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UNITED STATES ARMY
COMMUNICATIONS-ELECTRONICS COMMAND



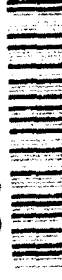
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FORT MONMOUTH, NEW JERSEY

ADVANCE PLANNING
BRIEFING FOR INDUSTRY
“MEETING THE ARMY’S POWER NEEDS
OF TOMORROW”



93-14656



SHERATON EATONTOWN HOTEL AND CONFERENCE CENTER

2 JUNE 1993

078

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ADVANCE PLANNING BRIEFING FOR INDUSTRY

MEETING THE ARMY'S POWER NEEDS OF TOMORROW

U.S. ARMY

COMMUNICATIONS-ELECTRONICS COMMAND

UNCLASSIFIED



DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS-ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000



REPLY TO
ATTENTION OF

Office of the Commanding General

Ladies and Gentlemen:

On behalf of the Communications-Electronics Command (CECOM) and the C3I community, I am pleased to present these proceedings of the Advance Planning Briefing for Industry (APBI). This program is designed to enhance the Government-Industry communications network by providing forums for discussions based on the Army's current and future portable power sources needs.

It is imperative that Government and Industry continue working together as a team to provide state-of-the-art portable power sources that will meet the Army's needs and lower operational and support costs. I sincerely hope that this symposium will prove beneficial to Industry in the planning effort required to provide continued support to the soldier in the field.

I welcome your participation in our APBI program.

Sincerely,

Otto J. Guenther

Otto J. Guenther
Major General, U.S. Army
Commanding

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ADVANCE PLANNING BRIEFING
FOR INDUSTRY

JUNE 2, 1993

SHERATON EATONTOWN HOTEL AND CONFERENCE CENTER
EATONTOWN, NEW JERSEY

MEETING CHAIRMAN
MR. PATRICK J. WHITFILL
DIRECTOR, SYSTEMS MANAGEMENT

AGENDA

WEDNESDAY, JUNE 2, 1993

0700 REGISTRATION-SHERATON

0815 ADMINISTRATIVE REMARKS
 Mr. Richard Rizzo
 Systems Management Directorate, CECOM

0820 WELCOMING REMARKS
 COL Domenic F. Basile
 Deputy Commander for Business, CECOM

0840 SESSION I: COMMUNICATIONS-ELECTRONICS BATTERIES FOR THE
 NINETIES AND BEYOND

 BATTERY PROGRAM GOALS
 Mr. Patrick J. Whitfill
 Director, Systems Management, CECOM

 R&D EFFORTS/POTENTIAL CHEMISTRIES
 Dr. Robert P. Hamlen
 Electronics and Power Sources Directorate
 US Army Research Laboratory

 ACQUISITION PHILOSOPHY
 Mr. Jeffrey Spangher
 Systems Management Directorate, CECOM

0950 QUESTION AND ANSWER PERIOD

1000 BREAK

1020 SESSION II: REDUCTION OF BATTERY RELATED OPERATING AND
 SUPPORT COSTS

BATTERY STANDARDIZATION
Mr. Jeffrey Spangher
Systems Management Directorate, CECOM

DOD AVIATION BATTERY SYSTEMS STANDARDIZATION (AVBATTSS)
Mr. Dan Kieffner
Naval Surface Warfare Center, Department of the Navy

STATE OF CHARGE TECHNOLOGY
Mr. Jeffrey Spangher
Systems Management Directorate, CECOM

1120 QUESTION AND ANSWER PERIOD

1130 LUNCH

1245 SESSION II

EPA/DISPOSAL ISSUES
Mr. Christopher Kencik
Safety Office, CECOM

COMMERCIAL BATTERIES
Mr. Richard O. Banyard
Product Integrity and Production Engineering Directorate, CECOM

POWER SUPPLIES AND BATTERY CHARGERS
Mr. Richard O. Banyard
Product Integrity and Production Engineering Directorate, CECOM

