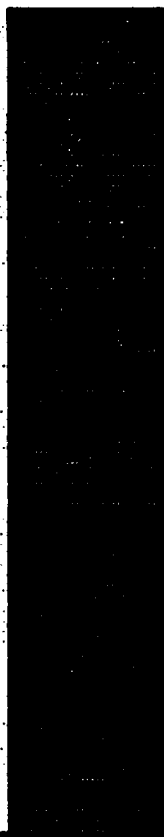
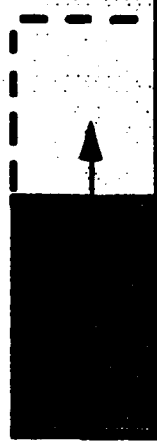
OCT 89  SEP 91



CYCLE 94 - 08

CYCLONE - 60-1010
PAPER

TOP DOWN GUIDANCE



The diagram illustrates the timeline of Army solution strategy and programming. It features a central vertical axis with several key milestones marked by horizontal lines and text:

- APR 89**: The starting point on the left.
- OCT 89**: Marked with a vertical line and the text **BATTLEFIELD CAPABILITY ISSUE** to its right.
- MAR/APR 90**: Marked with a vertical line and the text **FY 90** to its right.
- MAR/APR 91**: Marked with a vertical line and the text **FY 91** to its right.
- SEP 91**: The final point on the right, marked with a vertical line.

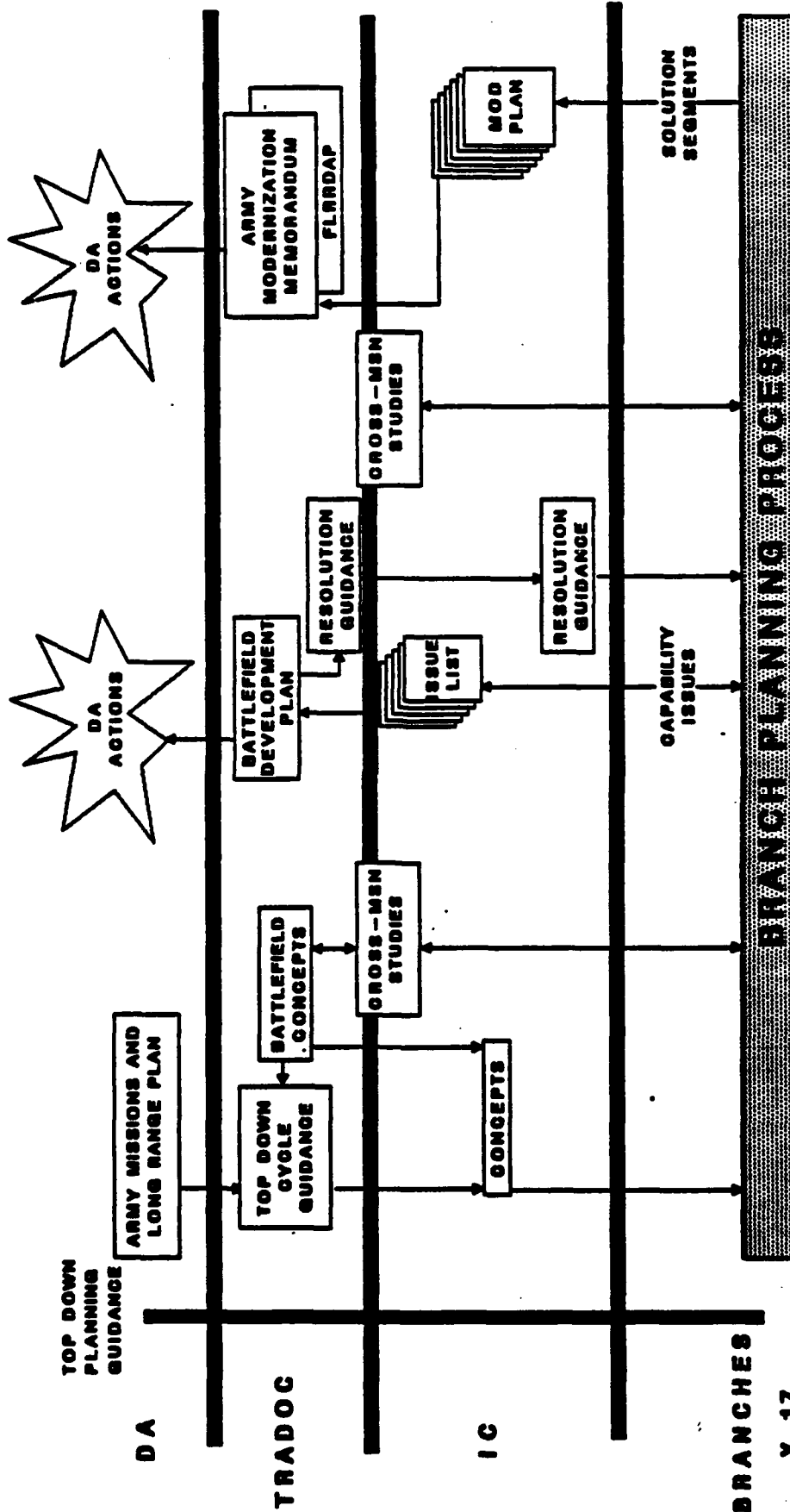
Two large, bold, italicized arrows point from left to right, indicating the direction of the strategy and programming:

- ARMY SOLUTION STRATEGY**: A large arrow pointing right, positioned above the central axis.
- PROGRAMMING**: A large arrow pointing right, positioned below the central axis.

00000000

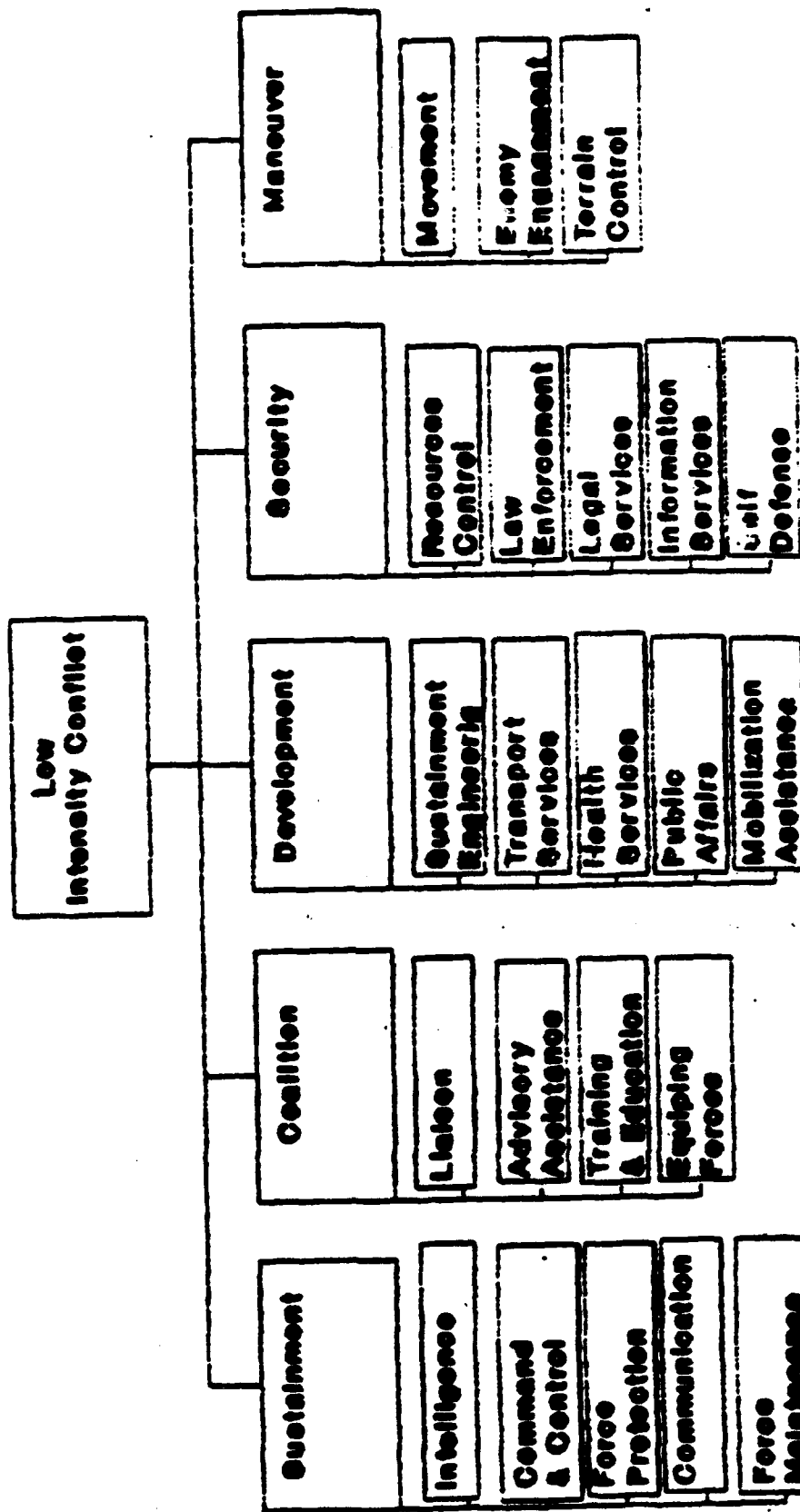
**TOP DOWN
GUIDANCE
98-10**

MODERNIZED CBRS



[illegible]

LIC OPERATING SYSTEMS (LOS)



POTENTIAL TECHNOLOGY APPLICATIONS IN LIC

DISCRIMINATE WEAPONS SYSTEMS

**MINIATURIZED EXPLOSIVES & NARCOTICS DETECTION
EQUIPMENT**

**SMART ELECTRONIC CARDS FOR PERSONAL
IDENTIFICATION**

X-RAY MACHINES FOR NON-METALLIC OBJECTS

CULTURAL-SPECIFIC PACKAGED RATIONS

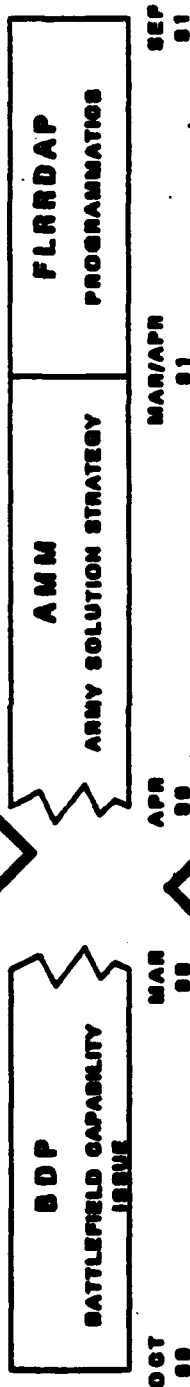
COMPUTER SIMULATIONS FOR MISSION REHEARSALS

LOW-COST, EFFECTIVE NIGHT VISION EQUIPMENT

LOW-COST, SIMPLE COUNTERMINE EQUIPMENT

PROBLEM

23 JAN 90: PRES' BUDGET SUBMIT
6 FEB 90: CSA OFFSITE



1. WHAT IS VALUE OF BDP
DONE UNDER OLD "RULES"
2. CAN CBRs CYCLE REACT
TO NEW "RULES"

CHANGING FOCUS

CFE
POLITICAL UPHEAVAL
CONTINGENCY - FWD DEPLOYED
RESOURCES
DEF MGMT REVIEW

TRENDS

CONFLICTS

- ↓ NUCLEAR
- ↓ GLOBAL-HIGH INTENSITY
- ↑ REGIONAL
- ↑ LOW INTENSITY

RESOURCES

- ↓ BUDGETS
- ↓ DEMOGRAPHICS
- ↓ FORCE STRUCTURE

FORCES

- ↓ FORWARD DEPLOYED
- ↑ CONTINGENCY
- ↑ SPEC MSN/NATION DEVELOP

WEAPONS

- ↑ COST
- ↓ NUMBERS
- ↑ COMPLEXITY
- ↑ SENSOR CAPABILITY
- ↑ LETHALITY/RANGE/ACCURACY



FORCE DESIGN BUREAU

INTEGRATION

ARMY
GUIDANCE

CONCEPT
REVIEWS
& STUDIES

TRADOC
GUIDANCE

PROPORENT
REVIEWS

CONVICT & SCHOOLS

INTEGRATION
ORGANIZATION
MATERIALS



FORCE DESIGN
BUREAU



CURRENT FORCES DIRECTORATE

TRENDS

... MORE DEPLOYABLE ...
... MORE MOBILITY ... INDEPENDENT OPERATIONS ...



FORCE DESIGN
BUREAU

ALB-F DESIGN FEATURES

9280



CURRENT FORCES DIRECTORATE

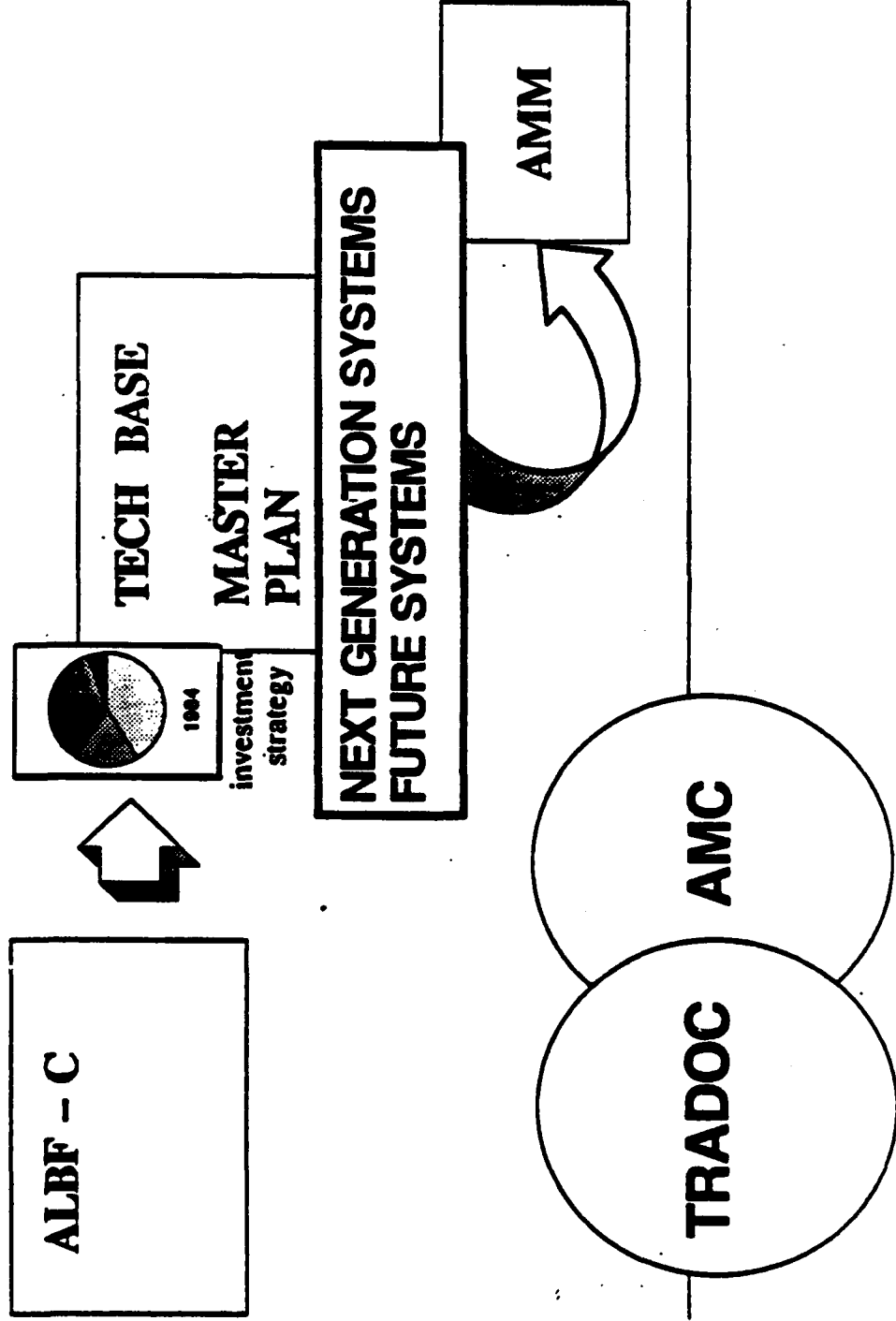
EXAMPLES

LWT CHEMICAL SYSTEMS
 LWT COUNTER OBSTACLE SYSTEM
 LWT COUNTER MISSILE SYSTEM
 LWT POSITIVE AIRWORKING SYSTEM
 LWT BACKPACK UAV
 A TRUE LIGHT TANK
 LWT POWER GENERATION

OBJECTIVE: LEVERAGE TECHNOLOGY

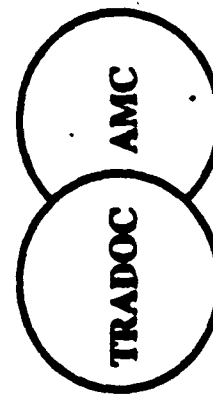
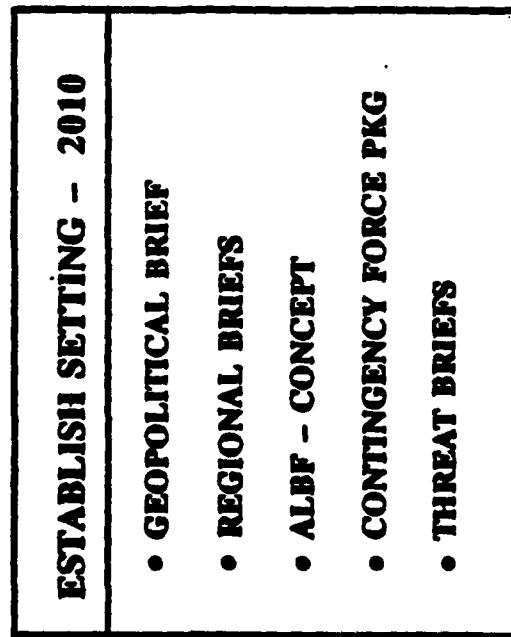
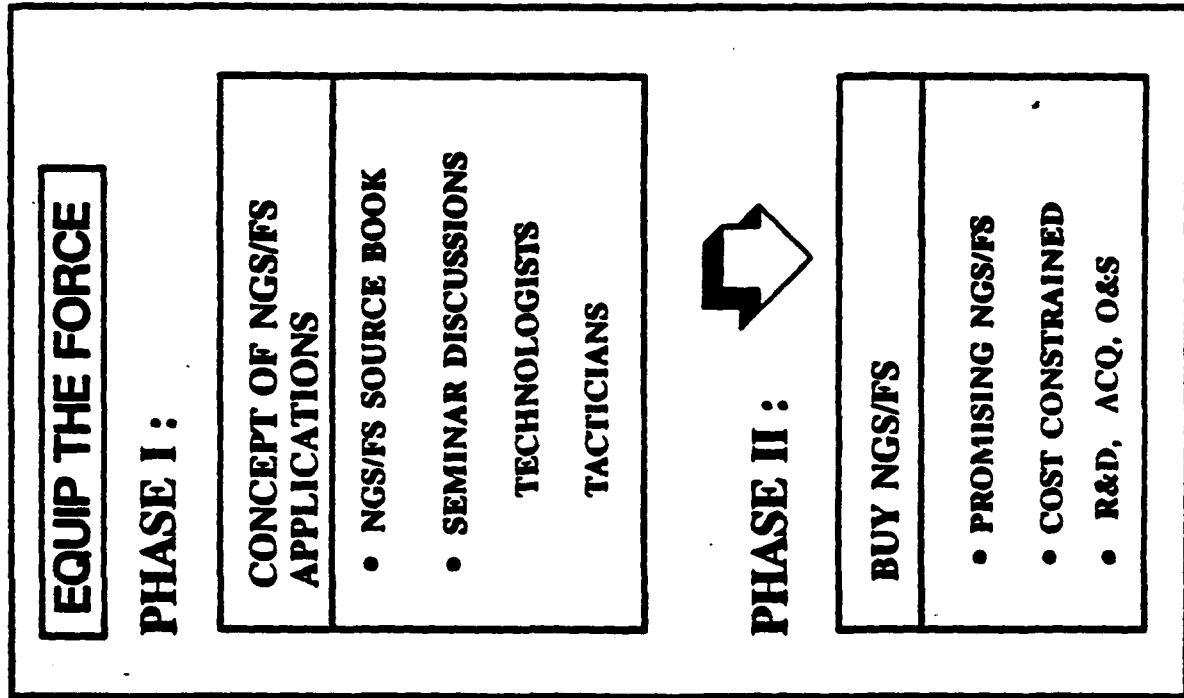
FOR WINNING ---

TECH BASE SEMINAR GAMING



TECH BASE INVESTMENT STRATEGY REVIEW

PHASES I & II : Tech Base Investment Strategy Conf '90



TECH BASE INVESTMENT STRATEGY REVIEW

PHASE III : Tech Base Seminar Game II

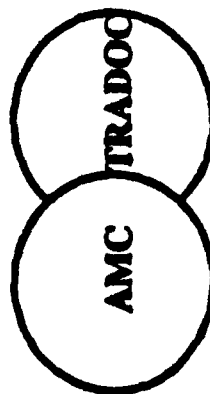
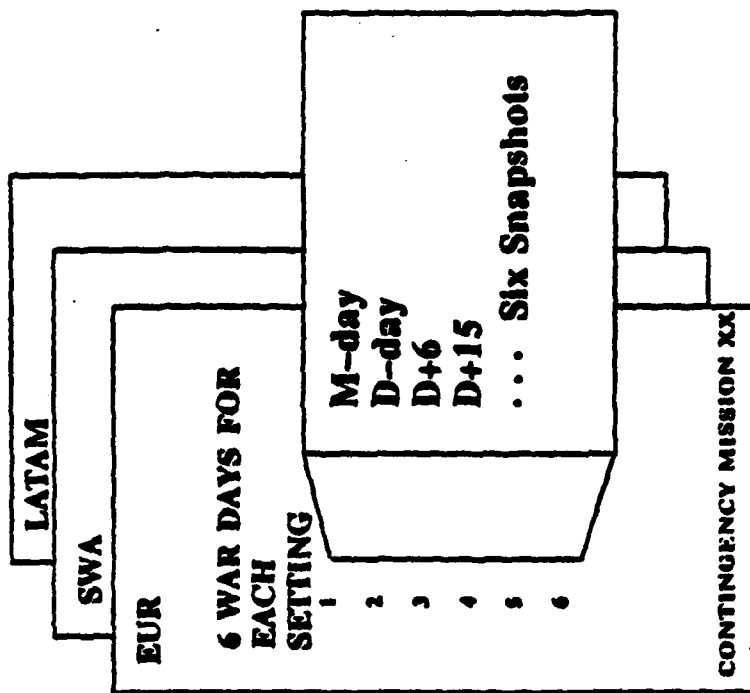
EVALUATE THE FORCE

SEMINAR GAMING

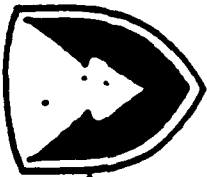
- SELECTED NGS/FS
- SEMINAR DISCUSSIONS
- TECHNOLOGISTS
- TACTICIANS
- COMPUTER ASISTED



3 REGIONAL SETTINGS



13 APR 1975
For: COMAD



US ARMY MATERIEL COMMAND
OFFICE OF THE CHIEF SCIENTIST

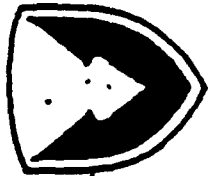
NATIONAL ACADEMY OF SCIENCE
BOARD ON ARMY SCIENCE & TECHNOLOGY (BAST)
STRATEGIC TECHNOLOGY FOR THE ARMY (STAR) STUDY

OBJECTIVE

RECOGNIZE NOW, HIGH-PAYOFF TECHNOLOGIES THAT CAN:

- BE INSERTED INTO 21st CENTURY ARMY EQUIPMENT & DOCTRINE
- YIELD GREATLY IMPROVED WARFIGHTING CAPABILITY

AMC



US ARMY MATERIEL COMMAND
OFFICE OF THE CHIEF SCIENTIST

STRATEGIC TECHNOLOGIES FOR THE ARMY (STAR) STUDY SCOPE

- DURATION: TWO YEARS
- MANYEARS OF EFFORT REQUIRED:
 - 150 PER YEAR FOR BAST MEMBERS
 - 150 PER YEAR FROM ARMY
(ASA, AMC, TRADOC, COE, MRDC, ARI, SDC, SOCOM)
- BAST PRINCIPALS:
 - DR MARTIN A. GOLAND, BAST CHAIRMAN
 - DR WILLIS HAWKINS, STUDY CHAIRMAN
 - MR. RAY L. LEADABRAND, INTEGRATION SUBCOMMITTEE
 - MR. MICHAEL D. RICH, TECH MGMT & DEV PLANNING
SUBCOMMITTEE
 - MR. ROBERT R. EVERETT, SCIENCE & TECHNOLOGY
SUBCOMMITTEE

AMC

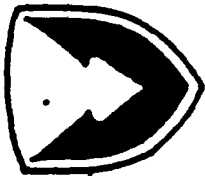


US ARMY MATERIEL COMMAND
OFFICE OF THE CHIEF SCIENTIST

STRATEGIC TECHNOLOGY FOR THE ARMY (STAR) STUDY APPROACH

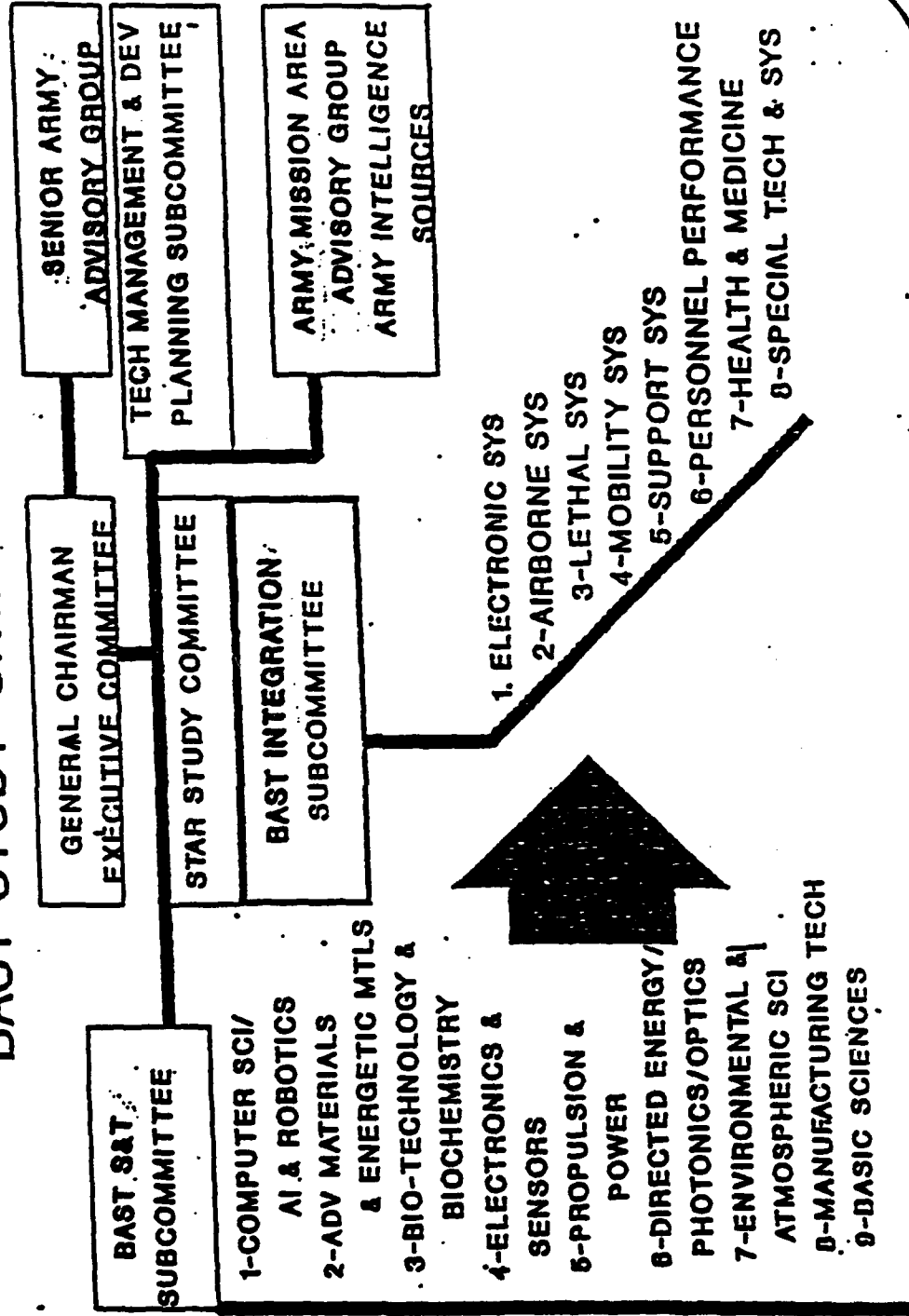
- IDENTIFY THE ADVANCED TECHNOLOGY MOST LIKELY TO BE IMPORTANT IN GROUND WARFARE IN THE 21ST CENTURY
- OFFER TECHNOLOGY STRATEGIES THAT THE ARMY SHOULD CONSIDER IN DEVELOPING THEIR FULL POTENTIAL
- SUGGEST, WHERE POSSIBLE, THE IMPLICATIONS FOR FORCE STRUCTURE MODERNIZATION AND STRATEGY

AMC



US ARMY MATERIEL COMMAND
OFFICE OF THE CHIEF SCIENTIST

STRATEGIC TECHNOLOGY FOR THE ARMY (STAR) BAST STUDY ORGANIZATION



AMC

CURRENT STATUS

ARMY

- APPROVED DIRECTED ENERGY MASTER PLAN

- RF CONCEPTS

- ATACM RF MUNITION AND LOITERING RF DRONE
- COUNTERMINE - RF DEVICE
- AREA DENIAL - RF MINE
- PROXIMITY FUZE/SENSOR JAMMER
- COMBAT VEHICLE/AIRCRAFT PROTECTION
- RF AIR DEFENSE SYSTEM

AIR FORCE/NAVY

- DRAFT DIRECTED ENERGY MASTER PLANS

- OPERATIONAL CONCEPTS NOT YET IDENTIFIED

"DEWINING THE DEWABLE" — SURVIVABILITY —

RADIO FREQUENCY

NEAR TERM

- IDENTIFY VULNERABILITIES
- RF HARDEN EQUIPMENT
- PLAN FOR ADDITIONAL PROTECT

MID TERM

- DEV HARDER, CHEAP MICROCIRCUITS
- DEV ALT FOR SOFT COMPONENTS

CONCEPT

● DEFEAT

● DESTROY

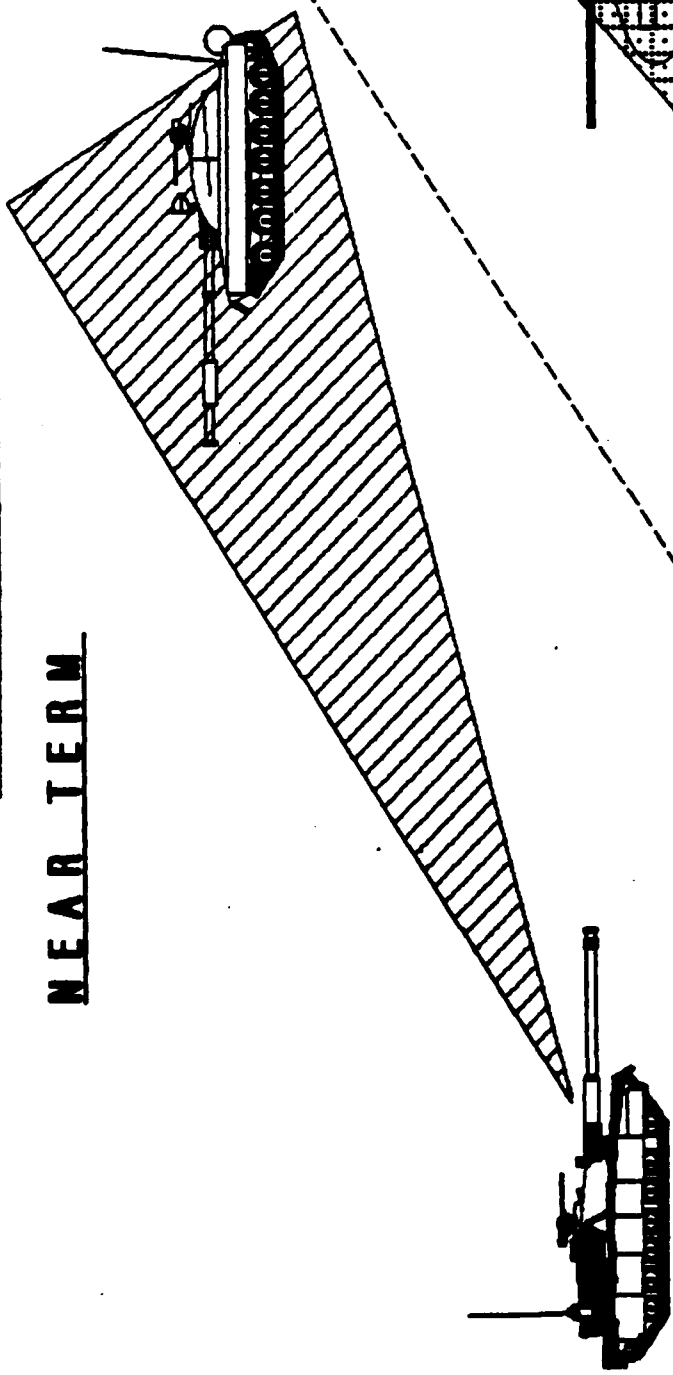
● DISRUPT

ENEMY COMBAT POWER USING EM RADIATION
(CONCERT WITH C/A TEAM)

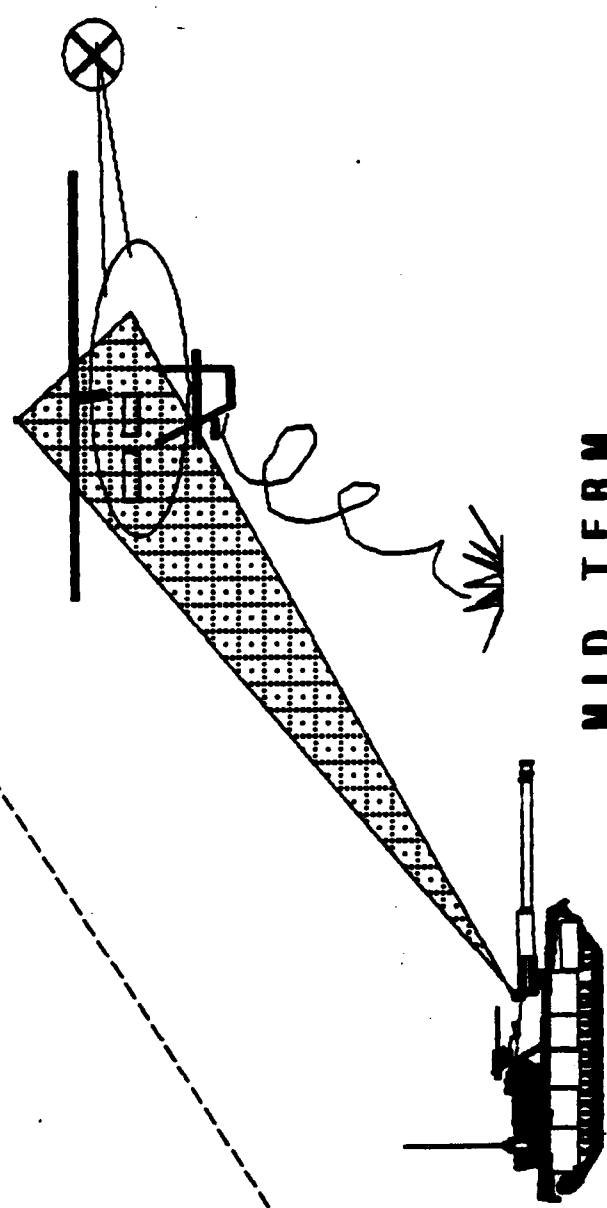
RF MISSION

RF COMBAT

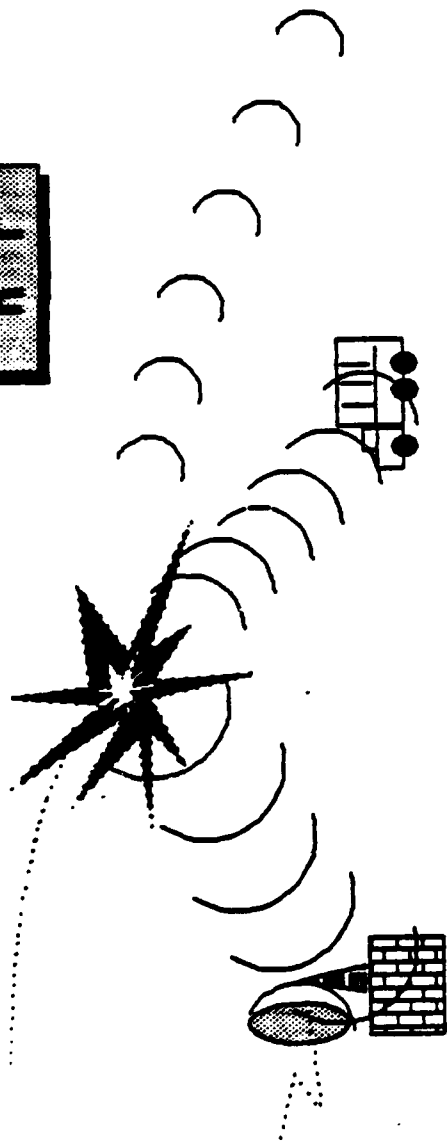
NEAR TERM



MID TERM

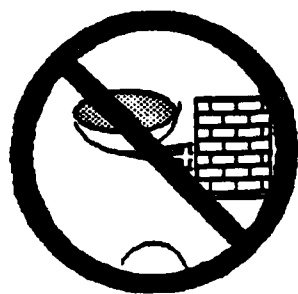


R F

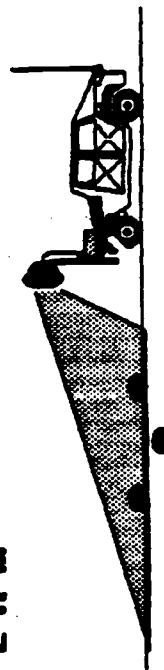


NEAR TERM

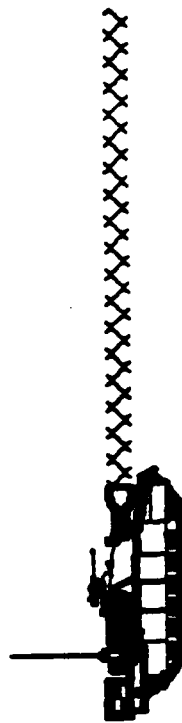
MID TERM



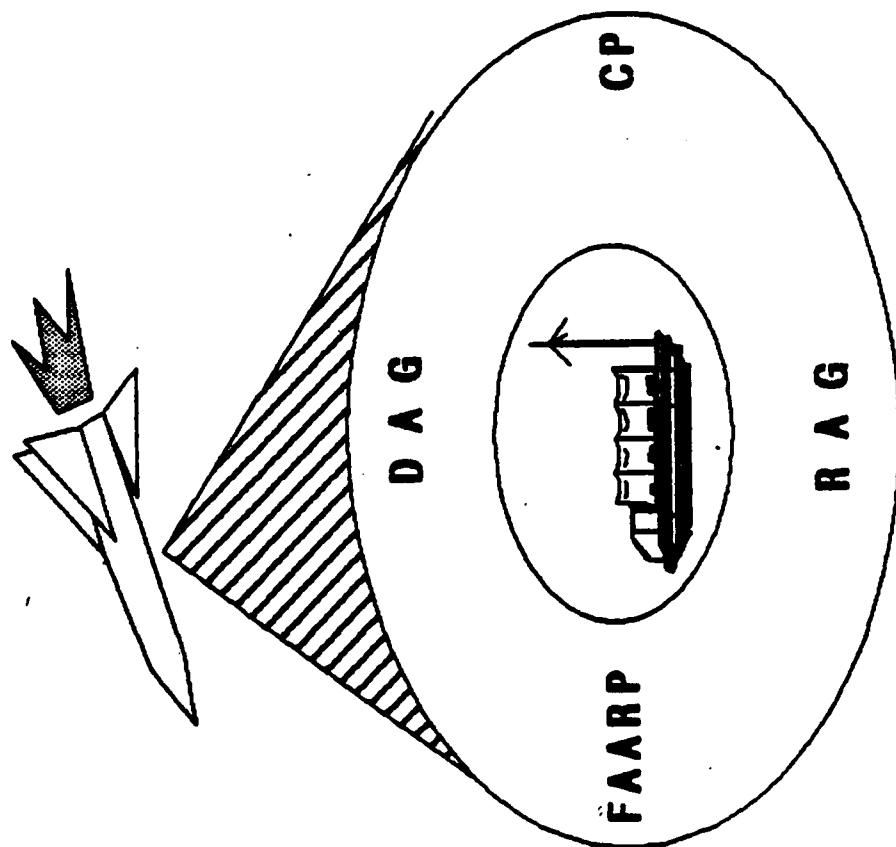
MID TERM



FAR TERM



ATACM/RF MUNITION & LOITERING/RF DRONE



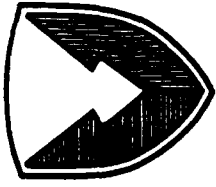
PURPOSE: ATTACK DEEP TARGETS
- FOLLOW ON MVR
- C2
- HIGH PAYOFF

SUPPORTS: IN CONCERT WITH
CDR's OPN'L AND
TACTICAL PLAN

OC11



HARRY DIAMOND LABORATORIES



**U. S. ARMY
LABORATORY COMMAND**

Session I Technology Applications

**Session Chairman:
Philip F. Ingersoll
Director, Technology Applications
Laboratory**

TECHNOLOGY APPLICATIONS LABORATORY

SLCHD-TA

394-2400

Phil Ingersoll, SES Director
Joseph W. Miller, Jr, Deputy Director
E. Ronald Sebol, Principal Laboratory Engineer
William Konick, Fuse Management

15 December 1989

Commercial (301) 394-XXXX
Autovon 290-XXXX
Facsimile 394-4309

Not an official organization chart.

Special Systems Branch

Robert Christopherson
SLCHD-TA-SS 394-5720

- Chaparral M917 ESUP
- Chaparral M917E1 Design
- Electrostatic Fusing
- Long Stand-Off Anti-Armor Fuse
- Advanced Mines

Engineering Technology Branch

John O. Wedel, Jr
SLCHD-TA-ET 394-5077

- Test Equipment Design and Fabrication
- Chaparral M917 TDD
- Chaparral M917E1 TDD
- PATRIOT M918 Fuse
- Production Test Equipment Support
- M735 Recertification Test Equipment Support
- Stockpile Surveillance and Test Support
- Reliability Analysis
- Radiographics

Electronic Systems Branch

Robert S. Goodman
SLCHD-TA-ES 394-3710

- M732E2 Artillery Proximity Fuse Development
- MLES Medium Altitude Proximity /Time Fuse
- Multi-Option Fuse for Artillery
- Electronic Safety & Arming

Mechanical Systems Branch

David L. Overman
SLCHD-TA-MS 394-2420

- Electronic Safety & Arming
- Micro Machining Research
- Fluidics
- Mechanical Engg Support
- Fusing
- Traffic Jam
- Medical R&D

Tactical Systems Branch

John M. Miller
SLCHD-TA-TS 394-2620

- XM749 Nuclear Artillery Fuse Development
- XM42 Setter Development
- GPS Applications

Energy Systems & Materials Branch

Dr. Jeff Nelson
SLCHD-TA-EM 394-3114

- Liquid Reserve Power Supplies
- Thermal Reserve Power Supplies
- Materials Engineering and Testing

FAST / Demo Office

Dr. Carl Campagnuolo
SLCHD-TA-FD 394-3193

- Wind Driven Fuse Power Supplies
- Turbine Alternators
- Fluidic Generators
- Man/Engine Powered Gens
- Mortar Fusing Prod Support
- Field Assistance for Science & Technology Office

Advanced Sensors System Branch

Dr. Philip J. Emmertman
SLCHD-TA-AS 394-3000

- Artificial Intelligence Research
- Robotic Vehicle Gun System
- VISTA/CIP Battlefield Sensor Fusion and Display
- Smart Weapons Program

Systems Engineering Branch

Joseph W. Tokarcik
SLCHD-TA-SE 394-2703

- Production Contracting and Support
- Chaparral M917
- Chaparral M917E1
- PATRIOT Fuse
- M735 Nuclear Arty Fuse
- XM749 Nuc Arty Fuse
- G78 Series Generators

The Harry Diamond Laboratories Technology Applications Laboratory

Personnel

Approximately 200 employees: Mostly Electronic, Chemical and Mechanical Engineers, Physicists, Mathematicians, Chemists, and technicians. Supplemented by about 30 on-site contract technical employees.

Facilities

Facilities include electronic, computer, chemistry and material testing laboratories, mechanical shops and computer aided design and drafting.

Budget

Over \$40 million per year, split between in-house expenses and contractor support. In addition, approximately \$300 million in on-going production contracts.

Customers

LABCOM, other Army commands, Army Project Managers, and Navy and Air Force organizations.

Projects

Chaparral Missile Fuze. Fabricated sixty fuzes at HDL in past couple of years and flight tested them at White Sands Missile Range (WSMR) with 100% score. Contractor has been competitively selected to produce 9000 fuzes to HDL technical data package.

MLRS Medium Altitude Proximity/Time Fuze. Fabricated over one hundred fuzes at HDL and flight tested them at WSMR and Dugway Proving Ground. Contractor recently selected to manufacture Engineering Development quantity of fuzes for further testing.

M732E2 Artillery Proximity Fuze. Fabricated 150 fuzes at HDL for tests at Yuma Proving Ground. Contractor fabricated 1500 fuzes for further testing. Production contractor to be competitively

PATRIOT Missile Fuze, M749 Nuclear Artillery Fuze, Long Stand-off Anti-armor Fuze, Multi-Option Fuze for Artillery, M734/M745 Mortar Fuzes, and other HDL designed fuzes. Fuzes under various stages of development and/or production.

Long Stand-off Anti Armor Fuze. Tech base developed magnetic/optical fuze for application to TOW-like weapons.

Electronic Safety and Arming. Continuing research into cost and component size reduction to make ESA's practical for rocket, mortar, and artillery fuzing.

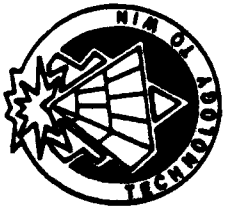
VISTA/CIP Command Information Processor. Vehicle mounted expert system to aid field commanders in tactical decision making. Contains 17 computers, color graphics and flat panel text displays, graphics tablets, remote terminals, and sensor communications. Designed and fabricated at HDL. Follow-on work under way for Marines and USAICS.

TEAM project. Autonomous target recognition vehicle with armament. Designed as experimental research platform.

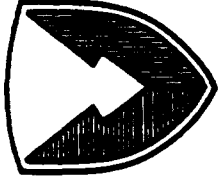
ISOPADS. Super sensitive fluidic microphones for application as soldier listening devices such as helmet mounted "bionic" ears.

Navigator. Low cost fluidic navigation system for Army vehicles. Three axis system scheduled for delivery to NTC this year.

Other Projects: Hand and Foot powered generators. Liquid and thermal reserve power supplies. Materials research and mechanical design in support of HDL projects.



HARRY DIAMOND LABORATORIES



**U. S. ARMY
LABORATORY COMMAND**

Global Positioning System

**John S. Eicke
Electronics Engineer
Tactical Systems Branch
Technology Applications Laboratory**

TITLE: Applications of Global Positioning System Technology

TECHBASE INVESTMENT STRATEGY AREA

The Global Positioning System (GPS) has potential applications in Army Next Generation/Future Systems, including the Advanced Field Artillery System and Lightweight 155mm Towed Howitzer.

DESCRIPTION

Develop a variety of components and systems utilizing GPS which can be integrated into Army systems to establish location and velocity information. Systems to utilize such capabilities might include radiosondes and artillery registration fuzes, as well as guidance systems, search and rescue beacons, etc. Harry Diamond Laboratories is seeking industry inputs on existing as well as future technology.

OBJECTIVE/APPROACH

The objective is to use GPS to provide new and enhanced capabilities, improved accuracy, and lethality of field artillery systems.