1340 QUESTION AND ANSWER PERIOD

1350 BREAK

1410 SESSION III: END ITEM POWER MANAGEMENT

FIELD REALITIES OF BATTERIES
Mr. Douglas A. Antisell
Office of Project Manager, Single Channel Ground and Airborne
Radio System (SINCGARS)

END ITEM EQUIPMENT DESIGN REQUIREMENTS
Mr. Perry W. Hugo
Research, Development and Engineering Center, CECOM

POWER SOURCES STATEMENT OF WORK
Mr. Richard O. Banyard
Product Integrity and Production Engineering Directorate, CECOM

1510 QUESTION AND ANSWER PERIOD

1520 SESSION IV: BUSINESS OPPORTUNITIES

BUSINESS OPPORTUNITIES
Dr. Joseph Buccieri
C31 Acquisition Center, CECOM

1540 QUESTION AND ANSWER PERIOD

1600 EXECUTIVE PANEL

Mr. Patrick J. Whitfill
Director, Systems Management
US Army Communications-Electronics Command

Dr. Robert P. Hamlen
Director, Power Sources Division
US Army Research Laboratory

Dr. Joseph Buccieri
Chief, Division B, C31 Acquisition Center
US Army Communications-Electronics Command

Mr. Richard O. Banyard
Chief, CCS/Avionics Division
Product Integrity and Production Engineering Directorate
US Army Communications-Electronics Command

1630 CLOSING REMARKS
Mr. Patrick J. Whitfill
Director, Systems Management, CECOM

1645 ADJOURN

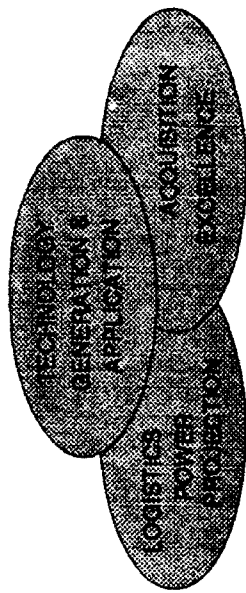
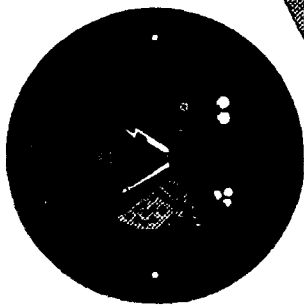
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WELCOMING REMARKS



COL DOMENIC F. BASILE
DEPUTY COMMANDER FOR BUSINESS,
CECOM



US ARMY COMMUNICATIONS- ELECTRONICS COMMAND AND FORT MONMOUTH SENSURING LAND FORCE DOMINANCE MEETING THE ARMY'S POWER NEEDS OF TOMORROW

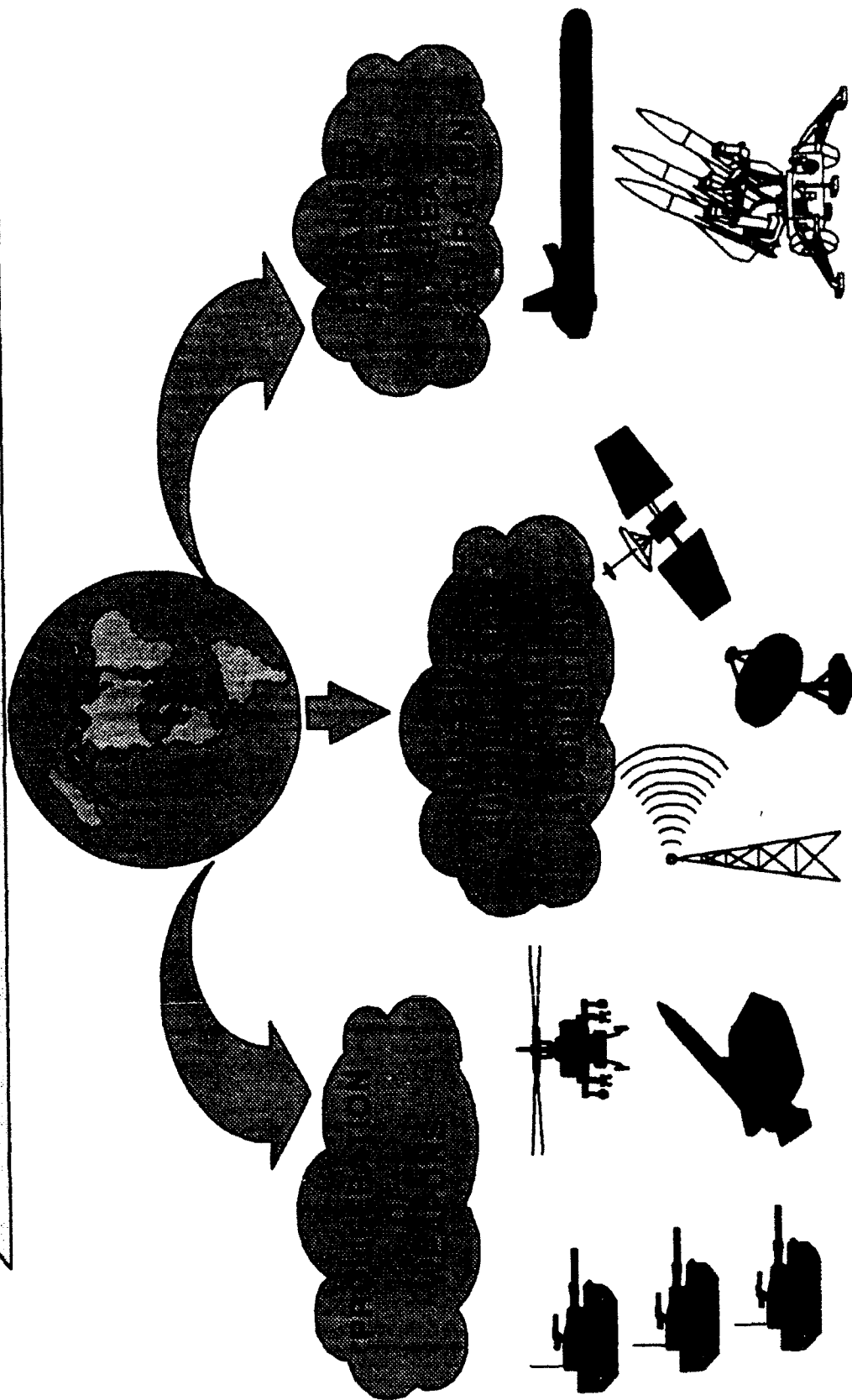
COL DOMENIC BASILE
DEP CDR FOR BUSINESS

OUTLINE

- BACKGROUND
- HOW WE WILL MEET THE CHALLENGE
- APPLYING NEW IDEAS
- CONCLUSION

BACKGROUND

PLANNING FOR THE FUTURE

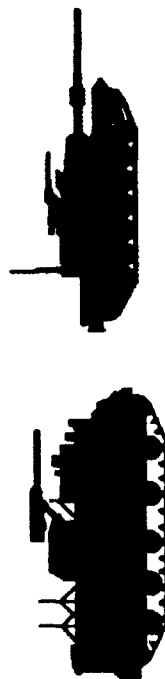


THE WORLD IS MORE: UNPREDICTABLE, UNSTABLE, VOLATILE

BACKGROUND

ARMY MISSIONS

TRADITIONAL:



PROMPT & SUSTAINED
COMBAT OPERATIONS
ON LAND

NON-TRADITIONAL:

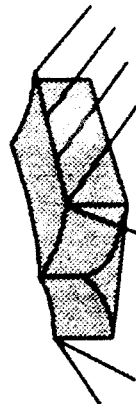
COUNTER DRUG



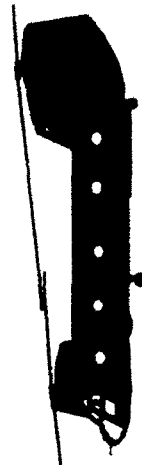
DEMOCRATIC REFORM



DISASTER RELIEF



HUMANITARIAN RELIEF



BACKGROUND BATTLEFIELD OF THE FUTURE

UNPRECEDENTED
LETHALITY

INCREASED
DEPTH

INCREASED
TEMPO

BACKGROUND

ENSURING LAND FORCE DOMINANCE

PROJECT AND
SUSTAIN THE FORCE



PROTECT THE FORCE



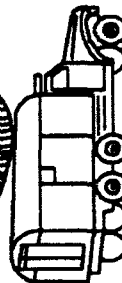
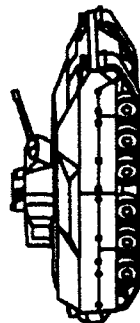
DOMINATE THE
MANEUVER BATTLEFIELD



WIN THE
INFORMATION
WAR



CONDUCT
PRECISION
STRIKES

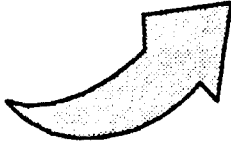


ARMY MODERNIZATION OBJECTIVES

BACKGROUND

STRATEGIC VISION

- ARMY STRATEGIC VISION
 - TOTAL FORCE TRAINED & READY TO FIGHT
 - SERVING THE NATION AT HOME & ABROAD
 - STRATEGIC FORCE CAPABLE OF DECISIVE VICTORY



• AMC'S STRATEGIC VISION

- ARMY'S LEADER IN EQUIPPING & SUSTAINING TOTAL FORCE
 - SUPERIOR TECHNOLOGY & RESPONSIVE SUPPORT
 - WORLDWIDE POWER PROJECTION
 - DECISIVE VICTORY



• OUR STRATEGIC VISION

- WORLD CLASS ORGANIZATION OF QUALITY SOLDIERS AND CIVILIANS
- PROVIDING AND SUSTAINING TECHNOLOGICALLY SUPERIOR C3IEW SYSTEMS
- ENABLING THE INTUITIVE COMMANDER TO OWN THE NIGHT, OWN THE SPECTRUM, AND KNOW THE ENEMY

HOW WE WILL MEET THE CHALLENGE KEY INVESTMENT TENETS FOR THE FUTURE

- MAINTAIN SCIENCE & TECH BASE

- CONDUCT ADVANCED TECHNOLOGY DEMOS

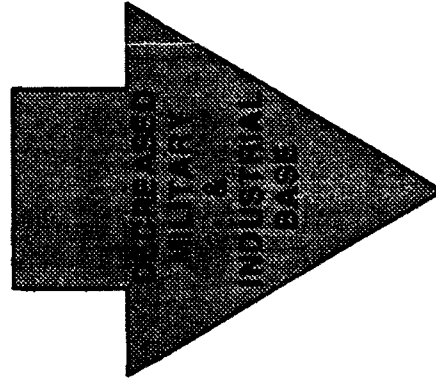
- INSERT ADVANCED TECHNOLOGIES IN EXISTING SYSTEMS

- LIMIT DEMONSTRATION VALIDATION TO PRODUCTION SYSTEMS

- MAINTAIN INDUSTRIAL BASE

HOW WE WILL MEET THE CHALLENGE

SHIFT IN ACQUISITION EMPHASIS



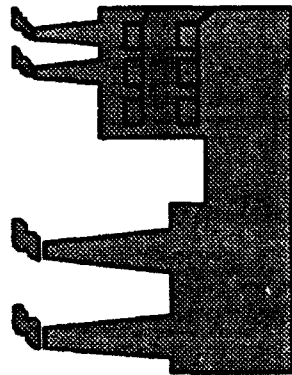
REQUIRES:

- ACQUISITION EXPERTISE
- BEST VALUE
- CONTRACTOR EVALUATION
- COMMUNICATIONS WITH INDUSTRY
- UNSOLICITED PROPOSAL MGT
- INDUSTRIAL BASE MGT