Technical Barriers are:

- Miniaturization: Packaging GPS receiver/repeater and antenna in projectile fuze volume, MMIC components, miniature antennas
- Receiver Dynamics: Fast acquisition receivers in high dynamic environments, receivers utilizing NAVAID inputs
- High-G: Receiver/repeater and components for use in artillery projectile environment
- Processing: Near real-time data processing, differential measurement systems
- Survivability: Steerable null antennas, signal processing to enhance ECM performance, techniques, GPS/Glonass compatible systems

REMARKS

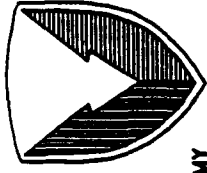
In direct support of:

- LABCOM GPS Artillery Spotter Round Cooperative program
- LABCOM GPS Radiosonde Cooperative program

Technical POCs: Mr. John Miller Mr. John Eicke
 Telephone: 301-394-2620 Telephone: 301-394-2620



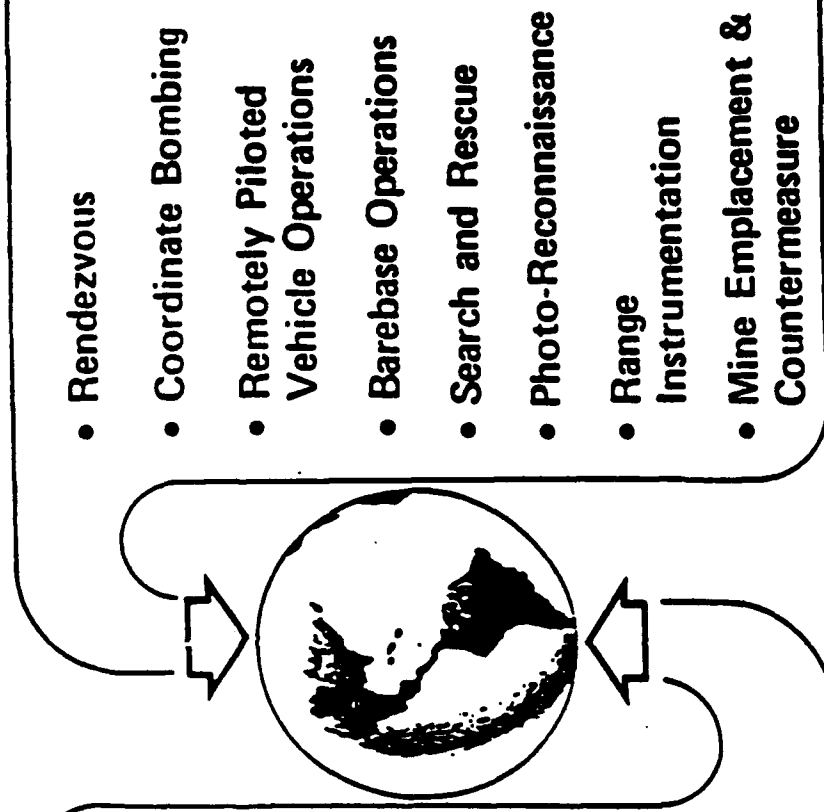
GPS MILITARY APPLICATIONS



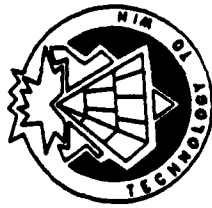
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- En Route Navigation
- Low-Level Navigation
- Target Acquisition
- Close Air Support
- Missile Guidance
- Command & Control
- All-Weather Air Drop
- Sensor Emplacement
- Precision Survey
- Instrument Approach

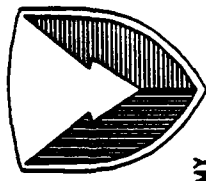


- Rendezvous
- Coordinate Bombing
- Remotely Piloted Vehicle Operations
- Barebase Operations
- Search and Rescue
- Photo-Reconnaissance
- Range Instrumentation
- Mine Emplacement & Countermeasure



HARRY DIAMOND LABORATORIES

CURRENT HDL GPS PROGRAMS



US ARMY
LABORATORY COMMAND

* GPS ARTILLERY REGISTRATION ROUND

Provide trajectory data to gun position

Packaged in standard fuze

GPS Translator approach

HDL, HEL and BRL cooperative program

* GPS RADIOSONDE

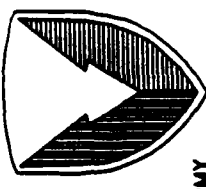
Provide wind velocity data

GPS translator and receiver approaches considered

HDL, ASL and ETDL cooperative program



STATUS OF GPS PROGRAMS



US ARMY
LABORATORY COMMAND

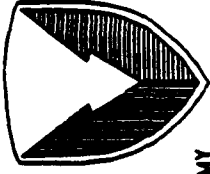
HARRY DIAMOND LABORATORIES

- * FY90-91: FEASIBILITY STUDIES & EVALUATIONS
- * FY92: FIELD DEMONSTRATIONS
- * FY93: TRANSITION TO FULL SCALE DEVELOPMENT
- * PRODUCTION
 - RADIOSONDE - 50,000 UNITS OVER 5 YEARS
 - REGISTRATION FUZE - 50,000 UNITS OVER 5 YEARS



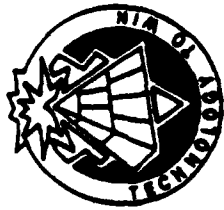
HARRY DIAMOND LABORATORIES

AREAS OF INTEREST IN GPS



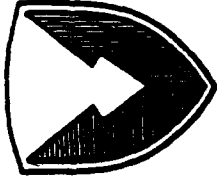
US ARMY
LABORATORY COMMAND

- * CUSTOM GPS COMPONENTS
- * SPECIALIZED GPS RECEIVERS
- * GPS RECEIVER ANALYSIS TOOLS
- * GPS TRANSLATORS
- * GPS ANTENNAS



HARRY DIAMOND LABORATORIES

U. S. ARMY
LABORATORY COMMAND



Fuzing

William L. Konick
Fuzing Manager
Technology Applications Laboratory

TITLE: Fuzing

TECHBASE INVESTMENT STRATEGY AREA

Fuzing will continue to have applicability to the broad spectrum of munitions systems from inexpensive ammunition items through sophisticated missile systems. Fuzes are used to keep the munition item safe to handle and store while providing optimum warhead lethality against the target after sensing the correct launch environment. Fuzing systems developed in the Technology Applications Laboratory at Harry Diamond Laboratories (HDL) are generically applicable to Next Generation / Future Systems (NG/FS) in the following Battlefield Functional Mission Areas: Fire Support, Air Defense, Close Combat Light, and Close Combat Heavy. An exhaustive list of specific systems will not be attempted here. However, three representative NG/FS are associated with each techbase work package in the briefing.

DESCRIPTION

Develop a variety of fuzing components, such as electronic safing and arming devices and power supplies, and fuzing systems for Army munitions. Pack as much sophistication as possible into physically small fuzing systems to enhance overall system lethality, and deal with countermeasures of all types. Simultaneously, satisfy other important constraints such as safety, reliability, cost, human engineering, and fire control system interface. Other important issues that must be dealt with in fuzing development include use of insensitive munitions, and understanding the effects of long-term storage. The HDL Technology Applications Laboratory not only performs techbase development of fuzes, but also has strong customer-funded fuzing programs in engineering development, engineering in support of production, and product improvement programs.

OBJECTIVE/APPROACH

The objective is to continuously improve the effectiveness of the fuzes that are provided to the Army for its munitions.

Technical barriers are:

- Miniaturization: Packaging sophisticated sensors and signal processors into standardized ammunition fuze contours and into vanishingly small volumes in precision guided munitions and missiles.

- Signal processing and algorithm development: Signal processors must be able to handle the increased quantity and rates of data that the new sensors can provide. Targets must be discriminated from clutter at extended detection ranges.
- Pre-launch power: Certain ammunition items will require the presence of electrical power for hand setting before use. How will this be accomplished while satisfying long-term storage requirements?
- Encounter simulation: Modeling and hardware-in-the-loop capabilities must be upgraded to accommodate new sensors and encounter scenarios.
- Low energy fire set components: Critical for achieving electronic safing and arming performance and cost goals.

REMARKS

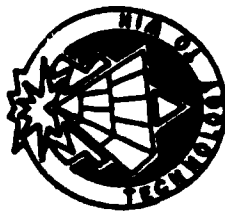
Customer programs in direct support of:

- PM-Patriot
- PM-Chaparral
- PM-Mortar Systems
- PM-Nuclear Munitions
- AMCCOM
- PM-MLRS

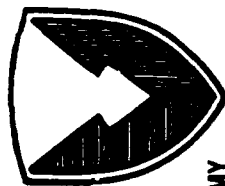
Techbase in direct support of:

- PM-Fuzes
- PM-AFAS
- PM-TOW
- PM-AAWS-M

Technical POC: Mr. William Konick
 SLCHD-TA
 (202)394-2400



ADVANCED PLANNING BRIEFING FOR INDUSTRY



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

TECHNOLOGY APPLICATIONS LABORATORY

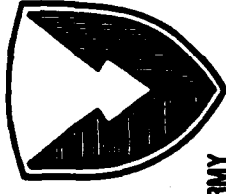
"FUZING"

Presented By
William L. Konick
(202)394-2400

SESSION I ~ 23 JANUARY 1990



NOTICE!



HARRY DIAMOND LABORATORIES

US ARMY
LABORATORY COMMAND

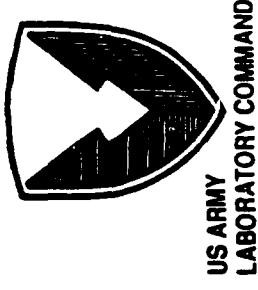
In accordance with applicable regulations, the information in this briefing is conditioned by the following:

- **The estimates are based on the best information available.**
- **The information is subject to modification and is in no way binding on the Government.**
- **More specific information relating to the procurement of any individual item or class of items will not be furnished until the proposed acquisition is synopsized in the Commerce Business Daily or the solicitation is issued.**

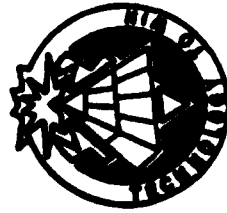


HARRY DIAMOND LABORATORIES

Outline

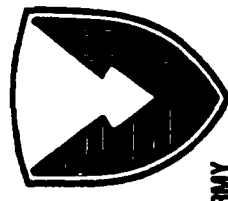


- **Background**
- **Existing fuze production contracts**
- **Fuzes that are soon to go into production**
- **Fuzing tech base programs
in the Technology Applications Laboratory**



HARRY DIAMOND LABORATORIES

Background

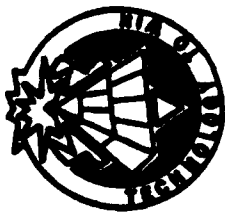


Fuzing Mission at HDL

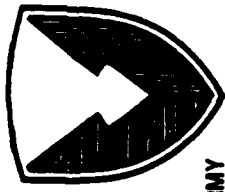
LABCOM Regulation 10-1:

HDL has Army leadership for -

Providing assistance to hardware developers through the design and application of advanced electronic fuzing and radar technologies



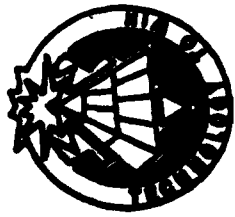
Mission Areas Supported



US ARMY
LABORATORY COMMAND

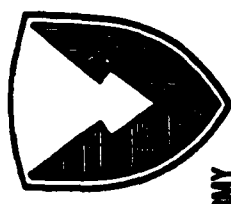
HARRY DIAMOND LABORATORIES

- Fire Support
- Air Defense
- Close Combat Light
- Close Combat Heavy

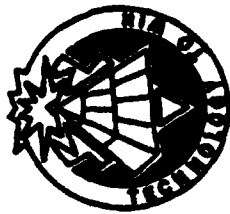


Fuzes in Production

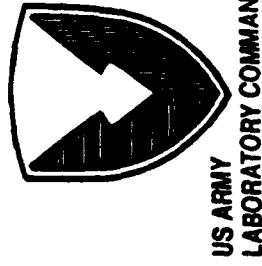
HARRY DIAMOND LABORATORIES



- Patriot
- Chaparral
- M734 Mortar Fuze
- M745 Mortar PD/Practice Fuze
- M749 Fuze - 155mm Nuclear Artillery

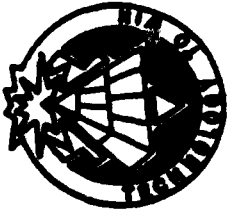


Patriot M818E2

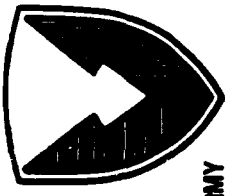


HARRY DIAMOND LABORATORIES

- **Description:** Fuze for surface-to-air missile
- **Status:** In production
- **Current contractor -**
Allied Signal, Bendix Communications Division
Contract award Nov 88, \$50M for 1027 units
First article: Jan 90
Delivery schedule: through Apr 91
- **Next contract to award: approx 31 Jan 90**
FY90 quantity: 912 units
Priced options for FY91 & FY92: 1765 units max
Year: FY91 FY92
Max Quan: 1065 700
- **POC name, office symbol, phone:**
David Thier, SLCHD-TA-SE, (202)394-2703



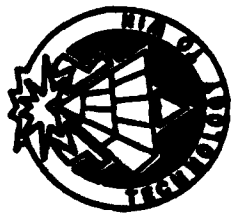
Chaparral M817E1 TDD



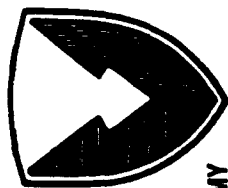
HARRY DIAMOND LABORATORIES

- Description: Fuze for surface-to-air missile
- Status: In production
- Current contractor -
Loral (Fairchild Weston Systems Inc)
Contract award May 89, \$3.6M for 390 units
First article (TDD): May 90
Basic delivery schedule: May 90 - Nov 90
- Options:

Year:	FY90	FY91	FY92	FY93	FY94
Max Quan:	1200	2000	2000	2000	2400
- POC name, office symbol, phone:
Les Kitchman, SLCHD-TA-SE, (202)394-2703



M734

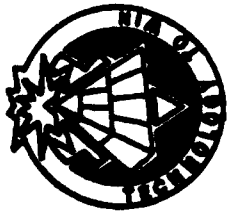


US ARMY
LABORATORY COMMAND

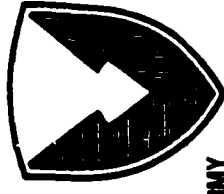
HARRY DIAMOND LABORATORIES

- **Description:** Multi-option fuze for mortar cartridges
- **Functions:** proximity, near-surface-burst, impact, delay
- **Status:** In production
- **Key milestones**
 - TC 1977 on 60mm ctg, TC 1987 on 81mm ctg
 - FY90 will TC on 4.2in and 120mm ctgs
- **Current contractors:** Accudyne, Eastman Kodak
- **FY90 buy for 187K units on the street, award Mar 90**
- **Future requirements:**

Year	FY91	FY92	FY93	FY94
Units(K)	124	54	128	39
- **POC name, office symbol, phone:**
Frank Blodgett, SLCHD-TA-FD, (202)394-3193



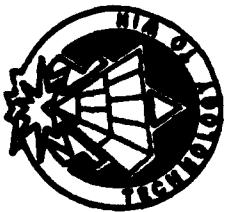
M745



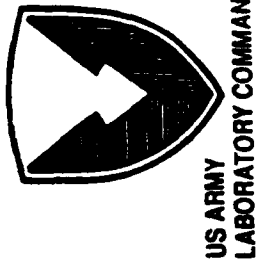
HARRY DIAMOND LABORATORIES

- **Description:** Fuze, PD, Dual Purpose for mortar cartridges
- **Status:** In production
- **Key milestones**
 - TC 1988 on 60mm WP and HE ctgs
 - FY90 will TC on M888 60mm HE ctg
 - FY90 will TC on 4.2in and 120mm smoke ctgs
- **Current contractor:** Accudyne, FY89 buy, 185K units
- **FY90 buy for 47K units on the street, award Mar 90**
- **Future requirements:**

Year	FY91	FY92	FY93	FY94
Units(K)	124	54	128	39
- **POC name, office symbol, phone:**
Frank Blodgett, SLCHD-TA-FD, (202)394-3193



M749

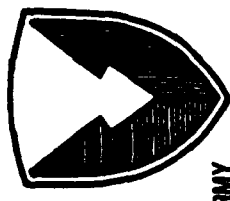


HARRY DIAMOND LABORATORIES

- **Description:** Fuze for 155mm nuclear artillery projectile
- **Status:** In production
- **Current contractor -**
Motorola
Contract award Mar 88, \$34.5M for 527 units
Option exercised Nov 89, \$15.3M for 248 units
Delivery schedule: Aug 89 - 1Q FY92
- **POC name, office symbol, phone:**
Bill Webster, SLCHD-TA-SE, (202)394-2703



Fuzes to go into Production



HARRY DIAMOND LABORATORIES

- **M732E2 PIP Artillery Fuze**
- **XM450 MAP/T Fuze for MLRS**



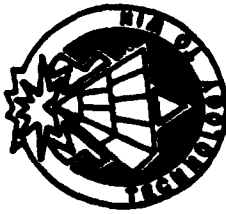
M732E2

US ARMY
LABORATORY COMMAND

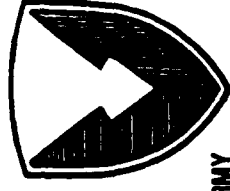
HARRY DIAMOND LABORATORIES

- Description: Proximity fuze for artillery unitary warhead burster projectiles, including rocket-assisted projectiles
- Status: Production to start FY91
- Key milestones
 - IPR Dec 89
 - TC Jan 90
- Contract opportunities: AMCCOM will attempt to limit procurement to MOB base
- Future requirements:

Year	FY91	FY92	FY93	FY94
Units(K)	190+	0	0	0
- POC name, office symbol, phone:
Bob Goodman, SLCHD-TA-ES, (202)394-3710

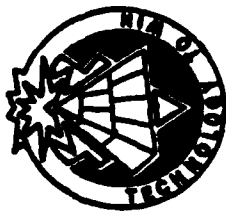


XM450

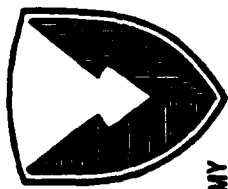


HARRY DIAMOND LABORATORIES

- **Description:** Proximity and time fuze for MLRS binary chemical warhead
- **Status:** Full scale development (6.4)
- **Key milestones**
 - PRR Feb 90, PQT FY91
 - Milestone III IPR 1Q FY92
 - Production FY92
- **Current contractor:** (FSD) 500 units
Joint venture of KDI Precision Products and Electronic Development Corporation
- **Production contract** to be full and open competition
Years: FY92 - FY97
Quantities: Classified
- **POC name, office symbol, phone:**
Bob Goodman, SLCHD-TA-ES, (202)394-3710

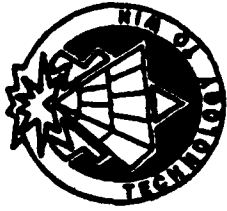


Fuzing Tech Base

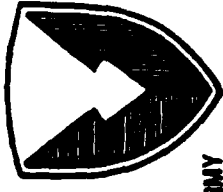


HARRY DIAMOND LABORATORIES

- **MOFA (Multi-Option Fuze for Artillery)**
- **LSAA (Long-Standoff Anti-Armor)**
- **ESA (Electronic Safing and Arming)**

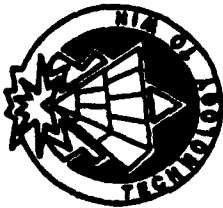


MOFA

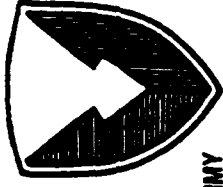


HARRY DIAMOND LABORATORIES

- **Description:** Single fuze for use on all burster projectiles in all current and developmental field artillery systems
- **Next generation / future systems supported:**
 - Advanced Field Artillery System (AFAS)**
 - Extended Range Artillery Projectile II (ERA II)**
 - Lt Wt 155mm Towed Howitzer**
- **Key technologies:**
 - MIMIC**
 - Flexible LCD**
 - Active Battery for pre-launch power**
- **Status:** in last year of 6.2
- **Key milestones - to be managed by PM-AFAS**
 - Proof of Principle (6.3a):** FY91 - FY92
 - Full Scale Development (6.4):** FY93 - FY96
- **Production start:** FY97
- **HDL contract opportunities - limited to component development**
- **POC name, office symbol, phone:**
 - Bob Goodman, SLCHD-TA-ES, (202)394-3710**



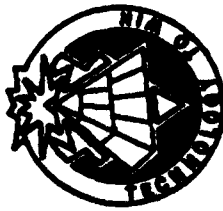
LSAA



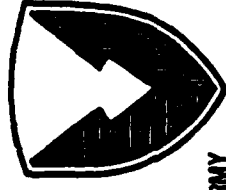
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- Description: Low-cost magnetic / optical anti-armor standoff fuze
- Next generation / future systems supported:
 - Line of Sight Antitank
 - Multimode Antiarmor Weapon System (MMAAWS)
 - Future Smart Munition
- Key technologies:
 - Low-cost optics
 - Triple-axis magnetometer
 - Signal processing
- Status: Tech base (6.2)
- Key milestones:
 - FY89 - Transferred technology to PM-TOW
 - FY90 - Perform smoke and countermeasures field tests
 - FY91 - Investigate methods to extend standoff distance
- Contract opportunities - none, in-house effort
- POC name, office symbol, phone:
 - Bob Christopherson, SLCHD-TA-SS, (202)394-3720

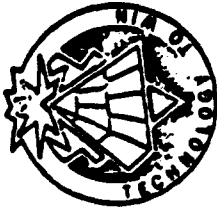


ESA

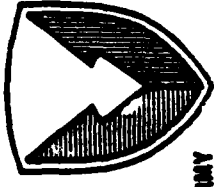


HARRY DIAMOND LABORATORIES

- **Description:** Development of miniaturized electronic safing and arming (ESA) technology with emphasis on insertion into low-cost systems (missiles, rockets, artillery, mortars)
- **Next generation / future systems supported:**
 - Very broad range of applicability, including -
 - Patriot 2000
 - Multimode Antiarmor Weapon System
 - Low Intensity Conflict Rocket System (LICRS)
- **Key technologies:** Efficient, low-cost, rugged and reliable components
 - Capacitors - high voltage
 - Miniaturized DC to DC converters
 - High voltage switches
 - Low-energy slapper bridges
- **Status:** Tech base (6.2)
- **Key milestones:**
 - FY90 - Zuni flight test (modified ATACMS) and mortar technology demos; Support PM-AAWS-M risk reduction ESA development
 - FY91 - Flight test generic low-cost missile ESA
- **HDL contract opportunities - component development**
- **POC name, office symbol, phone:**
 - Bob Goodman, SLCHD-TA-ES, (202)394-3710



BATTLEFIELD AUTOMATION



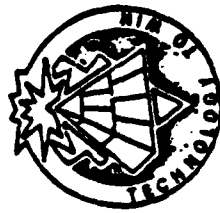
HARRY DIAMOND LABORATORIES

PRESENTED BY

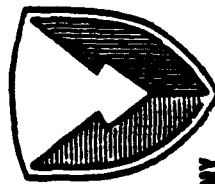
DR. PHILIP J. EMMERMAN

ADVANCED SENSORS SYSTEMS BRANCH

Harry Diamond Laboratories
2800 Powder Mill Road
Adelphi, Md 20783-1197
(301) 394-3000



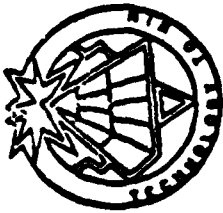
MULTI-SENSOR PROCESSING



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- REMOTE, COMBAT INFORMATION PROCESSOR
- LOCAL, AUTOMATIC TARGET ACQUISITION

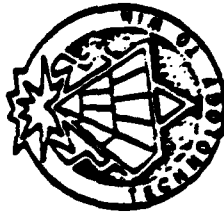


RELATED PROGRAMS

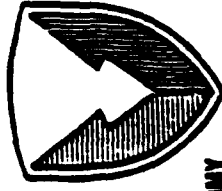
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

PROGRAM	SPONSOR	FOCUS
COMBAT INFORMATION PROCESSOR		
SMART WEAPONS SYSTEM	LABCOM/BRL	FIRE SUPPORT
CIP TESTBED	MARINES	COMMAND AND CONTROL
AI MODULE	DCSINT	INTELLIGENCE
MULTI-MISSION AREA SENSOR	PM-TAAWS	AIR DEFENSE
ROBOTIC (ATR)		
TECHBASE ENHANCEMENTS FOR		CLOSE COMBAT
AUTONOMOUS MACHINES	LABCOM/HEL	LIGHT AND HEAVY
(TAAWS) TARGET ACQUISITION FOR ARMY WEAPON SYSTEMS		
(ATR) AUTOMATIC TARGET RECOGNITION		



OVERALL GOAL

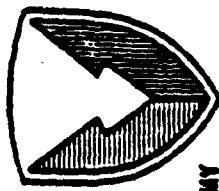


HARRY DIAMOND LABORATORIES

**DETERMINE THE OPERATIONAL BENEFITS
WHICH RESULT FROM PROVIDING
NEAR-REAL-TIME COMBAT INFORMATION
TO THE TACTICAL COMMANDER**

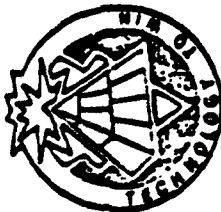


OBJECTIVES

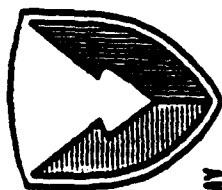


HARRY DIAMOND LABORATORIES

- DETERMINE AND EVALUATE OPERATIONAL REQUIREMENTS
 - BRIGADE LEVEL PROCESSING AND INTERFACE REQUIREMENTS
 - SENSOR PROCESSING AND INTEGRATION REQUIREMENTS
 - COLLATERAL DATA BASE REQUIREMENTS
- VALIDATE OPERATIONAL BENEFITS OF ADVANCED TECHNOLOGIES
 - KNOWLEDGE BASED DECISION AIDS
 - MULTIPROCESSING
 - SPECIALIZED DATA BASES
 - PROGRAMMABLE COMMUNICATION INTERFACES
- PROVIDE LESSONS LEARNED AND DATA TO SUPPORT FUTURE PLANNING OF ARMY COMMAND AND CONTROL SYSTEMS

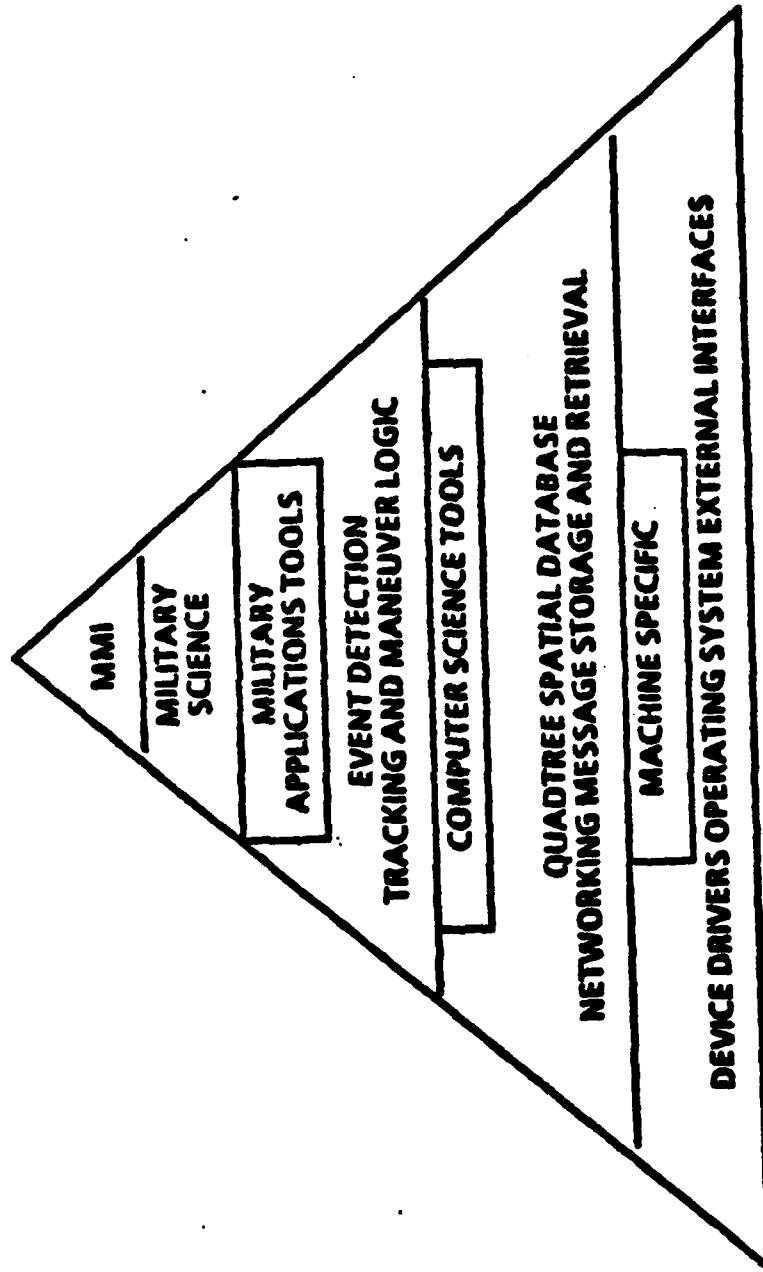


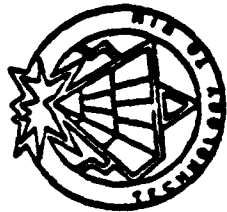
SOFTWARE DEVELOPMENT AREAS



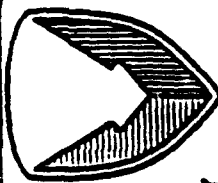
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



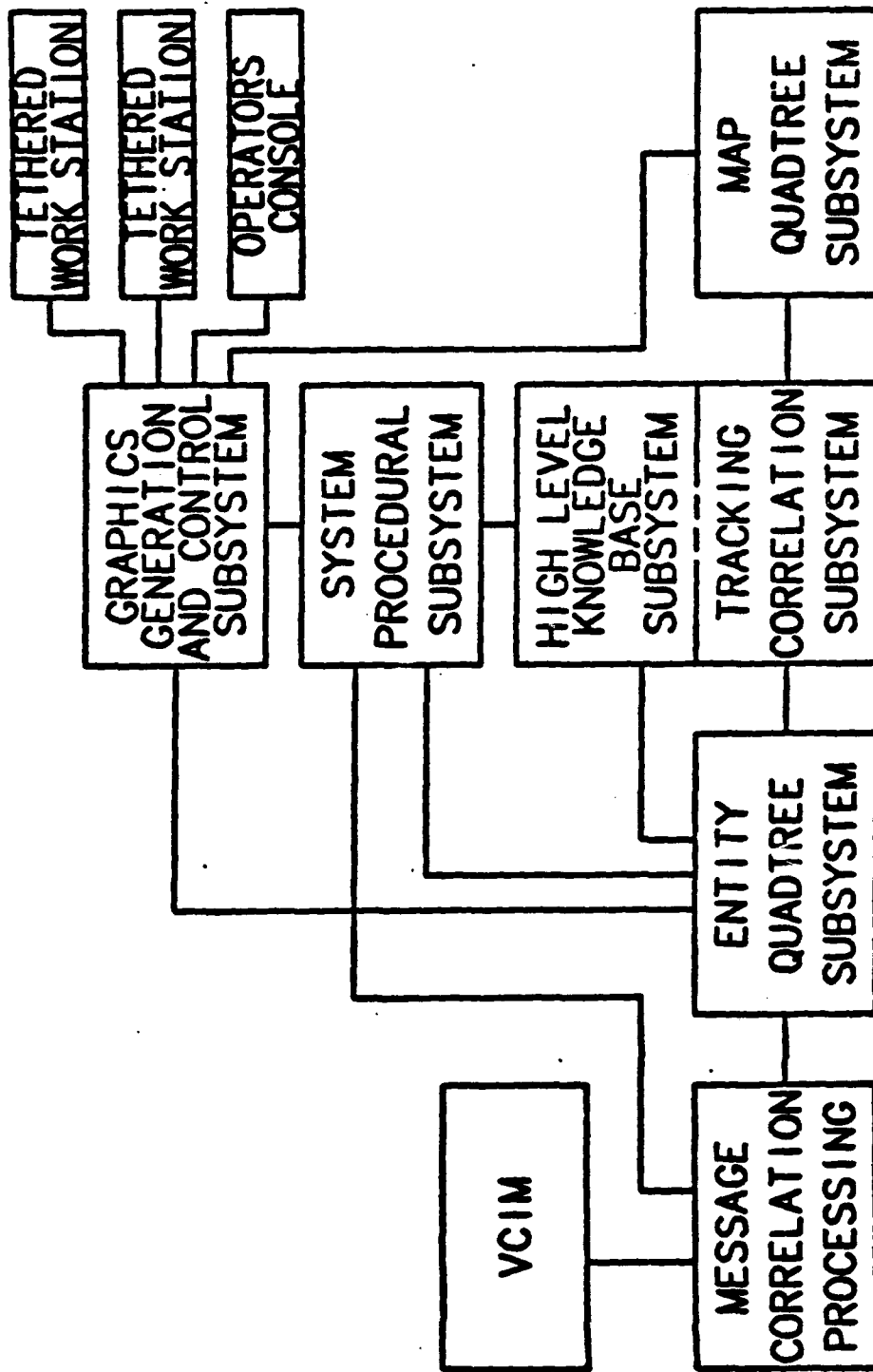


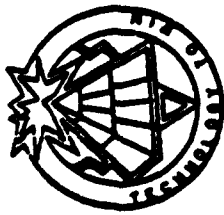
CIP KNOWLEDGE BASED PROCESSOR SUBSYSTEM BLOCK DIAGRAM



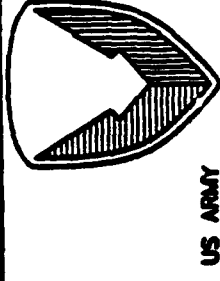
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



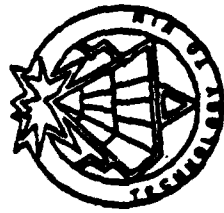


CURRENT FUNCTIONALITY

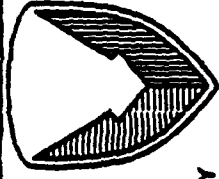


US ARMY
LABORATORY COMMAND

- ELECTRONIC MAPS (VECTOR FEATURES)
- TERRAIN ANALYSIS (PLANNING AND EXECUTION)
 - LINE OF SIGHT
 - FIELD OF VIEW
 - MOBILITY CORRIDORS
 - ROUTE PLANNING
- THREAT ANALYSIS
 - TARGET CLUSTERING
 - TARGET PREDICTION
- TACTICAL MESSAGE SUPPORT
 - PROTOCOLS (MTS, TACFIRE, MISMART)
 - AUTOMATIC PARSING
 - AUTOMATIC STORAGE
 - SELECTED RETRIEVAL
 - CONFIGURABLE AUTOMATIC DISTRIBUTION

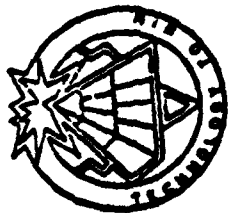


CURRENT FUNCTIONALITY (CONTINUED)



US ARMY
LABORATORY COMMAND

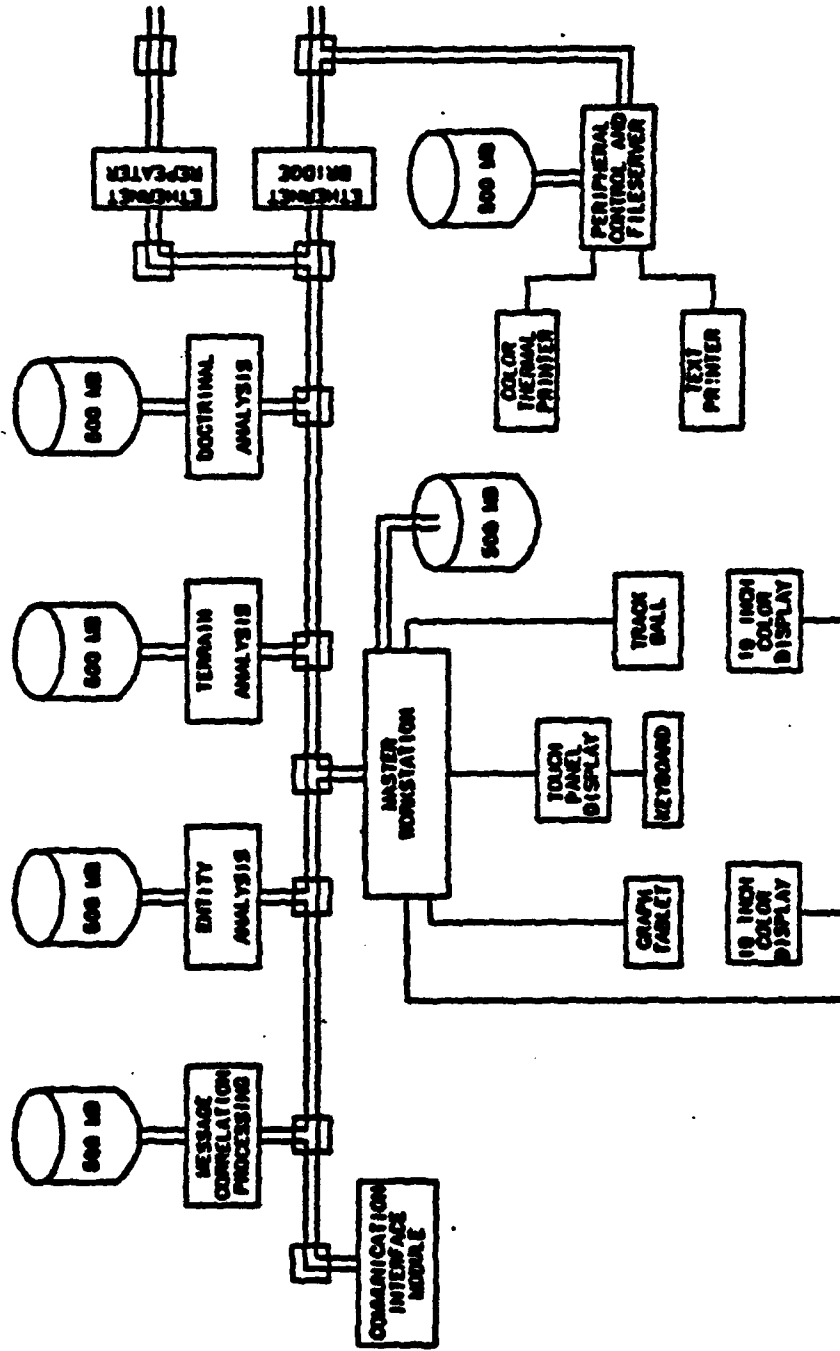
- UNITS DATABASE
 - TRACKING
 - CORRELATION
 - SHARED AMONG ALL USERS
 - AUTOMATIC UPDATING FROM MESSAGES
 - SUPPORTS STANDARD MILITARY SYMBOLS (FM 101-5-1)
- CONTROL MEASURES DATABASE
 - SHARED AMONG ALL USERS
 - SUPPORTS STANDARD MILITARY SYMBOLS (FM 101-5-1)
 - EVENT DETECTION
- HARD COPY
 - PAPER
 - OVERLAY (STANDARD SCALES)



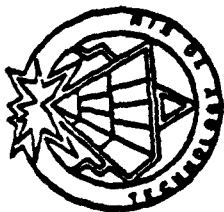
CIP FUNCTIONAL BLOCK DIAGRAM

US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



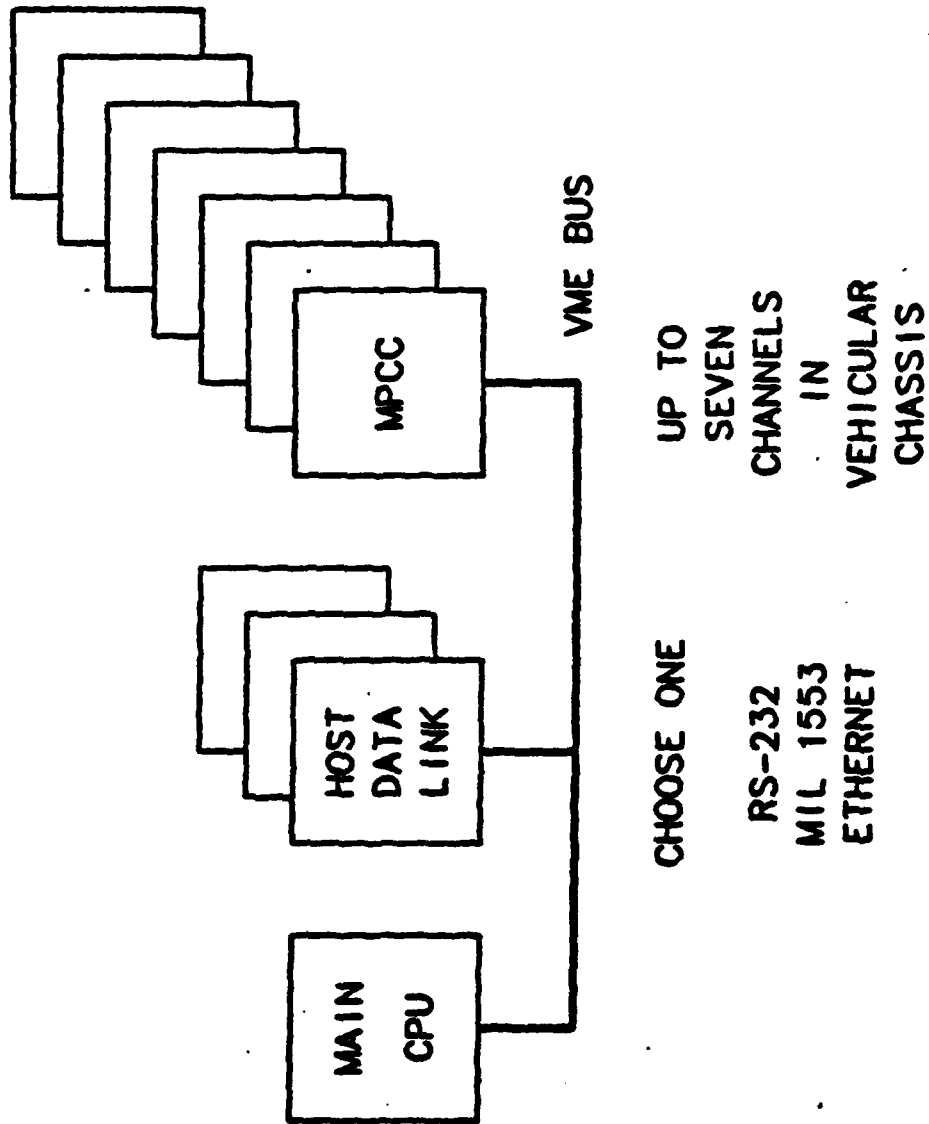
UNV1.DWG



CIM ARCHITECTURE

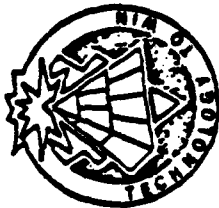
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



CIM-5

7/07/89

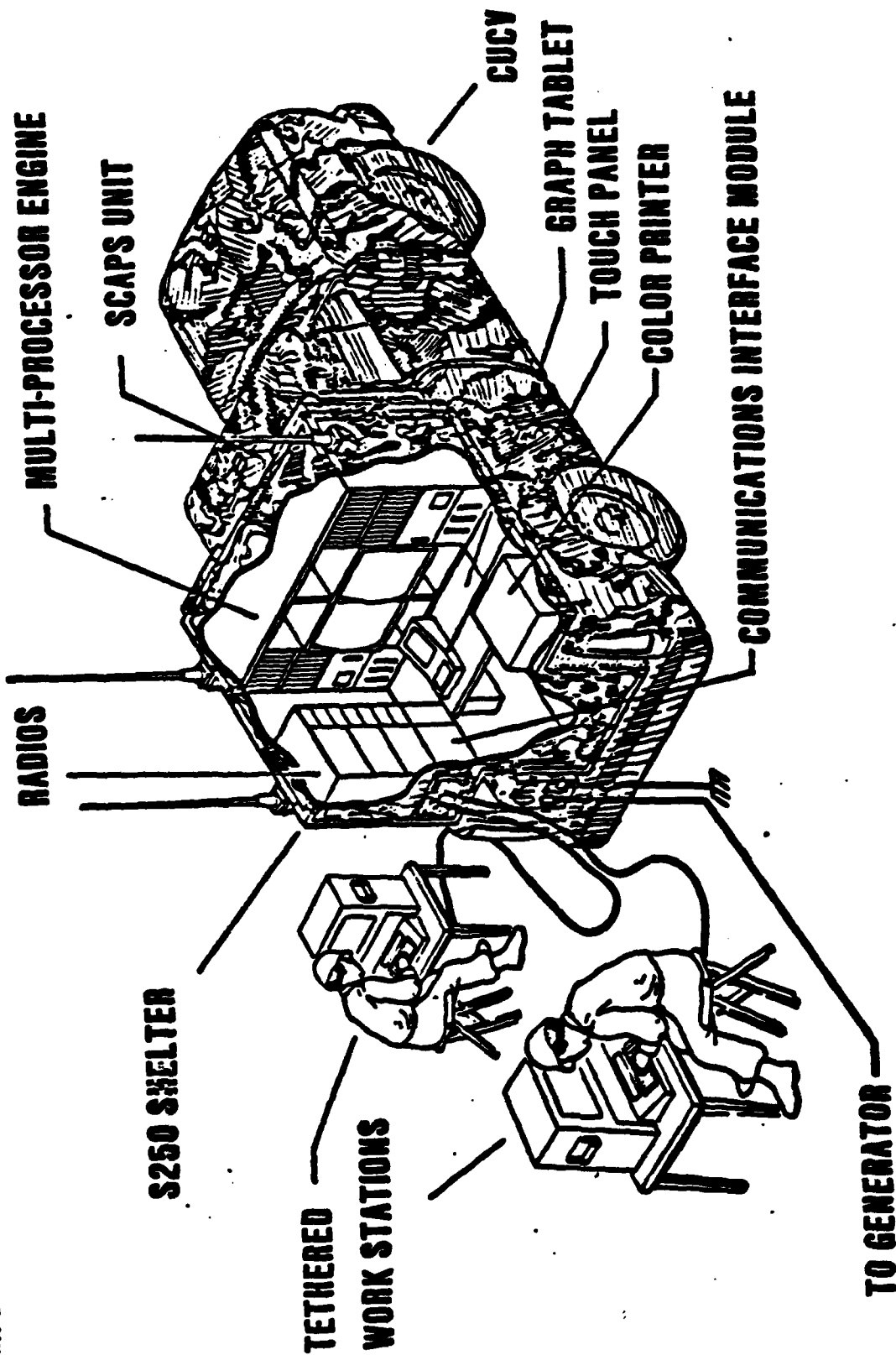


BRIGADE MULTI-FUNCTIONAL AREA PROCESSOR

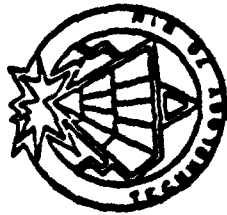
TEST BED

US ARMY
LABORATORY COMMAND

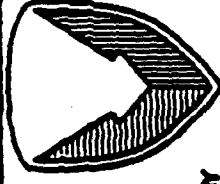
HARRY DIAMOND LABORATORIES







TEST BED FEATURES

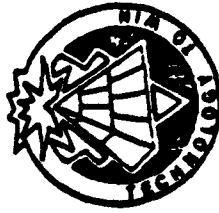


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

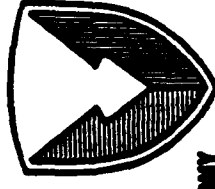
- FLEXIBLE, POWERFUL, AND MOBILE
REAL TIME TOOL FOR MULTI-FUNCTIONAL AREA
AND MULTI-SENSOR INTEGRATION.
- ENHANCES THE TRACKING OF ENTITIES/TARGETS BY
UTILIZING TERRAIN AND DOCTRINAL KNOWLEDGE.
- AUTOMATICALLY DETECTS EVENTS OF ENTITY MOVEMENT
INTO OR OUT OF A MILITARY AREA OF INTEREST.
- SUPPORTS MULTIPLE COOPERATING EXPERT SYSTEMS.
- EXCELLENT GROWTH POTENTIAL
HARDWARE • OPEN TO SEMICONDUCTOR
INDUSTRY ADVANCES.
(VME STANDARD)
- SOFTWARE • OPEN TO ADVANCES IN REAL TIME
OPERATING SYSTEMS, LANGUAGES,
AND APPLICATIONS.
(UNIX AND REAL TIME KERNELS)

UAVS.DWG



HARRY DIAMOND LABORATORIES

AUTOMATIC TARGET ACQUISITION AND INTEGRATION GOALS

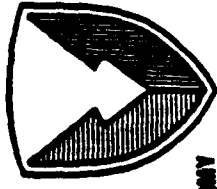


US ARMY
LABORATORY COMMAND

- EXTREMELY LOW PROBABILITY OF FALSE ALARM CONSISTENT WITH ROBOTIC MISSIONS
- VEHICLE SURVIVABILITY, AFFORDABILITY, SIZE
- REAL WORLD SCENARIOS - DAY/NIGHT, CLUTTER, OBSCURANTS
- NAVIGATION AND ATA INTEGRATION
- HIGH OVERALL SYSTEM RELIABILITY/ FAILSAFE OPERATION



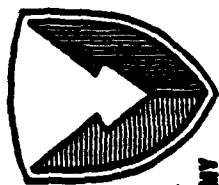
APPROACH



US ARMY
LABORATORY COMMAND

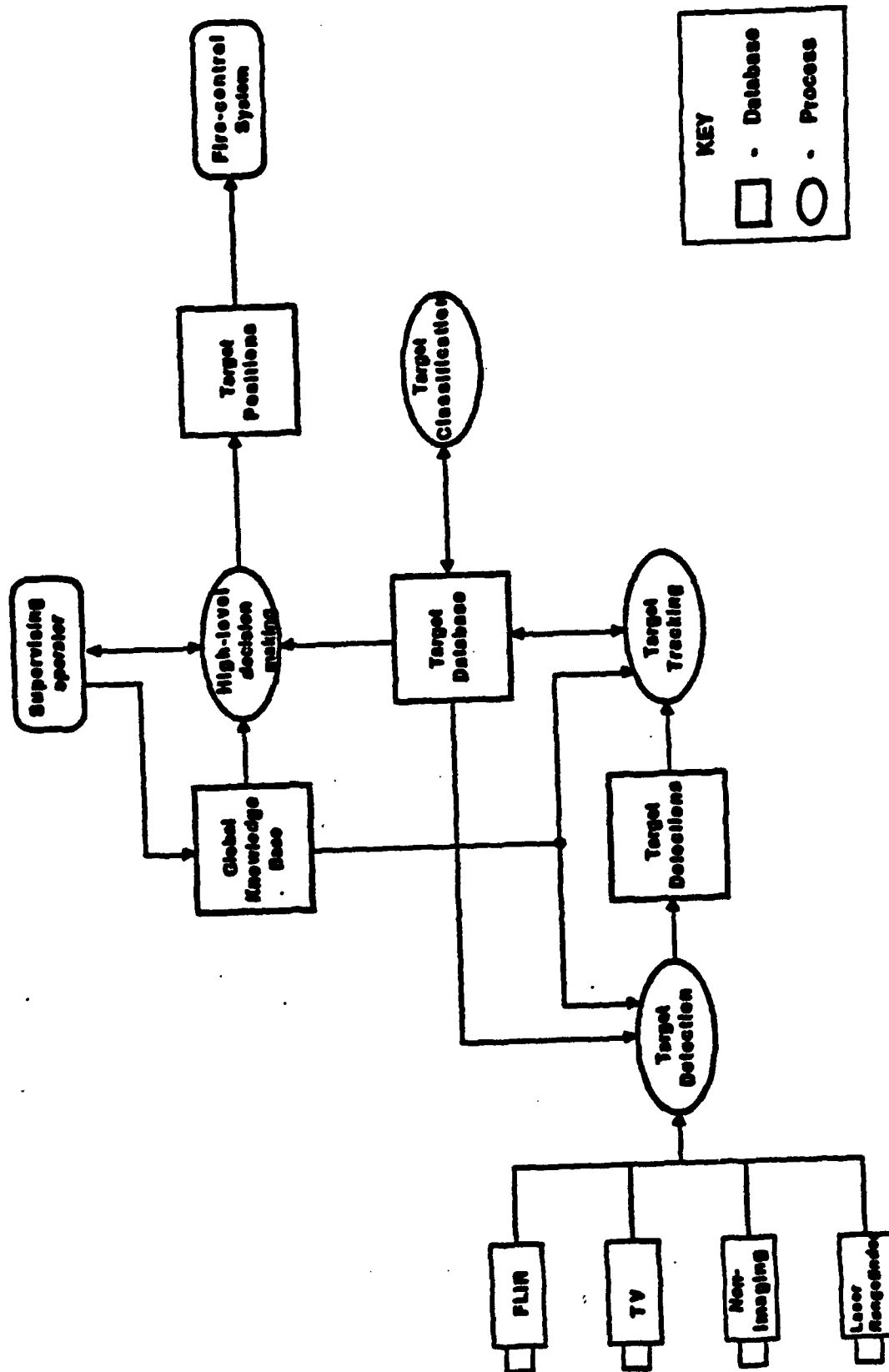
NATICK DIAMOND LABORATORIES

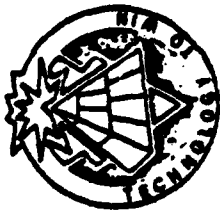
- PASSIVE SENSORS
- SENSOR FUSION
- OPEN SYSTEMS APPROACH, HARDWARE AND SOFTWARE
- ALGORITHMS BASED ON MOTION DETECTION, SPATIAL CORRELATION, AND USE OF CONTEXTUAL KNOWLEDGE



**U.S. ARMY
LABORATORY COMMAND**

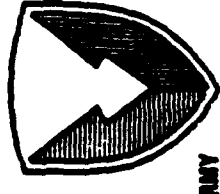
WARRY DIAMOND LABORATORIES





FUTURE CAPABILITIES

HARRY DIAMOND LABORATORIES



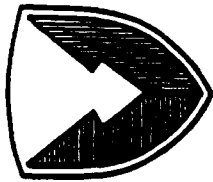
US ARMY
LABORATORY COMMAND

- WEATHER/NBC MODEL
- MOBILITY MODEL
- SMALLER, LIGHTER SYSTEMS
- COLLECTION MANAGEMENT
- SITUATION ASSESSMENT
- TARGET DEVELOPMENT
- ADVANCED MULTI-SENSOR CORRELATION
- FUTURE USER DEFINED REQUIREMENTS



HARRY DIAMOND LABORATORIES

**U. S. ARMY
LABORATORY COMMAND**



Session II Nuclear Survivability

**Session Chairman:
Dr. John C. Ingram
Deputy Director, Nuclear
Survivability Laboratory**

NUCLEAR SURVIVABILITY PROGRAM

The Harry Diamond Laboratories, Nuclear Survivability Program develops a full range of verified and demonstrated technology products and methodologies required to assure the future survivability of U.S. Army materiel during and after a nuclear exchange. HDL as the AMC Lead Laboratory for nuclear weapons effects survivability is charged to formulate, budget and execute this broad technology program that is required so that mission essential Army equipment can be made as survivable as the soldier. This is needed so Army can avoid the potentially disastrous situation of having soldiers who are willing and able to fight after a nuclear attack, but are unable to do so because combat systems fail to withstand hostile nuclear environments.

The 6.2 Nuclear Survivability Technology part of the overall Army Nuclear Survivability Program provides technology products for all nuclear effects areas (e.g. EMP, radiation and blast/thermal) including the simulation of these effects and the development of nuclear hardening methods and techniques needed for designing nuclear-survivable equipment, testing it and assessing and validating systems survivability and maintaining that survivability throughout the life cycle. The continuing evaluation of emerging technologies that are being introduced into new and product improved military system designs make this tech base an iterative program that provides the Army with affordable hardening solutions for development and fielded system use.

Nuclear weapons effects and simulators are studied and developed, maintained and improved for use in designing survivable equipment. Radiation shielding technology is developed and demonstrated for protection of crews in armored vehicles.

There are several major areas of concern in this program. First is the high altitude electromagnetic pulse (HEMP) in which advanced protection devices are being developed to prevent the loss of the entire inventory of electronic military systems from a HEMP nuclear weapon burst. Additionally, this task area develops analysis methods and techniques for hardening tactical Army systems to EMP effects and the capability to simulate the new military standard, MIL-STD-2169. Free field current injection and computer simulation techniques are being used to assess the impact of this new environment on past and future EMP hardening approaches.

The next major area of interest, is Air Blast and Thermal radiation. Mobile tactical systems are particularly vulnerable to being overturned by the blast wave. This task will develop advanced techniques like lightweight outriggers and other overturning restraints for use with Army vehicles that carry mobile C3I systems. Additionally, the program will conduct Large Blast/Thermal Simulator (LB/TS) cost reduction research in cooperation with DNA. Non-ideal blast will also be investigated.

Finally the Tactical Source Region (TSR) area is concerned with an annular area around the burst point of a low yield nuclear weapon beyond the range where personnel and equipment are disabled by the blast and thermal radiation. In this area, nuclear radiation is being deposited in the air creating a complex, time varying radiation, ionizing electron and electromagnetic pulse (EMP) environment. This task objective is to develop the analytical methods and basic technology necessary to ensure the survivability of Army equipment in this environment. Resolution of the tactical source region problem will involve above ground tests in AURORA and underground nuclear tests (UGT) and will help develop tactical source region hardening requirements and lead to approaches for TSR simulation.

The Nuclear Effects Support Team is a 6.3b AMC sponsored program funded to facilitate transfer of nuclear survivability information from the research community to systems under development. NEST assistance is available to meet the needs of project managers

The Nuclear Survivability Assessment Team (NSAT) Program, has the goal of facilitating Army nuclear survivability by analysis and test and where required the hardening of unhardened equipment fielded. The Army equipment list for this program has been prioritized by the Training Doctrine Command for test, evaluation, and hardening retrofit. Based on the work NSAT does, a database has been established for future Army use.

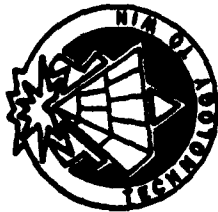
The 6.2 nuclear survivability technology products are developed by HDL and fed into demonstration packages that integrate into standard nuclear survivability hardening modules for use by project managers and major subordinate command elements working the nuclear survivability of future generation military systems. The major areas being worked on are covered in the following paragraphs.

The high altitude EMP (HEMP) Defense Standards and Specifications Program (DSSP) is directed at providing support to high priority time sensitive, strategic ground based mobile C3I systems. The program demonstrates low risk EMP hardening for these systems and develops associated specifications, standards, hardening guidelines and practices.

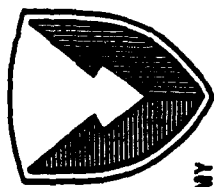
The development of hardness assurance/hardness maintenance (HA/HM) techniques and procedures is being developed for application to the acquisition and the operational phases of a nuclear hardened system. The Army needs these techniques and procedures so that systems can be kept survivable. The increasing numbers of Army systems that have nuclear hardening criteria make this and future derivative efforts an area of important and continuing concern.

HDL has pursued a non-developmental item (NDI) advanced system hardening effort for the past several years that has the objective of generating techniques and methods for selecting or modifying NDI equipment so that it can survive in a nuclear battlefield environment containing initial nuclear radiation (INR), electromagnetic pulse (EMP), and blast/thermal radiation. Survivability problems for different NDI categories have been identified and approaches developed on how these problems can be solved. Guidelines for selection of nuclear survivable NDI technologies are output of this program. Because of the increasing use of the NDI procurement route, this and its future derivative efforts are clearly going to be more important to the Army in the coming years.

Finally, there is the Large Blast/Thermal Simulator (LB/TS) related program whose objectives and approach have been developed by BRL with HDL and DNA support to provide realistic cost-effective means of simulating the response of tactical systems to the full threat yield spectrum of blast/thermal environments. DNA has agreed to build the LB/TS and finance its characterization and operation by AMC on an Army site. This task will support the BRL "probative tube", which is a small scale model of the LB/TS where tube/target interaction can be studied along with instrumentation and potential LB/TS improvements. Using the probative tube, improvements can be demonstrated and the technology transferred to the full scaled LB/TS. If successful, these efforts can reduce the original cost of the LB/TS and the subsequent operating costs by millions of dollars. Additionally, BRL can use it as a modern blast simulator in its own right.



OUTLINE



HARRY DIAMOND LABORATORIES

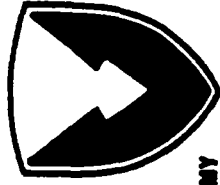
- 0 BACKGROUND
- 0 THREAT
- 0 POLICY AND REQUIREMENTS
- 0 ORGANIZATION INTERFACES
- 0 TECHNOLOGY INVESTMENT STRATEGY
- 0 TECHNOLOGY AREAS OF INTEREST
- 0 SUMMARY

X

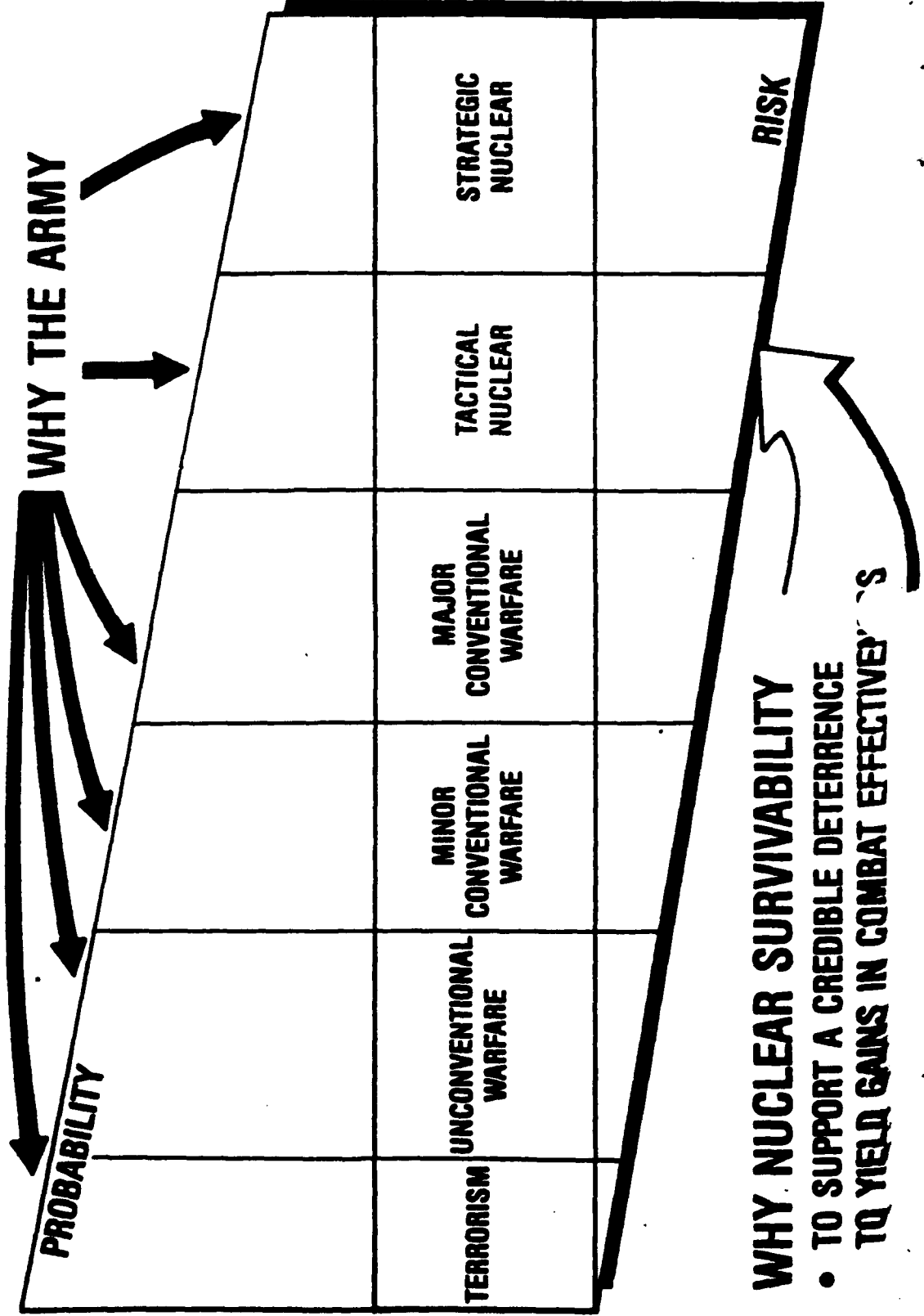


SPECTRUM OF CONFLICT

HARRY DIAMOND LABORATORIES



US ARMY
LABORATORY COMMAND



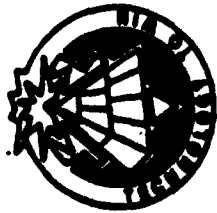
NUCLEAR SURVIVABILITY

**CAPABILITY OF SYSTEM TO WITHSTAND
INITIAL NUCLEAR WEAPONS EFFECTS
(BLAST, THERMAL, RADIATION, EMP)
AND STILL ACCOMPLISH ITS MISSION.**

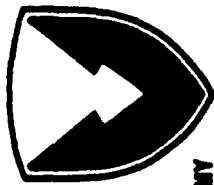
CAN DO BY --

- **HARDENING**
- **REDUNDANCY**
- **TIMELY RESUPPLY**
- **MITIGATION TECHNIQUES**

Page 2/2



NUCLEAR SURVIVABILITY OF ARMY MATERIEL



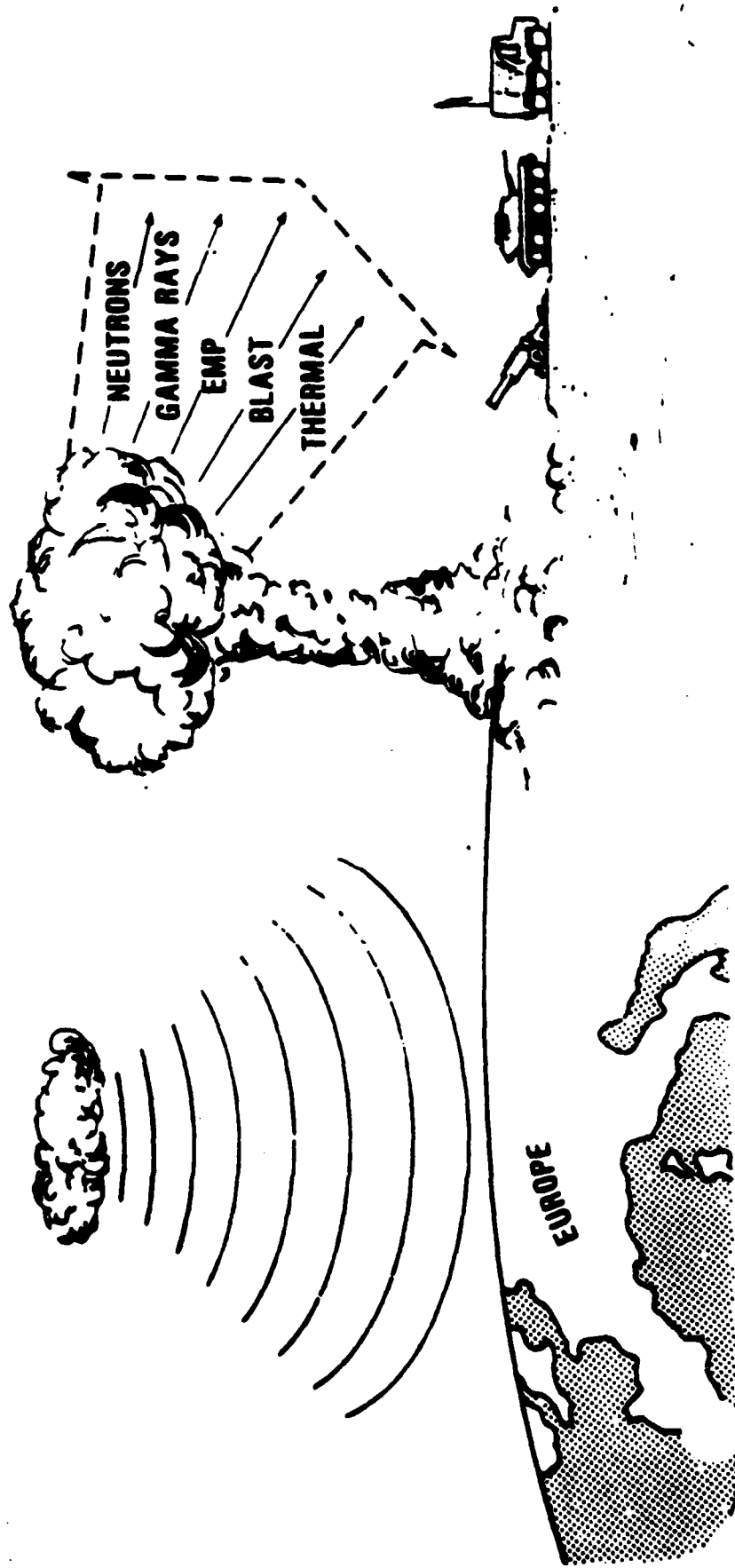
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

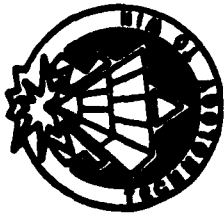
NUCLEAR THREAT

HIGH ALTITUDE BURST -
ELECTROMAGNETIC PULSE (EMP)

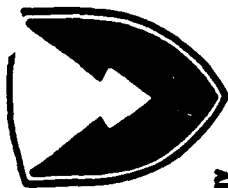
TACTICAL THREAT -
BALANCED SURVIVABILITY



200-1200



THREAT



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

HOW THE TREATY AFFECTS THE SUPERPOWERS

WHAT WILL BE ELIMINATED

Deployed Missiles		
Intermediate Range (600-3,400 miles)	429	470
Short Range (300-600 miles)	0	387
Non-deployed Missiles	-	-
Intermediate Range	260	356
Short Range	170	539
TOTAL:	859	1,752

VERIFICATION PROVISIONS

- Initial inspections 60 days after the treaty enters into force.
- Close-out inspections after three years to ensure that the missiles have been destroyed.
- 20 short-notice inspections in the first three years.
- 15 short-notice inspections in the next five years.
- 10 short notice inspections in the following five years.
- U.S. inspectors to be based at a Soviet military factory in Votkinsk for 13 years.
- Soviet inspections to be based at a U.S. military factory in Utah for 13 years.

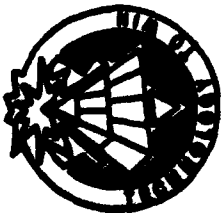
WHAT WILL REMAIN

Strategic Nuclear Weapons

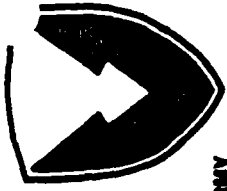
Launchers	2,001	2,515
Warheads	13,002	10,595
Nonstrategic Nuclear Weapons (number of warheads)	-	-
Land-Based Battlefield Nuclear Weapons	7,073	9,043
Strategic Defensive Nuclear Warheads	-	5,100
Naval Battlefield Nuclear Weapons	3,645	2,705
TOTAL (nonstrategic)	10,718	16,848

Sources: U.S. Arms Control and Disarmament Agency and the Natural Resources Defense Council

10000071-007



U.S. ARMY POLICY



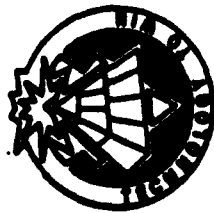
U.S. ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

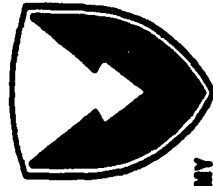
PHILOSOPHY

- THE EQUIPMENT MUST SURVIVE IF SUFFICIENT CREW SURVIVE TO COMPLETE THE MISSION

REPRODUCED



REQUIREMENTS



ARMY DIAMOND LABORATORIES

US ARMY
LABORATORY COMMAND

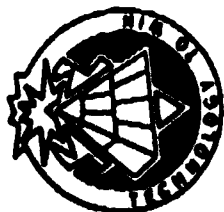
AR 70-60		AMC SUPPLEMENT
DODI 4245.4 • INCLUDE NUCLEAR SURVIVABILITY IN DESIGN... OF MAJOR AND NONMAJOR SYSTEMS CRITICAL TO NUCLEAR CONFLICTS	• IMPLEMENTS DODI • MAKE MISSION-ESSENTIAL SYSTEMS SURVIVE NUCLEAR EFFECTS • HARDEN ESSENTIAL COMPONENTS • CONSIDER NUCLEAR SURVIVABILITY EARLY IN CONCEPT PHASE • ESTABLISH SURVIVABILITY CRITERIA AND DEMONSTRATE SURVIVABILITY DURING DEVELOPMENT • MANAGE NUCLEAR SURVIVABILITY THRU LIFE CYCLE • CONSIDER SOFT FIELDIED EQUIPMENT FOR RETROFIT	• IMPLEMENTS AR 70-60 • HEIGHTEN AWARENESS, INTERE AND SUPPORT FOR NUCLEAR SURVIVABILITY • DISSEMINATE INFORMATION THROUGHOUT COMMAND • ESTABLISH MECHANISM TO REVIEW SYSTEM NUCLEAR SURVIVABILITY STATUS • ENSURE ADEQUATE TESTING IS ACCOMPLISHED • ESTABLISH CAPABILITY TO CONDUCT REASSESSMENT OF FIELDIED SYSTEMS

100-1-10

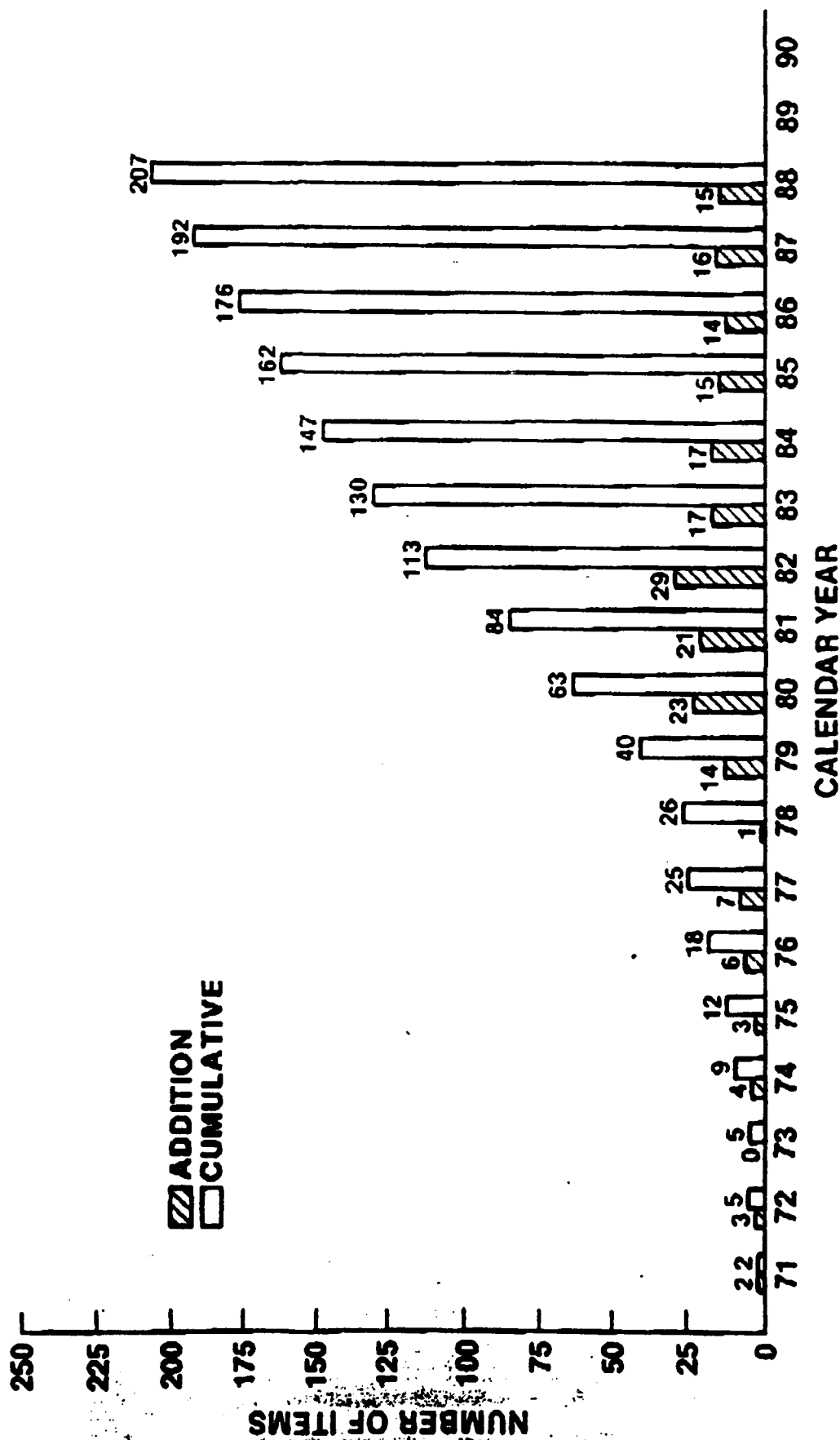
SYSTEMS/EQUIPMENTS ISSUED CRITERIA



US ARMY
LABORATORY COMMAND



HARRY DIAMOND LABORATORIES

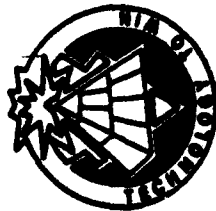


29-89

WED

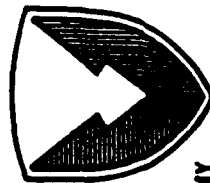
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P. 07/18



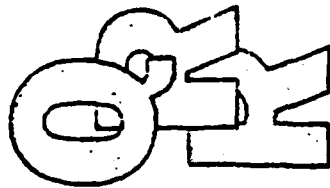
TECHNOLOGY

REQUIREMENTS



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



ARMY
**Qualitative
Research
Requirements**
for
NUCLEAR WEAPONS EFFECTS INFORMATION (U)

**FY 89/90
FINAL EDITION
February 1988**



Deputy Chief of Staff for Operations and Plans
Prepared By: U.S. Army Nuclear and Chemical Agency

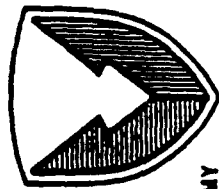
NUCLEAR SURVIVABILITY PROGRAM

Technology Program Drivers

- o New Threats/Next Generation Weapons
- o System Life Cycle Considerations
 - Hardness, Maintenance and Surveillance
 - Integrated Logistics
- o Advances in Automation and Robotics
- o Commercial Products and Non-Developmental Items
- o Next Generation Materials, Electronics, Photonics



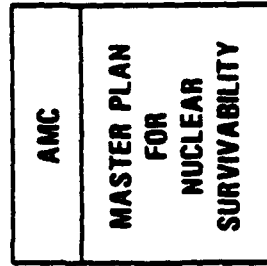
PLANS DIRECTORY

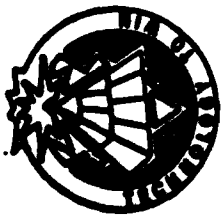


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

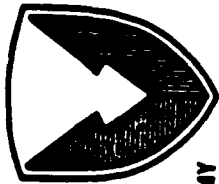
FUNDING SOURCE	HDL FUNCTIONAL AREA PLAN
DA	PIP PROGRAMS
OSD	PIF PROGRAMS SIMULATOR UPGRADES
6.3B	NUCLEAR WEAPON EFFECTS SUPPORT TEAM (NEST) FIELDIED SYSTEMS
6.3A	HARDNESS ASSURANCE/HARDNESS MAINTENANCE/GENERIC ENCLOSURES NON-DEVELOPMENTAL ITEMS/ ADVANCED SYSTEMS HARDENING LARGE BLAST/THERMAL SIMULATOR (LB/TS)/TACTICAL SOURCE REGION SIMULATOR (TRS) DEFENSE STANDARDS & SPECIFICATIONS PROGRAM (DSSP)
6.2	HAEMP BLAST/THERMAL (B/T) TACTICAL SOURCE REGION (TSR)
6.1	NEW EMP ENVIRONMENTS/RADIATION EFFECTS IN SEMICONDUCTOR DEVICES
CUSTOMER PROGRAMS	



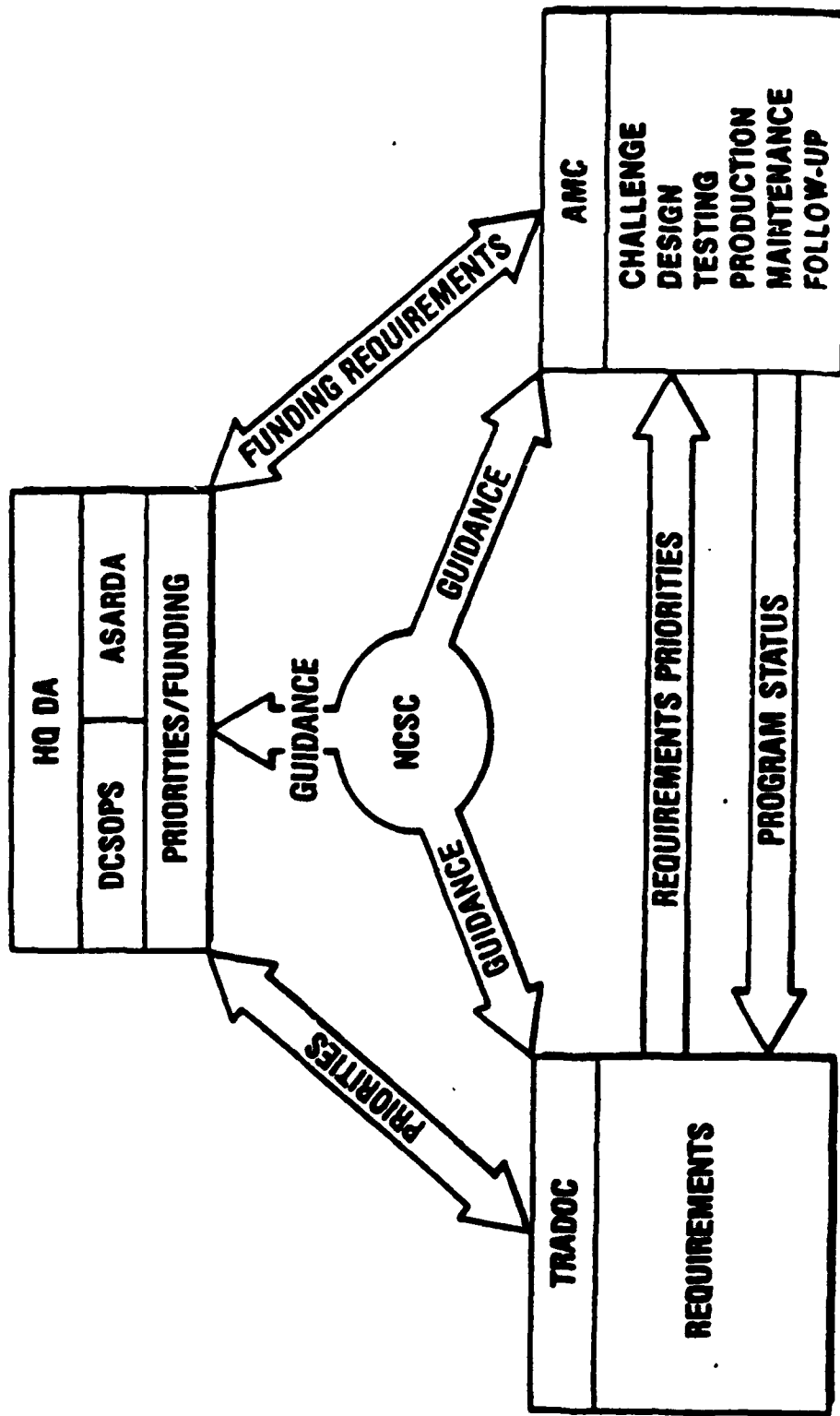


MARTY DIAMOND LABORATORIES

REQUIREMENTS STRATEGY FOR MANAGING THE ACQUISITION



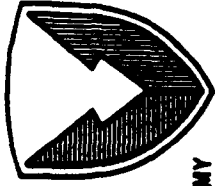
US ARMY
LABORATORY COMMAND



NSCS—NUCLEAR AND CHEMICAL SURVIVABILITY COMMITTEE

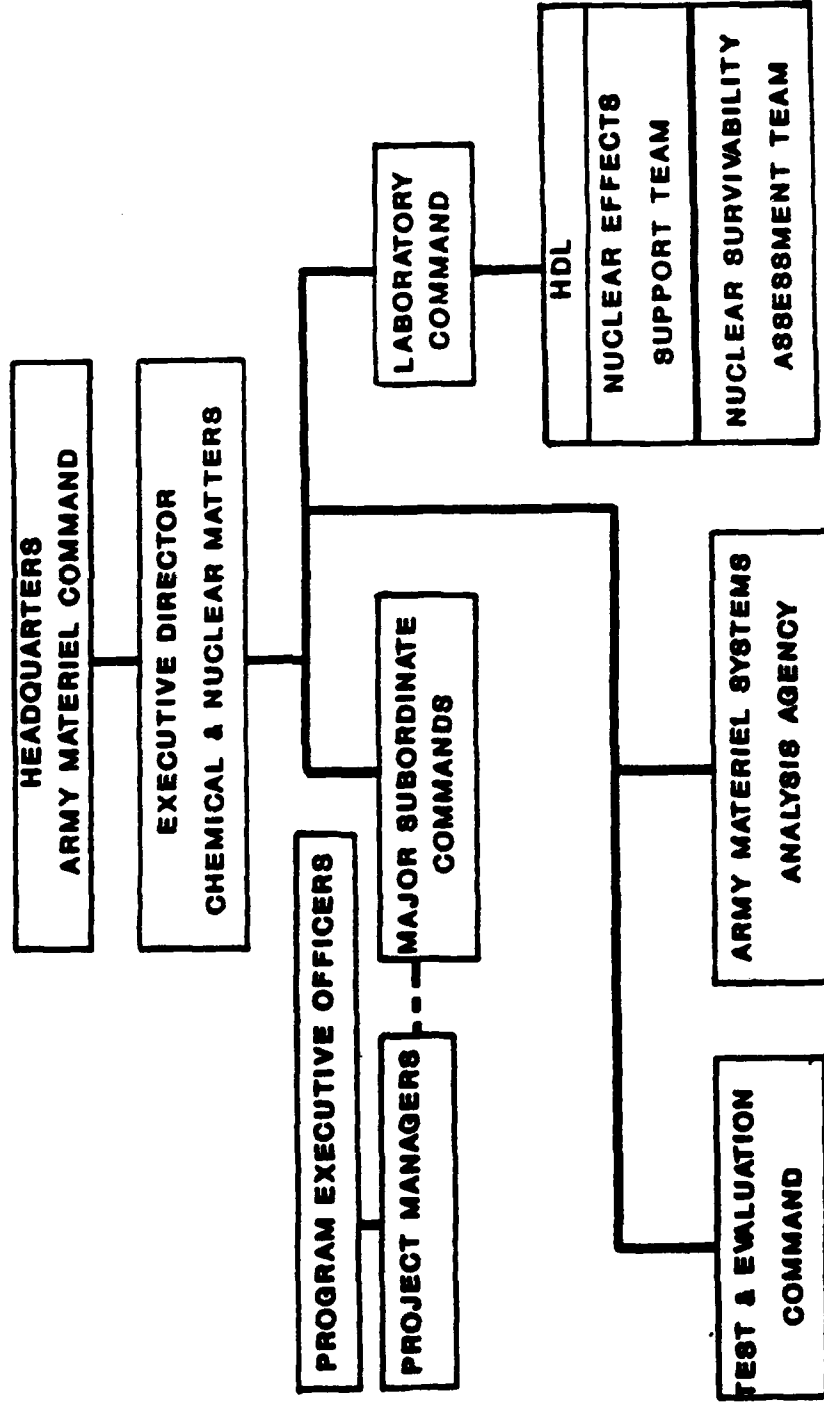


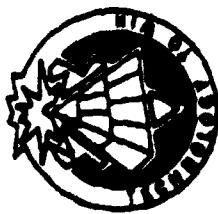
AMC NUCLEAR SURVIVABILITY PROGRAM



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES





NUCLEAR SURVIVABILITY TECHNOLOGY BASE INVESTMENT STRATEGY

US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

EMERGING TECHNOLOGIES

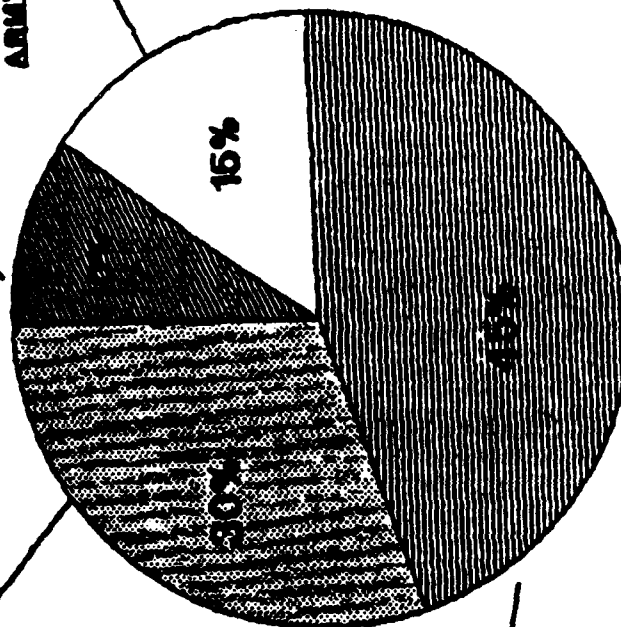
- VLSI HARDENING
- FIBER OPTIC RESPONSE
- NEW LIGHTWEIGHT MATERIAL OUTRIGGERS
- HARDENED ELECTRO OPTICAL DEVICES
- ADV. HARDENING FOR FUTURE EMP THREATS
- LIGHT WEIGHT COMPOSITES
- NEW THERMAL HARDENING SOLUTIONS

CHRONIC PROBLEMS

ARMY FIELDED SYSTEM PROGRAM

SUPPORTING CAPABILITY

- EMP SIMULATION
- CURRENT INJECTION CAPABILITY
- AESOP UPGRADE
- INST. UPGRADE
- VEMPS-II DESIGN
- BLAST/THERMAL
- LB/TS
- HE FIELD TESTS
- TACTICAL SOURCE REGION
- AURORA UPGRADE
- UNDERGROUND TEST



NEXT GENERATION AND FUTURE SYSTEMS

- ADVANCED FIELD ART. SYS.
- RAD C2, LOSF, NLOS
- FUTURE UAV
- ADVANCED CARGO AIRCRAFT
- JAMMER 2000
- DISTRIBUTED COMMO SYSTEM
- ROBOTIC COMMAND VEHICLES
- DISTRIBUTED DATA PROCESSING SYS.
- RADARS 2000
- MEAM
- ARWS-H
- CAMM

NUCLEAR SURVIVABILITY PROGRAM

Technology Development Areas of Interest

- o Effects Generation Mechanisms
 - EMP (High Altitude, Source Region, System Generated)
 - Non-ideal Blast
 - Forest Blowdown
- o Coupling & Loading
 - Experimental Techniques
 - Theoretical Modeling and Validation
 - Advanced Analytical Capabilities
 - Tailored Parallel/Pipelined Processing Architectures
- o Component, Subsystem and System Response
 - Testing and Test Analysis
 - Modeling and Simulation
 - Tailored Component Fabrication
 - Database (Creation and maintenance)
- o Survivability/Vulnerability Assessment
 - Standard Methodologies
 - AI Expert Assistants
 - Stochastic Modeling and Operations Research Considerations
 - Effects Synergisms

NUCLEAR SURVIVABILITY PROGRAM

Technology Development Areas of Interest (continued)

o Hardening Capabilities

- Advanced Materials for Blast/Thermal Protection
- Integrated Electromagnetic Protection
- Terminal Protection Devices
- Electromagnetic Shielding
- Shock Isolation
- Radiation Hard Components

o Simulation/Instrumentation

- Advanced EMP Simulator Designs and Components
- LB/TS Improvements
- Wide Bandwidth, Large Dynamic Range Sensors

NUCLEAR SURVIVABILITY PROGRAM

Survivability Applications

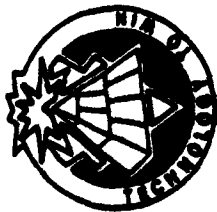
- o Standards and Specifications Development and Validation
- o Hardness Maintenance and Surveillance Testing Demonstration
- o Life Cycle Survivability Demonstrations (NG/FS)
- o NDI Survivability Demonstrations
- o LB/TS Product Improvements
- o Next Generation EMP Simulators
- o Fielded Systems Product Improvements

X

NUCLEAR SURVIVABILITY PROGRAM

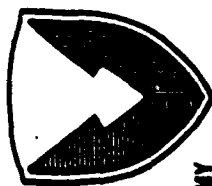
SURVIVABILITY SUPPORT

- o PEO/PM Support of Developmental Systems
- o Independent Assessments of Critical Systems
- o Support to DA and DoD Customers



NUCLEAR SURVIVABILITY

~~GOAL~~
SUMMARY

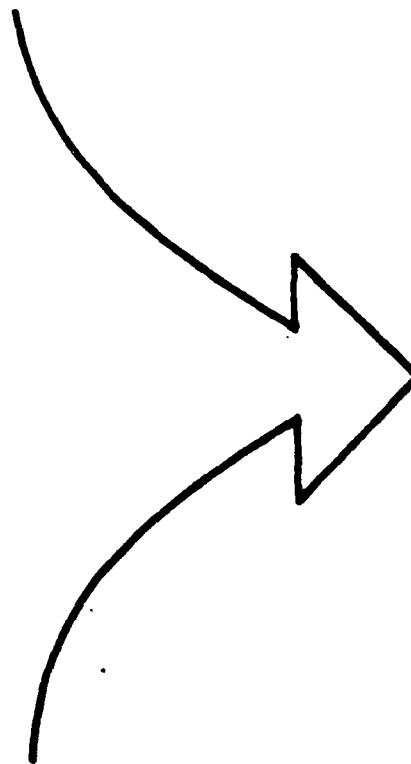


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

GOOD TECHNOLOGY BASE

GOOD MANAGEMENT/ENGINEERING
PRACTICES AT THE PM LEVEL

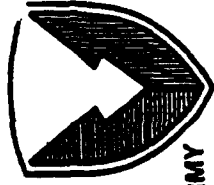


COST-EFFECTIVE
APPROACH FOR PROVIDING
NUCLEAR SURVIVABLE EQUIPMENT
FOR THE MODERN INTEGRATED BATTLEFIELD



HARRY DIAMOND LABORATORIES

NUCLEAR SURVIVABILITY TECHNOLOGY



US ARMY

LABORATORY COMMAND

6.2 TECHNOLOGY DEVELOPMENT

- ELECTROMAGNETIC PULSE
- TACTICAL SOURCE REGION
- BLAST/THERMAL
- HARDENED ELECTRONICS

PROJECTED FUNDING: \$ IN MILLIONS

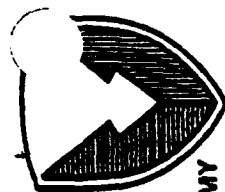
<u>FY91</u>	<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>FY95</u>	<u>FY96</u>
9.2	13.1	14.4	15.3	15.3	15.3

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6 Dec 81



NUCLEAR SURVIVABILITY TECHNOLOGY

HARRY DIAMOND LABORATORIES



US ARMY

LABORATORY COMMAND

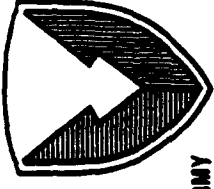
6.2 TECHNOLOGY DEVELOPMENT

- ELECTROMAGNETIC PULSE
- TACTICAL SOURCE REGION
- BLAST/THERMAL
- HARDENED ELECTRONICS

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ELECTROMAGNETIC PULSE EFFECTS PROGRAM

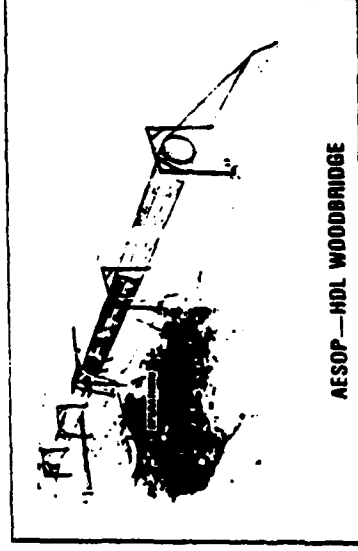


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

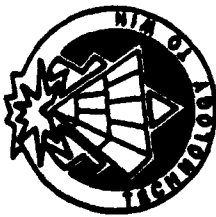
OBJECTIVE

- DEVELOP TECHNOLOGY TO HARDEN ARMY TACTICAL SYSTEMS TO HIGH ALTITUDE BURST ELECTROMAGNETIC PULSE EFFECTS
- MAINTAIN STRONG ANALYTIC AND EXPERIMENTAL CAPABILITIES TO VERIFY SYSTEM HARDNESS TO HAEMP

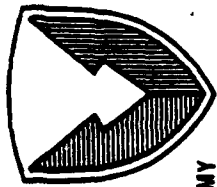


PROGRAM MILESTONES

- DIRECT DRIVE FACILITY FOR NON-RADIATING EMP SIMULATION
- RELOCATION OF RADIATING EMP SIMULATORS
- TERMINAL PROTECTION DEVICE DEVELOPMENT
- ISOLATION TRANSFORMER DEVELOPMENT
- NEW ANALYTIC TECHNIQUES FOR CALCULATING SYSTEM COUPLING
- DEDICATED MICROCOMPUTER FOR ADVANCED EMP CALCULATIONS



EMP HARDENING TECHNOLOGY



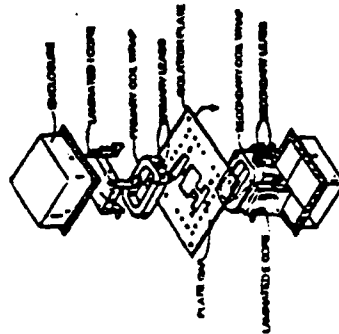
HARRY DIAMOND LABORATORIES

15 KVA ISOLATION TRANSFORMER

OBJECTIVE

PROVIDE THE THEORETICAL, EXPERIMENTAL, AND INSTRUMENTAL MEANS TO HARDEN ARMY TACTICAL EQUIPMENT AGAINST HEMP

- ANALYTIC ALGORITHMS
- TERMINAL PROTECTION DEVICES
- ISOLATION POWER TRANSFORMERS
- DEVICE DAMAGE CHARACTERIZATION
- MODERN TEST MAINTENANCE AND DIAGNOSTIC EQUIPMENT



POTENTIAL CONTRACT SUPPORT

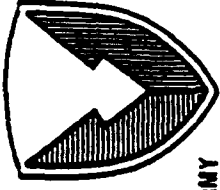
- DAMAGE ANALYSIS
- DEVICE AND TRANSFORMER DEVELOPMENT
- SEMICONDUCTOR DAMAGE CHARACTERIZATION
- TEST EQUIPMENT

PROGRAM MILESTONES

- TERMINAL PROTECTION DEVICE DEVELOPMENT
- ISOLATION TRANSFORMER DEVELOPMENT
- EXPLOITATION OF FOREIGN TECHNOLOGY



CURRENT INJECTION SIMULATION



US ARMY
LABORATORY COMMAND

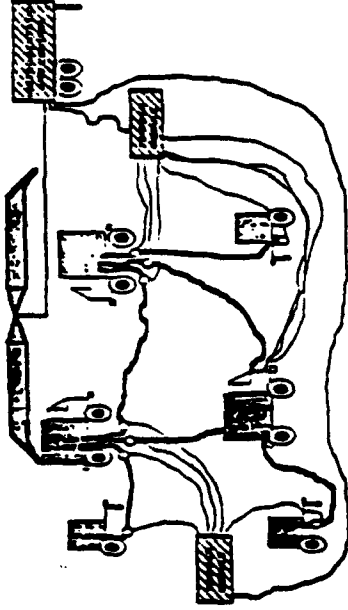
HARRY DIAMOND LABORATORIES

OBJECTIVE

DEVELOP HARDWARE AND ANALYTICAL
TECHNIQUES CAPABLE OF NON-RADIATING
EMP TESTING OF GENERAL TACTICAL SYSTEMS

- EVALUATE HARDENING APPROACHES
- DEMONSTRATE OVERALL SYSTEM HARDNESS
- LIFE CYCLE HARDNESS SURVEILLANCE

SYNCHRONOUS INJECTION SYSTEM



PROGRAM MILESTONES

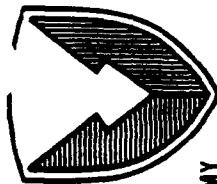
- DIRECT-DRIVE FACILITY SYSTEM REQUIREMENTS
- SYSTEM DESIGN AND PROTOTYPE DEVELOPMENT
- FACILITY DEVELOPMENT
- ACCEPTANCE TESTING

POTENTIAL CONTRACT SUPPORT

- COUPLING ANALYSIS AND TESTS
- DRIVER DESIGN



EMP SIMULATION

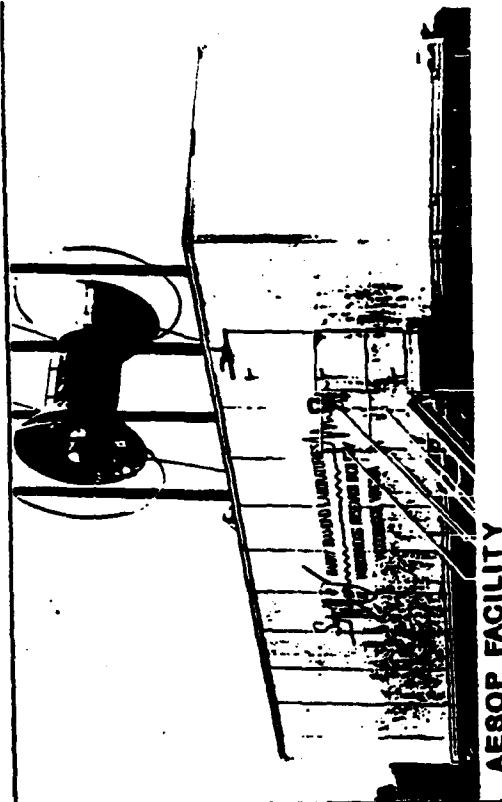


HARRY DIAMOND LABORATORIES

OBJECTIVE

OPERATE, MAINTAIN, AND UPGRADE THE ARMY'S RESEARCH AND DEVELOPMENT HIGH ALTITUDE ELECTROMAGNETIC PULSE (EMP) SIMULATION FACILITY ASSETS.

RELOCATE HIGH POWER RADIATING EMP SIMULATORS TO THE WESTERN U.S.

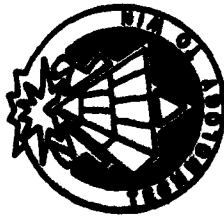


AESOP FACILITY

PROGRAM MILESTONES

- POTENTIAL CONTRACT SUPPORT
 - SCALE MODEL FACILITY IMPROVEMENT
 - INSTRUMENTATION
 - SIMULATOR RELOCATION
 - COMPLETE FABRICATION AND INSTALLATION OF VEMPS II

- AESOP FACILITY RELOCATION
- CONTINUOUS WAVE FACILITY OPERATION
- IVAN II FACILITY OPERATION
- SCALE MODEL FACILITY OPERATION
- DEVELOPMENT OF VEMPS II FACILITY FOR DEPLOYMENT IN WESTERN U.S.



EMP COUPLING AND ANALYSIS

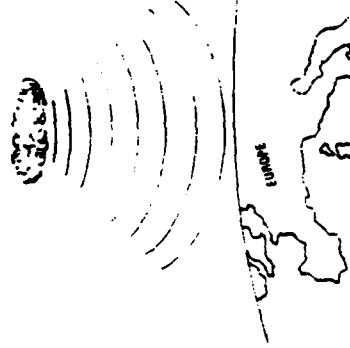
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- DEVELOP ANALYTIC TECHNIQUES TO IMPROVE CAPABILITY FOR HARDENING SYSTEMS TO HIGH ALTITUDE BURST EMP
- REFINE CALCULATIONAL TECHNIQUES FOR DETERMINING EMP COUPLING AND SHIELDING

HIGH ALTITUDE BURST --
ELECTROMAGNETIC PULSE (EMP)



POTENTIAL CONTRACT SUPPORT

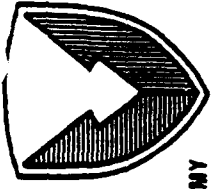
- COMPLETE THE DEFINITION OF THE E2 AND E3 WAVEFORMS FOR DOD-STD-2169
- IMPROVED EMP SHIELDING METHODS
- COUPLING ANALYSIS METHODS

PROGRAM MILESTONES

- DEFINE EMP ENVIRONMENTS PRODUCED BY NEW WEAPONS
- NEW ANALYTIC TECHNIQUES FOR CALCULATING SYSTEM COUPLING
- DEDICATED MINICOMPUTER FOR ADVANCED EMP CALCULATIONS
- EMP SHIELDING GUIDELINES



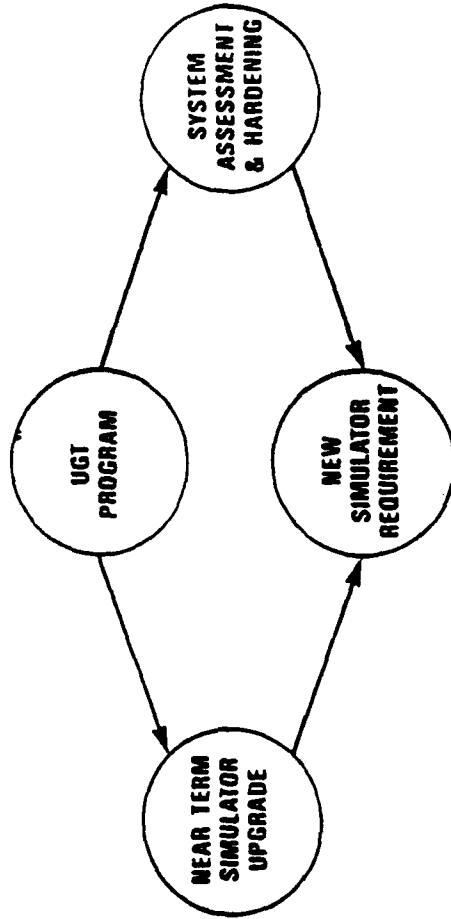
TACTICAL SOURCE REGION PROGRAM



HARRY DIAMOND LABORATORIES

OBJECTIVE

DEVELOP TECHNOLOGY TO HARDEN ARMY
TACTICAL SYSTEMS TO THE SOURCE REGION
EMP THREAT USING ABOVE GROUND TEST
FACILITIES AND ANALYTIC CAPABILITY.

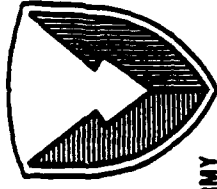


PROGRAM MILESTONES

- ABOVE GROUND TEST PROGRAM AND AURORA UPGRADE
- UNDERGROUND TEST TO VERIFY TACTICAL SOURCE REGION THREAT
- TSR HARDENING GUIDELINES
- NEW TSR SIMULATOR AVAILABLE FOR SYSTEM TESTING

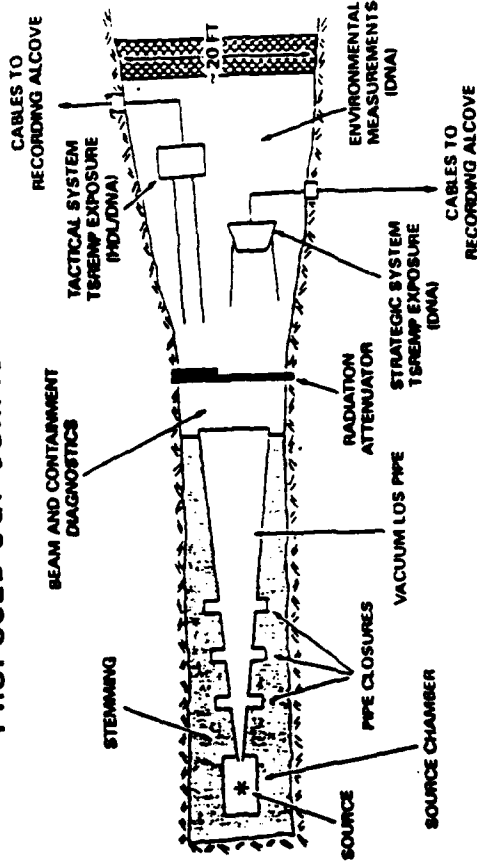


UNDERGROUND TEST PROGRAM



HARRY DIAMOND LABORATORIES

PROPOSED UGT CONFIGURATION



OBJECTIVE

- VALIDATE ANALYTICAL AND ABOVE GROUND EXPERIMENTAL TACTICAL SOURCE REGION SIMULATION
- VALIDATE TACTICAL SOURCE REGION HARDENING PROCEDURES
- GENERATE A DATABASE FOR A TACTICAL SOURCE REGION SIMULATOR DESIGN

POTENTIAL CONTRACT SUPPORT

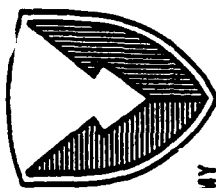
- HARDWARE FABRICATION
- ANALYSES AND RESPONSE PREDICTIONS
- TEST PLANNING
- SYSTEM TESTS AT SIMULATORS
- UNDERGROUND NUCLEAR TESTING

PROGRAM MILESTONES

- SYSTEM RESPONSE PREDICTIONS
- PRELIMINARY SGEMP HARDENING GUIDELINES
- ABOVE GROUND TESTS TO VERIFY ANALYTIC PREDICTIVE TECHNIQUES AND ESTABLISH VALIDATION PROCEDURES
- UNDERGROUND TEST TO VERIFY THE ABILITY OF ABOVE GROUND TESTING AND ANALYSIS TO VALIDATE THE HARDNESS OF ARMY SYSTEMS



SREMP/SGEMP SIMULATION



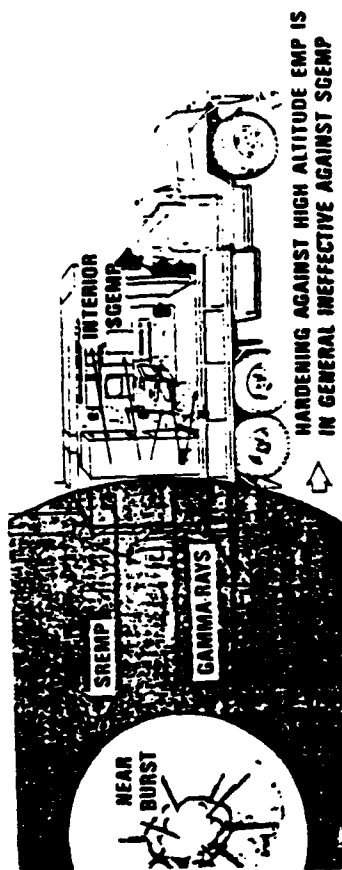
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- DEVELOP A CAPABILITY FOR EFFECTIVE SIMULATION OF THE SREMP/SGEMP THREAT ON THE TACTICAL BATTLEFIELD.
- PROVIDE RADIATION HARDNESS ASSURANCE FOR ARMY TACTICAL SYSTEMS.

TACTICAL SOURCE REGION EFFECTS



POTENTIAL CONTRACT SUPPORT

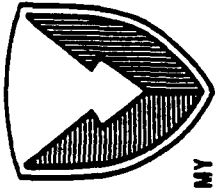
- SIMULATOR DESIGN STUDIES
- PULSE POWER COMPONENTS
- TEST SUPPORT

PROGRAM MILESTONES

- AURORA RISETIME REDUCED FROM 50NS TO 10NS; PULSE WIDTH REDUCED TO 30NS
- TACTICAL SREMP ENVIRONMENT SIMULATED INSIDE COMMUNICATIONS SHELTER
- FOUR AURORA DRIFT TUBES OPTIMIZED TO INCREASE OUTPUT AND UNIFORMITY; DECREASE RISETIME FOR SCALE MODELING
- VALIDATE ANTENNA AND CABLE COUPLING CODES



TACTICAL SOURCE REGION SIMULATOR

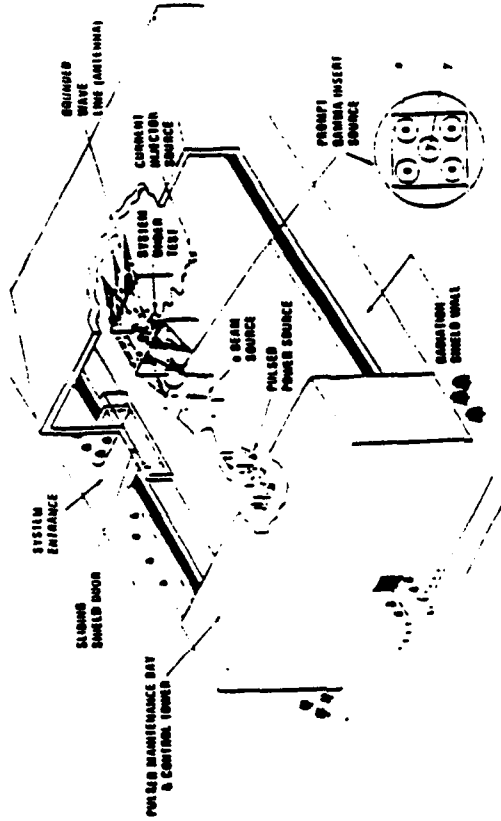


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- PROVIDE A COST EFFECTIVE SREMP/SGEMP TESTING CAPABILITY FOR ARMY TACTICAL SYSTEMS
- SREMP PHENOMENOLOGY TEST BED
- PROVIDE RADIATION HARDNESS ASSURANCE



PROGRAM MILESTONES

- INTERIM TEST CAPABILITY AT AURORA
- LOW JITTER SWITCHES
 - ELECTRON BEAM DRIFT TUBES
 - MIXED GAMMA AND ELECTRON ENVIRONMENT

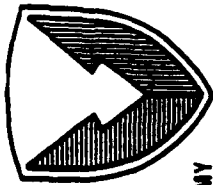
- NEW TSR SIMULATION FACILITY
- TEST 100 ARMY SYSTEMS TO THEIR TSR SPECIFICATIONS

POTENTIAL CONTRACT SUPPORT

- SIMULATOR DESIGN
- ENVIRONMENTAL STUDIES
- PULSE POWER COMPONENTS
- FACILITY CONTROLS AND INSTRUMENTATION



BLAST/THERMAL EFFECTS PROGRAM

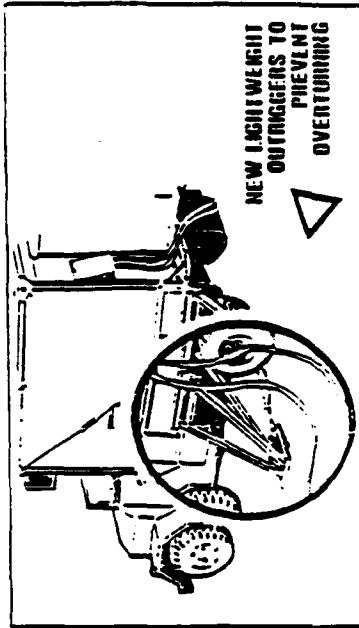


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- DEVELOP TECHNOLOGY TO HARDEN ARMY TACTICAL SYSTEMS TO NUCLEAR BLAST AND THERMAL EFFECTS
- IMPROVE AND MAINTAIN SIMULATION AND MODELING CAPABILITIES TO DESIGN AND TEST HARDENED SYSTEMS



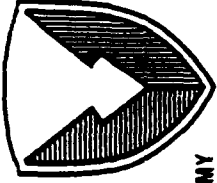
OVERTURN PROTECTION

PROGRAM MILESTONES

- HIGH EXPLOSIVE TESTS
- 1/6 SCALE TEST BED FOR LARGE BLAST/THERMAL SIMULATOR
- BLAST OVERTURN PROTECTION DEVICES
- FOREST BLOWDOWN AND FIRE HAZARD
- NON-IDEAL BLAST SIMULATION



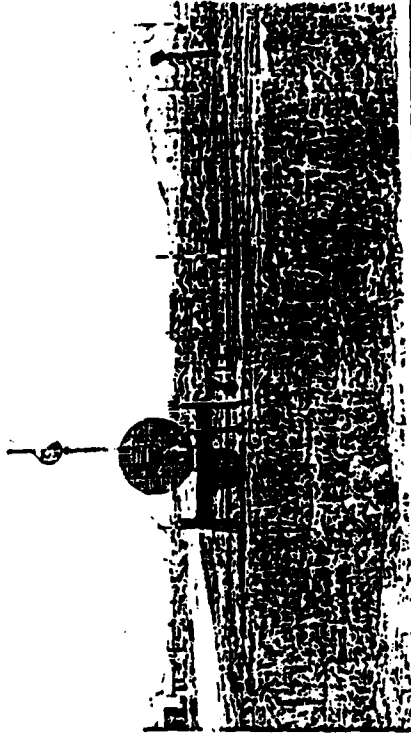
BLAST/THERMAL HARDENING TECHNOLOGY



HARRY DIAMOND LABORATORIES

OBJECTIVE

- DETERMINE VULNERABILITY LIMITS OF TACTICAL ARMY SYSTEMS/SUBSYSTEMS
- RECOMMEND HARDENING AND SHIELDING SOLUTIONS FOR BLAST, THERMAL AND RELATED EFFECTS



POTENTIAL CONTRACT SUPPORT

- ANALYSES AND TESTS
- MATERIAL EVALUATIONS
- EQUIPMENT DESIGN
- HARDENING GUIDELINES

PROGRAM MILESTONES

- DAMAGE ASSESSMENTS
- BLAST/THERMAL HARDENED SHELTER
- BLAST OVERTURN PROTECTION DEVICES
- SHOCK ISOLATION METHODS
- THERMAL PROTECTIVE COATINGS
- PIP PROGRAM ON MOBILE ELECTRIC POWER

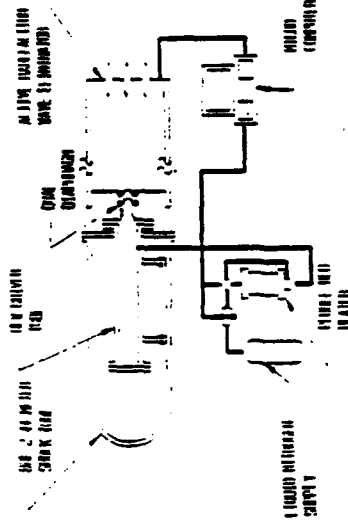


HARRY DIAMOND LABORATORIES

•DEVELOP A TEST BED FOR SCALED TESTING OF CRITICAL DESIGN ELEMENTS FOR THE LB/TS 65% DESIGN

•IMPROVE BLAST/THERMAL SIMULATION CAPABILITY FOR SMALL ARMY SYSTEMS

LARGE SCALE LB/T8 TEST BED



PROGRAM MILESTONES

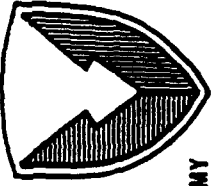
POTENTIAL CONTRACT SUPPORT

- **HARDWARE FABRICATION**
- **INSTRUMENTATION**
- **ANALYTICAL STUDIES**
- **TEST SUPPORT**

- TEST DRIVER SYSTEM
- PEBBLE BED HEATER
- DOUBLE DIAPHRAGM SYSTEM
- PROTOTYPE RAREFACTION WAVE ELIMINATOR
- THROAT VALVE EVALUATION
- INERTIAL REFERENCE SYSTEM PROTOTYPE
- LB/TS PERFORMANCE CHARACTERIZATION
- LIFE CYCLE SUPPORT FOR LB/TS OPERATION AND IMPROVEMENT



NON-IDEAL BLAST SIMULATION

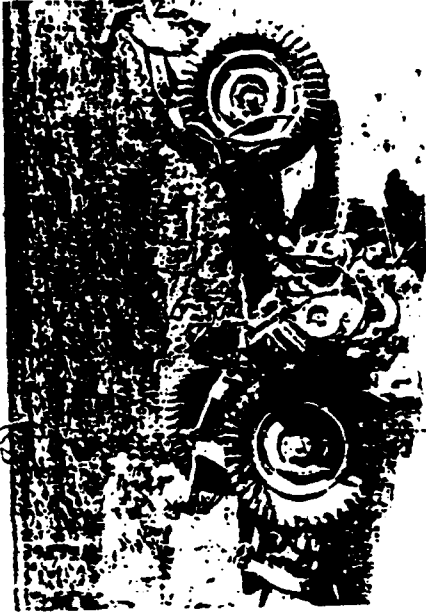


HARRY DIAMOND LABORATORIES

US ARMY
LABORATORY COMMAND

OBJECTIVE

- CHARACTERIZE NON-IDEAL BLAST/THERMAL PHENOMENOLOGY FOR TACTICAL ARMY SYSTEMS
- DETERMINE INCREASE IN VULNERABILITY RADIUS FOR TACTICAL ARMY SYSTEMS



NON-IDEAL BLAST
(2-4 TIMES THE LOAD)

POTENTIAL CONTRACT SUPPORT

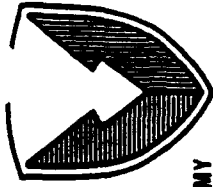
- ANALYSES AND TESTS
- FLUID DYNAMICS STUDIES
- SIMULATOR DESIGN CALCULATIONS
- SYSTEM RESPONSE ANALYSES

PROGRAM MILESTONES

- DETERMINE INCREASED VULNERABILITY RADIUS
- INCORPORATE NON-IDEAL TESTING CAPABILITY INTO LB/T8 TEST BED
- INCORPORATE NON-IDEAL BLAST EFFECTS INTO LB/T8 FACILITY
- CHARACTERIZE LIMITS OF LB/T8 NON-IDEAL PERFORMANCE



FOREST BLOWDOWN



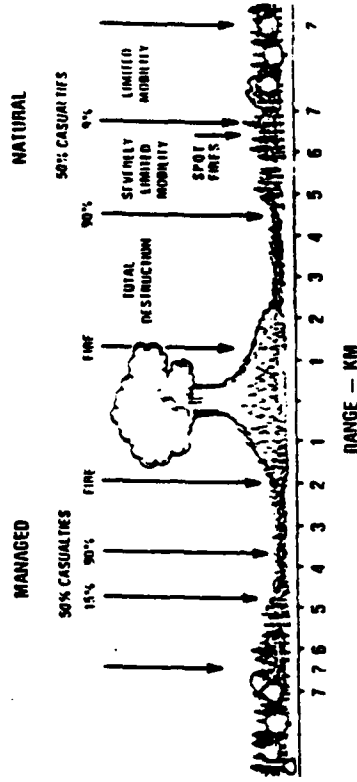
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- CHARACTERIZE PHYSICAL PHENOMENOLOGY OF TREE AND DEBRIS TRANSPORT
- DEVELOP COMPUTERIZED PREDICTIVE METHODOLOGY
- INCORPORATE INTO EFFECT MANUAL FOR FIELD APPLICATION

REPRESENTATIVE FOREST DAMAGE 300KT SOURCE

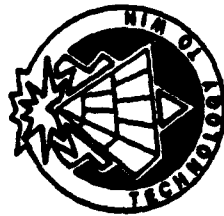


POTENTIAL CONTRACT SUPPORT

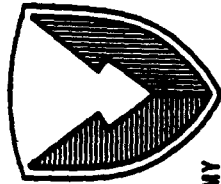
- DATA ON TREE CHARACTERISTICS
- TEST SUPPORT
- SYSTEM DAMAGE ANALYSIS
- FOREST FIRE MODELS

PROGRAM MILESTONES

- MISERS GOLD EXPERIMENT
- STEM FRACTURE ANALYSIS
- DEBRIS LETHALITY
- CLUSTER EFFECTS
- MOBILITY IMPAIRMENT STUDIES
- LETHALITY OF DEBRIS ON ARMY EQUIPMENT
- LIVE FOREST EXPERIMENT (1KT AT HOB)
- FIRE SPREAD PREDICTION METHODS



EMERGING TECHNOLOGIES



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

DETERMINE THE EFFECTS OF THE TACTICAL
NUCLEAR RADIATION ENVIRONMENT ON EMERGING/
ADVANCED TECHNOLOGIES AND TO MAKE
RECOMMENDATIONS ON ENHANCING SURVIVABILITY

- COMPOSITE MATERIALS
- MICROELECTRONICS
- FIBER OPTICS/ELECTRO-OPTICS
- ROBOTICS
- SENSORS
- COMPUTERS
- COMMUNICATION



POTENTIAL CONTRACT SUPPORT

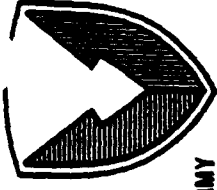
- COMPONENT RESPONSE DATA
- HARDENING METHODS
- SYSTEM AND EQUIPMENT HARDNESS ESTIMATES
- OPERATIONS RESEARCH

PROGRAM MILESTONES

- ADVANCED HARDENED MICROELECTRONICS TESTING PROCEDURES
- CCD/CID IMAGING DETECTOR RESPONSE TO NUCLEAR RADIATION
- SURVIVABILITY ENHANCEMENTS FOR ROBOTIC SYSTEMS
- FIGHTING UNIT SURVIVABILITY EVALUATION



6.1 RADIATION SPECIAL EFFECTS

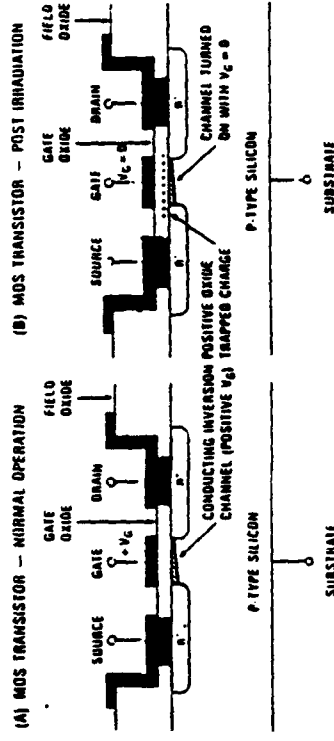


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- UNDERSTAND TIME-DEPENDENT RADIATION RESPONSE OF MICROELECTRONIC CIRCUITS.
- DEVELOP THIN FILM FERROELECTRIC TECHNOLOGY FOR RADIATION RESISTANT NON VOLATILE MEMORIES FOR MISSILE AND SPACE APPLICATIONS.
- CORRECT UNCERTAINTY IN EMP PREDICTION CAPABILITIES DUE FOR EXAMPLE TO AIR CONDUCTIVITY/ELECTRON MOBILITY INACCURACIES.



PROGRAM MILESTONES

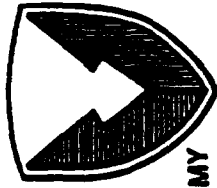
- RADIATION PROBLEMS IN BURIED OXIDES AND TRENCHES FOR ISOLATION BETWEEN TRANSISTORS
- POLARIZABILITY, RETENTION, AND ENDURANCE PROPERTIES OF THIN FERROELECTRIC FILMS
- MODELS FOR CHARGING GRAIN BOUNDARIES IN FERROELECTRICS TO PREDICT FILM DEGRADATION
- MODEL FOR TIME DEPENDENT DISTRIBUTION FUNCTION FOR ELECTRON MOBILITIES

POTENTIAL CONTRACT SUPPORT

- BASIC PHYSICS MECHANISMS
- COMPONENT RESPONSE DATA



NUCLEAR EFFECTS SUPPORT



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

6.3B SYSTEM DEVELOPMENT SUPPORT

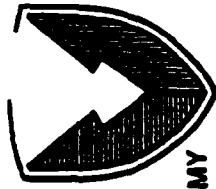
- NUCLEAR EFFECTS SUPPORT TEAM
- NUCLEAR SURVIVABILITY ASSESSMENT TEAM
- NUCLEAR SURVIVABILITY OF FIELDDED SYSTEMS

PROJECTED FUNDING: \$ IN MILLIONS

<u>FY91</u>	<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>FY95</u>	<u>FY96</u>
2.2	2.2	2.2	2.2	2.2	2.2



NUCLEAR EFFECTS SUPPORT



US ARMY

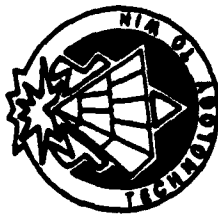
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

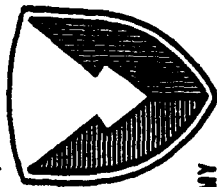
6.3B SYSTEM DEVELOPMENT SUPPORT

- NUCLEAR EFFECTS SUPPORT TEAM
- NUCLEAR SURVIVABILITY ASSESSMENT TEAM
- NUCLEAR SURVIVABILITY OF FIELDDED SYSTEMS

for
20-21-22



6.3b NUCLEAR EFFECTS SUPPORT TEAM

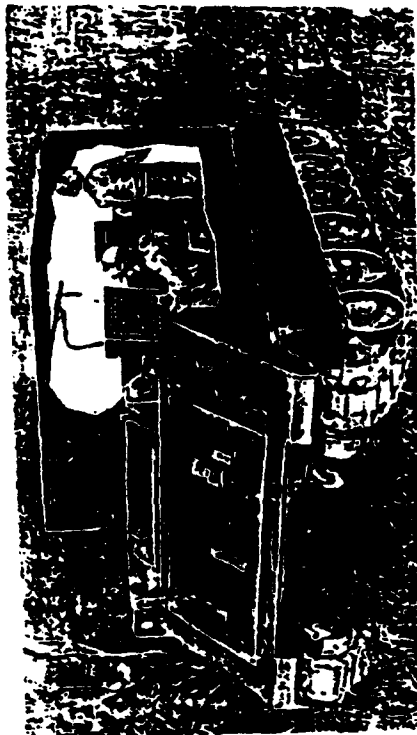


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

PROVIDE AD HOC NUCLEAR SURVIVABILITY
TECHNICAL AND MANAGEMENT SUPPORT TO
MATERIEL DEVELOPERS AND THEIR CONTRACTORS
THROUGHOUT THE MATERIEL ACQUISITION LIFE
CYCLE



BATTERY COMPUTER SYSTEM

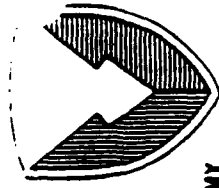
POTENTIAL CONTRACT SUPPORT

- AD HOC TEAM MEMBERS
- SYSTEM HARDENING
- EXPERT SYSTEM DEVELOPMENT

PROGRAM MILESTONES

- HARDENING STRATEGY FOR NEXT GENERATION
AND FUTURE SYSTEMS (HFM, GBCS, SASS)
- HARDNESS MAINTENANCE/SURVEILLANCE
TECHNOLOGY TRANSFER
- HARDNESS AWARENESS COURSE FOR MSC/RDEC
ADVISORS
- COMPLETE PROTOTYPE EXPERT SYSTEMS
MANAGEMENT SUPPORT FOR MATERIEL
DEVELOPERS

NUCLEAR EFFECTS SUPPORT TEAM FUNCTIONS



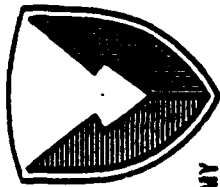
**US ARMY
LABORATORY COMMAND
HARRY DIAMOND LABS**

ADVISES AND ASSISTS IN:

- **MANAGEMENT AND TECHNICAL GUIDANCE**
- **REQUEST FOR PROPOSAL FORMULATION**
- **PRE-BIDDERS CONFERENCES**
- **SOURCE SELECTION EVALUATION BOARDS**
- **CONTRACT NEGOTIATIONS**
- **TEST INTEGRATION WORKING GROUPS**
- **CONTRACTOR REVIEWS**



6.3b NUCLEAR SURVIVABILITY ASSESSMENT TEAM

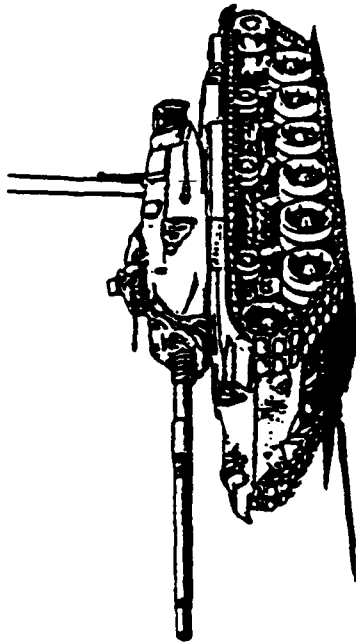


HARRY DIAMOND LABORATORIES

OBJECTIVE

- SUPPORT AMC IN MANAGEMENT OF THE NUCLEAR SURVIVABILITY PROGRAM
- CONDUCT INDEPENDENT TECHNICAL EVALUATIONS OF NUCLEAR SURVIVABILITY PROGRAMS AS DIRECTED BY AMC
- COORDINATE THE NUCLEAR SURVIVABILITY PROGRAM INSIDE AND OUTSIDE OF AMC

M60A3 TANK BATTALION



POTENTIAL CONTRACT SUPPORT

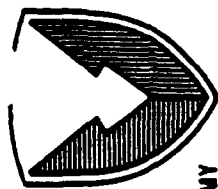
- SYSTEM AND EQUIPMENT ASSESSMENTS
- DATA COLLECTION AND MANAGEMENT

PROGRAM MILESTONES

- INR TESTING OF QRG'S (5KW AND 30KW)
- INR TESTING OF SCOTT 3KW GENERATOR SET
- SERVED ON SAG FOR COEA PROTOCOL REPORT
- RESTRUCTURE PROGRAM FOR ASSESSING FIELDED SYSTEMS
- CONTINUE ASSESSMENTS
- ENTER SURVIVABILITY DATA INTO DATA BASE



6.3b NUCLEAR SURVIVABILITY OF FIELDED SYSTEMS



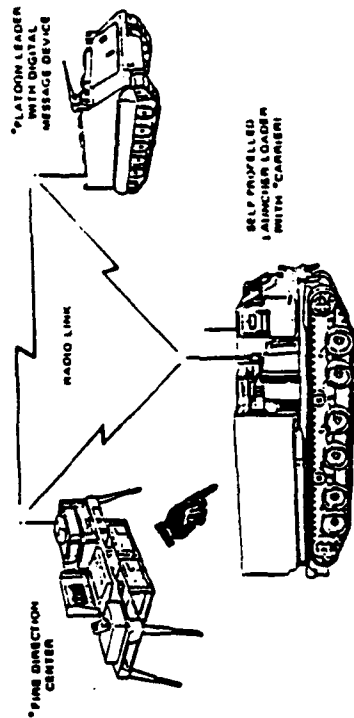
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- ASSESS NUCLEAR SURVIVABILITY OF FIELDED SYSTEMS IN PRIORITY ORDER ESTABLISHED BY HQ TRADOC
- IDENTIFY HARDENING REQUIREMENTS
- RECOMMEND PRODUCT IMPROVEMENTS
- MAINTAIN NUCLEAR SURVIVABILITY DATABASE FOR TACTICAL ARMY EQUIPMENT

MLRS SYSTEM



- POTENTIAL CONTRACT SUPPORT
- SYSTEM SURVIVABILITY ASSESSMENTS
- HARDENING RECOMMENDATIONS

PROGRAM MILESTONES

FY86-FY89 ASSESSMENTS:

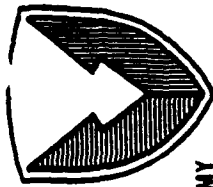
- M1 BATTALION
- FIRE CONTROL C3
- 4 INFANTRY BATTALIONS
- MLRS BATTERY
- LANCE BATTERY
- M80 BATTALION
- M109 BATTALION
- PATRIOT

FY89 - RESTRUCTURE PROGRAM FOR
CONTINUATION

FY90-FY91 - DEVELOP HARDENING
REQUIREMENTS



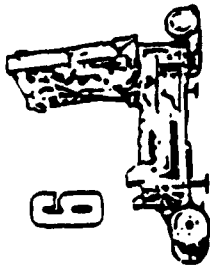
NUCLEAR SURVIVABILITY ASSESSMENTS



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

M109 HOWITZER

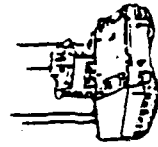


OTHER SUPPORT EQUIPMENT

- Survey Pads
- Radar Q36/Q37
- AM Radio Sets
- HEMTT
- Cargo Fuel
- Trucks

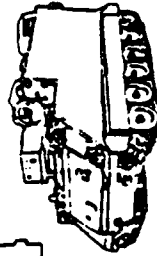
- CUCV
- HMMWV
- 2 1/2 T
- 5 T
- Trailers
- TACMS (Tac Army CSS Computer Sys)

3



- MVR CQ FSI
- M981 FISTV
- DMD
- GLLD
- Radios
- Generators

4



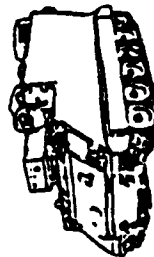
- MVR BN/BDE FSO
- M577 CP Carrier
- VFMED
- Radios

1



CANNON BATTERIES

- M109 Howitzer & Ammunition
- M992 FAASV/M548 Cargo Carrier
- M578 Recovery Vehicle
- AN/PVS 5/AN-TVS-5 Night Vision Devices
- AN/PRC-68 SUT
- Gun Display Unit

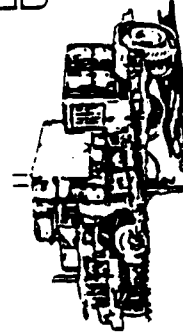


2

BATTERY FDC

- M577 CP Carrier
- GYK 29 BCS
- Backup Computer Sys
- Radios, Antennas, & Mounts

5



FA BATTALION TACFIRE

- GSG-10V TACFIRE
- Radios, Antennas & Mounts
- AN/VRC 12
- AN/VRC 125
- Speech Secure Equipment
- 5 Ton Trucks

EXTERNAL SUPPORT

TRANSPORTATION

- Resupply

ORDNANCE

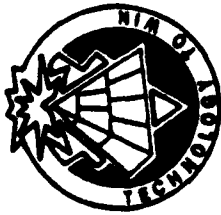
- Ammo
- Maintenance

DIVARITY ASSETS

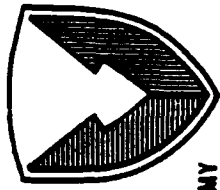
- Met Data

QUARTERMASTER

- Logistics



PROGRAM MANAGER SUPPORT



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

FY88 ACCOMPLISHMENTS

FY88 STATUS

•SOURCE SELECTION/EVALUATION BOARD
(MELIOS, TAGJAM, ACCS, FAAD NLOS)

•SOURCE SELECTION/EVALUATION BOARD
(AWS-M, NBCRS, IRV, HAIDE-II, LAMS, JSTARS)

•HARDNESS TESTING
(QG-174, AJCM, SCOTT 3KW GENERATOR,
M749 FUZE COMPONENTS, FORKLIFT TRUCK)

•HARDNESS TESTING
(QUIET RELIABLE GENERATOR SET, FORKLIFT
TRUCK, SINGGARS, VEMASID, SCOTT 3KW
GENERATOR, M749 FUZE)

•NUCLEAR SURVIVABILITY ASSESSMENTS
(HAB, SCOTT 3KW GENERATOR, QUIET
RELIABLE GENERATOR SETS)

•NUCLEAR SURVIVABILITY ASSESSMENTS
(FOTL, GBCS, EFVS, QUIET RELIABLE
GENERATOR SETS, TDFD)

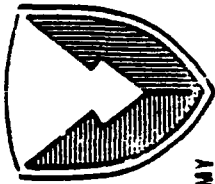
•JOINT SERVICES PROGRAM SUPPORT
(JSTARS, DWTS, CSCE, JTIDS, V-22 OSPREY)

•INITIATE JOINT AMC/TRADOC INVESTIGATION
OF SURVIVABILITY ALTERNATIVES

•HARDNESS ASSURANCE/HARDNESS
MAINTENANCE STRATEGY
(SINGGARS, CAWS/MAPS, SADARM, JSTARS
SST, CSCE)

•LIFE CYCLE NUCLEAR SURVIVABILITY
STRATEGY
(AFV, SINGGARS, JSTARS, FOTL, HAIDE-II,
SADARM, BCS, CSCE, VEMASID)

NUCLEAR HARDENING TECHNOLOGY



US ARMY
LABORATORY COMMAND

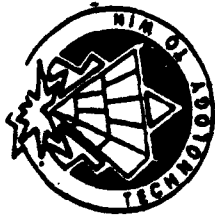
WARRANTY DIAMOND LABORATORIES

OBJECTIVE

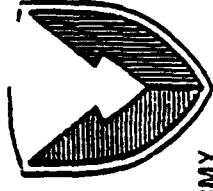
TRANSITION 8.2 NUCLEAR SURVIVABILITY
TECHNOLOGY PRODUCTS INTO TECH DEMO
PACKAGES: INTEGRATE INTO STANDARD
NUCLEAR SURVIVABILITY HARDENING MODULES
FOR US BY PMS, MSCS, AND ELEMENTS
INVOLVED IN NEXT GENERATION/FUTURE
SYSTEMS DEMOS.

rec'd
6 Dec 89

X



ADVANCED HARDENING TECHNOLOGY



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

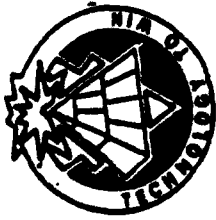
DEMONSTRATIONS - 6.3a

- DEFENSE STANDARDIZATION AND SPECIFICATION PROGRAM (DSSP)
- NON-DEVELOPMENTAL ITEMS (NDI)
- HARDNESS ASSURANCE/HARDNESS MAINTENANCE (HA/HM)
- LARGE BLAST/THERMAL SIMULATOR (LB/TS)

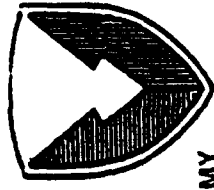
PROJECTED FUNDING: \$ IN MILLIONS

<u>FY91</u>	<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>FY95</u>
2 152	2.49	0.5	0.5	0.5

X



ADVANCED HARDENING TECHNOLOGY



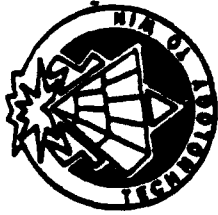
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

DEMONSTRATIONS - 6.3a

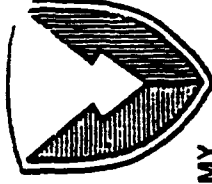
- DEFENSE STANDARDIZATION AND SPECIFICATION PROGRAM (DSSP)
- NON-DEVELOPMENTAL ITEMS (NDI)
- HARDNESS ASSURANCE/HARDNESS MAINTENANCE (HA/HM)
- LARGE BLAST/THERMAL SIMULATOR (LB/TS)

3



NUCLEAR HARDENING TECHNOLOGY

HARRY DIAMOND LABORATORIES



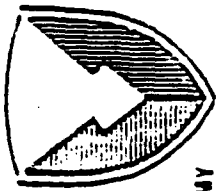
US ARMY
LABORATORY COMMAND

WILL COVER:

- PROGRAM BACKGROUNDS
- BUDGETARY INFORMATION
- STATUS
- PLANS
- TECHNICAL BARRIERS
- INTERFACES



DEFENSE STANDARDS AND SPECIFICATIONS PROGRAM

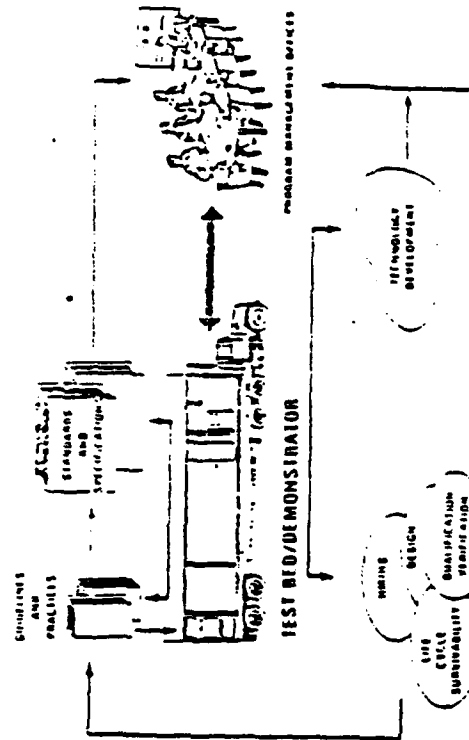


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- DEVELOP NEAR-TERM FIRM HARDENING GUIDELINES AND PRACTICES TO DOD-STD-2169 FOR SYSTEMS WHICH SUPPORT TIME SENSITIVE FUNCTIONS
- DEMONSTRATE TECHNOLOGY TO SUPPORT A LOW-RISK HARDENING PROGRAM FOR MQBC31 SYSTEMS
- TRANSFER TECHNOLOGY INTO DSSP FORMAT
- PROVIDE TECHNOLOGY TRANSFER AND APPLICATION ASSISTANCE TO USERS



POTENTIAL CONTRACTOR SUPPORT

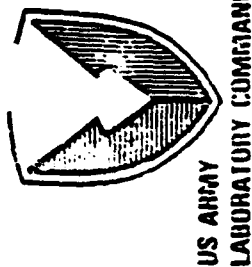
- Collection/Analyses of Testbed Demonstration Data
- Update of Guidelines & Procedure Documentation
- New Standards

PROGRAM MILESTONES

- TEST BED DEMONSTRATOR AND CW SYSTEM FIELDIED
- ACTIVE TECHNOLOGY TRANSFER INITIATED
- DEVELOPMENT OF TRANSPORTABLE HANDBOOK AND SECTION OF MIL-STD-188-125
- UPDATE GUIDELINES AND PROCEDURES FOR DESIGN AND HARDNESS



INTRODUCTION



HARRY DIAMOND LABORATORIES

ARMY RESPONSIBILITIES

ATSD(AE) DESIGNATED THE ARMY TO BE RESPONSIBLE FOR STANDARDIZATION AND SPECIFICATION OF HEMP PROTECTION FOR TGBC's STRATEGIC TIME-URGENT SYSTEMS

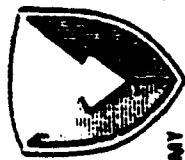
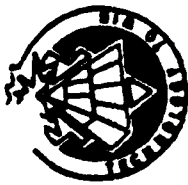
SPECIFICALLY, THE ARMY WAS TASKED TO:

- INITIATE SELECTIVE SHORT-RUN MEASURES TO BRIDGE GAP UNTIL LONG-RANGE OBJECTIVES CAN BE MET
- COMPOSE A FRAMEWORK FOR EMP STANDARDS AND SPECIFICATIONS FROM EXISTING PROGRAMS AND SPECIFIC NEAR-TERM EMP INITIATIVES
- ADDRESS SCOPE AND TIMING OF ACTIONS LEADING TO DEVELOPMENT OF GUIDELINES AND PRACTICES AND DESIGNATE LEAD ACTIVITY THROUGH ARMY STANDARDIZATION OFFICE

ARMY PROGRAM OBJECTIVES

- TO DEVELOP NEAR-TERM FORMAL HARDENING GUIDELINES AND PRACTICES FOR TGBC's SYSTEMS WHICH SUPPORT TIME SENSITIVE FUNCTIONS
- TO DEVELOP (DEMONSTRATE) TECHNOLOGY TO SUPPORT A HEMP HARDENING PROGRAM FOR TGBC's SYSTEMS
- TO TRANSFER THE TECHNOLOGY INTO DEFENSE STANDARDIZATION AND SPECIFICATION PROGRAM (DSSP) FORMAT
- TO PROVIDE TECHNOLOGY TRANSFER AND APPLICATION ASSISTANCE TO USERS

X

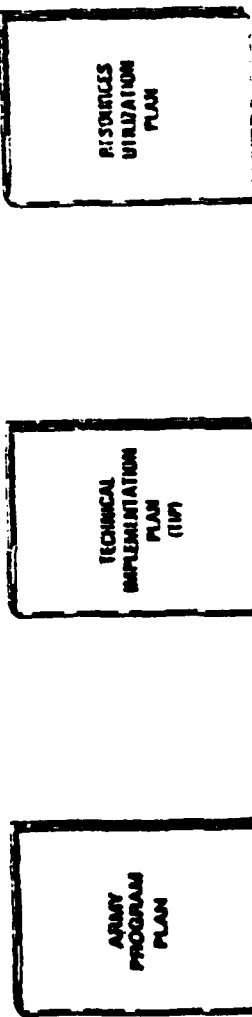


US ARMY
LABORATORY COMMAND

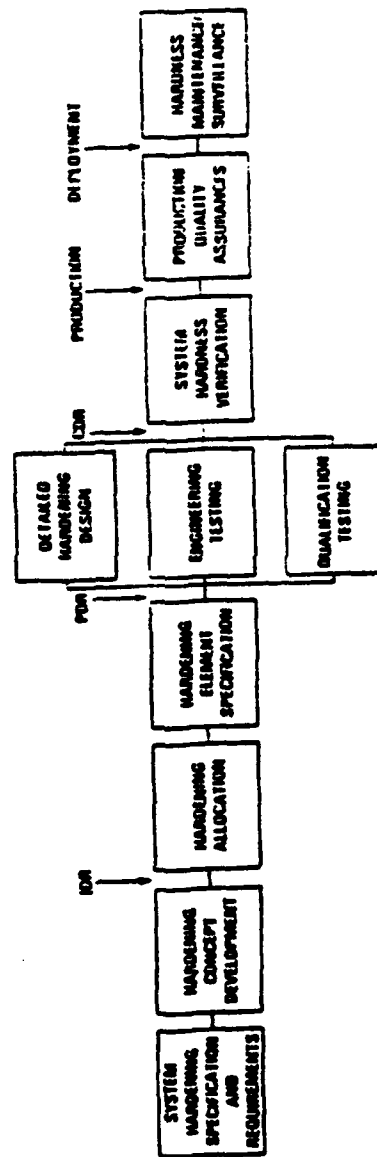
PROGRAM ACCOMPLISHMENTS

TECHNICAL IMPLEMENTATION APPROACH

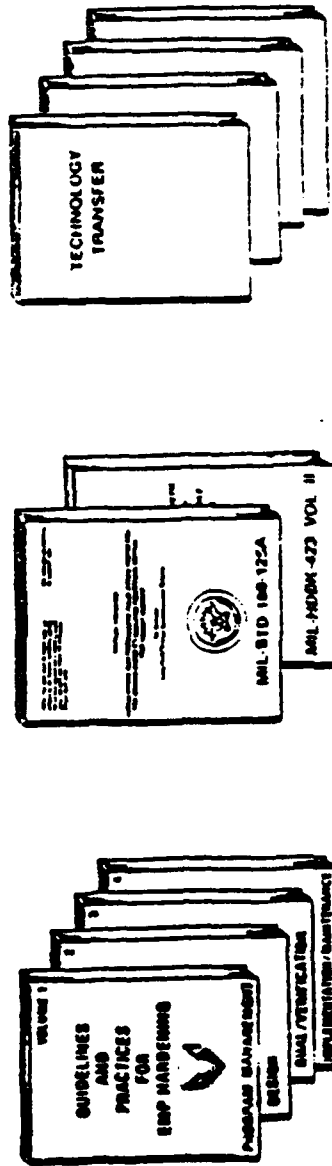
ARMY DIAMOND LABORATORIES



- PROGRAM PLANNING



- LIFE-CYCLE LOW-RISK APPROACH



- PROGRAM OUTPUT

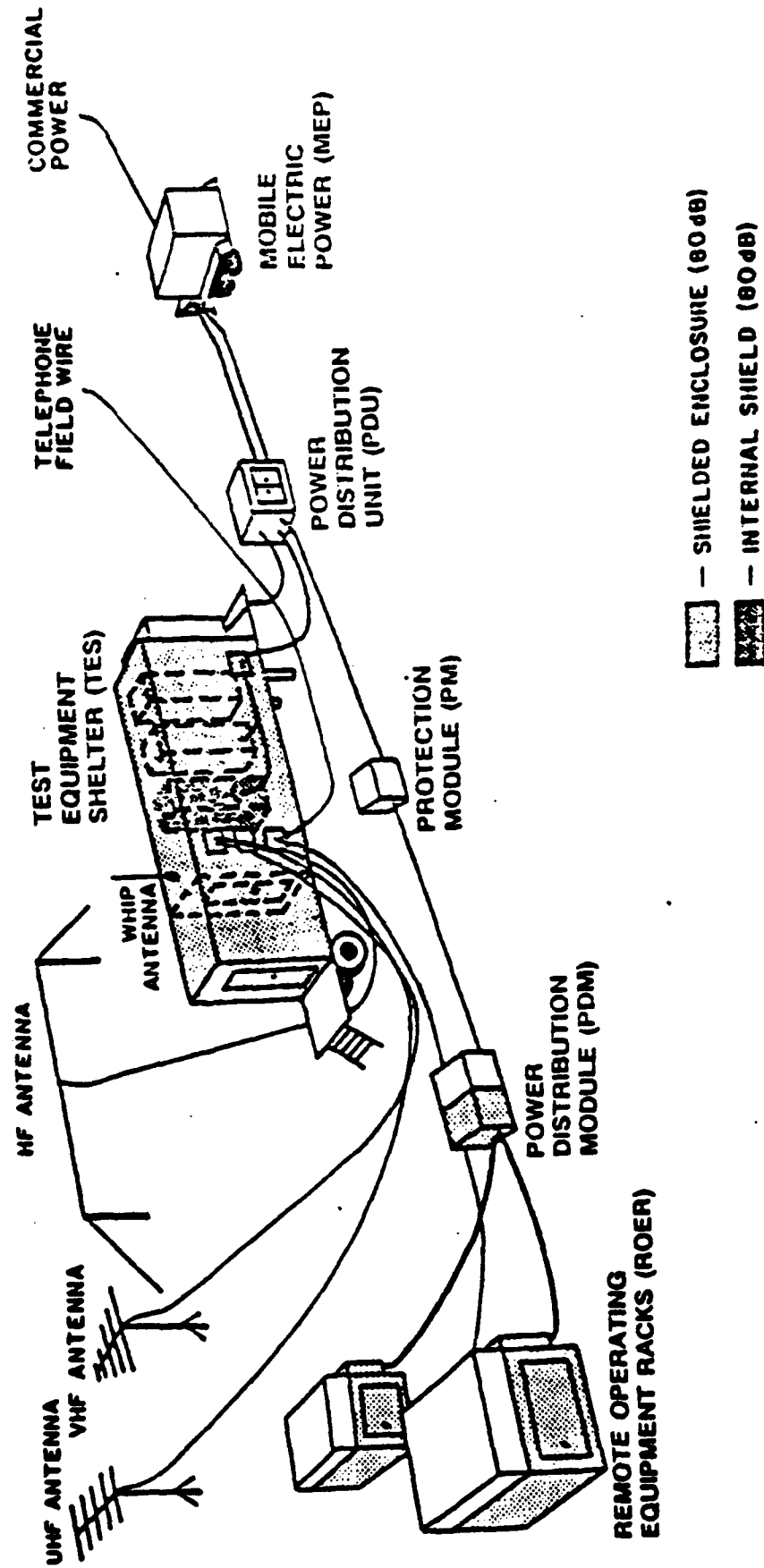


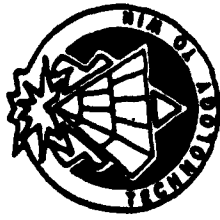
PROGRAM ACCOMPLISHMENTS

US ARMY
LABORATORY COMMAND

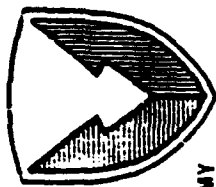
HARRY DIAMOND LABORATORIES

TEST BED/DEMONSTRATOR





PROGRAM ACCOMPLISHMENTS



HARRY DIAMOND LABORATORIES

US ARMY
LABORATORY COMMAND

TEST PROGRAM SUMMARY

TESTS PERFORMED

- HORIZONTAL POLARIZATION CALIBRATION - CW
- SIMPLE DISTRIBUTED SYSTEM
- HORIZONTAL POLARIZATION BASELINE - TB/D
- PENETRATION PROTECTION DEVICE BENCH TESTING
- SYSTEM RESPONSE - PHASE I - TB/D
- HM/HS - PHASE I

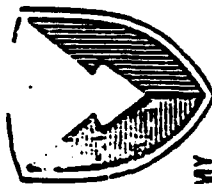
TECHNICAL ISSUES ADDRESSED

- ENVIRONMENT SPEC-E1
- NUMBER OF SHIELDS
- EXTERIOR STRESS
- STRESS ALLOCATION
- SPECIFICATION/ALLOCATION
- SPECIFICATION/LAYER SHIELD
- SURGE PROTECTION DESIGN
- HM/HS BASELINE
- VERIFICATION PROTOCOL
- BULK/INDIVIDUAL WIRE
- ESA PERFORMANCE
- EXTRAPOLATION TO THREAT
- HM/HS SIMULATORS
- HM/HS TEST METHODS
- LIFE CYCLE ANALYSIS
- STRESS BOUND ANALYSIS

R E S U L T S



PROGRAM ACCOMPLISHMENTS



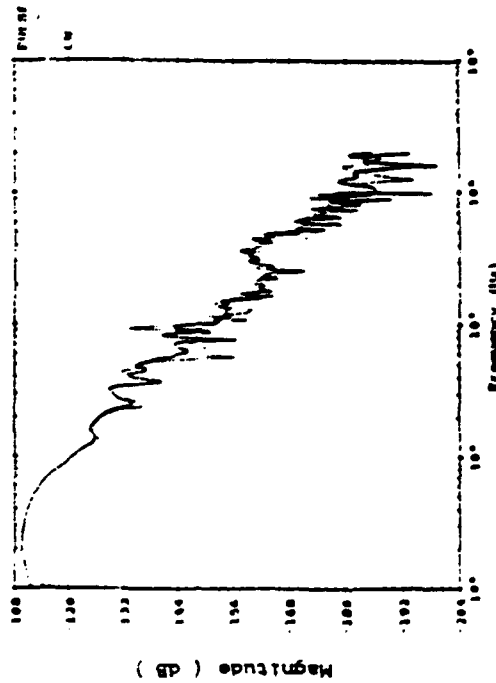
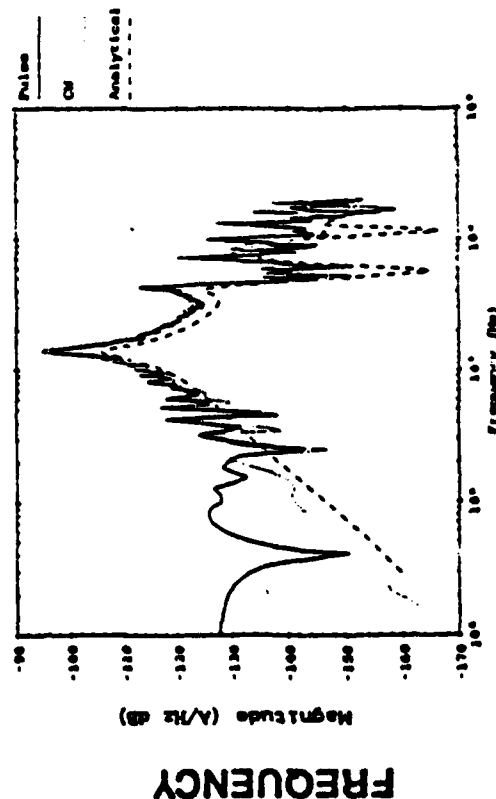
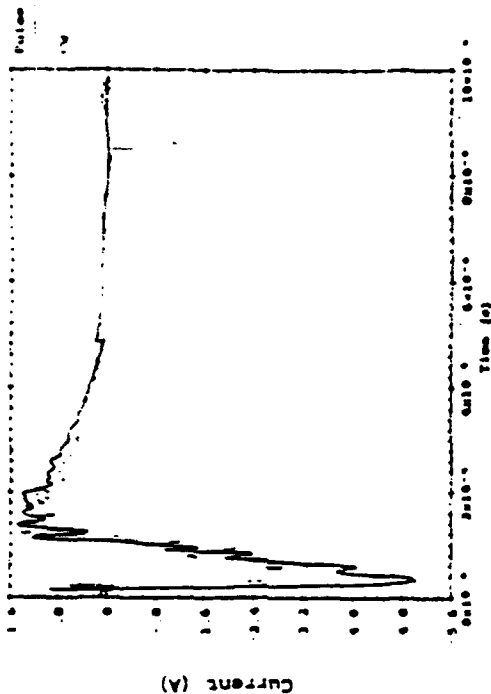
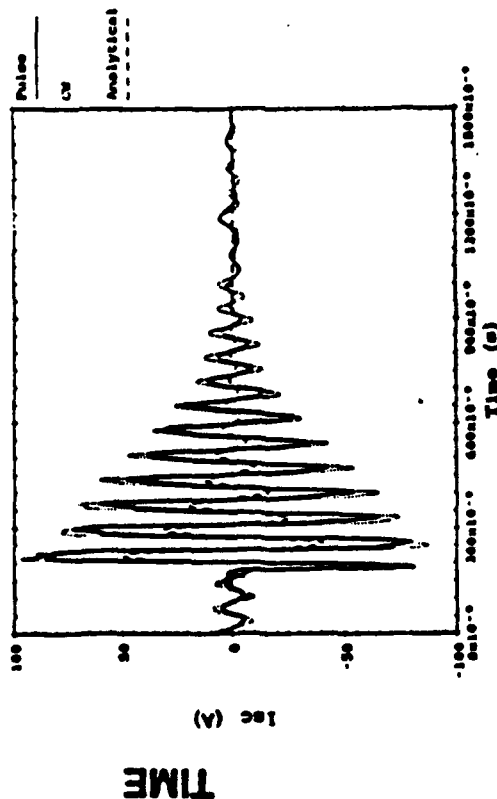
US ARMY
LABORATORY COMMAND

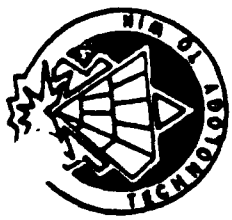
HARRY DIAMOND LABORATORIES

CW/PULSE COMPARISONS

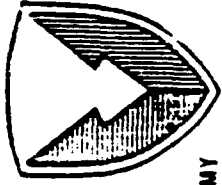
10 METER DIPOLE

SYSTEM GROUND CABLE





PROGRAM ACCOMPLISHMENTS



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

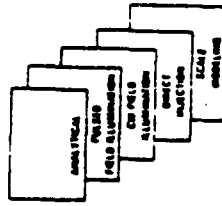
TECHNOLOGY TRANSFER

SIDS/HDBK DEVELOPMENT

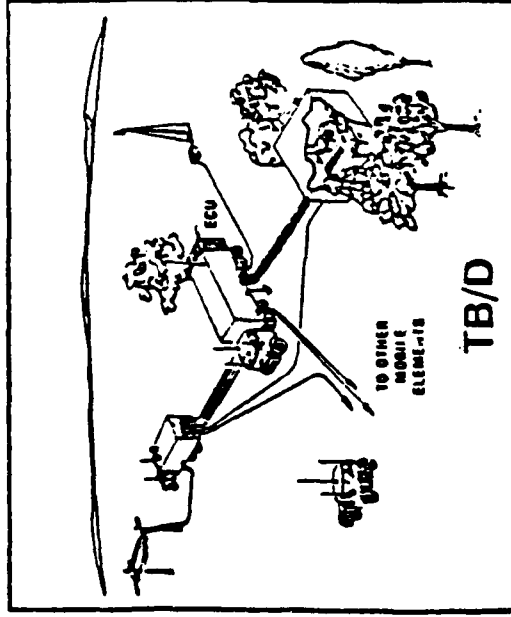
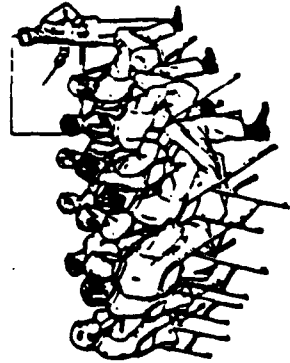
PM/SPO BRIEFINGS



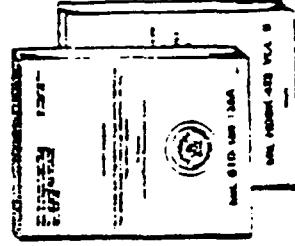
DSSP REPORTS



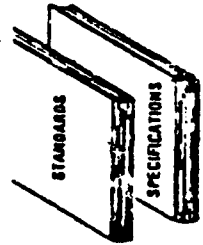
TECHNICAL PAPERS



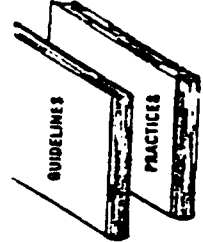
TRANSPORTABLE
GBC'I SYSTEMS



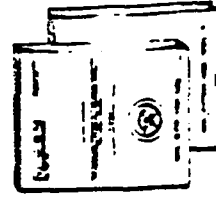
REVISED SPECS/STDS

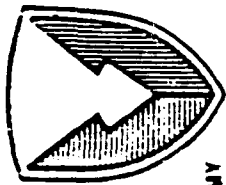


Ge & Po DISTRIBUTED



FIXED
GBC'I SYSTEMS





**US ARMY
LABORATORY COMMAND**

FUTURE PLANS

HARRY DIAMOND LABORATORIES

SCHEDULE

R & D DEMONSTRATION

26 A

16 A3

06 PJ

26 A

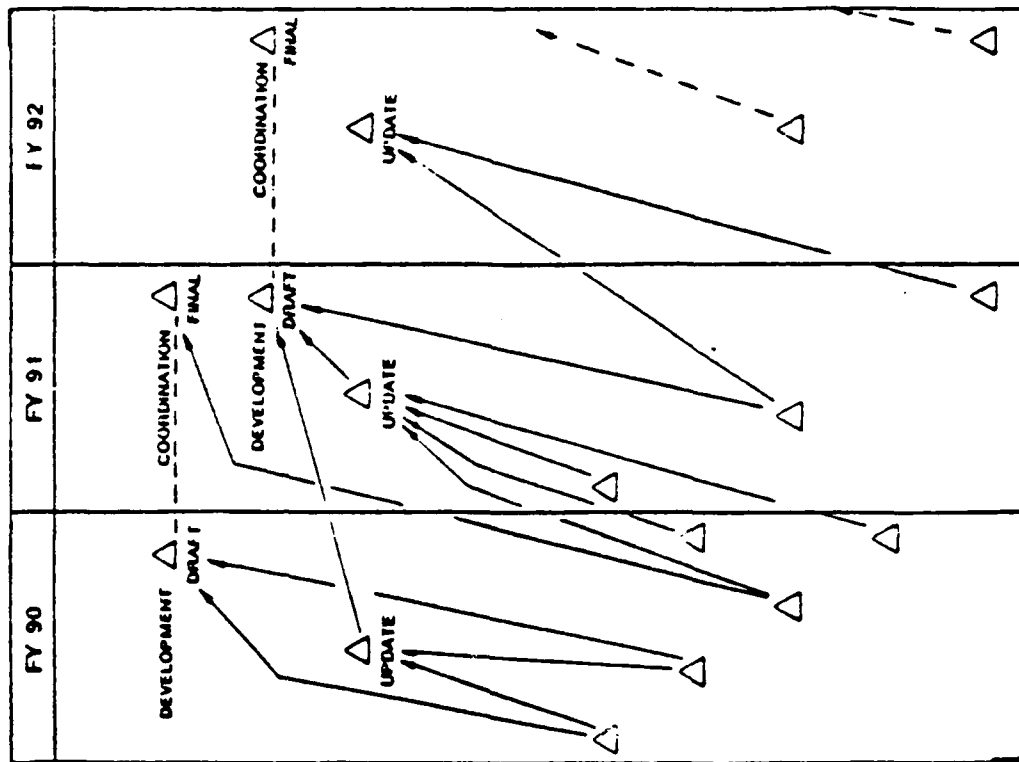
MIL-STD-100-125 (TRANSPORTABLE)

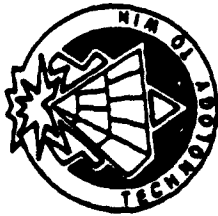
MIL-HDBK-423 (VOL II)

GUIDELINES AND PRACTICES

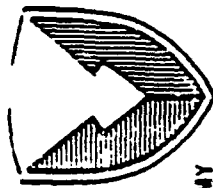
TESTS

- HM/HS I & II
- PPD BENCH TEST I & II
- SYSTEM RESPONSE II, III & IV
- VERTICAL CW CAL/B.L
- HS TECHNIQUES/BITE I & II





HARDNESS ASSURANCE HARDNESS MAINTENANCE

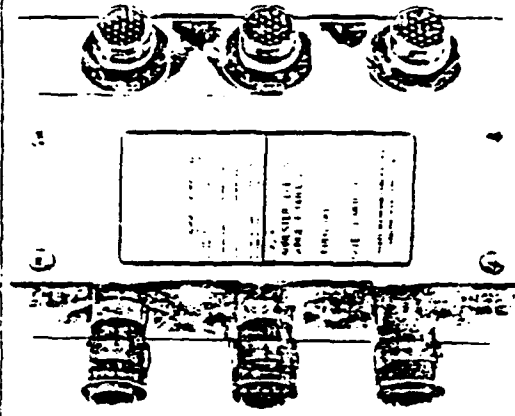


HARRY DIAMOND LABORATORIES

OBJECTIVE

- DEVELOP TECHNOLOGY TO ENSURE LIFE CYCLE NUCLEAR SURVIVABILITY OF ARMY TACTICAL SYSTEMS
- DEVELOP RELIABILITY AND MAINTAINABILITY ANALYTICS FOR MAXIMUM HCI/HCP AVAILABILITY
- OBTAIN HCI/HCP FAILURE MODE RATE DATA BASES FROM FIELDED SYSTEMS FOR NEW SYSTEMS DEVELOPMENT
- DEVELOP GENERIC NWE TMDE FOR DEPOT AND FORWARD MAINTENANCE ECHELONS

AN/TRC 145 PIP

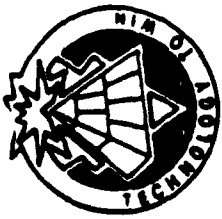


POTENTIAL CONTRACTOR SUPPORT

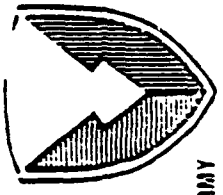
- Collection/Analyses of Failure Data
- Generic TMDE Prototype Design for Different System Types

PROGRAM MILESTONES

- DEVELOP FIELDED SYSTEMS FAILURE DATA BASE
- GENERIC TMDE PROTOTYPE
- TMDE TECHNOLOGY DEMONSTRATION



HARRY DIAMOND LABORATORIES



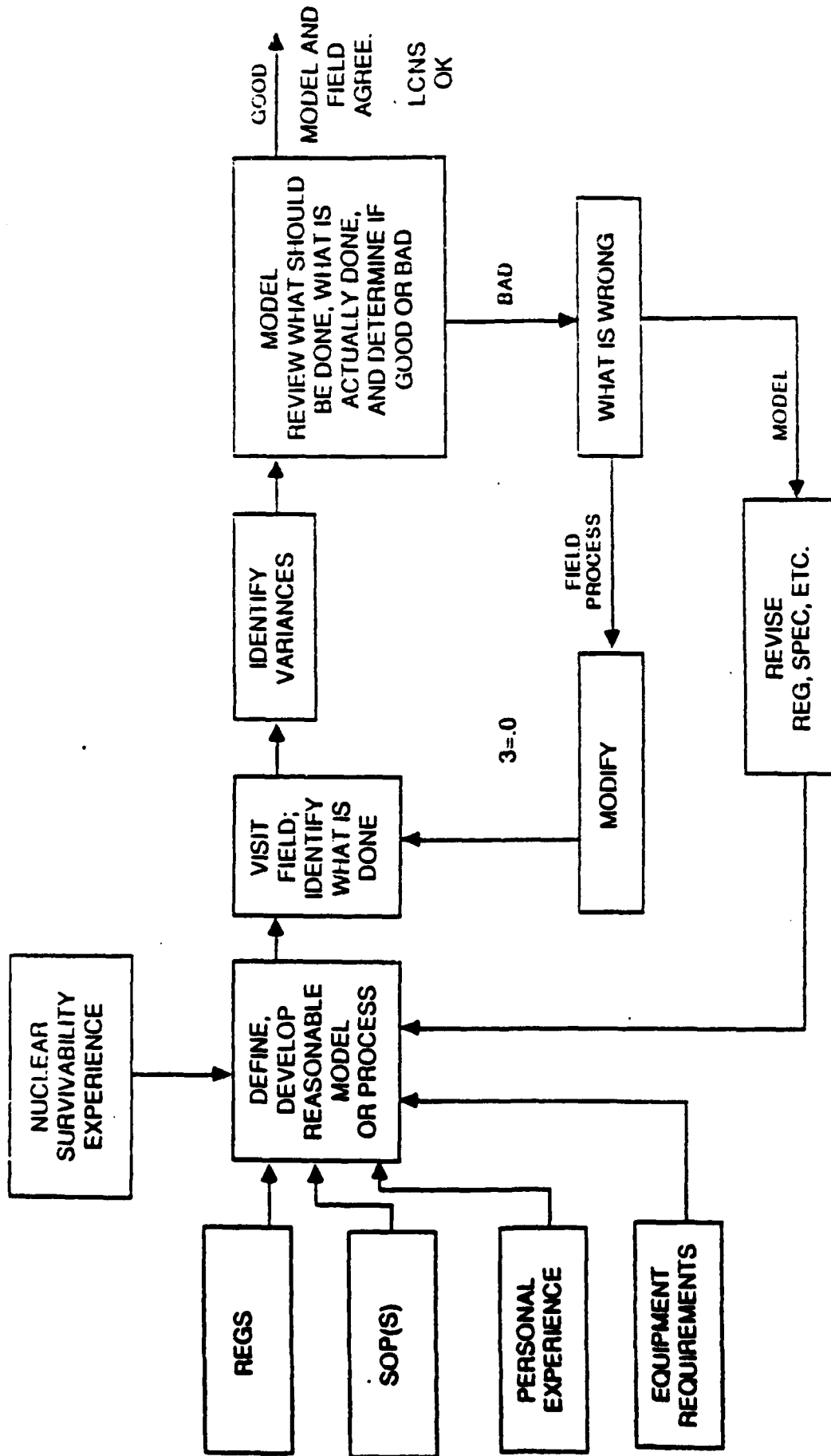
US ARMY
LABORATORY COMMAND

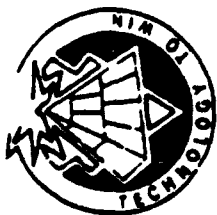
THRUSTS CONVERGING ON COORDINATED SOLUTION

- EXAMINE MATERIEL ACQUISITION PROCESS
- EXAMINE OPERATIONS AND SUPPORT PROCESS
- EVALUATE NS TECHNOLOGY BASE
- INTEGRATE NS THROUGHOUT LIFE-CYCLE

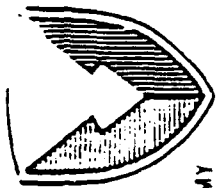
X







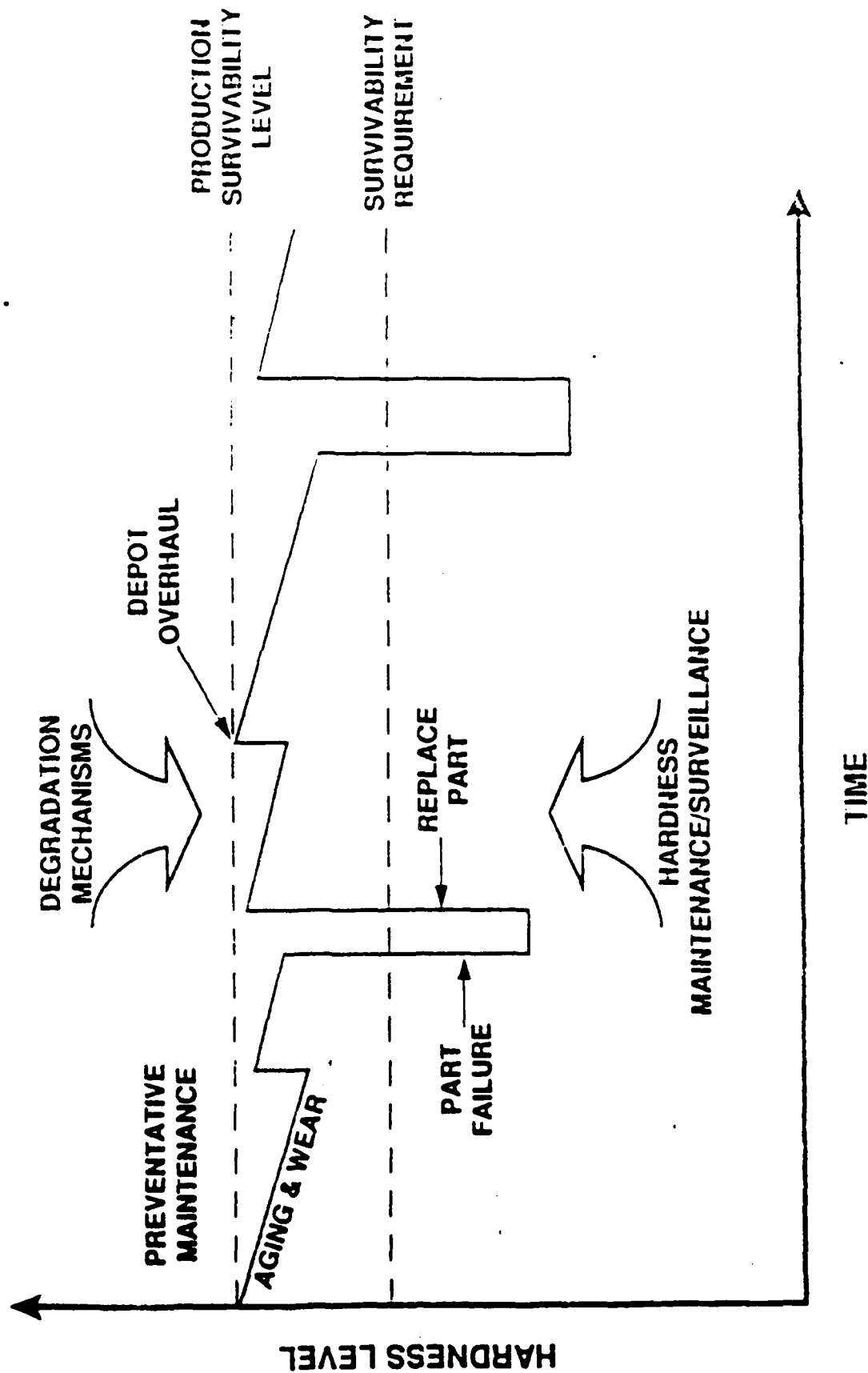
HARDNESS TIME HISTORY WITH HM/HS

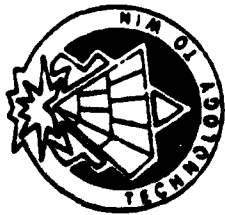


U.S. ARMY

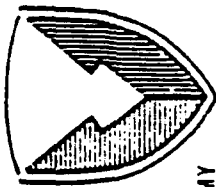
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES



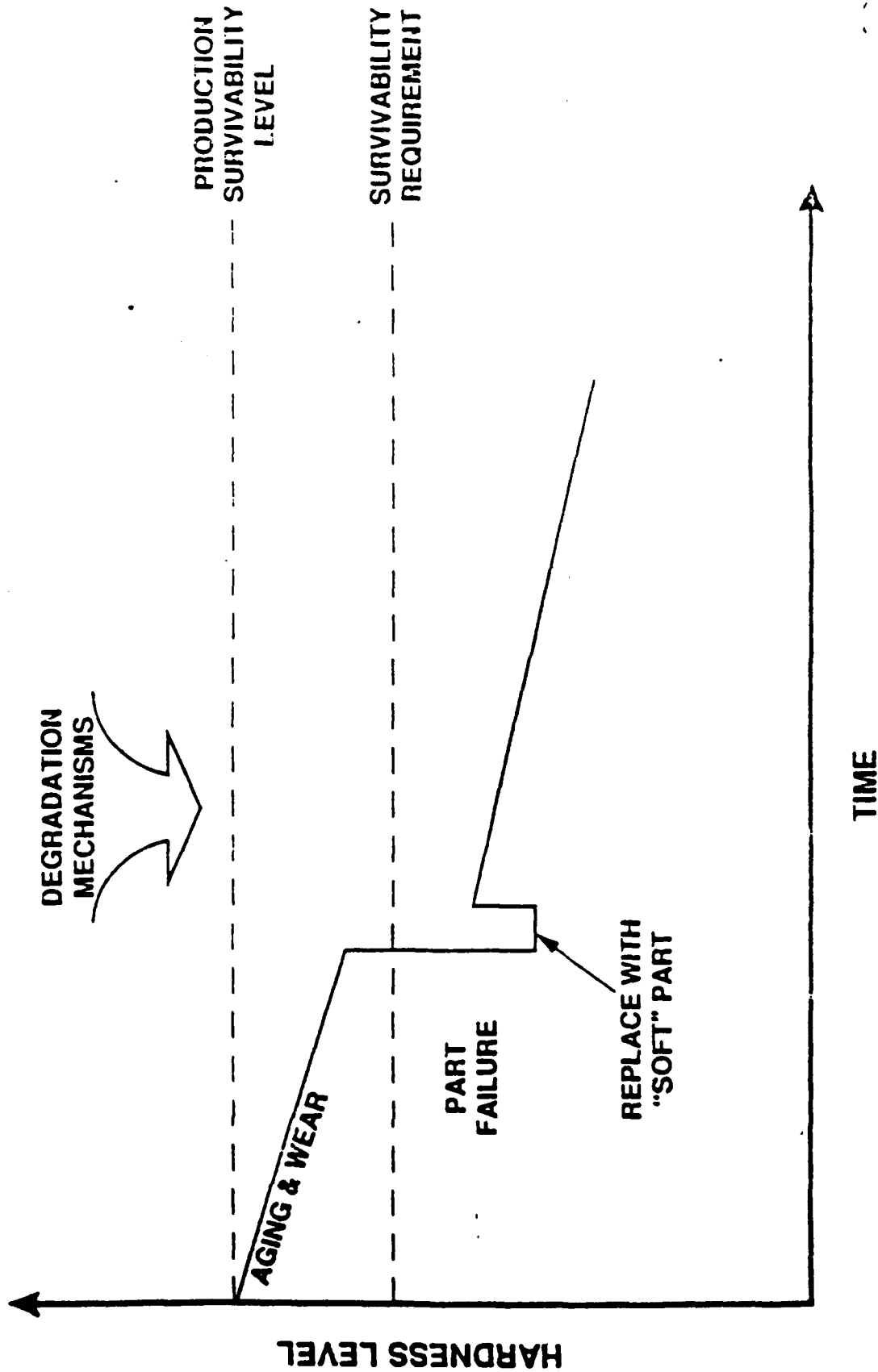


HARDNESS TIME HISTORY WITHOUT HM/HS



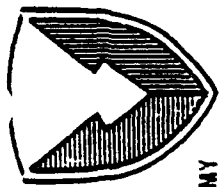
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES





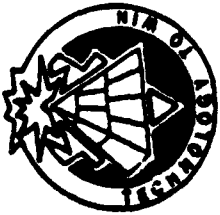
SUMMARY



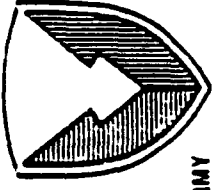
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- A VIABLE LCNS PROGRAM IS ESSENTIAL IF CRITICAL SYSTEMS ARE TO PERFORM THEIR ASSIGNED MISSIONS ON THE NUCLEAR BATTLEFIELD
- THE ARMY IS SEEKING AN EFFECTIVE LCNS PROGRAM AT AN AFFORDABLE PRICE
- SUCCESS IS ENHANCED THROUGH COORDINATION AND KEY PLAYER PARTICIPATION



NON DEVELOPMENTAL ITEMS

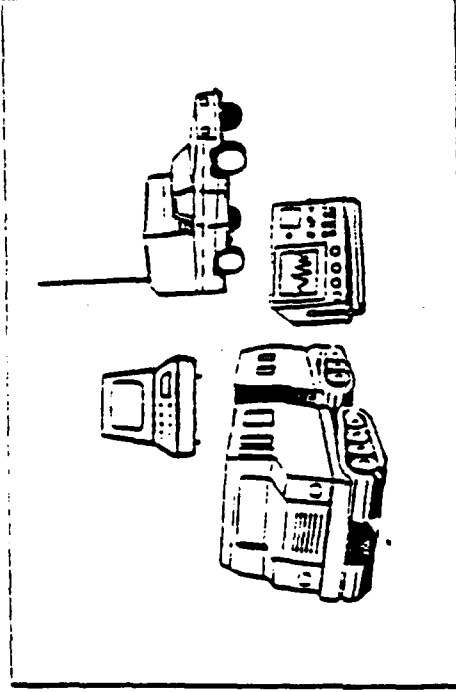


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- PRODUCE GUIDELINES FOR SELECTING NUCLEAR SURVIVABLE TECHNOLOGIES IN NDI PROCUREMENT
- DEMONSTRATE NUCLEAR HARDENING TECHNIQUES THAT CAN BE COST EFFECTIVELY INCORPORATED INTO NDI



POTENTIAL CONTRACTOR SUPPORT

- Techniques for Decreasing Nuclear Vulnerability on NDI
- Identification of Emerging Technologies NDI Survivability Problems
- Updated Guidelines for NDI Procurement

PROGRAM MILESTONES

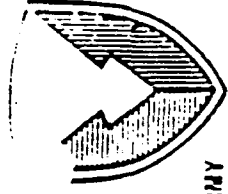
- INR SUSCEPTIBILITY OF NDI CANDIDATE TECHNOLOGIES DETERMINED
- FEASIBILITY OF ADD-ON CIRCUMVENTION TO NDI FOR INR HARDENING SHOWN
- ANALYSIS OF EMP EFFECTS ON NDI
- DEMONSTRATION OF NDI HARDENED TO INR AND EMP
- GUIDELINES FOR HARDENING NDI

X



NON-DEVELOPMENTAL ITEM (NDI) SURVIVABILITY

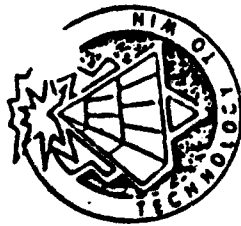
HARRY DIAMOND LABORATORIES



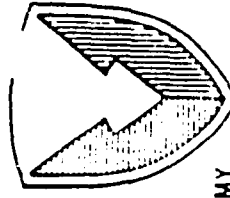
US ARMY
LABORATORY COMMAND

THE PROBLEM

- INCREASED USAGE OF ELECTRONICS ON TACTICAL BATTLEFIELD
- MILITARY DEVELOPMENT TIMES LAG RAPIDLY ADVANCING TECHNOLOGY
- COMMERCIAL EQUIPMENTS USE STATE-OF-THE-ART BUT ARE NOT HARDENED



NDI NUCLEAR SURVIVABILITY OBJECTIVES:



US ARMY

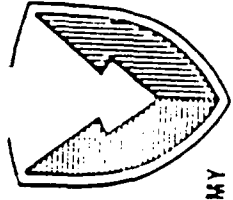
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- PRODUCE GUIDELINES FOR SELECTING TECHNOLOGIES IN NDI PROCUREMENTS.
- DEMONSTRATE HARDENING TECHNIQUES THAT CAN BE COST EFFECTIVELY INCORPORATED INTO NDI.



NDI NUCLEAR SURVIVABILITY APPROACH:



HARRY DIAMOND LABORATORIES

US ARMY
LABORATORY COMMAND

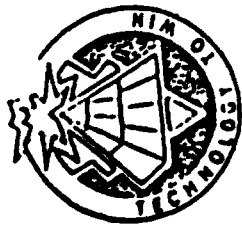
- DETERMINE THE NUCLEAR SUSCEPTIBILITY
OF NDI CANDIDATE TECHNOLOGIES.
- INVESTIGATE AND DEMONSTRATE SURVIVABILITY
ENHANCEMENT TO NDI SYSTEMS THROUGH:

MINOR MODIFICATIONS

ADD-ON HARDENING KITS

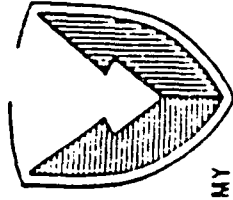
USE OF PREFERRED SYSTEM TECHNOLOGIES
OR CONFIGURATIONS

X



NDI NUCLEAR SURVIVABILITY BENEFITS:

HARRY DIAMOND LABORATORIES

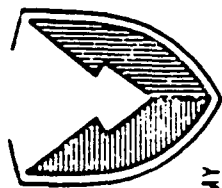


US ARMY
LABORATORY COMMAND

- NUCLEAR SURVIVABLE NDI EQUIPMENT CAN
RESULT IN A LARGE SAVINGS OF BOTH MONEY
AND TIME OVER THAT REQUIRED FOR THE
NORMAL DEVELOPMENT AND FIELDING OF
ARMY EQUIPMENT.
- RESULTS ARE ALSO APPLICABLE TO
UNHARDENED ARMY SYSTEMS.

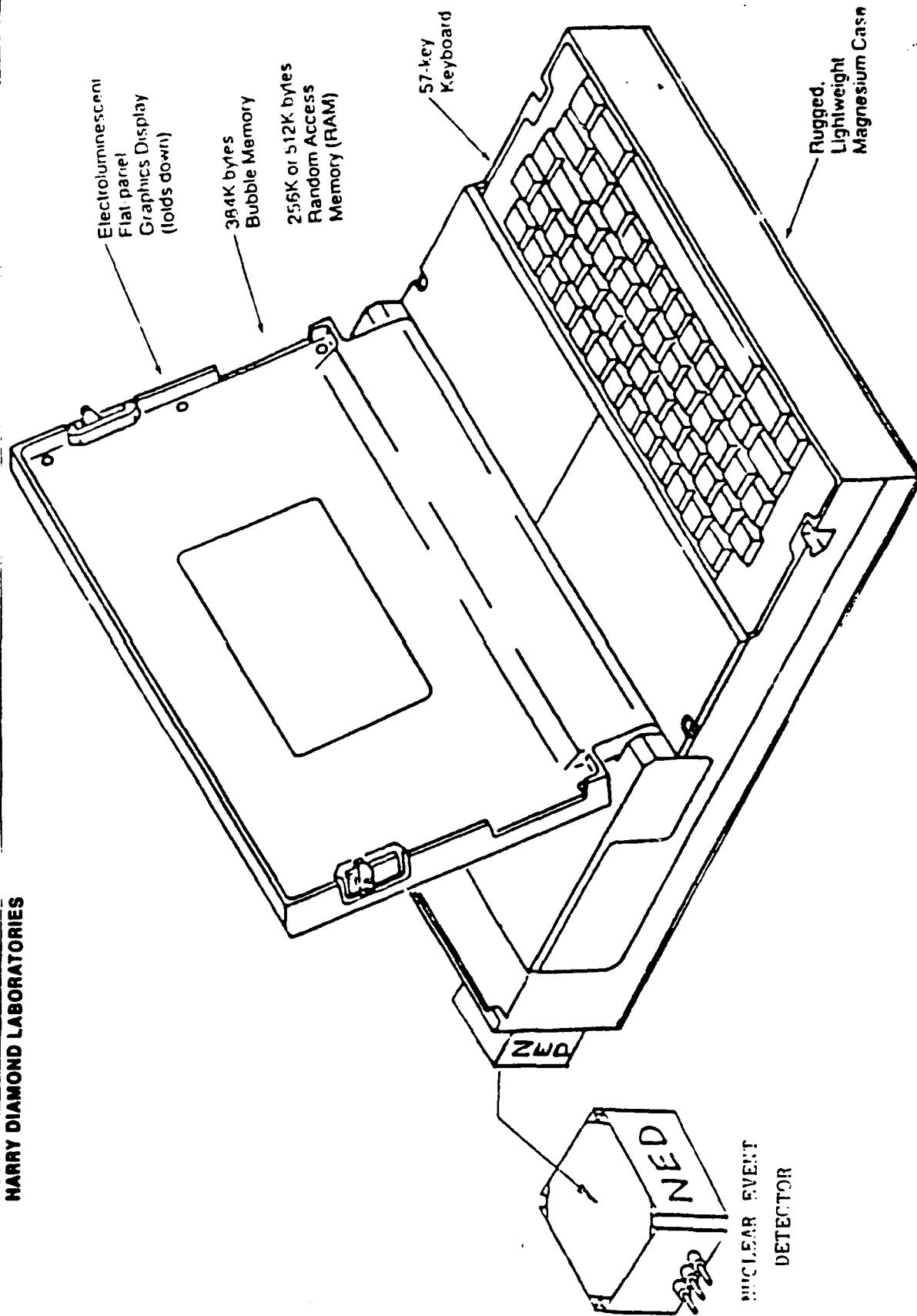


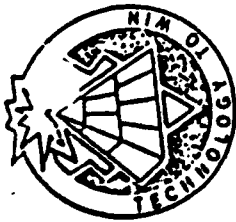
GRID PORTABLE COMPUTER
WITH ADDED NUCLEAR EVENT
DETECTOR (NED) MODULE



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES





NDI SCHEDULE

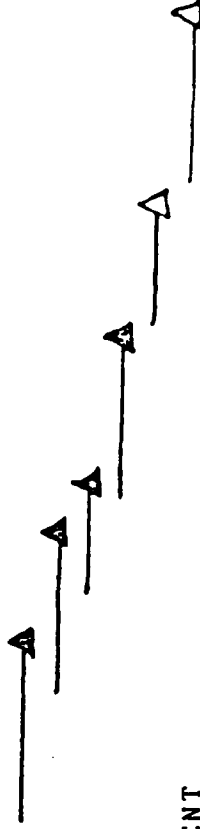
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

FY86 FY87 FY88 FY89 FY90 FY91 FY92

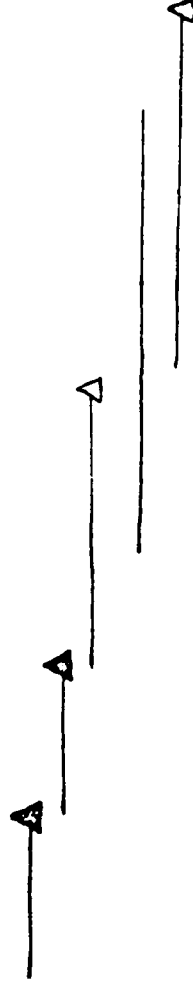
INITIAL NUCLEAR RADIATION

BASELINE SURVIVABILITY
SURVIVABILITY VALIDATION (GRID)
CIRCUMVENTION FEASIBILITY STUDY
PROVE CIRCUMVENTION CONCEPTS
SYSTEM DEMO
STATE-OF-THE-ART GUIDELINE DOCUMENT



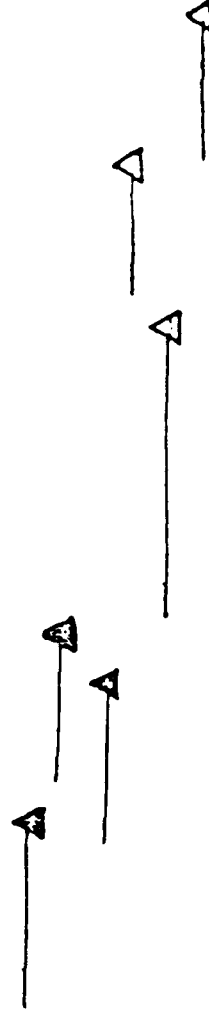
ELECTRO-MAGNETIC PULSE

PRELIMINARY HEMP GUIDELINES
HEMP TESTS
INTERIM GUIDELINES
SREMP INPUT
FINAL GUIDELINES



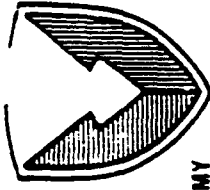
THERMAL/BLAST

PROTECTIVE COATING GUIDELINES
TEST WEATHERED COATINGS
OPTICAL PROTECTION STUDY
OPTICAL PROTECTION DEMO
NDI SHOCK MITIGATION
THERMAL/BLAST GUIDELINES





LARGE BLAST/THERMAL SIMULATOR

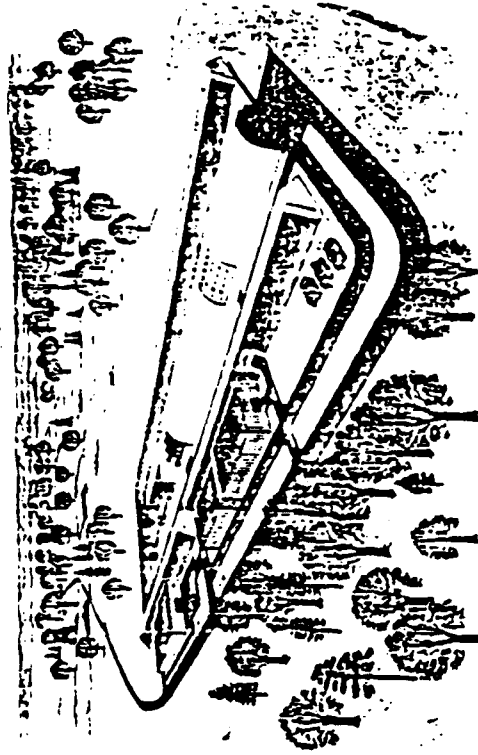


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- ACQUIRE DOD FACILITY FOR NUCLEAR BLAST/THERMAL SURVIVABILITY TESTING OF FULL SCALE EQUIPMENT TO THREAT LEVELS



LB/TS FACILITY CONCEPT

POTENTIAL CONTRACTOR SUPPORT

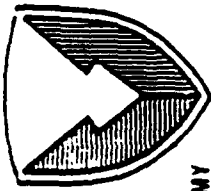
- Probative Tube Control System Design
- Analytical Codes for Tube/Target Response
- Instrumentation

PROGRAM MILESTONES

- CONSTRUCT TEST BED FACILITY
- 1/2 SCALE THROAT VALVE TEST
- LB/TS CONSTRUCTION
- THROAT VALVE RETROFIT
- FACILITY CHARACTERIZATION
- FULL SCALE EQUIPMENT TESTING



LARGE BLAST/THERMAL SIMULATOR

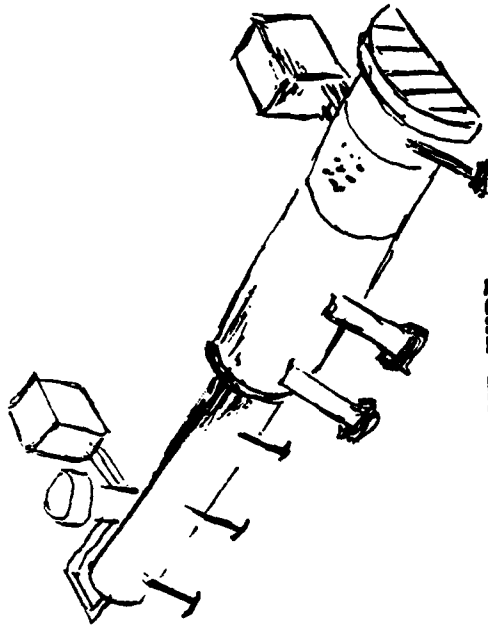


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

OBJECTIVE

- ACQUIRE DOD FACILITY FOR NUCLEAR BLAST/THERMAL SURVIVABILITY TESTING OF FULL SCALE EQUIPMENT TO THREAT LEVELS



PROBATIVE TUBE

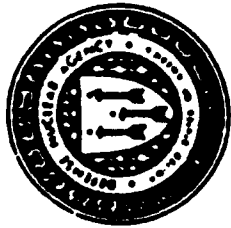
PROGRAM MILESTONES

- CONSTRUCT TEST BED FACILITY
- 1/2 SCALE THROAT VALVE TEST
- LB/TS CONSTRUCTION
- THROAT VALVE RETROFIT
- FACILITY CHARACTERIZATION
- FULL SCALE EQUIPMENT TESTING

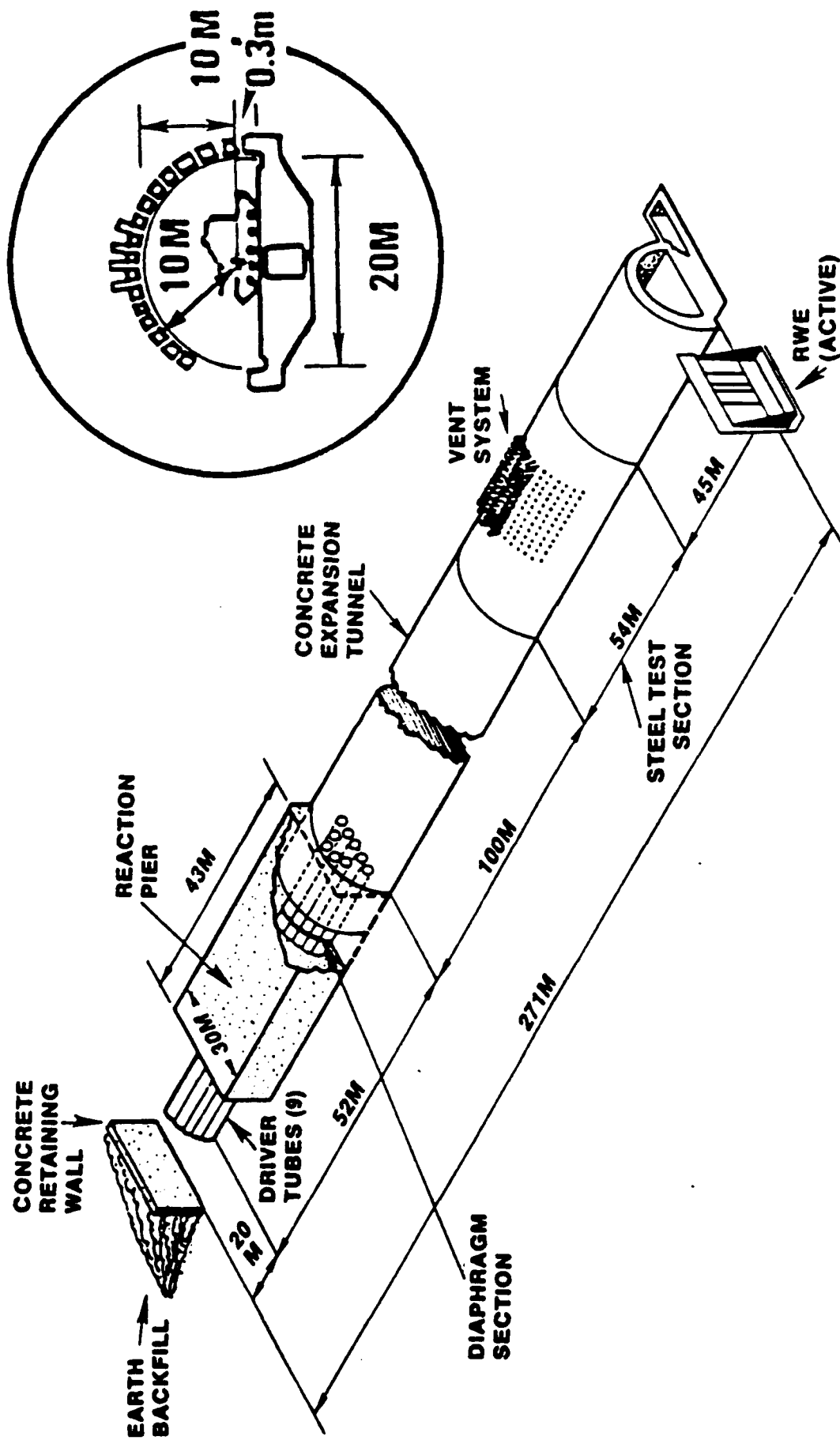
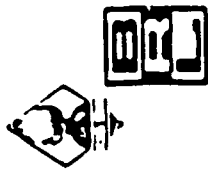
POTENTIAL CONTRACTOR SUPPORT

- Probative Tube Control System Design
- Analytical Codes for Tube/Target Response
- Instrumentation

X



LARGE BLAST/THERMAL SIMULATOR



Large Blast/Thermal Simulator

Current Concepts

- Yield Range: 1 to 600 kt
- Overpressure (Maximum): 2 to 35 psi
- Coupled Thermal Source: up to 320 cal/sq cm
- Large Cross Sectional Area: 163 sq m
- Multiple Heated Nitrogen Drivers: 9
- Pebble Bed Evaporator/Superheater
- Double Diaphragm System for Gas Release
- Movable Hydraulic Packers for Volume Changes
- Active Rarefaction Wave Eliminator

Blast Capabilities

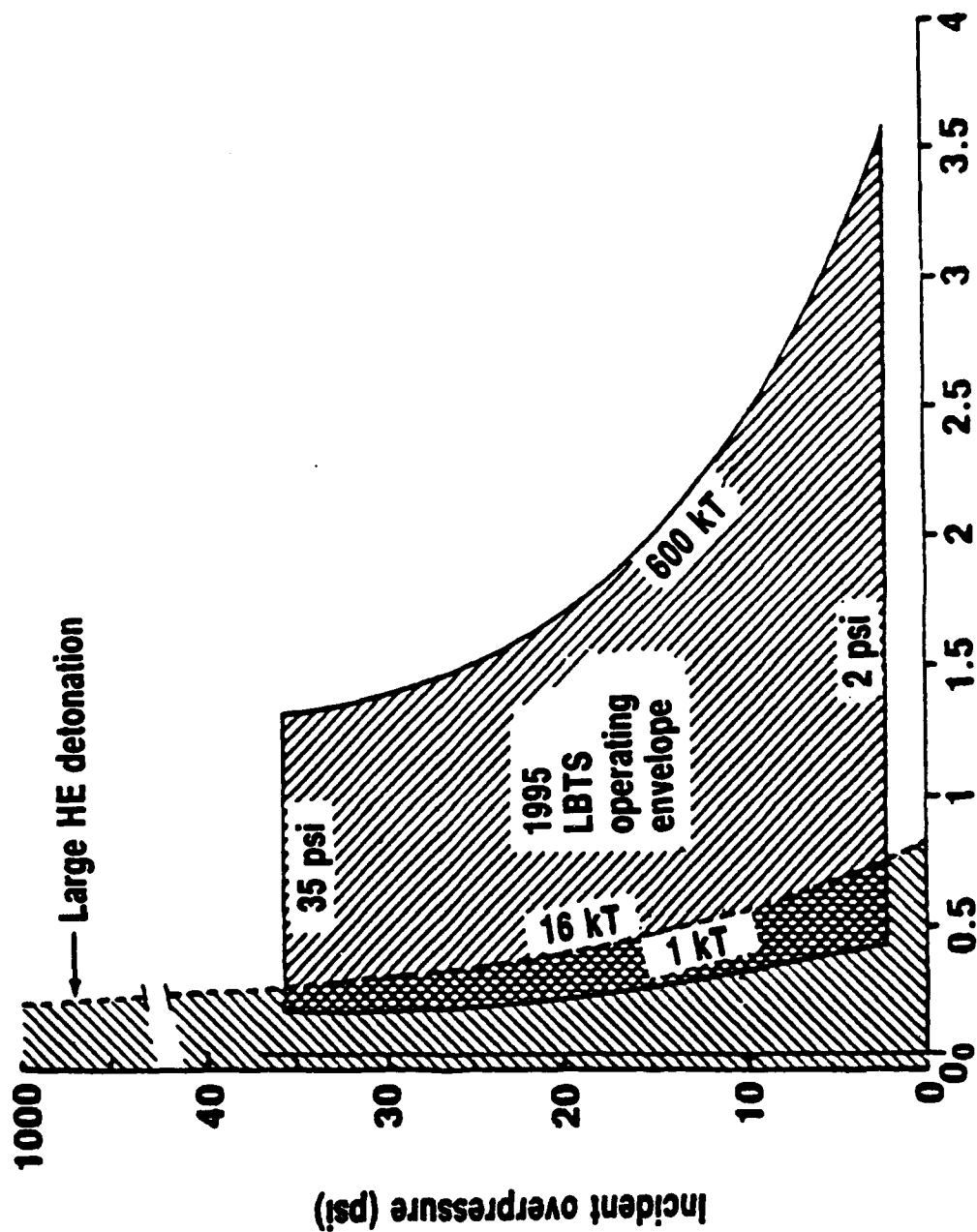


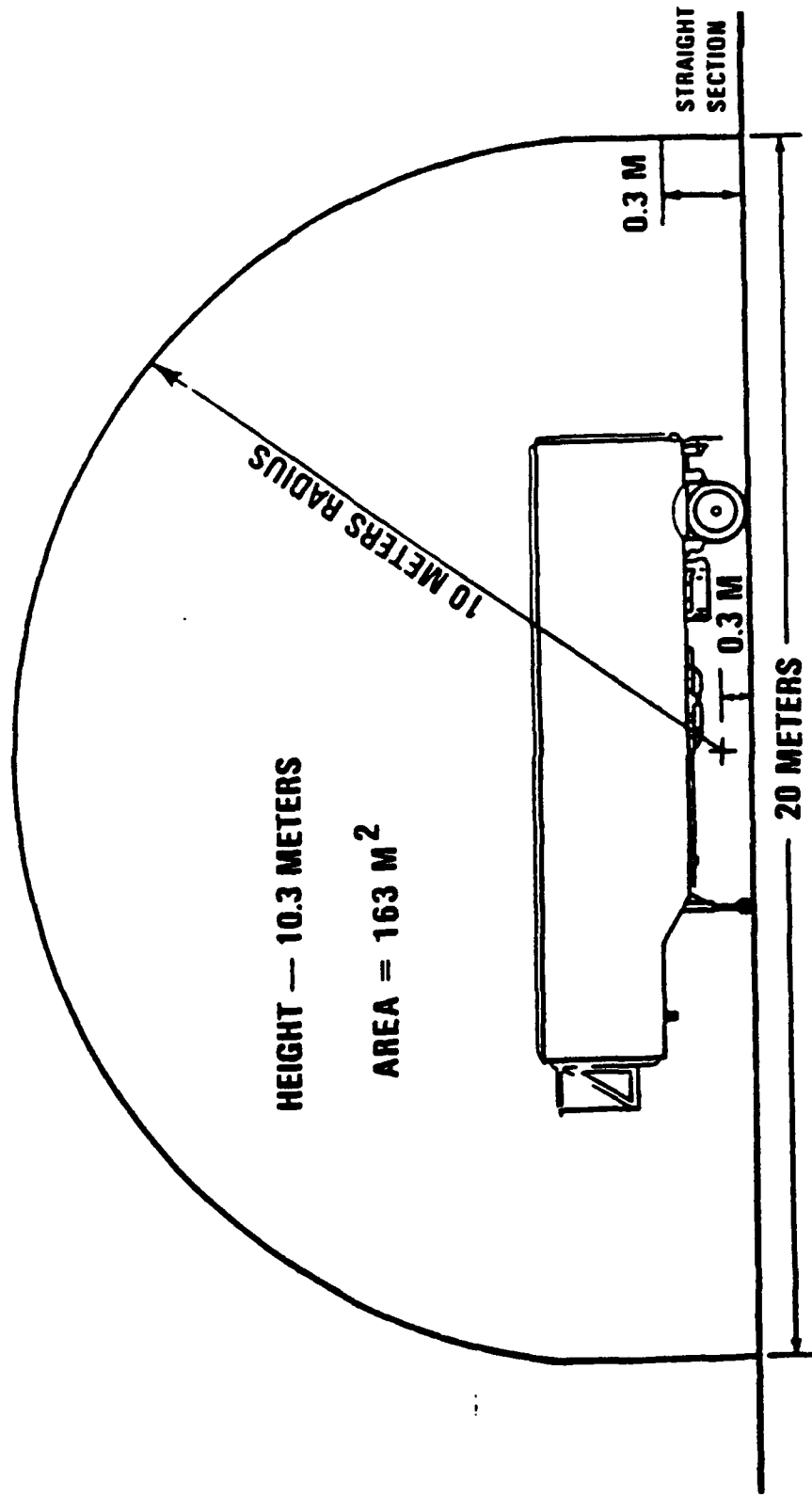
Figure 4. Blast capabilities of LB/TS and large HE detonations

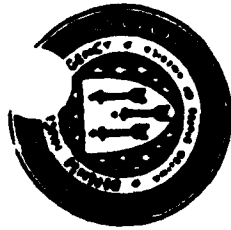


LARGE BLAST/THERMAL SIMULATOR



PROBABLE TEST SECTION

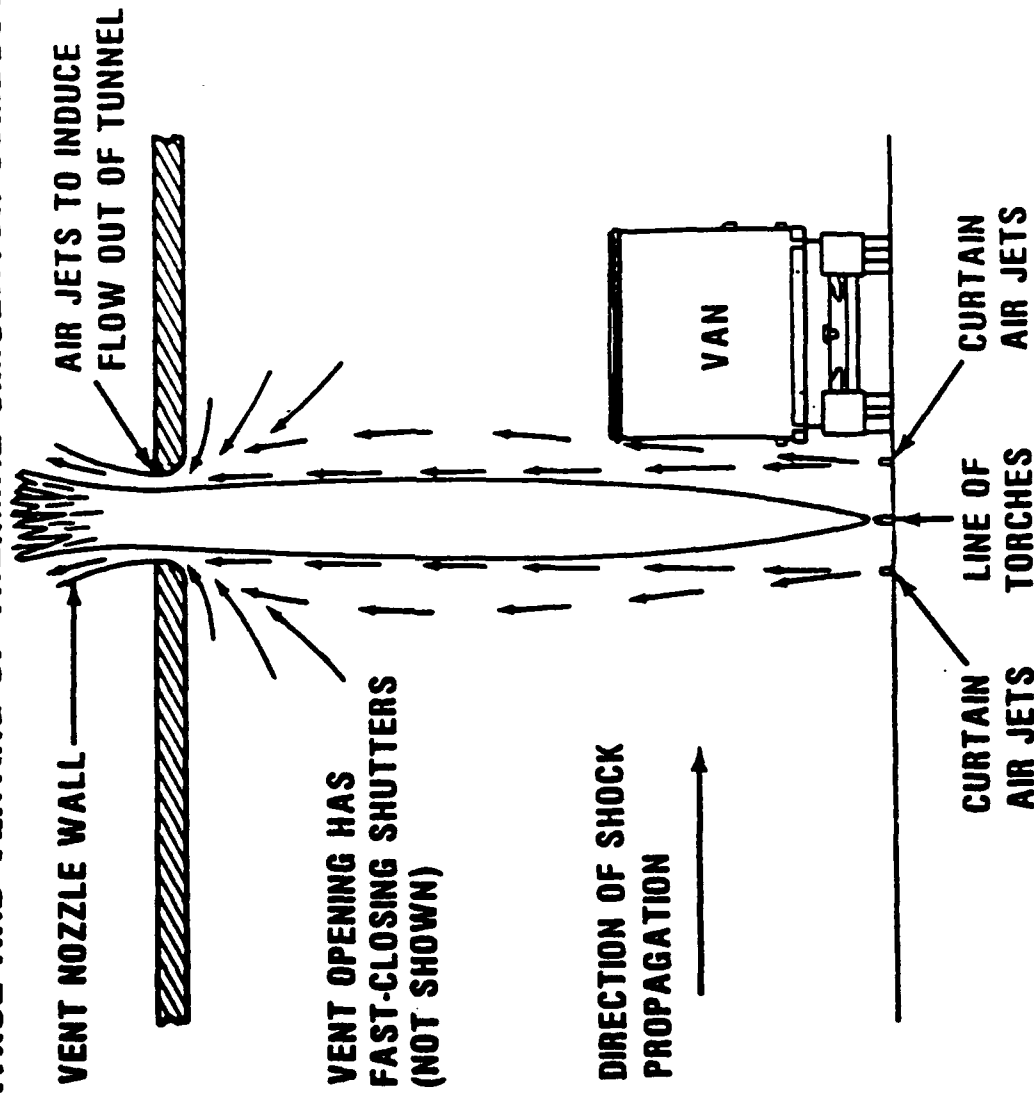


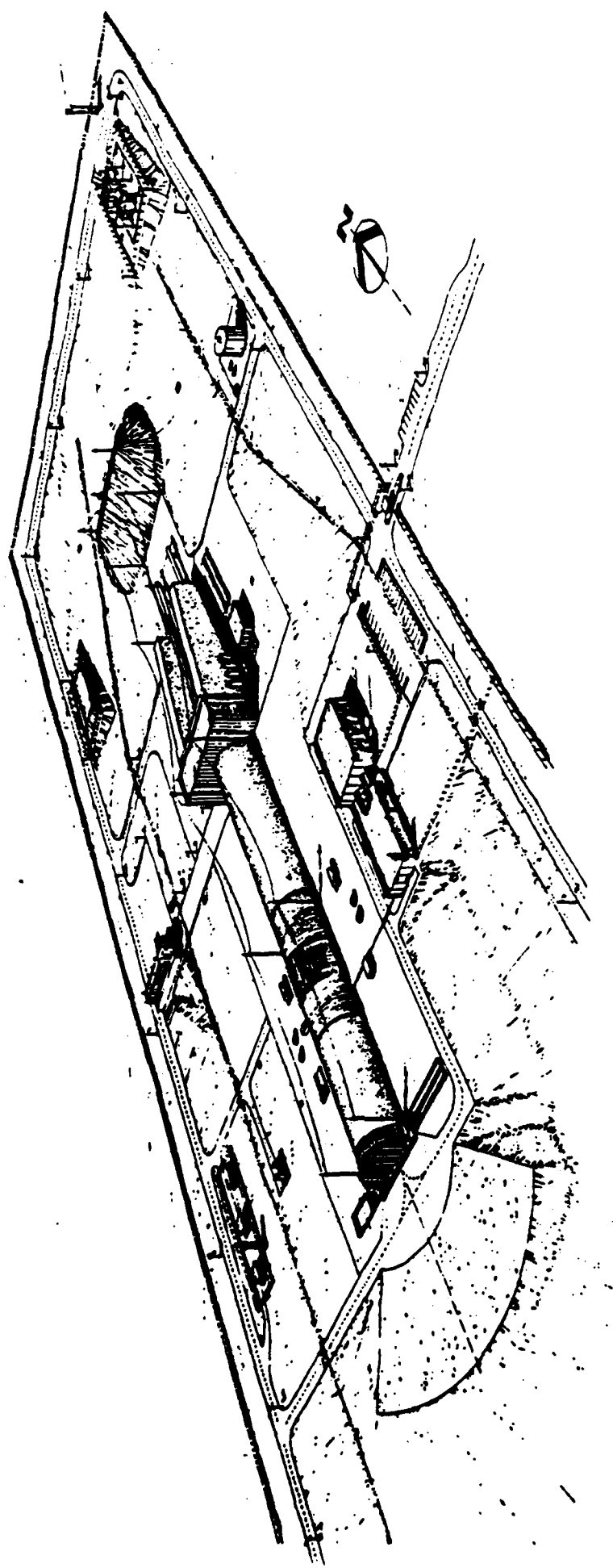


LARGE BLAST/THERMAL SIMULATOR



CONCEPT FOR CONTROL AND VENTING OF THERMAL SIMULATOR COMBUSTION PRODUCTS





LARGE BLAST / THERMAL SIMULATOR

Large Blast/Thermal Simulator

Research and Development Schedule

90 91 92 93 94 95

LB/Ts Design



LB/Ts Construction



Control System Design



Fast Acting Throat Valve
Research



Advanced Instrumentation
Techniques



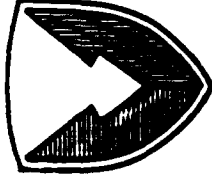
Non-Ideal Blast Simulation
Techniques





HARRY DIAMOND LABORATORIES

**U. S. ARMY
LABORATORY COMMAND**



Aurora/Radiation Simulation Technology

**Dr. Forrest J. Agee
Chief, Radiation Simulation
Technology Branch
Nuclear Survivability Laboratory**

**TITLE: Aurora and Proposed Tactical System Radiation (TSR)
Facility**

TECH BASE INVESTMENT STRATEGY AREA: SOO2 Modeling/Simulation

Aurora can be used to produce radiation in the form of both high-energy X rays and electron beams. Both types of radiation can be tailored to meet the needs of test objects.

DESCRIPTION:

Aurora's versatility makes it useful for a broad range of investigators. For example, Aurora produces X rays in the Gamma spectrum, allowing experimenters to assess the effects of transient radiation on electronics ranging from tiny chips to entire weapons systems. Aurora can also be used to test small objects at extremely high doses (for example, it can produce 300,000 RAD(Si) over 250 cm³) or, it can irradiate with good dose uniformity, a volume as large as 14m³ at a dose of 675 RAD(Si). Currently, no test facility is capable of testing complete deployed systems at high levels of X rays or with multiple pulses (proposed TSR).

OBJECTIVE/APPROACH:

The objective is to provide the Army with the means to test completely deployed systems as large as "Peacekeeper" with multiple Gamma-ray simulators producing X rays in the 10 ME V range.

TECH BARRIERS:

The technical barriers are:

- a. conceptual design for the facility: type of construction, design criteria, test area enclosure and utilities requirements, office area security systems approach and safety considerations;
- b. NEPA: review of scope, technical approach, risks, etc.;
- c. simulator design, drift tube design, drift tube fabrication;
- d. facility detail design, drift tube testing; and
- e. facility construction and simulator fabrication.

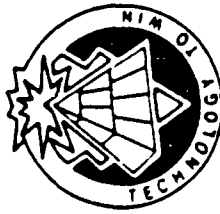
REMARKS:

In direct support of: space and strategic systems, tactical systems, systems technology, nuclear effects simulation technology.

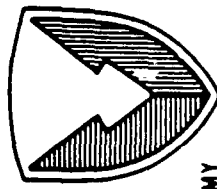
The Tactical System Radiation (TSR) facility represents a multimillion dollar investment of capital assets.

TECHNICAL POCs: Dr. Forrest J. Agee or Mr. Mark G. Caruso
Harry Diamond Laboratories
ATTN: SLCHD-NW-RS
2800 Powder Mill Road
Adelphi, MD 20783-1197

(301) 394-2290



AURORA MISSION



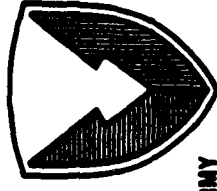
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- PROVIDE DNA SIMULATOR OF γ RAY INDUCED TREE EFFECTS TO SUPPORT DOD DEVELOPMENT OF
 - SPACE AND STRATEGIC SYSTEMS
 - TACTICAL SYSTEMS
 - SYSTEMS TECHNOLOGY
 - NUCLEAR EFFECTS SIMULATION TECHNOLOGY



UNIQUE FEATURES OF AURORA RADIATION FACILITY



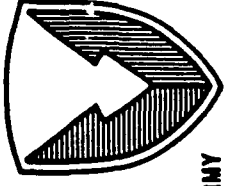
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- 45 krad GAMMA DOSE AND 3×10^{11} r/s DOSE RATE (OVER BASKETBALL SIZE VOLUME)
- BOTH INTENSE AND DIFFUSED E-BEAM CAPABILITIES
- HI-INTENSITY BREMSSTRAHLUNG CAPABILITY (≥ 500 krad)
- MODERATE ENERGY BREMSSTRAHLUNG WITH BACKSCATTER
- MULTIPLE PULSE (TWO PULSES, 20 K-rad each)
- MICROWAVE RADIATION AT 1 GHz (8GW IN WAVEGUIDE SO FAR)
- COMBINED ELECTRON AND GAMMA (SREMP)
- FAST RISE, SHORT PULSE SGEMP



TACTICAL SYSTEMS RADIATION (TSR) FACILITY



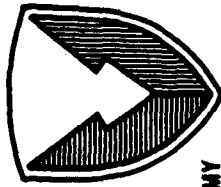
US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

- PROVIDE THE ARMY THE CAPABILITY TO TEST THE HARDNESS AND VULNERABILITY OF ARMY TACTICAL SYSTEMS TO THE TACTICAL NUCLEAR BATTLEFIELD ENVIRONMENT
- PROVIDE THE ARMY THE CAPABILITY FOR RESEARCH AND TESTING TO INSURE THE HARDNESS OF DEVELOPMENTAL FUTURE ARMY C³ SYSTEMS



AURORA TESTING SUPPORTS TRI-SERVICE PROGRAM



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

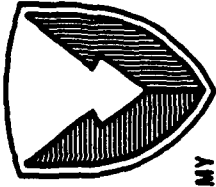
1984-1988

- PEACEKEEPER MISSILE (12 TESTS)
- ARMY TACTICAL CONVERTER
- ARMY SINGARS (4 TESTS)
- OSD-PIF AURORA MODERNIZATION
- SANDIA NATIONAL LABS CAPACITORS
- ARMY TACTICAL SREMP (4 TESTS)
- DNA-SNL SIMULATION FIDELITY
- AFWL SOIL CONDITIONS
- ARMY AN/UGT-74
- SDIO OPTICAL WINDOWS (3 TESTS)
- ARMY TACTICAL SGEMP (2 TESTS)
- DNA UGT GAGE
- NAVY UGT
- ARMY GRID COMPUTER (2 TESTS)
- SDIO HPM (3 TESTS)

- ARMY INDENTED DIODE
- DSCS III
- ARMY TACTICAL 3KW GENERATOR
- ARMY LOW JITTER SWITCH
- DNA MISTY ECHO UGT (2 TESTS)
- ARMY M-109 HOWITZER SGEMP
- NAVY CID STAR TRACKER
- ARMY/SNL XM785 FUZE/W82 PROJECTILE (4 TESTS)
- ARMY SBIR SOFTENED X-RAYS (4 TESTS)
- ARMY A TO D CONVERTERS
- ARMY PHOTOCONDUCTIVE DIAMOND TEST
- ARMY TACTICAL POWER SUPPLIES (2 TESTS)
- ARMY XM42 FUZE SETTER (3 TESTS)
- ARMY XM749 FUZE
- NSA KOK-13 RUTTER COMSEC (3 TESTS)



AURORA TESTING SUPPORTS TRI-SERVICE PROGRAM



US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

1989

- ARMY TACTICAL SREMP
- ARMY TACTICAL QUIET MOTOR GENERATOR
- ARMY LOW JITTER SWITCH (2 TESTS)
- PEACEKEEPER MISSILE (2 TESTS)
- ARMY TACTICAL GENERIC ENCLOSURES
- SDIO HIGH POWER MICROWAVES
- NSA RUTTER
- TRIDENT II
- MARX GENERATOR INSTALLATION AND TESTING

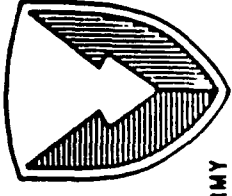
1990-1994

- PEACEKEEPER MISSILE (15 TESTS)
- ARMY FUZE UPGRADE
- ARMY DISTANT LIGHT UGT (6 TESTS)
- ARMY TACTICAL SOURCE REGION PROGRAM
- ARMY TSR SIMULATOR PROGRAM
- NSA COMSEC
- NAVY UHF FOLLOW-ON (2 TESTS)
- SDIO HIGH POWER MICROWAVES
- SMALL ICBM
- NUMEROUS OTHER ARMY, NAVY, USAF, DOD AGENCY AND DOE PROGRAMS YET TO BE SCHEDULED



AURORA USERS--THE EXPERIMENTERS

US ARMY
LABORATORY COMMAND



HARRY DIAMOND LABORATORIES

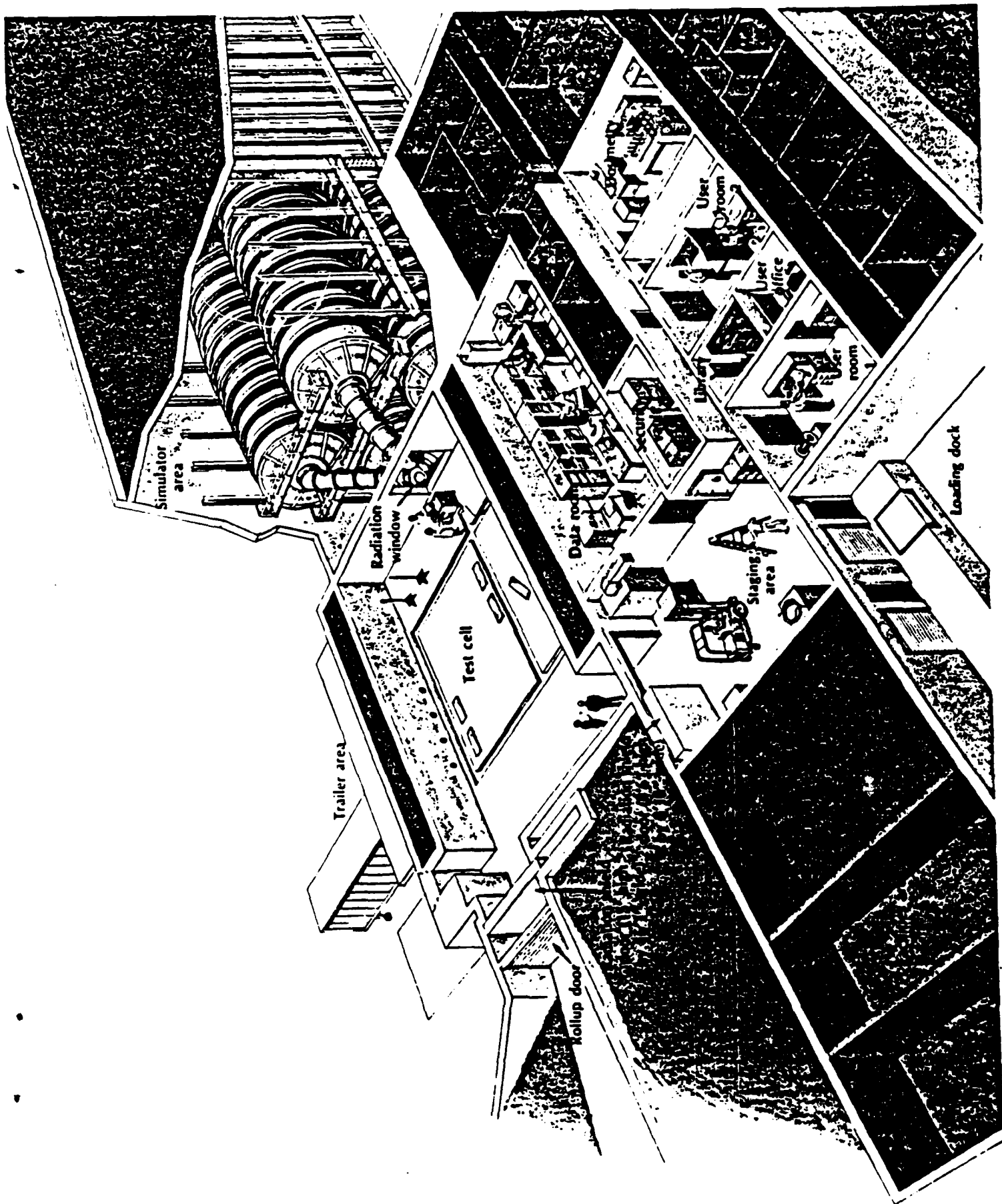
GOVERNMENT

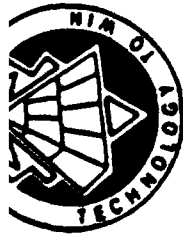
HARRY DIAMOND LABORATORIES
NAVAL RESEARCH LABORATORIES
NAVAL SURFACE WEAPONS CENTER
US ARMY MICOM
DOE NATIONAL LABORATORIES
SANDIA
LOS ALAMOS
LAWRENCE LIVERMORE

INDUSTRY

MCDONNELL DOUGLAS
SPERRY
UNISYS
MARTIN MARIETTA
BELL TELEPHONE LABORATORIES
HONEYWELL INT.
HUGHES AIRCRAFT
SRI
BALL AEROSPACE

BERKELEY RESEARCH ASSOCIATES
SIMULATION PHYSICS INC.
GENERAL ELECTRIC
RCA
NORTHROP
APPLIED PHYSICS LABORATORY -- JOHNS HOPKINS
AEROJET ELECTRO SYSTEMS
BENDIX
LOCKHEED MISSILES & SPACE CO.
RAYTHEON
MISSION RESEARCH CO.
AVCO
SAIC
JAYCOR
ITT
ROCKWELL
PHYSICS INTERNATIONAL
PULSE SCIENCES INC.
DESIGN ANALYSIS CONSULTANTS



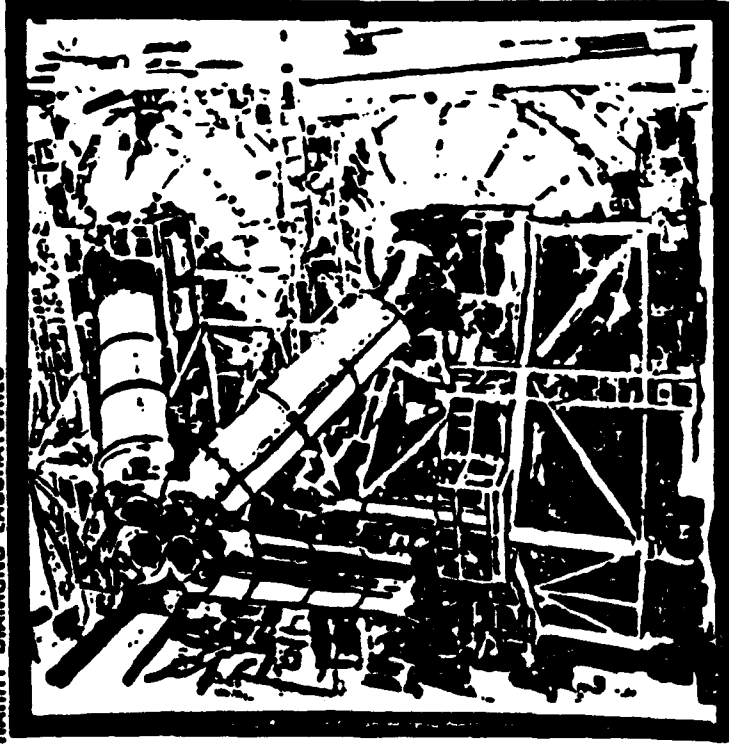


AURORA TUBULAR DRIFT TUBE ENHANCEMENT UPGRADES

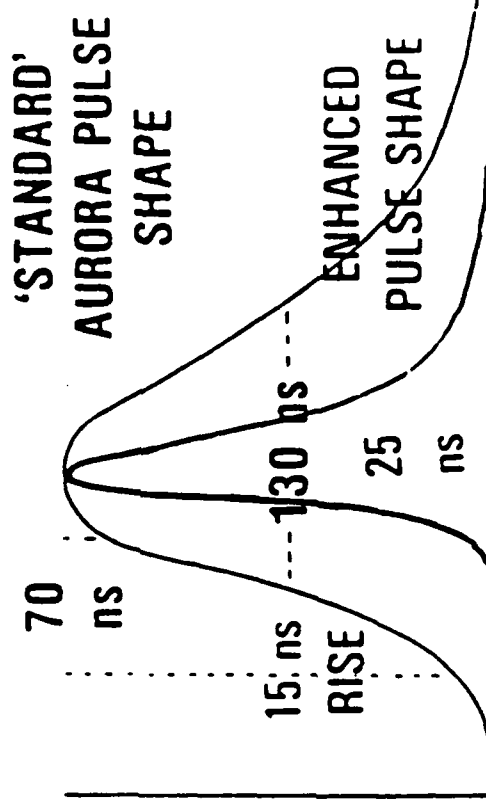


US ARMY
LABORATORY COMMAND

HARRY DIAMOND LABORATORIES

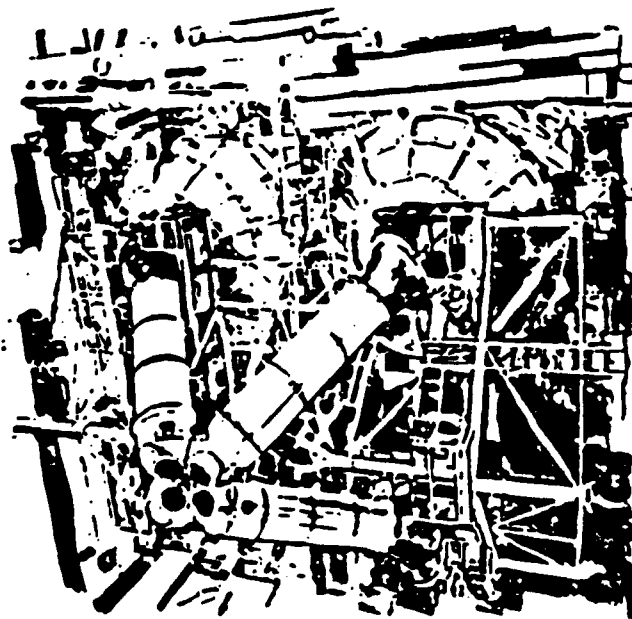


Aurora

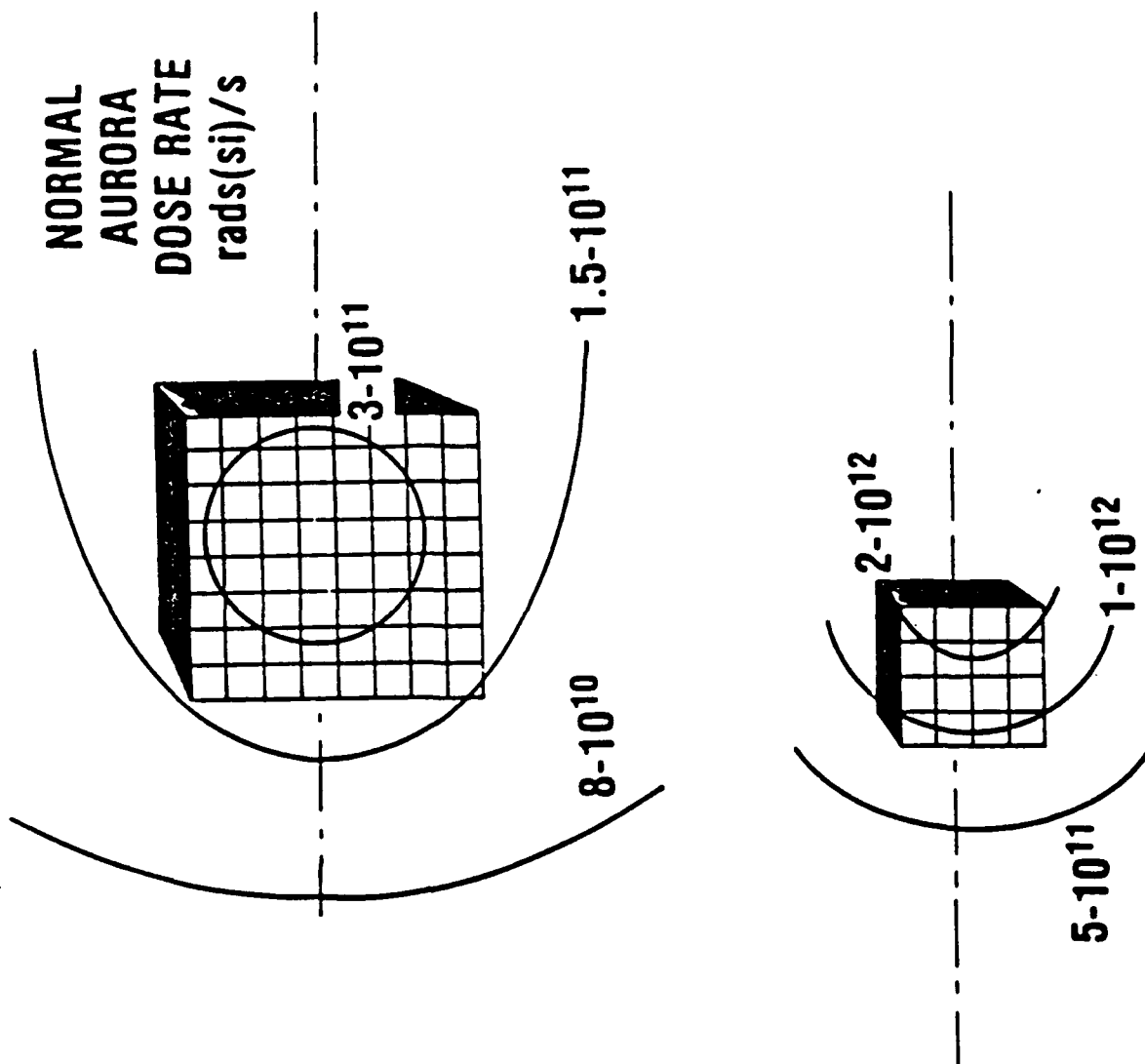


- ELECTRON BEAM DRIFT TUBE SHARPENS RISE TIME
- DIVERTER SWITCHES SHORTEN PULSE WIDTH

AURORA HIGH-INTENSITY BREMSSTRAHLUNG UPGRADE

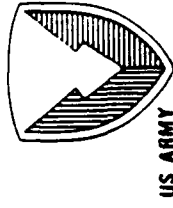


Aurora



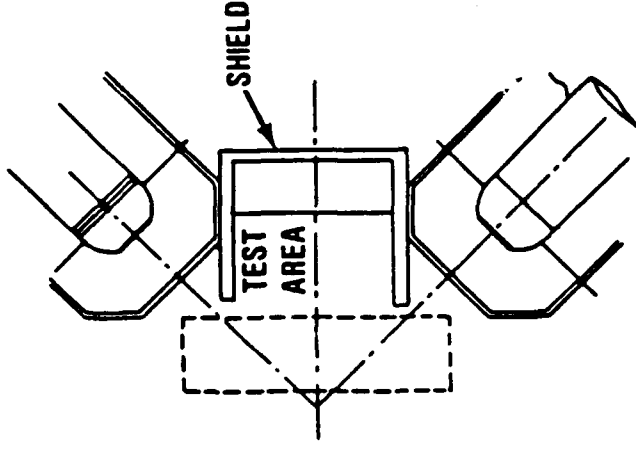
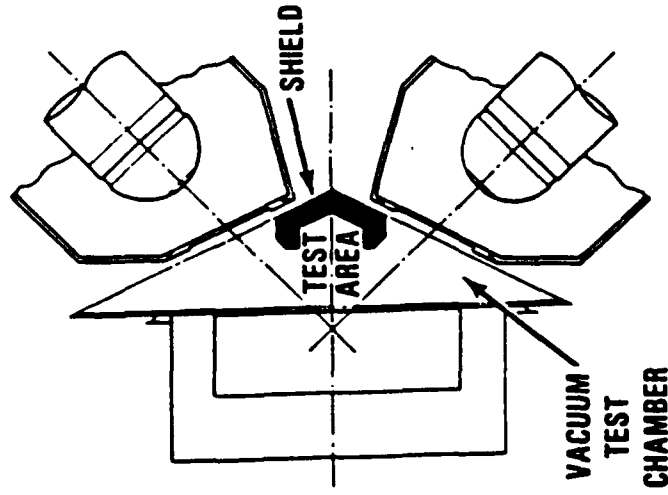


SOFTENED X-RAY CAPABILITY AT AURORA

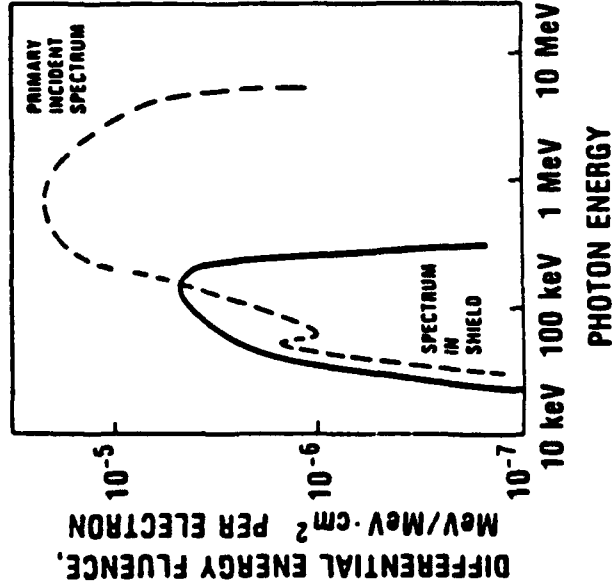


HARRY DIAMOND LABS

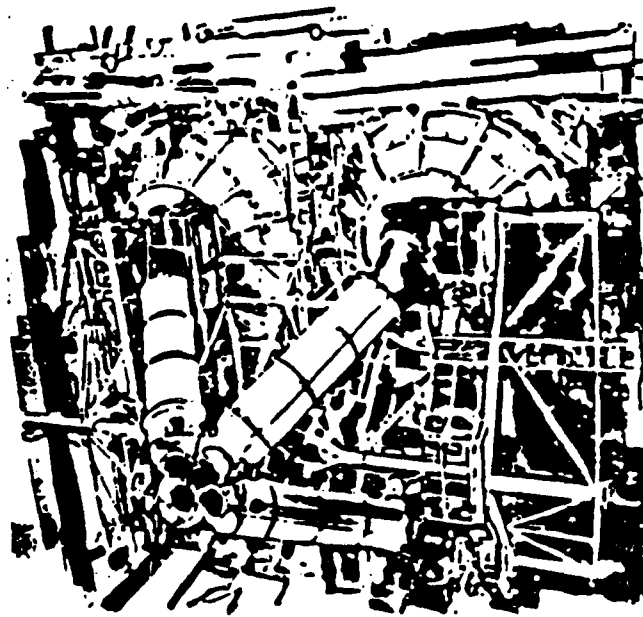
PRESENT CAPABILITY	"LARGE ANODE TIP MODIFICATIONS"
• 1600 EM² TEST AREA • 2.6 KRADS (Si) WITH 2:1 UNIFORMITY	• NEW ANODE TIPS TO GIVE 10,000 CM² TEST AREA • 2 KRADS (Si) WITH 2:1 UNIFORMITY



SPECTRUM COMPARABLE TO
1.5 MeV BREMSSTRAHLUNG



AURORA PULSE SHAPE ENHANCEMENT UPGRADES

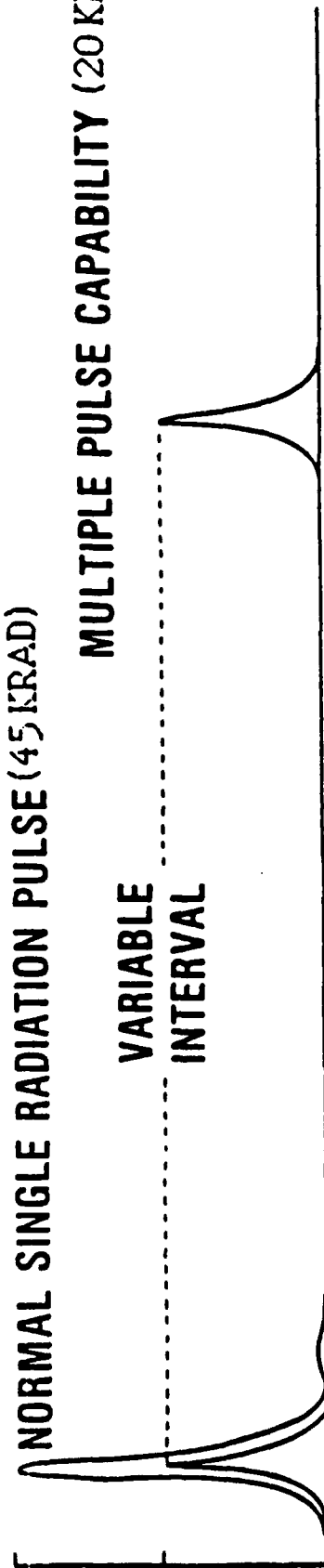


Aurora

NORMAL SINGLE RADIATION PULSE (45 KRAD)

MULTIPLE PULSE CAPABILITY (20 KRAD)*

VARIABLE
INTERVAL



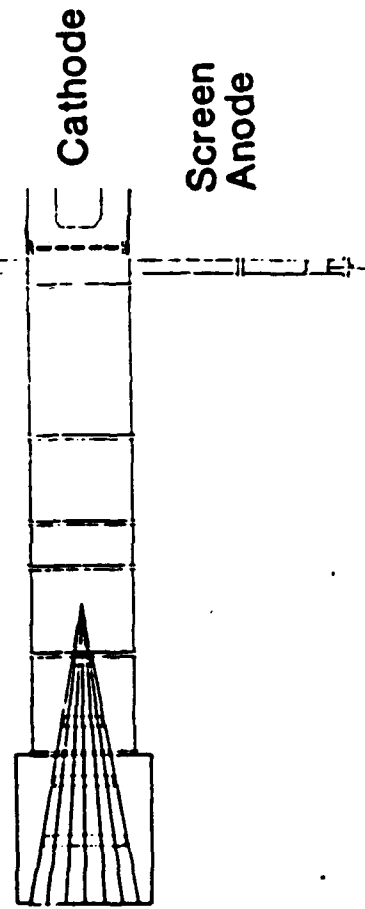
AURORA Reflex Diode Microwave Generation Experiment



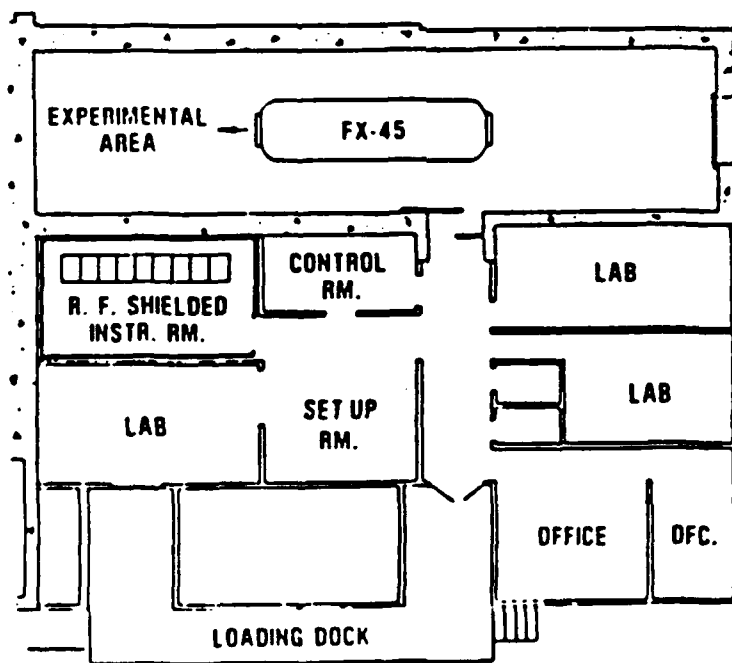
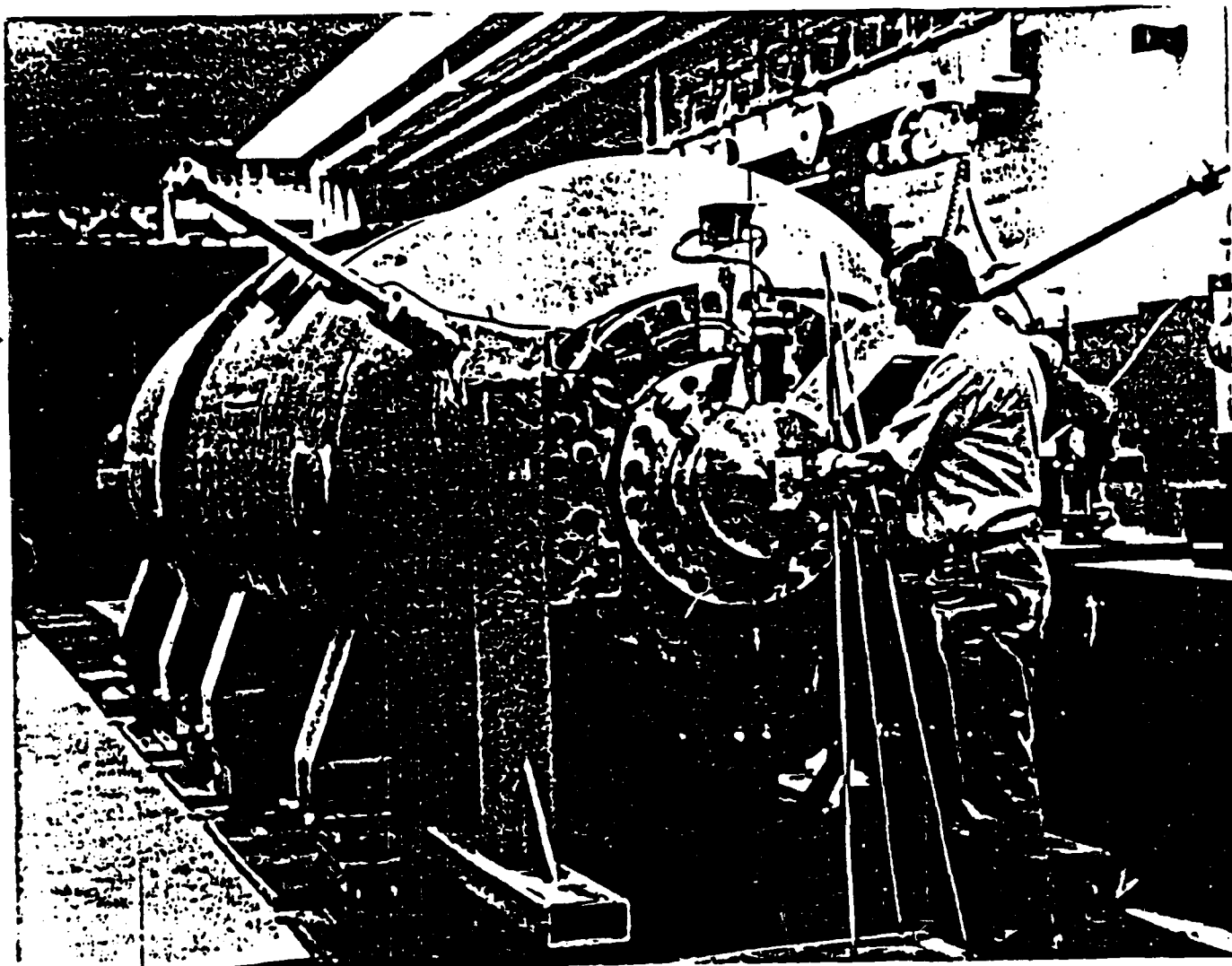
LANL Wire Calorimeter to
Measure Axial Microwave
Energy

SNLA Space Cloth Calorimeter
to Measure Radial Microwave
Energy

SNLA Directional Coupler to
Measure Radial Power
Waveform



Cross-Section View of Reflex Diode and Diagnostics

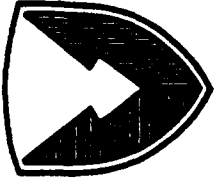


APPROXIMATE SCALE
0 5 10 15 20 FT.

HIFX FACILITY FLOOR PLAN

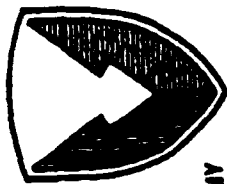


U. S. ARMY
LABORATORY COMMAND



Domestic Technology Transfer Opportunities

**Clifford E. Lanham
Army Domestic Technology
Transfer Program Manager**



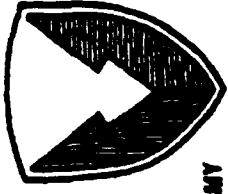
US ARMY
LABORATORY COMMAND

ARMY DOMESTIC TECHNOLOGY TRANSFER PROGRAM

USDP/PA&A, DOD-207LE-01



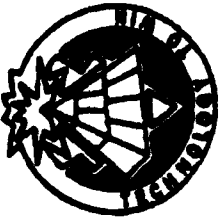
PROGRAM GOALS



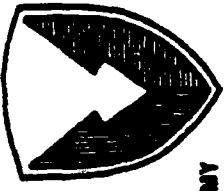
**US ARMY
LABORATORY COMMAND**

**THE DOMESTIC TECHNOLOGY TRANSFER PROGRAM IS INTENDED TO
MAXIMIZE THE BENEFIT FROM THE INVESTMENT IN ARMY R&D BY:**

- ACHIEVING MORE RAPID TECHNOLOGY SPINOFF FOR IMPROVED
PRODUCTS AND PROCESSES IN DOMESTIC INDUSTRY**
- PROVIDING TECHNICAL ASSISTANCE IN REGIONAL, STATE, AND
LOCAL ECONOMIC DEVELOPMENT**
- PROVIDING TECHNICAL ASSISTANCE TO STATE AND LOCAL
GOVERNMENTS FOR IMPROVED PRODUCTIVITY
(>\$100 BILLION SECTOR OF ECONOMY)**



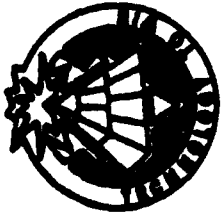
NATIONAL POLICY



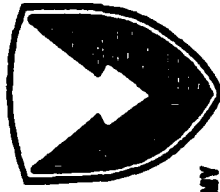
US ARMY
LABORATORY COMMAND

IMPROVING TECHNOLOGY TRANSFER FROM FEDERAL LABORATORIES IS CONSIDERED IMPORTANT IN ADDRESSING THE "COMPETITIVENESS ISSUE". AS A RESULT:

- **THERE WAS STRONG BI-PARTISAN SUPPORT FOR THE NEW LEGISLATION AND ITS AGGRESSIVE IMPLEMENTATION.**
- **RAPID IMPLEMENTATION WAS REQUIRED BY EXECUTIVE ORDER 12591 (10 APRIL 1987).**
- **THERE HAVE BEEN NUMEROUS CONGRESSIONAL HEARINGS AND A GAO FOLLOW-UP.**



THE STEVENSON - WYDLER TECHNOLOGY INNOVATION ACT OF 1980



**US ARMY
LABORATORY COMMAND**

PRINCIPAL PROVISIONS OF SEC. 11

- **STATED THAT THE FEDERAL GOVERNMENT WILL STRIVE TO TRANSFER ITS TECHNOLOGY**
- **REQUIRED EACH FEDERAL LABORATORY TO ESTABLISH AN OFFICE OF RESEARCH AND TECHNOLOGY APPLICATIONS (ORTA)**
- **RECOMMENDED STAFFING AND FUNDING LEVELS FOR ORTA'S**
- **DELINEATED FOUR FUNCTIONS FOR ORTA'S**
- **REQUIRED BIENNIAL REPORTING THROUGH THE CENTER FOR THE UTILIZATION OF FEDERAL TECHNOLOGY IN COMMERCE DEPT.**



FEDERAL TECHNOLOGY TRANSFER ACT OF 1986

**US ARMY
LABORATORY COMMAND**

PRINCIPAL POINTS

- **AMENDS THE STEVENSON-WYDLER ACT OF 1980**
- **STRENGTHENS POLICY WHICH MAKES TECHNOLOGY TRANSFER PART OF THE LAB MISSION**
- **REQUIRES THAT LABS WITH MORE THAN 200 S&E PERSONNEL HAVE A FULL TIME ORTA**
- **DEFINES ARMY, NAVY, AND AIR FORCE AS AGENCIES**
- **REQUIRES EACH AGENCY TO REPORT ANNUALLY WITH BUDGET SUB-MISSION TO OMB**
- **EXPANDS NUMBER OF ORTA FUNCTIONS TO FIVE**
- **CHARTERS THE FEDERAL LABORATORY CONSORTIUM**
- **PROVIDES AUTHORITY FOR GOVERNMENT LABS TO ENTER INTO COOPERATIVE R&D AGREEMENTS**
- **PROVIDES 15% OF ROYALTIES TO INVENTORS AND THE MAJORITY OF THE BALANCE TO LABS**



- REFERRAL TO OTHER FEDERAL LABS

- NON-EXCLUSIVE

1/5/90

ARMY DOMESTIC TECHNOLOGY TRANSFER

Clifford E. Lanham
Army Domestic Technology Transfer
Program Manager
U.S. Army Laboratory Command
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ARMY ORTA POCs

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AV N/A
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- Fire Support Armaments Center
- Armament Engineering Directorate

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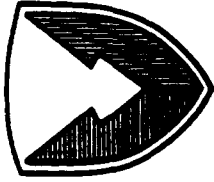
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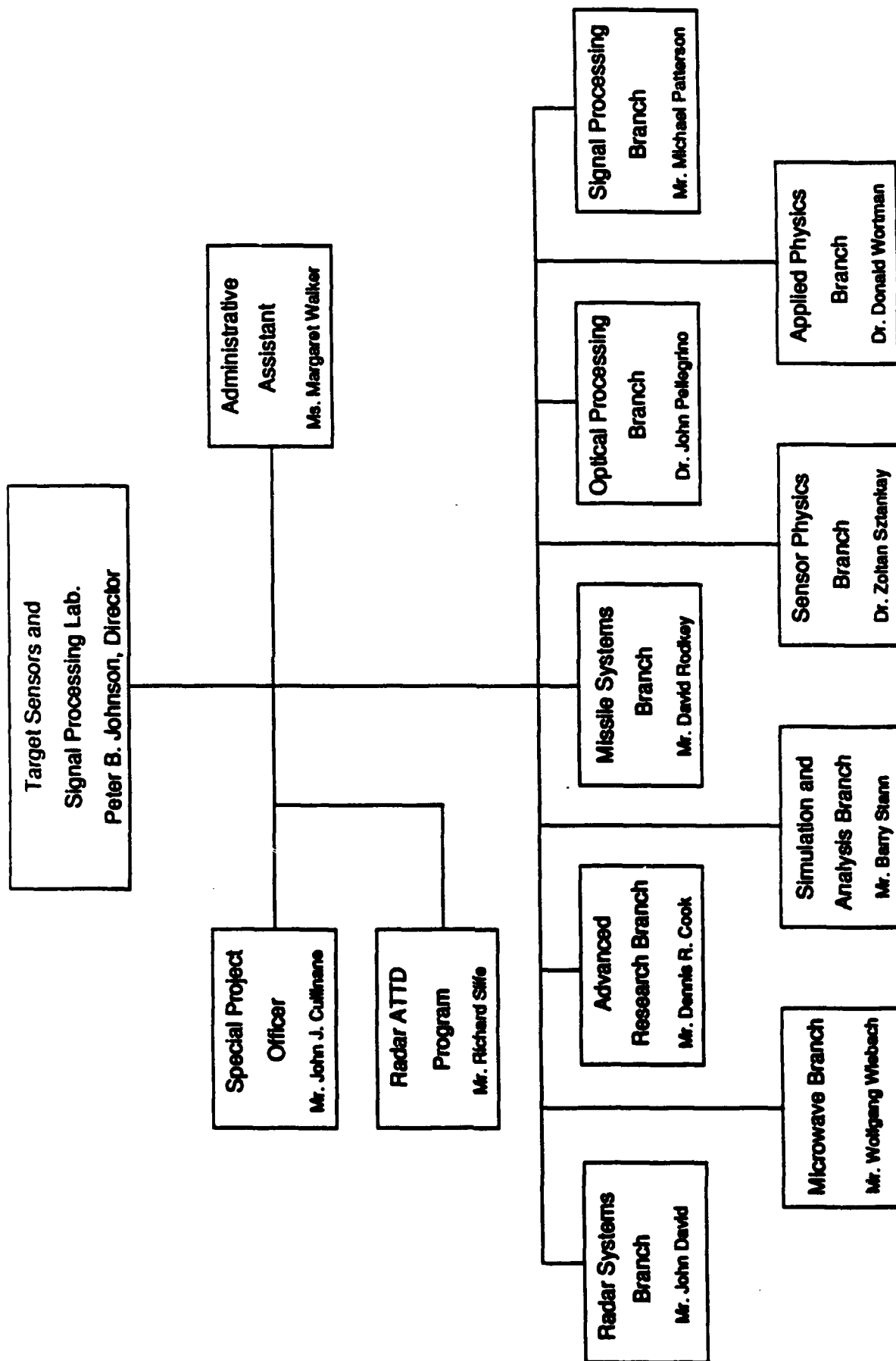
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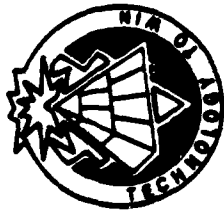


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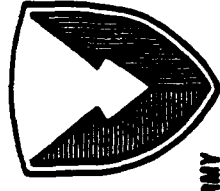
Session III Target Sensors and Signal Processing

**Session Chairman:
Peter B. Johnson
Director, Target Sensors and
Signal Processign Laboratory**





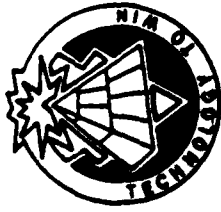
SENSOR TECHNOLOGY DESCRIPTION



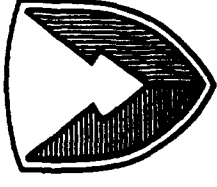
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PERFORM RESEARCH IN SENSOR TECHNOLOGY, BACKSCATTER
MODELING AND SYSTEM DESIGN. INTEGRATE SENSOR RESEARCH
WITH ADVANCED DIGITAL AND OPTICAL PROCESSING TECHNOLOGY
INTO SMALL, LIGHT WEIGHT, LOW COST, SURVIVABLE SENSORS
TO SUPPORT ARMY TACTICAL REQUIREMENTS FOR:

- .. SURVEILLANCE RADARS
- .. FUZE SENSORS
- .. ANTI-RADIATION MISSILE COUNTER MEASURE TECHNOLOGY



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Signal Processing Technology

Dr. John M. Pellegrino
Chief, Optical Processing
Technology Branch
Target Sensors and
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TITLE: OPTICAL SIGNAL PROCESSING

TECHBASE INVESTMENT STRATEGY AREA: EMERGING TECHNOLOGIES -
ADVANCED SIGNAL PROCESSING AND COMPUTING

Optical processing modules, combined with digital processing hardware, provide advanced, high-throughput processing capability for real-time applications. Such signal processing systems are for ground and air based missions involving radar processing, communications intercept, and target recognition.

DESCRIPTION

Develop optical processing modules with low weight, power consumption, and volume, possessing high throughput/high processing gain characteristics for real-time signal processing applications. Combined in hybrid testbed systems with digital and rf analog processing capabilities; demonstrations will encompass processing of wideband, complex radar and communications signals, and offer extensive processing capacity for image processing/target recognition problems.

OBJECTIVE/APPROACH

The objective is to provide the battlefield commander with real time analysis and interception of the prevailing signal environment. Key optical devices, algorithms, and architectures, along with new electro-optic implementations are examined to enhance current signal processing capabilities.

Tech barriers are:

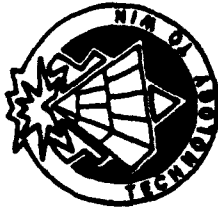
- Materials and Devices: Larger time apertures, greater efficiency
- Detector Arrays: Increased dynamic range in two dimensions
- Diode Lasers: Visible, high power, narrower linewidth
- Spatial Light Modulators: Higher resolution
- Sophisticated Algorithms and Architectures for Exotic Signal Types: Exploit parallel/multi-dimensional architectures for greater processing power
- Rugged, Compact Modular Units: More universal environmentally rugged designs
- System Interfaces: Greater compactness, increased processing power
- Advanced GaAs Optoelectronic Structure for Neural Networks

REMARKS

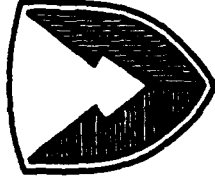
In direct support of:

- Integrated Intercept System
- Integrated Jammers
- Integrated Sensors
- Distributed IEW Fusion
- Intelligence and Electronic Warfare Vehicle

Technical POC: Mr. John Pellegrino
Telephone: (202) 394-2520



ARMY SIGNAL PROCESSING REQUIREMENTS



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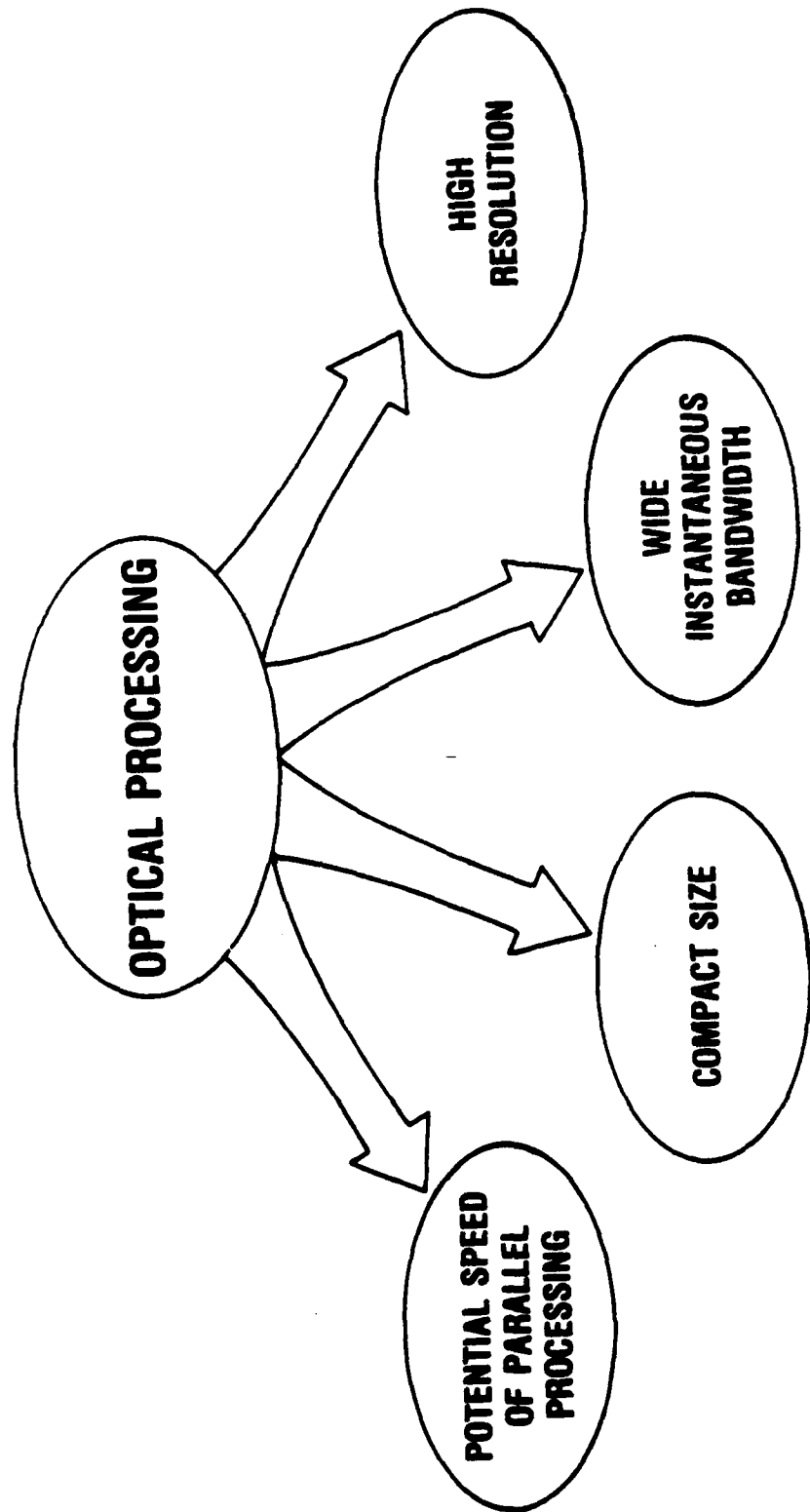
For the 1990's and beyond, signal processing systems designed for the Army's tactical applications must be able to handle large numbers of signals with exotic modulation types. This involves:

- Wide Bandwidth
- Fine Resolution
- Large Dynamic Range
- High Throughput
- Ultra Fast Update Capability
- Sophisticated Algorithms and Signal Recognition Capability
- Advanced Hardware for System Interfacing

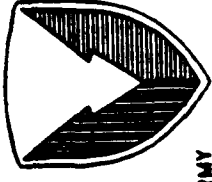
Processors must also be capable of operating over a wide range of environmental conditions, size, weight, and power requirements appropriate for shelter-based and UAV-based implementation. Optical processors have demonstrated present and potential capability to address these issues.

OPTICAL SIGNAL PROCESSING

**TASK: FAST, ACCURATE DETECTION AND PROCESSING OF WIDE
BANDWIDTH SIGNALS WITH COMPACT HARDWARE**

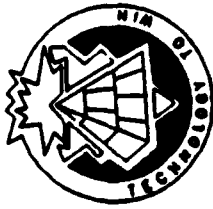


OPTICAL SIGNAL PROCESSING PROGRAM APPROACH

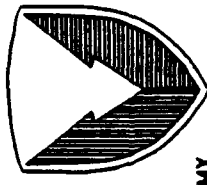


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- ** Support component development for
Bragg cells, SLM's, laser diodes,
photodetector arrays (one and two
dimensional), and development of
optically sensitive materials**
- ** Support development of optical
algorithms and architectures for
rugged, compact modular building
block processors and system
interfaces**



TECHNOLOGICAL BARRIERS COMPONENTS



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**KEY COMPONENT AREAS WHICH NEED DEVELOPMENT IN ORDER TO ENHANCE
PROCESSOR SPECIFICATIONS AND SO MEET PROCESSING REQUIREMENTS:**

MATERIALS:

III-V OPTOELECTRONICS

ACOUSTO-OPTIC, MAGNETO-OPTIC, ELECTRO-OPTIC,...

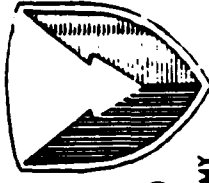
DEVICES:

HIGH POWER (>100mW) RED, SINGLE MODE LASER DIODES

HIGH RESOLUTION MODULATORS, ONE- AND TWO-DIMENSIONAL

HIGH DYNAMIC RANGE(>70dB), HIGH FRAME RATE(>100Hz) OPTICAL DETECTORS

TECHNOLOGICAL BARRIERS ALGORITHMS AND ARCHITECTURES



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Key areas for optical processor development to enhance processing capabilities and so meet Army processing system requirements :

SOPHISTICATED ALGORITHMS AND ARCHITECTURES FOR EXOTIC SIGNAL TYPES

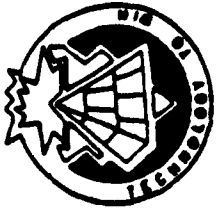
Currently high success with one-dimensional (and some 2-D) architectures; need to develop these further and exploit parallel/multi-dimensional nature of optics for greater processing power.

RUGGED, COMPACT MODULAR UNITS

Take application specific units and generalize to make more universal designs. Advanced architectures must also be environmentally rugged.

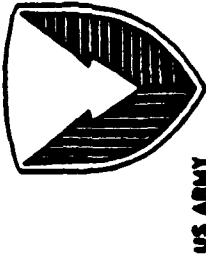
SYSTEM INTERFACES

Current electronic interfaces large; both digital and analog interfaces can be made much more compact and with greater processing power.



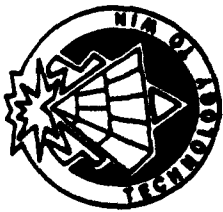
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SIGNAL PROCESSING TECHNOLOGY VISION

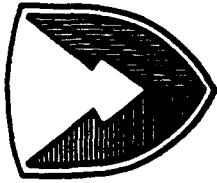


LONG TERM PROSPECTS:

- Inherently parallel, high throughput, high bandwidth, small processing structures for a wide variety of applications
 - hybrid bulk/ integrated optics structures for multidimensional processing capabilities
 - optoelectronic integrated circuits (OEIC) for wideband processing
- III-V optoelectronics for neural networks
- Complementary use of optical/digital technology in systems



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**U. S. ARMY
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Fuzing Technology

Dr. Z. G. Sztankay
Chief, Sensor Physics Branch
Target Sensors and
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TITLE: FUZING TECHNOLOGY

TECH BASE INVESTMENT STRATEGY AREA

Emerging Technologies -- Protection/Lethality

Next Generation/Future Systems -- Deep-Fire Smart Munition
 Median Surface-to-Air Missile
 The Army Counter-Air Weapon System
 Future Smart Munition
 Long-Range Artillery Missile
 Patriot 2000
 LOS-F-H Block II
 Multi-Mode Anti-Armor Weapon System

DESCRIPTION

This topic covers applied research and exploratory development on proximity fuze sensors for air defense and anti-armor applications. Because the bulk of the effort is focused on guidance-integrated fuzing, the terminal phase of missile guidance, including aim-point wander, is also a program focus. Technologies being investigated for air-target fuzing include rf, electro-optical, electrostatic, and millimeter wave guidance-integrated. The anti-armor program is focused on millimeter-wave guidance-integrated fuzing. Special problem areas are fuzing in a high clutter environment, countermeasures, and low-observable targets. Strong emphasis is placed on obtaining basic data on targets, clutter, and countermeasures, and on using the data to develop and validate computer models for encounter simulations used to develop and evaluate fuzing and terminal homing designs and algorithms.

OBJECTIVE/APPROACH

The objective is to meet new proximity fuzing requirements and reduce the cost of future proximity fuzes.

The approach and technology barriers are:

- Clutter-Resistant Air-Target Fuzing: The current primary goal of this program is to provide proximity sensing against air targets near the tree line with prefunctioning on clutter. Measurements have been and are being made of foliage and target returns with rf, electro-optical, and electrostatic sensors, and fuzing concepts are being evolved and tested. The threat of countermeasures, such as chaff and ECM for rf sensors and smoke for electro-optical sensors, must continue to be overcome. Fuzing against low-observable targets will be a strong consideration in the future. Applications include FAADS-LOS-F-H, MSAM, TACAWS, Stinger Follow-On.

- Guidance-Integrated Air-Target Fuzing: The goal of this program is to eliminate the need for a separate proximity fuze by obtaining the fuzing information from the guidance sensor. The current effort is concentrated on the 35-GHz active seeker program for Patriot. An instrumentation radar system is being developed for use in obtaining basic data during end-game encounter simulations against suitable targets. The data will yield target signatures and seeker aim points, and will be used to develop encounter models, which in turn will be used to conceive and evaluate seeker wave forms and algorithms that will yield minimum aim-point wander and optimum fuzing. ECM and chaff resistance and low-observable targets are also prime concerns. Future systems applications include MSAM.
- Guidance-Integrated Anti-Armor Fuzing: This program is currently investigating the feasibility of using seeker information to provide standoff fuzing for advanced shaped-charge warheads on 95-GHz anti-armor smart weapons. Fully-polarimetric ISAR images and dual-plane monopulse seeker signals are being obtained and analyzed to predict and optimize seeker aim-points and to explore and develop fuzing concepts. Computer target models are being developed and will be used in end-game encounter simulations, and breadboard guidance-integrated standoff fuzing sensors will be developed and tested. Technology barriers include aim-point wander, different seeker and fuzing time constants, clutter, and countermeasures, especially target cross-section reduction. Potential applications are millimeter wave smart weapon seekers like MLRS-TGSM and APM.

REMARKS

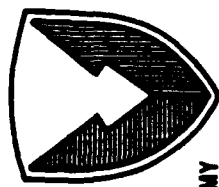
These programs are carried out in close cooperation with, and in some cases in direct support of, MICOM and ARDEC. Development and higher level funding originates with these and other non-LABCOM agencies.

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- Guidance-Integrated Anti-Armor Fuzing:
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OUTLINE



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- Clutter-Resistant Air-Target Fuzing

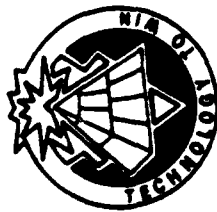
RF

Electro-Optical

Electrostatic

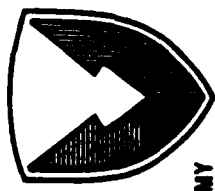
- Guidance-Integrated Air-Target Fuzing

- Guidance-Integrated Anti-Armor Fuzing



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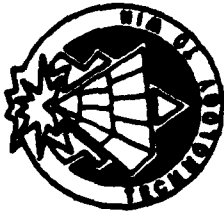
OBJECTIVE



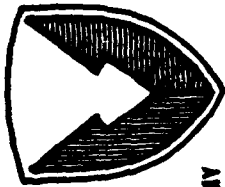
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Address enhanced requirements for and reduce the cost of electronic fuzing sensors for air and ground targets. Required performance improvements are:

- Optimize burst point control
- Increase resistance to countermeasures
- Detect targets in clutter
- Detect low observable targets
- Increase reliability

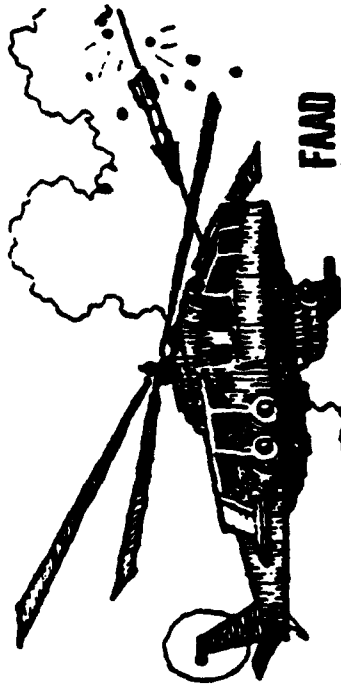


CLUTTER-RESISTANT AIR-TARGET FUZING



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MAINTAIN LETHALITY OF AIR DEFENSE MISSILES AND
PROJECTILES AGAINST MASKED TARGETS AND AVOID PREFIRE

TECHNICAL

CRITICAL TECHNOLOGY:

• TARGET/CLUTTER SIGNATURES • SIGNAL PROCESSING
ALGORITHMS • ENCOUNTER SIMULATION • VHSIC/MIMIC

RISKS/PROBLEMS:

• LOW OBSERVABLES (L.O.) • PREFIRE ON CLUTTER • BURST
POINT CONTROL • ECM • CHAFF • OBSCURANTS

RELATED PROGRAMS:

FAADS-LOS-F-H, MSAM, STINGER FOLLOW-ON, TACAWS
TMAS, 30-MM AIR-TO-AIR CARTRIDGE

PERFORMING ORGANIZATIONS:

CONTRACTOR:

IN-HOUSE: NDL

FUNDING (\$M)

PROGRAM MILESTONE SCHEDULE

MILESTONES FY89 FY90 FY91 FY92 FY93 FY94

TGT. SIG. COLLECTION _____

CLUTTER SIG. COLLECTION _____

SIGNATURE ANALYSIS _____

ALGORITHM DEVELOPMENT _____

ENCTR. SIM. FOR L.O. TGT _____

APPROPRIATION

FY89 FY90 FY91 FY92 FY93 FY94

RTDE FUNDED

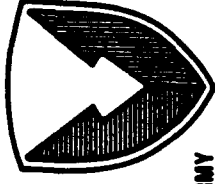
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CLUTTER-RESISTANT AIR-TARGET FUZING



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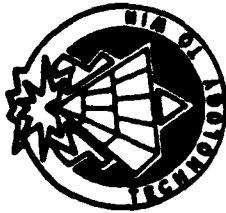
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Barriers:

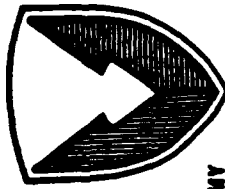
- Targets in Clutter
- Countermeasures
- Chaff, ECM, Smoke
- Low-Observable Targets

Approach:

- Various Sensor Technologies
- Obtain Basic Data
- Clutter, Targets, Countermeasures
- Develop Computer Models for Encounter Analysis
- Conceive and Analyze Concepts
- Build and Test Breadboards



GUIDANCE-INTEGRATED AIR-TARGET FUZING



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HARRY DIAMOND LABORATORIES

HIMADS



IMPROVE LETHALITY AND REDUCE COST
OF AIR DEFENSE MISSILES

ATM



TECHNICAL

CRITICAL TECHNOLOGY:

- SEEKER SENSORS • SIGNAL PROCESSING ALGORITHMS
- AIMABLE WARHEADS • VHSIC/MIMIC • LOW OBSERVABLES

RISKS/PROBLEMS:

- SENSOR SELECTION • DISCRIMINATE TARGET FROM CLUTTER • ECM RESISTANCE • ORGANIZATIONAL SEPARATION

RELATED PROGRAMS:

PATRIOT, HAWK/MSAM

PERFORMING ORGANIZATIONS:

CONTRACTOR: HAC, RAYTHEON

IN-HOUSE: HDL, MICOM

PROGRAM MILESTONE SCHEDULE

MILESTONES

BASELINE STUDY

INSTRUMENTATION DEV

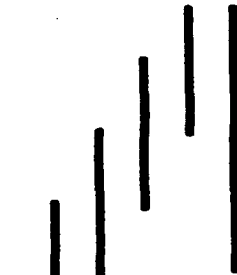
TARGET SIGNATURES

TARGET MODELING

END GAM

ALGORITHM DEV

FY88 FY89 FY90 FY91 FY92 FY93 FY94



APPROPRIATION

**RTDE FUNDED
UNFUNDED**

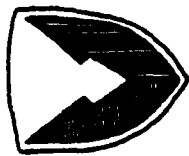
FUNDING (\$M)

FY88 FY89 FY90 FY91 FY92 FY93 FY94

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1.7 0.3 0.3 0.3 0.2 0.3

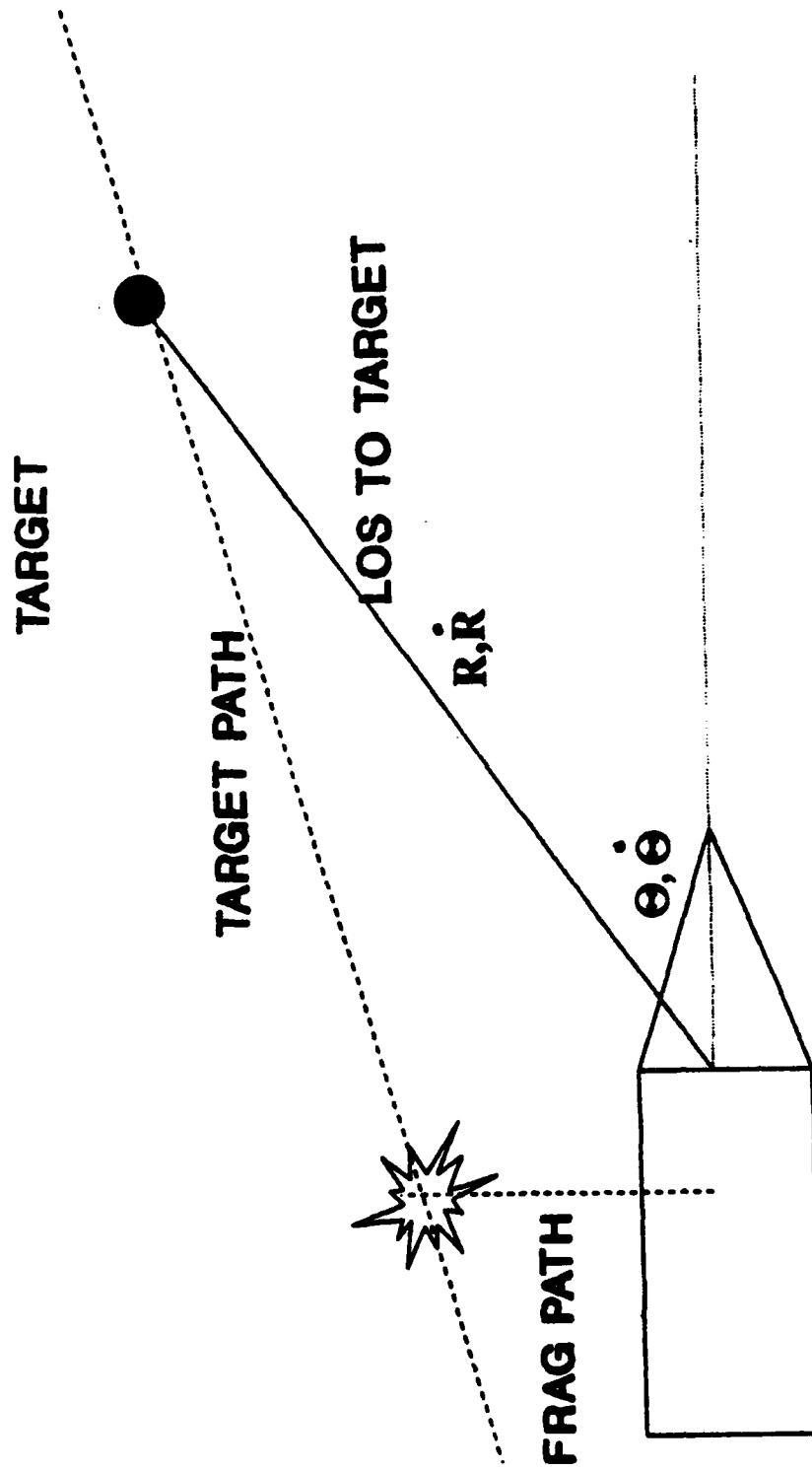


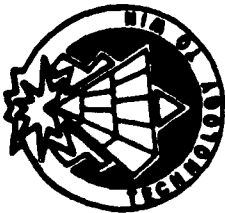
AIR TARGET GIF BASIC CONCEPT



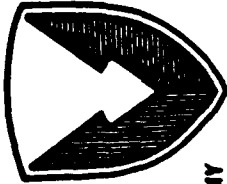
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GUIDANCE-INTEGRATED ANTI-ARMOR FUZING



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LETHALITY REQUIRES MAXIMIZING WARHEAD, REDUCING FUZE
SPACE & WEIGHT ALLOCATIONS, OPTIMIZING AIMPOINT

TECHNICAL

CRITICAL TECHNOLOGY:

- TARGET/CLUTTER SIGNATURES • ENCOUNTER SIMULATION
- SIGNAL PROCESSING ALGORITHMS • AIM POINT ALGORITHMS
- VHSC/MMMC

RISKS/PROBLEMS:

- SENSOR SELECTION • DISCRIMINATE TARGET IN CLUTTER
- ECM RESISTANCE • ORGANIZATIONAL SEPARATION

RELATED PROGRAMS:

MLRS-TGW, NATO 155/COPPERHEAD III

PERFORMING ORGANIZATIONS:

CONTRACTOR

IN-HOUSE: HDL

PROGRAM MILESTONE SCHEDULE

MILESTONES

FY80 FY81 FY82 FY83 FY84

INSTRUMENTATION DEV

SIGNATURE COLLECTION

MODELING/SIMULATION

SEEKER/FUZE BREADBOARD

FLIGHT TEST ANALYZE

FUNDING (\$M)

APPROPRIATION

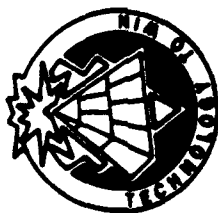
FY80 FY81 FY82 FY83 FY84

ROTE FUNDED

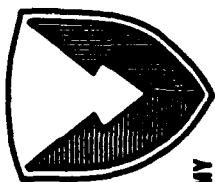
0.5 0.5 1.3 1.2 1.7 0.9

UNFUNDED

0.5 0.5 0.6 0.3 0.2

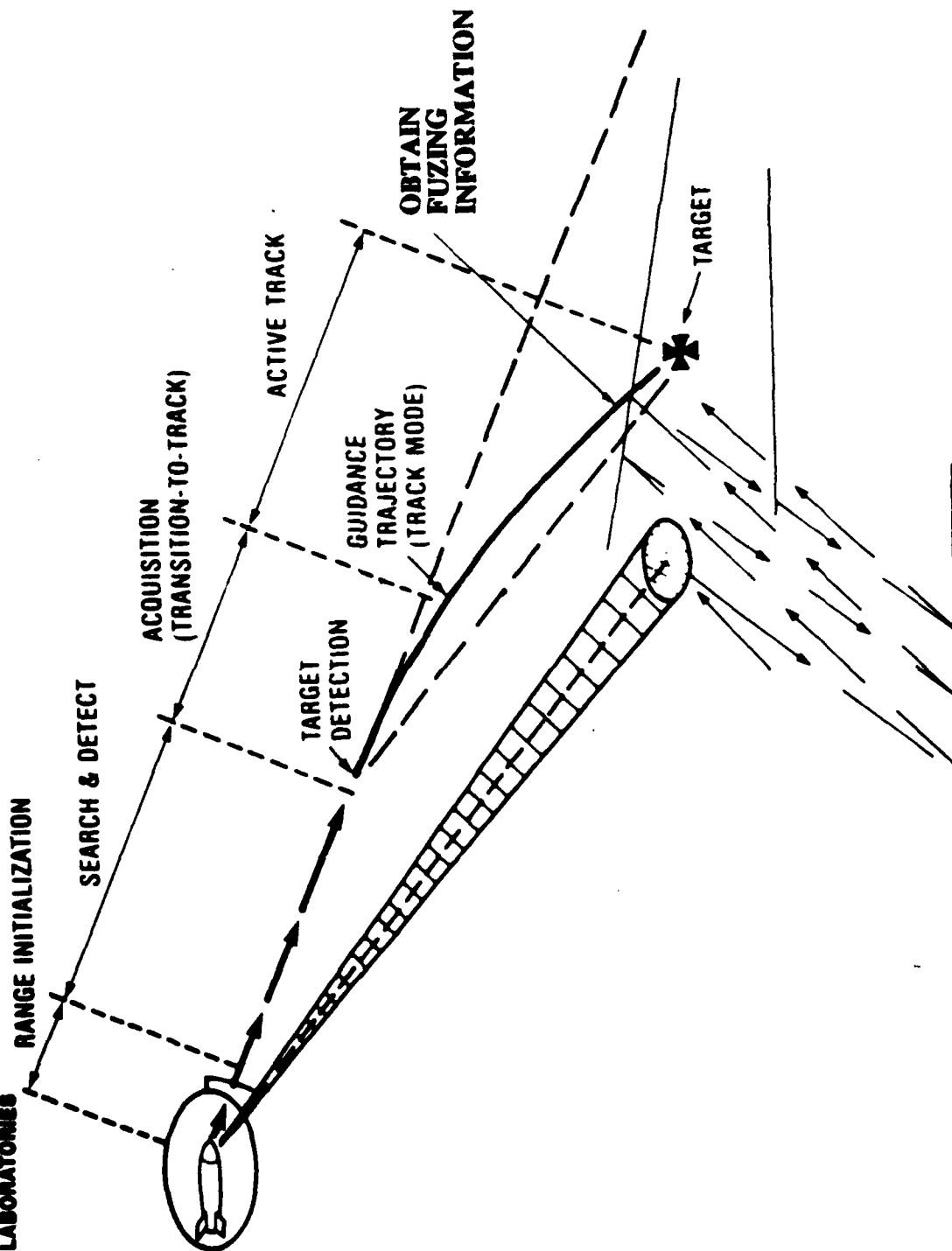


MMW ANTI-ARMOR SEEKER SCENARIO



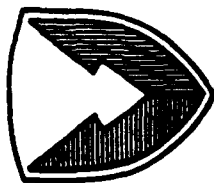
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**U. S. ARMY
LABORATORY COMMAND**

Radar Technology

**John M. David
Chief, Radar Branch
Target Sensors and
Signal Processing Laboratory**

TITLE: RSTA Radar Technology

TECHBASE INVESTMENT STRATEGY AREA: Next Generation/Future Systems

DESCRIPTION:

Radar technology that:

- a. improves all weather detection, location, classification and identification of targets employing camouflage, concealment and deception;**
- b. enhances platform survivability and reduces sensor susceptibility; and**
- c. reduces system cost, weight, prime power or enhances reliability and maintainability.**

OBJECTIVE/APPROACH:

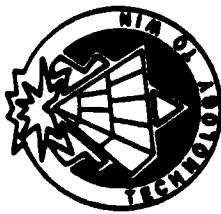
To provide radar technology that meets the requirements of Next Generation/Future Systems. A phased approach will be used where Phase I is primarily analysis leading to concept definition. Phase II involves implementation and evaluation of concept testbeds, and Phase III will transition the technology to Army Research Development and Engineering Centers.

TECHNICAL BARRIERS:

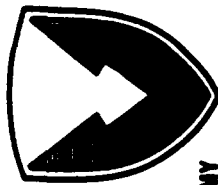
New concepts and components are required that provide a significant enhancement in radar technology to meet the requirements of the Next Generation/Future Systems.

**TECHNICAL POCs: John David or Barry Schiener
Harry Diamond Laboratories
ATTN: SLCHD-ST-R
2800 Powder Mill Road
Adelphi, MD 20783-1197**

Telephone: (301) 394-2530



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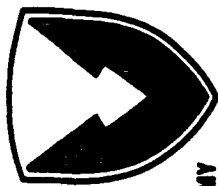
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HDL RSIA RADAR CHARTER.

- PURSUE RADAR TECHNOLOGY NEEDED FOR THE ARMY'S NEXT GENERATION/FUTURE SYSTEMS.
- TRANSITION THE TECHNOLOGY TO THE ARMY'S RD&CS.



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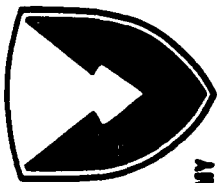
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TECHNOLOGY GOALS.

- RADAR TECHNOLOGY THAT IMPROVES ALL WEATHER DETECTION, LOCATION, CLASSIFICATION, AND IDENTIFICATION OF TARGETS EMPLOYING CAMOUFLAGE, CONCEALMENT, AND DECEPTION.
- RADAR TECHNOLOGY THAT ENHANCES PLATFORM SURVIVABILITY AND REDUCES SENSOR SUSCEPTIBILITY.
- RADAR TECHNOLOGY THAT REDUCES SYSTEM COST, WEIGHT, AND PRIME POWER OR ENHANCES RELIABILITY AND MAINTAINABILITY.



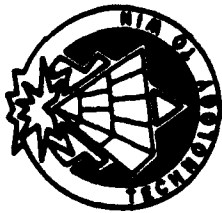
HARRY DIAMOND LABORATORIES



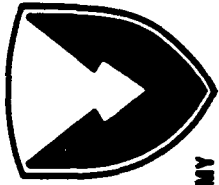
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CURRENT INTEREST.

- RSTA OF PERSONNEL, GROUND VEHICLES AND LOW AND SLOW A/C.
- ENHANCED PLATFORM SURVIVABILITY AND REDUCED SENSOR SUSCEPTIBILITY.
- BURIED MINE DETECTION.



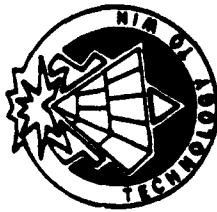
HARRY DIAMOND LABORATORIES



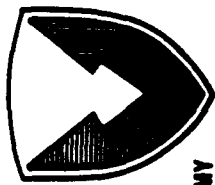
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ACTIVE PROGRAMS.

- EVALUATION OF STATIONARY RADARS FOR SURVEILLANCE AND TARGET ACQUISITION OF MOVING PERSONNEL, GROUND VEHICLES, AND HELICOPTERS.
- EVALUATION OF MOVING RADARS FOR SURVEILLANCE AND TARGET ACQUISITION OF MOVING GROUND VEHICLES AND HELICOPTERS.
- DETECTION OF STATIONARY TARGETS CONCEALED IN FOLIAGE.
- EVALUATION OF SEVERAL MULTISTAGE PROCESSING AND CFAR CONCEPTS.
- ANALYSIS OF 3D SAR CONCEPT.
- ANALYSIS OF MULTISTATIC CONCEPTS.



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APPROACH.

- COMPONENTS. PURCHASE ONE OR TWO FOR EVALUATION AS A MODULE OR AS PART OF A SYSTEM.

- CONCEPTS.

- o DETAIL REVIEW BY HDL

- o PHASED PROGRAM

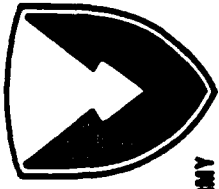
- oo PHASE I. COOPERATIVE PROGRAM WITH HDL WITH LIMITED FUNDING TO DEFINE CONCEPT.

- oo PHASE II. IMPLEMENTATION AND EVALUATION OF CONCEPT TESTBEDS.

- oo PHASE III. TRANSITION TO ARMY RD&ECS.



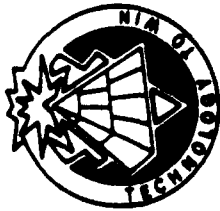
HARRY DIAMOND LABORATORIES



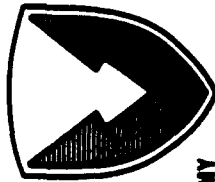
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SELECTION CRITERIA.

- APPLICABILITY TO TECHNOLOGY GOALS.
- APPLICABILITY TO CURRENT INTEREST.
- PAYOFF.
- PROBABILITY OF SUCCESS.



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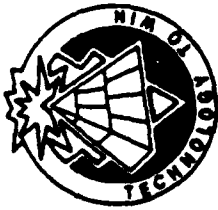


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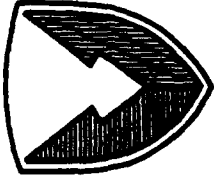
RADAR RSIA TECH BASE CONTRACT FUNDING.

FY90	91	92	93	94
0	250K	750K	1000K	1000K

- FY90 AND 91 FUNDING OUTLOOK IS NOT GOOD.
- IT WILL CHANGE.



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**U. S. ARMY
LABORATORY COMMAND**

Session IV Engineering and Technical Support

Session Chairman:

Ira R. Marcus

Director, Technical Support Laboratory

TITLE**TECHNICAL SUPPORT ACTIVITIES AT HDL**

The HDL performs a variety of inhouse technical activities to support its ongoing technical projects. The activities are in the general area of mechanical parts and electronics fabrication, environmental testing, field testing, S&E computer automation, product assurance, integrated logistical support, configuration management and special programs including manufacturing studies. Most fabrication programs are for prototype quantities and facilities are therefore configured for quick response and for flexibility.

To operate these facilities efficiently and smoothly it is necessary for HDL to procure supplies, equipment and materials for daily operation and to keep them modern through the procurement of modern equipment and software.

Points of contact for each area are as follows:

Mechanical Fabrication:	Harry Hill	301-394-3124
Electronic Fabrication:	Albert Lee	301-394-2820
Environmental Testing:	Ami Frydman	301-394-2804
Field Testing:	Ed Carney	301-394-2434
S&E Computer Automation:	Robert Rosen	301-394-2917
Product Assurance, ILS, Configuration Mgt:	John Maristch	301-394-2230

Specific capabilities of each of these support areas are as follows:

MECHANICAL FABRICATION

<u>General Fabrication</u>	<u>Special Fabrication</u>	<u>Specialty Areas</u>
Lathes	Optical Line Tracing	Wood/Plastic
Mills	Ultrasonic Machining	NC Programming
Drills	Electrical Discharge	Grinding
Grinders	Plastic Molding	Plating
Sheet Metal		Mech Inspection
Welding		Heat Treating
NC Machining *		Tool Crib
		Metal Stores

* Nine Numerical Control Machines (Three Mills. three Lathes. one EDM Machine, one Sheet Metal Punch and one Drill)

ELECTRONIC FABRICATION

<u>CAD</u>	<u>Printed Circuits</u>	<u>Hybrid/thick films</u>	<u>Assembly</u>
PC Design	Photographic	Design	General Fab
Manual	Step & Repeat	Fabrication	Wire Wrap
Automatic	Wet Chemistry	Packaging	Encapsulate
Mask Fab	Drill/Profile	Test	Inspection
Drill In	Multi-layer	Parylene Coat	Test
Drawings			
Wire Wrap			
Tape Preparation			
Reports			

ENVIRONMENTAL TEST AND SIMULATION

CLIMATIC TEST

Temperature
Humidity
Altitude
Salt Spray
Waterproofness

DYNAMIC TEST

LOW SHOCK

Jolt
Tumble
Free Fall
Complex Signal
Shock Spectrum

HIGH SHOCK*

Interior
Angular
Acceleration
Balloting
Transitional
Muzzle Exit
Exterior
Spin
Spin Decay
Drag
Terminal
Approach
Sensitivity
Impact
Delay after
impact
Graze impact

VIBRATION

Flight (Random)
Transportation/
Vibration
Sine, Random
3-D Vibration**

CENTRIFUGAL

* High Shock environments are simulated using a unique set of air guns built into our building, one gun is 300 feet long and has an eight inch bore.

** The 3-D vibration facility is a recent innovation.

DEMONSTRATION AND FIELD TESTING

The HDL Demonstration Support and Field Testing branch works at Army Proving Grounds located in the continental United States, Alaska, Panama, and overseas locations. Local testing is at the HDL Blossom Point Test area in southern Maryland. The Branch has facilities to support the following activities:

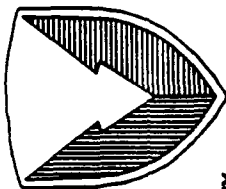
- Fuze Explosive Loading and Downloading
- Explosive Storage
- Fuze Explosive Laboratory Testing
- Range Firing
- Range Support
- Special Range Testing
- Data Acquisition
 - Electronic-Fleet of Data Acquisition Trucks
 - Photographic-High Speed video and Movies
- Data Reduction-Telemetry
- Helicopter Drop Tests

SCIENTIFIC AND ENGINEERING AUTOMATION SERVICES

The S & E Automation Services group provides technical computer services to all HDL scientists and engineers. This group maintains and operates a VAX 8800 computer which is available to the HDL staff via an in-house network. A current facilities project of this group is the design and procurement of an HDL-wide Local Area Network. Their most recent accomplishment has been the successful procurement of the LABCOM IBM mainframe. The primary mission of the this group is special computer programming assistance to S & E's. Equipment capability is focused on interactive computer graphics.

PRODUCT ASSURANCE, INTEGRATED LOGISTIC SUPPORT, AND CONFIGURATION MANAGEMENT

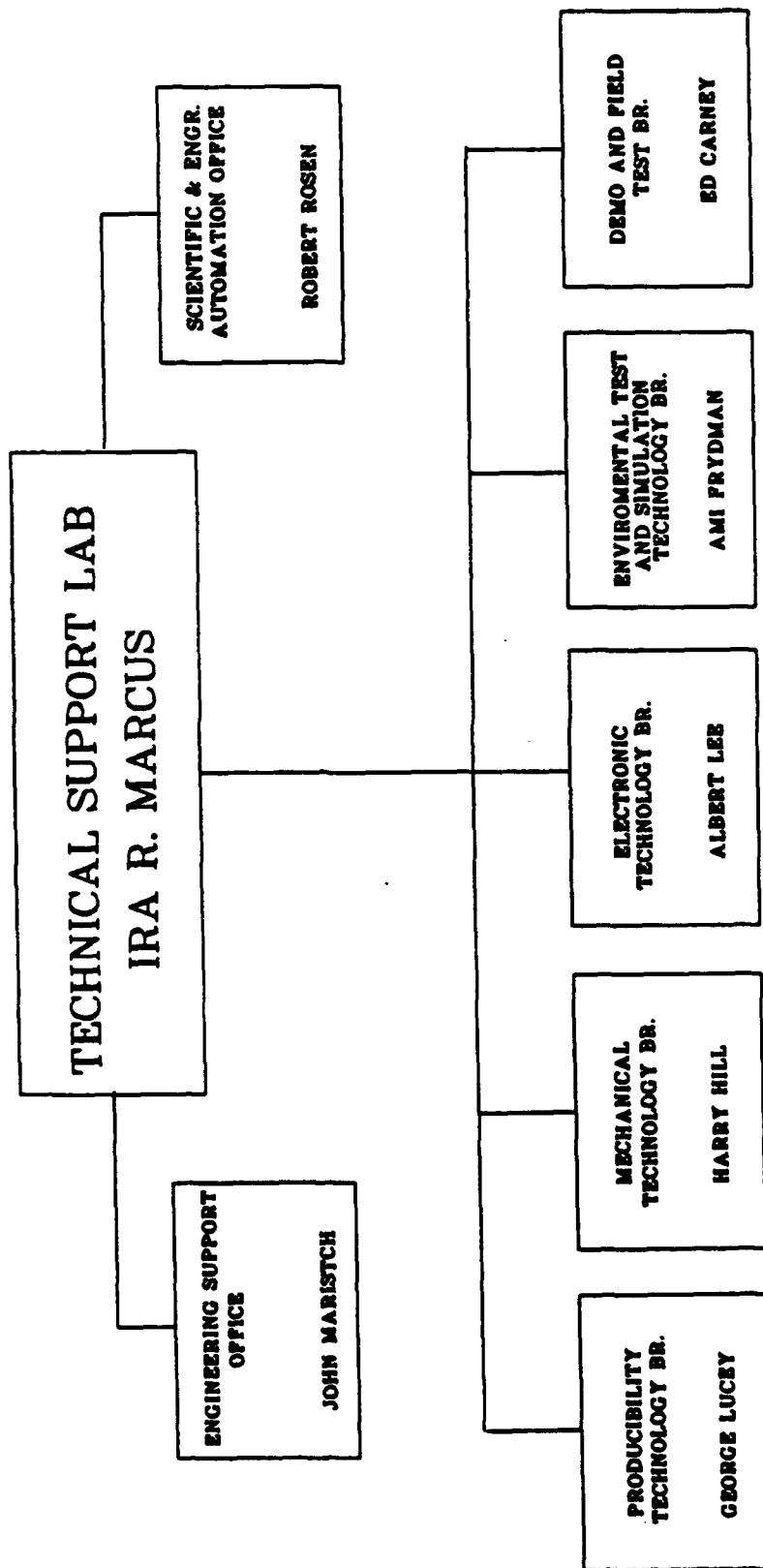
This office provides Product Assurance, ILS, and CM services to HDL development and production programs. Recent facilities improvements have been the acquisition of QA instrumentation to support the office. The primary facilities of this office is the data repository which house HDL's Technical Data Packages. Complete storage and reproduction equipment complements the management of the TDP's. Current activities are to transfer our 150,000 drawings to the Army's new DESREDS optical storage system.



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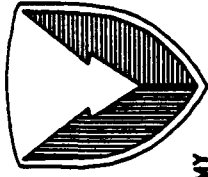
TECHNICAL SUPPORT LAB





MECHANICAL TECHNOLOGY BRANCH

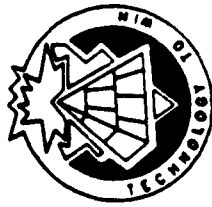
HARRY HILL, CHIEF



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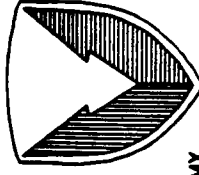
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GENERAL FABRICATION	SPECIAL FABRICATION	SPECIALTY AREAS
LATHES	N.C. MACHINING	PRECISION SHEET-METAL (METAL JOINING)
MILLS	ULTRASONIC MACHINING (HARD, BRITTLE)	NON METALLIC FABRICATION
DRILL PRESSES	ELECTRICAL DISCHARGE (SPARK EROSION)	PLASTIC MOLDING (AND DIE MAKING)
GRINDERS	OPTICAL LINE TRACER	GRINDING
		PLATING
		MECHANICAL INSPECTION
		METAL STORES
		TOOL CRIB
		HEAT TREATING



ELECTRONIC TECHNOLOGY BRANCH

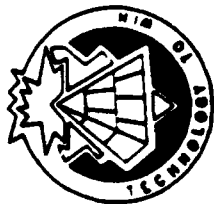
ALBERT LEE, CHIEF



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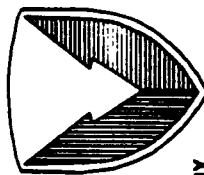
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COMPUTER AIDED DESIGN	PRINTED CIRCUIT FABRICATION	HYBRID-THICK FILM	ASSEMBLY
P.C. DESIGN	PHOTOGRAPHIC REDUCTION STEP AND REPEAT	DESIGN	CUSTOM FABRICATION
MANUAL LAYOUT		FABRICATION	WIRE WRAPPING
AUTOMATIC LAYOUT	WET CHEMISTRY - ETCHING - PLATING	PACKAGING	ENCAPSULATION
MASK GENERATION	BOARD DRILLING & PROFILING	PARYLENE COATING	PARTS HI-G QUAL.
DRILL TAPE PREPARATION	MULTILAYER BOARDS		INCOMING INSPECTION
DRAWINGS			BOARD TESTING
WIRE WRAP			WAVE SOLDERING
CONTROL TAPE PREPARATION			
REPORTS			



ENVIRONMENTAL TEST AND SIMULATION TECHNOLOGY BRANCH

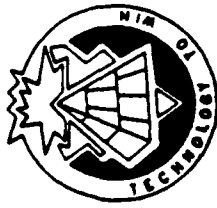
AMI FRYDMAN, CHIEF



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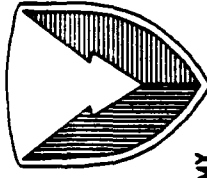
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<u>CLIMATIC</u>	<u>DYNAMIC</u>	
TEMPERATURE	<u>LOW SHOCK</u>	<u>HIGH SHOCK</u>
HUMIDITY	JOLT	INTERIOR
ALTITUDE	TUMBLE	ANGULAR
SALT SPRAY	FREE FALL	ACCELERATION
WATERPROOFNESS	COMPLEX SIGNAL	BALLOTTING
CAN ARRANGE FOR	SHOCK SPECTRUM	TRANSITIONAL
		MUZZLE EXIT
DESERT (DUST)	VIBRATION	EXTERIOR
FUNGUS	FLIGHT (RANDOM)	SPIN
VACUUM-STEAM-PRESSURE	TRANSPORTATION/ VIBRATION	SPIN DECAY
	SINE, RANDOM	DRAG
	3-D VIBRATION	TERMINAL
	CENTRIFUGAL	APPROACH SENSITIVITY
	PUSH/PULL/BEND -	MEASUREMENTS
	<u>MATERIALS</u>	IMPACT
		DELAY AFTER IMPACT
		GRAZING IMPACT



DEMO AND FIELD TEST BRANCH

ED CARNEY, CHIEF



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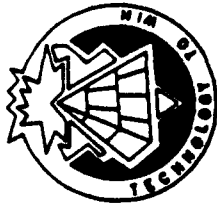
HARRY DIAMOND LABORATORIES

Data Acquisition

Electronic - Fleet of Trucks
Photographic - High Speed Video and Movies

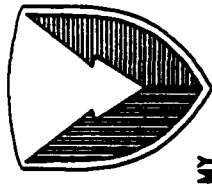
Data Reduction

Range Firing - Blossom Point
Range Support - Yuma Rep.
Special Setups - Blossom Point
Explosive Loading and Downloading
Explosive Storage
Explosive Testing
Helicopter Tests



S&E AUTOMATION OFFICE

ROBERT ROSEN, CHIEF



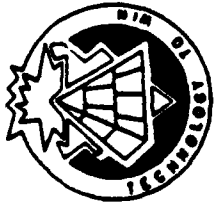
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VAX 8800 Computer Services for S&E's

Special Programming Assistance

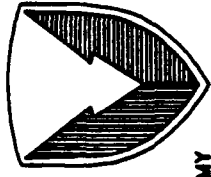
HDL Local Area Network - Procurement



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ENGINEERING SUPPORT OFFICE

JOHN MARISTCH, CHIEF

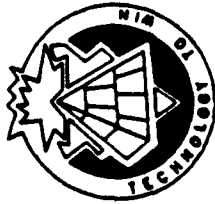


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Product Assurance

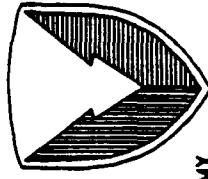
Integrated Logistical Support

Configuration Management Drawing Vault



PRODUCIBILITY TECHNOLOGY BRANCH

GEORGE LUCEY, CHIEF



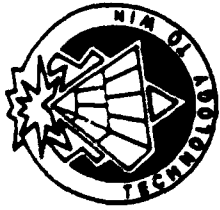
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MAJOR PROGRAMS

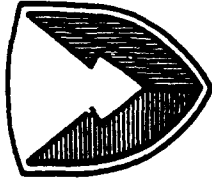
TRAFFIC JAM

MMT - Soldering

Support to DCS for Production, AMC



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U. S. ARMY
LABORATORY COMMAND

Automated Assembly of Electronics Circuits

George K. Lucey
Chief, Systems Engineering Branch
Technical Support Laboratory

TITLE: AUTOMATED ASSEMBLY OF ELECTRONIC CIRCUITS

TECHBASE INVESTMENT STRATEGY AREA

The Harry Diamond Laboratories is the LABCOM activity responsible for the U.S. Army Manufacturing Methods and Technology (MMT) Soldering Technology Program. MMT supports the LABCOM Producibility Mission, but is separate and distinct from the Tech Base. One HDL intent is to integrate areas of common interest, such as:

Systemic Issues:	Manufacturing Science	(I005)
Supporting Capabilities:	Special Purpose Equipment	(S005)
	Modeling and Simulation	(S002)
	Test and Evaluation	(S004)
Emerging Technologies:	Robotics	(E002)
	Artificial Intelligence	(E001)
	Advanced Materials	(E005)
	Advanced Signal Processing	(E006)
Next Generation Systems:	All electronics manufactured to soldering standards; e.g.	
	PATRIOT	(N057)
	SADARM	(N053)

DESCRIPTION

The DoD ManTech Program provides a means for the Tri-Services and the Defense Logistics Agency to invest in new manufacturing technologies which are essential to the affordability and quality of DoD products. These investments are made to agencies within both government and industry, but they focus on items of unacceptable risk to private investors. The Army program strategy (entitled Year-2010) is to establish Thrust Areas that emphasize issues identified in the DoD Critical Technologies Plan. Soldering Technology occupies the foreground in the electronics discipline within this plan, and the Harry Diamond Laboratories is the responsible agency within the U.S. Army Laboratory Command.

OBJECTIVE/APPROACH

The objective of the Soldering Technology Program is to improve the affordability and quality (producibility) of electronic systems on a national rather than a program basis. The approach is to establish a Joint Service center of excellence at the U.S. Navy NAVSEA Naval Weapons Support Center, Crane, Indiana, as a high-tech focal point of Tech Base scientists nationwide to interact with the production, quality, development, and standardization communities and thereby more effectively: 1) Introduce producibility considerations into next generation weapons systems; and 2) Resolve gaps in manufacturing science

which are currently inhibiting producibility of electronic systems. Examples of science issues relevant to the manufacturing cost of electronic systems are as follows: 1) Component solderability is presently gauged by dipping sample leads into solder and performing subjective visual inspection for anomalies. X-Ray spectroscopy could automate the process and remove subjectivity by measuring inhibiting intermetallics such as Cu_3Sn ; 2) Wetting after soldering is presently gauged by visual inspection of the angle of solder contact. An automated and quantitative approach may be to use X-Ray for detecting the presence of intermetallics that signify chemical bonding, such as Cu_6Sn_5 ; 3) The significance of manufacturing anomalies that occur in the assembly of electronic components is presently gauged by subjective visual inspection for defects perceived as risks to reliability. An automated approach may be to use 3-D Laser Imaging to detect the occurrence of anomalies and then automatically generate 3-D Finite Element computer models that calculate significance relative to field loading.

Roughly two million dollars will be invested yearly in MMT activities that require a complete understanding of X-Ray theory, lasers, electronic controllers, computers, robotics, etc. Contracting for scientific studies and one-of-a-kind machines will emphasize the Small Business 8A Set-Aside Program, Value Engineering Program, Army Research Office Scientific Services Program, and Engineering Services clauses of existing contracts. Cooperative exchanges which do not involve funding will utilize the Technology Transfer Program.

REMARKS

Soldering Technology currently does not have a strong scientific foundation. A zero-defect philosophy based upon perceptions of risk to field reliability has instead been imposed upon the electronics manufacturing industry. The national cost is billions of dollars yearly, and changes in these business practices will not be resolved by MMT funding. Contractors with common interests are encouraged to participate as consortium, avoid duplication of effort, and share resources, planning, facilities, etc.

Technical POC: Mr. George Lucey
Telephone: (202) 394-2680

OVERVIEW

- o ARMY MANTECH PROGRAM
- o HDL ROLE
- o INDUSTRY OPPORTUNITIES

MANTECH

PERMITS THE TRI-SERVICES TO INVEST
IN MANUFACTURING TECHNOLOGIES THAT ARE
CRITICAL TO DOD PRODUCTION BUT ARE OF
UNACCEPTABLE RISK TO INDUSTRY INVESTMENT

ARMY MANTECH PROGRAM

- WEAPONS COSTS ARE GROWING
- NEW BUSINESS PRACTICES NEEDED
- AMC HAS A MANTECH INITIATIVE
 - FOCUS ON CRITICAL TECHNOLOGIES
 - REMOVE MANAGEMENT LAYERS

HDL ROLE

US ARMY MMT THRUST AREA
FOR
SOLDERING TECHNOLOGY

FOCUS

**NATIONALLY PERVASIVE
ELECTRONICS MANUFACTURING PROBLEMS
REQUIRING WORLD CLASS SCIENTISTS
USING HIGH-TECH FACILITIES**

INVESTMENT PLANS

\$ 2 MILLION YEARLY

BUSINESS OPPORTUNITIES

**INTRODUCE TO ARMY PRODUCTION LINES
NEW AUTOMATION TECHNOLOGIES NOT NOW
INCLUDED IN SOLDERING STANDARDS**

GUIDELINES

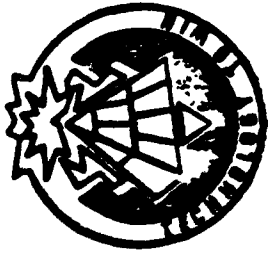
**DE-EMPHASIZE VISUAL INSPECTION
FOCUS ON PROCESS CONTROLS
CRITICAL TO FIELD RELIABILITY**

BUSINESS OPPORTUNITIES

- PROCESS MONITORS AND CONTROLS
- COMPUTER NETWORKING
- SOLDERABILITY
- WETTING
- CFC CLEANERS
- ANALYTICAL DESIGN TOOLS

CONCLUSION

MANUFACTURING SCIENCES MUST BE
IMPROVED TO REDUCE COST OF
ELECTRONIC ASSEMBLIES



SMALL BUSINESS

**US ARMY
LABORATORY COMMAND**

PROGRAM HISTORY

SMALL BUSINESS ACT - 1953

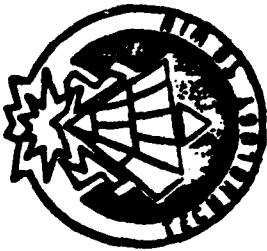
- Started program - "Fair Share"
- Created Small Business Administration
- 1958 Amendment - 8(a) Minority Business Assistance

P L 95-507 - Major Revision

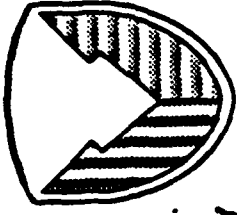
- Required Subcontract Goals
- Explanation to congress on goal achievement
- Small purchase set aside

P L 99-661 - Defense Authorization Act Section 1207

- 5% Goal - Disadvantaged Business
- 5% Objective - HBC/MI
- Pay 10% above Fair Market price



WHO IS SMALL



US ARMY

LABORATORY COMMAND

Type of Business

Not to Exceed

Construction
SIC 1521

\$17 million/yr.

R&D

500 employees

SIC 8731

Engineering Services
SIC 8711

\$13.5 million/yr.

Computer Programming
SIC 7371

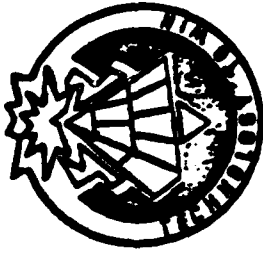
\$7.0 million/yr.

Service - N.E.C.

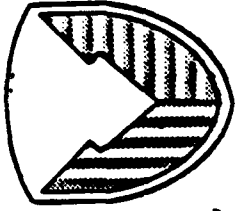
\$3.5 million/yr.

Manufacturing Industries - N.E.C.

500 employees



SMALL BUSINESS



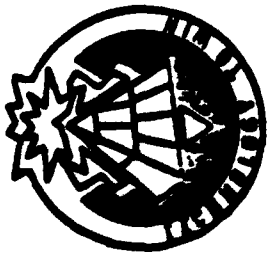
PROGRAM HISTORY (CON'T)

PL 100-180 -- Section 806 -- Defense Authority Act

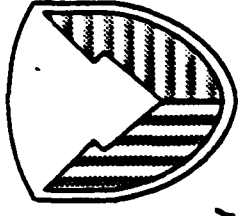
- Small Disadvantaged Business Set Asides**
- Maintain 8(a) Level/SDB -- 50% cost**
- Additional SADBUs duty -- HBCU/MI**

PL 100-656 -- "Business Opportunity Development Reform Act of 1988"

- Major change -- Micro management**
- 5% goal applicable Government-wide**
- Liquidated damages -- Subtract plan**
- SBA Right of Appeal on 8(a) contracting**
- 9 year 8(a) term**



CATEGORIES



**US ARMY
LABORATORY COMMAND**

TOTAL SMALL BUSINESS

SMALL BUSINESS SET-ASIDES

DISADVANTAGED BUSINESS

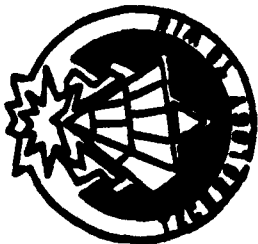
SMALL BUSINESS RESEARCH AND DEVELOPMENT

WOMAN OWNED BUSINESS

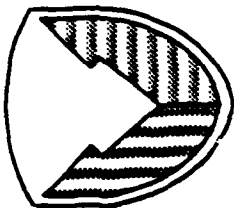
SMALL BUSINESS SUB-CONTRACTING

DISADVANTAGED BUSINESS SUB-CONTRACTING

**HISTORIC BLACK COLLEGES UNIVERSITIES/MINORITY
INSTITUTIONS**



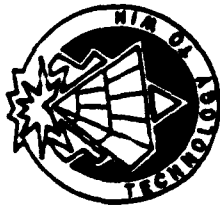
**SMALL AND DISADVANTAGED
BUSINESS PROGRAM
FISCAL YEAR 1989**



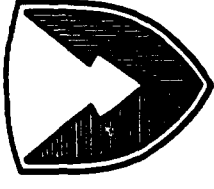
**US ARMY
LABORATORY COMMAND**

**TOTAL DOLLARS
TOTAL SMALL BUSINESS (%)
SMALL BUSINESS SET-ASIDE (%)
DISADVANTAGED BUSINESS (%)
SMALL BUSINESS RESEARCH & DEVELOPMENT (%)
WOMAN OWNED BUSINESS (MILLIONS)
HISTORIC BLACK COLLEGES & UNIVERSITIES
MINORITY INSTITUTIONS**

**\$296M
24.6%
10.3%
4.5%
16.7%
\$1.1M
1.4%**



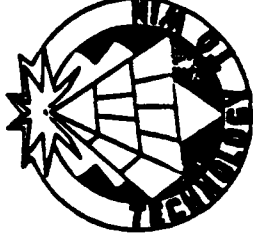
U. S. ARMY
LABORATORY COMMAND



Industrial Liaison Programs

Melvyn J. Shichtman
Technical and Industrial Liaison Officer
U.S. Army Laboratory Command
AMSLC-CM
(202) 394-3880

INFORMATION FOR INDUSTRY



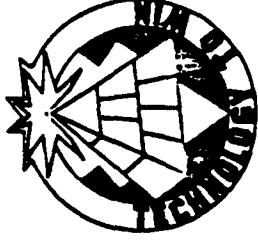
**US ARMY
LABORATORY COMMAND**

**IF YOU FIRST FIND OUT ABOUT IT
IN THE COMMERCE BUSINESS DAILY**

IT'S TOO LATE

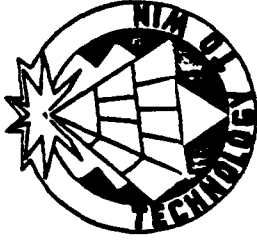
ARMY INFORMATION FOR INDUSTRY

**US ARMY
LABORATORY COMMAND**



WHAT'S IN IT FOR INDUSTRY?

- FEWER BLIND ALLEYS**
- MORE EFFICIENT MARKETING**
- VECTORED IR&D**
- MORE UNSOLICITED PROPOSAL WINNERS**
- SUPPORT FOR STRATEGIC PLANNING**



US ARMY
LABORATORY COMMAND

REGULATORY JUSTIFICATION

Army Regulation 70-35

Research, Development, and Acquisition

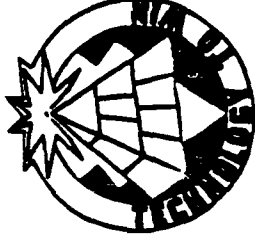
Information For Industry Programs

Headquarters
Department of the Army
Washington, DC

PROPONENT: ASSISTANT
SECRETARY OF THE ARMY
(RESEARCH, DEVELOPMENT,
AND ACQUISITION) SARD-TN

EXECUTIVE AGENT:
U.S. ARMY MATERIEL COMMAND
OFFICE OF THE DEPUTY CHIEF OF STAFF FOR
TECHNOLOGY PLANNING & MANAGEMENT
AMCLD-TI

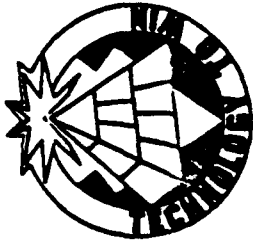
TECHNICAL & INDUSTRIAL LIAISON OFFICES



**US ARMY
LABORATORY COMMAND**

"T I L O" = ONE-STOP SHOPPING

- ADVANCE PLANNING INFORMATION**
- DESCRIPTIVE INFORMATION**
- MATCH-MAKING**
- UNSOLICITED-PROPOSAL GUIDANCE**
- POTENTIAL CONTRACTOR PROGRAM**
- R&D UNFUNDED STUDIES**
- BROAD AGENCY ANNOUNCEMENTS**
- SMALL BUSINESS INNOVATION RESEARCH**
- HAND-OUTS**



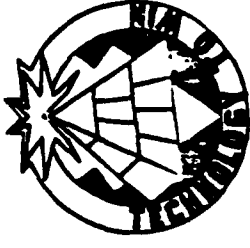
US ARMY
LABORATORY COMMAND

ARMY INFORMATION FOR INDUSTRY

TOPICS COVERED—

- TECHNICAL & INDUSTRIAL LIAISON OFFICES
- ARMY POTENTIAL CONTRACTOR PROGRAM
- R&D UNFUNDED STUDIES
- UNSOLICITED PROPOSALS
- BROAD AGENCY ANNOUNCEMENTS
- SMALL BUSINESS INNOVATION RESEARCH
- ADVANCE PLANNING BRIEFINGS FOR INDUSTRY
- TECHNOLOGY SYMPOSIA
- INDUSTRY DAYS
- TECHNICAL OBJECTIVE DOCUMENTS
- COMPETITION ADVOCATES
- SMALL & DISADVANTAGED BUSINESS UTILIZATION
- CHALLENGE TO INDUSTRY





US ARMY
LABORATORY COMMAND

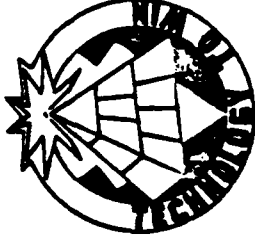
POTENTIAL CONTRACTOR PROGRAM

BENEFITS

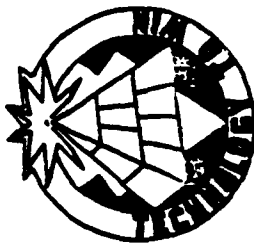
- CERTIFICATION OF NEED-TO-KNOW ○ DEFENSE TECHNICAL
INFORMATION CENTER
- SPONSORSHIP WITH DTIC
- LISTING IN DLA'S DISSEMINATION AUTHORITY LIST ○ DEFENSE
LOGISTICS
AGENCY
- ACTS IN LIEU OF AN ACTIVE DOD CONTRACT
- .. REGISTRANTS MAY RECEIVE INFORMATION
- .. BASIS FOR OBTAINING CLEARANCE
- .. MAINTAIN CLASSIFIED LIBRARY BETWEEN CONTRACTS

R & D UNFUNDED STUDIES

**US ARMY
LABORATORY COMMAND**



- ESSENTIALLY A NO-COST CONTRACT**
- PROVIDES GREATER ACCESS TO ARMY INFORMATION**
- STUDY HAS GREATEST MUTUAL BENEFIT**
- BASIS FOR EXPANDED NEED-TO-KNOW**



US ARMY
LABORATORY COMMAND

UNSOLICITED PROPOSALS

TALK TO ARMY SCIENTIST OR ENGINEER

IDENTIFY ARMY PROBLEMS

IDENTIFY ADDITIONAL SOURCES OF INFORMATION

OBTAIN INSTRUCTIONS ON SUBMISSION

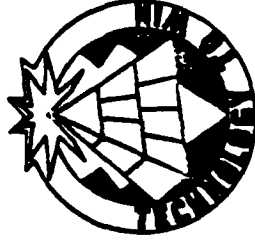
TILO

UNSOLICITED PROPOSAL PAMPHLET

ASK:

"WHO IS YOUR UNSOLICITED PROPOSAL COORDINATOR?"

"DO YOU HAVE AN ACTIVE BROAD AGENCY ANNOUNCEMENT?"



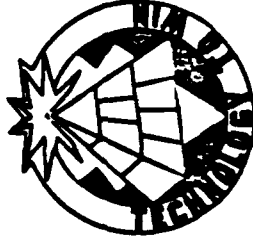
US ARMY
LABORATORY COMMAND

BROAD AGENCY ANNOUNCEMENTS

- DESCRIBES RESEARCH INTERESTS
- INCLUDES SELECTION CRITERIA
- EXPLAINS HOW TO PREPARE PROPOSALS
- SAYS WHEN PROPOSALS MAY BE SUBMITTED
- BAAs ANNOUNCED IN CBD

PROPOSALS ARE COMPETITIVE !

**SMALL BUSINESS
INNOVATION RESEARCH (SBIR)**



**US ARMY
LABORATORY COMMAND**

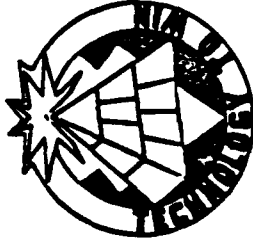
**ISSUE SOLICITATION OCTOBER
(ANNOUNCED IN COMMERCE BUSINESS DAILY)**

PROPOSALS DUE JANUARY

**PHASE I WINNERS SELECTED MAY
(SIX-MONTH, ONE-MAN YEAR EFFORT)**

**PHASE II WINNERS SELECTED 9 MONTHS AFTER
(24-MONTH, FIVE-MAN YEAR EFFORT) PHASE II AWARD**

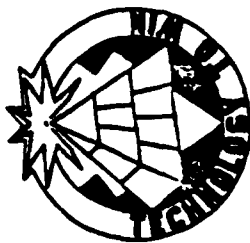
SBIR, CONTINUED



**US ARMY
LABORATORY COMMAND**

HOW TO RESPOND:

- 1. READ COMMERCE BUSINESS DAILY**
- 2. ORDER SOLICITATION**
- 3. READ CAREFULLY**
- 4. SELECT TOPICS IN YOUR AREA OF EXPERTISE ONLY**
- 5. ORDER BACK-UP INFO FROM DTIC**
- 6. PREPARE PROPOSAL (WATCH PAGE NUMBERS, ETC)**
- 7. SUBMIT ON TIME TO CORRECT ACTIVITY**



US ARMY
LABORATORY COMMAND

BRIEFINGS & SYMPOSIA

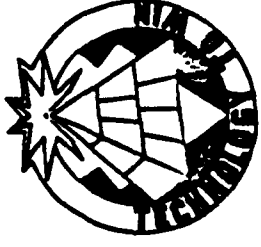
ADVANCE PLANNING BRIEFINGS FOR INDUSTRY

TECHNOLOGY SYMPOSIA

INDUSTRY DAYS

***CAN MIX & MATCH CHARACTERISTICS
TO SATISFY GOALS***

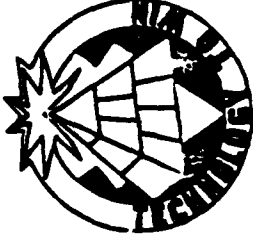
ADVANCE PLANNING BRIEFINGS FOR INDUSTRY



**US ARMY
LABORATORY COMMAND**

**RESEARCH
DEVELOPMENT
TEST &
EVALUATION**

- MID- & LONG-RANGE PLANNING
- THREAT & DOCTRINE DESCRIPTIONS
- EACH RDTE PROGRAM COVERED ONCE IN THREE YEARS
- PROVIDE FOR INDUSTRY FEED-BACK
- ANNOUNCED IN COMMERCE BUSINESS DAILY



US ARMY
LABORATORY COMMAND

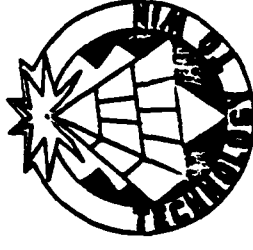
TECHNOLOGY SYMPOSIA

APPROACH

- ARMY BRIEFS THREAT, DOCTRINE, & TECH PROGRAM
 - .. CURRENT PROBLEMS / CRITICAL TECHNOLOGIES
- INDUSTRY BRIEFS GOVERNMENT-ONLY AUDIENCE
- DOCUMENT PROCEEDINGS & FOLLOW UP
- COMBINE WITH BROAD AGENCY ANNOUNCEMENT

RESULTS

- IDENTIFY TECHNOLOGY FOR EARLY DEMONSTRATION
- IMPROVE TECH-BASE PRIORITIZATION
- IMPROVED GOVERNMENT & INDUSTRY PROGRAMS



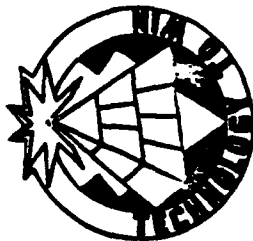
US ARMY
LABORATORY COMMAND

INDUSTRY DAYS

TELL INDUSTRY WHAT THE LAB / CENTER DOES

- **MISSION**
- **POCs**
- **FACILITIES**

"REVERSE IR&D ON-SITE REVIEW"



US ARMY
LABORATORY COMMAND

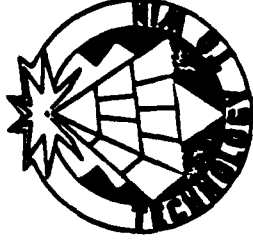
TECHNICAL OBJECTIVE DOCUMENTS

CONTENTS

- MISSION
- INVESTMENT STRATEGY
- RESEARCH PROGRAMS
- TECHNOLOGY PROGRAMS

PURPOSE

- STIMULATE DISCUSSIONS
- ENCOURAGE PARTICIPATION IN ARMY R&D
- FOCUS UNSOLICITED PROPOSALS AND IR&D



US ARMY
LABORATORY COMMAND

COMPETITION ADVOCATE

PROMOTE FULL AND OPEN COMPETITION

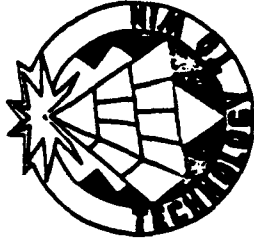
CHALLENGE BARRIERS TO COMPETITION

FORCE EARLY PLANNING FOR COMPETITION

CHALLENGE RESTRICTIVE SPECIFICATIONS

PROMOTE / ENSURE MARKET RESEARCH

SMALL & DISADVANTAGED BUSINESS UTILIZATION OFFICE



**US ARMY
LABORATORY COMMAND**

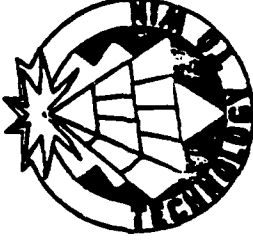
**PROVIDE SMALL BUSINESSES EQUITABLE
OPPORTUNITY TO COMPETE**

**ENSURE FAIR PROPORTION OF AWARDS
TO SMALL BUSINESSES**

WHY?

**INCREASE COMPETITION
REDUCE PRICE
EXPAND MOBILIZATION BASE**

CHALLENGE TO INDUSTRY



**US ARMY
LABORATORY COMMAND**

- **MAINTAIN AWARENESS OF ARMY TECHNOLOGY NEEDS**
REQUIREMENTS & PLANNING DOCUMENTS
INTERACTIONS WITH LABS & CENTERS
- **FOCUS IR&D ON ARMY NEEDS / OPPORTUNITIES**
RESPOND TO TECHNICAL EVALUATIONS & ON-SITE REVIEWS
- **INFORM ARMY OF ACCOMPLISHMENTS**
BRIEF LABS & CENTERS
DEMONSTRATE NEW TECHNOLOGIES