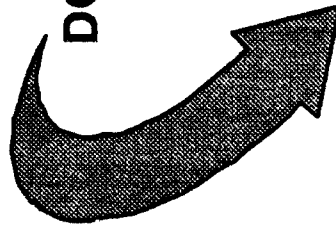


HOW WE WILL MEET THE CHALLENGE DEFENSE CHANGES AND THE INDUSTRIAL SECTOR

1980s



AVAILABILITY OF
DOD UNIQUE SECTORS
REDUCED



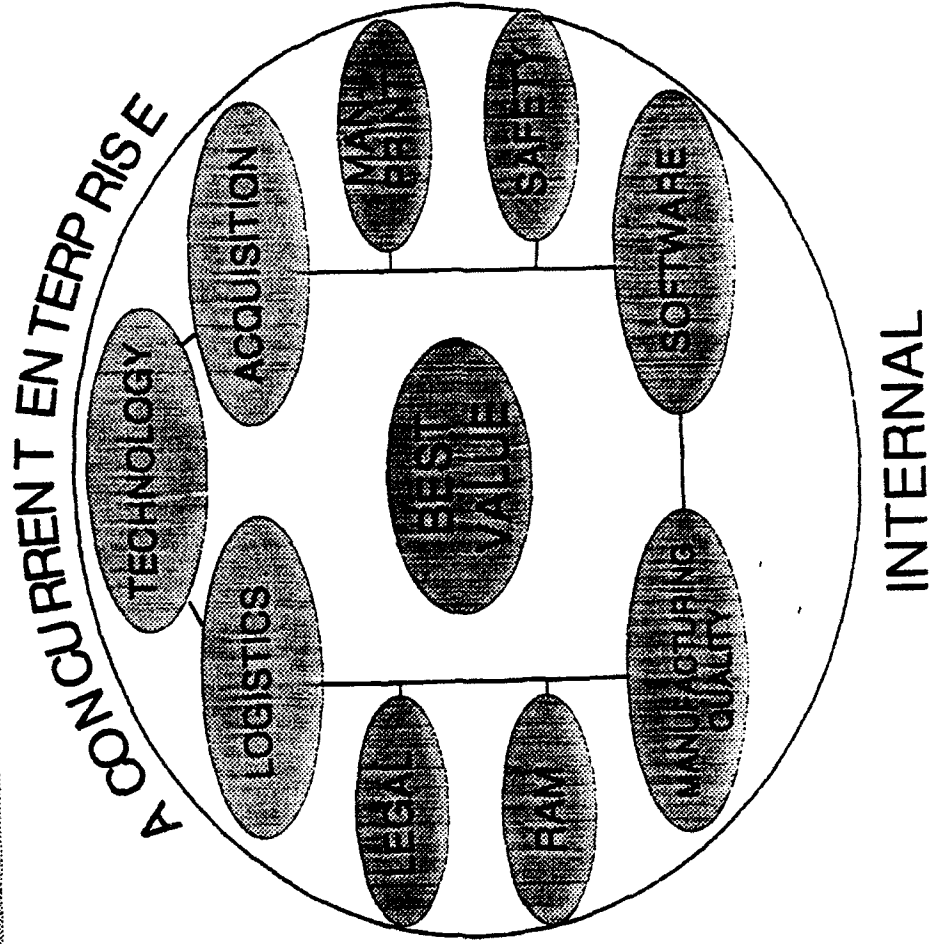
1990s

1990s

- STANDARDIZE TO COMMERCIAL AREAS
- APPLY MILITARY APPLICATIONS TO COMMERCIAL (GPS, BROAD BASED SPECTRUM)
- FOREIGN MILITARY SALES
- REPLACE WITH OTHER TECHNOLOGY
- (IMAGE INTENSIFICATION TO THERMAL IMAGE)
- PROCURE ACROSS SERVICES (CECOM PROCURES ALL POWER SOURCES)
- OMNIBUS TECHNIQUES
- DUAL PRODUCTION LINES

HOW WE WILL MEET THE CHALLENGE

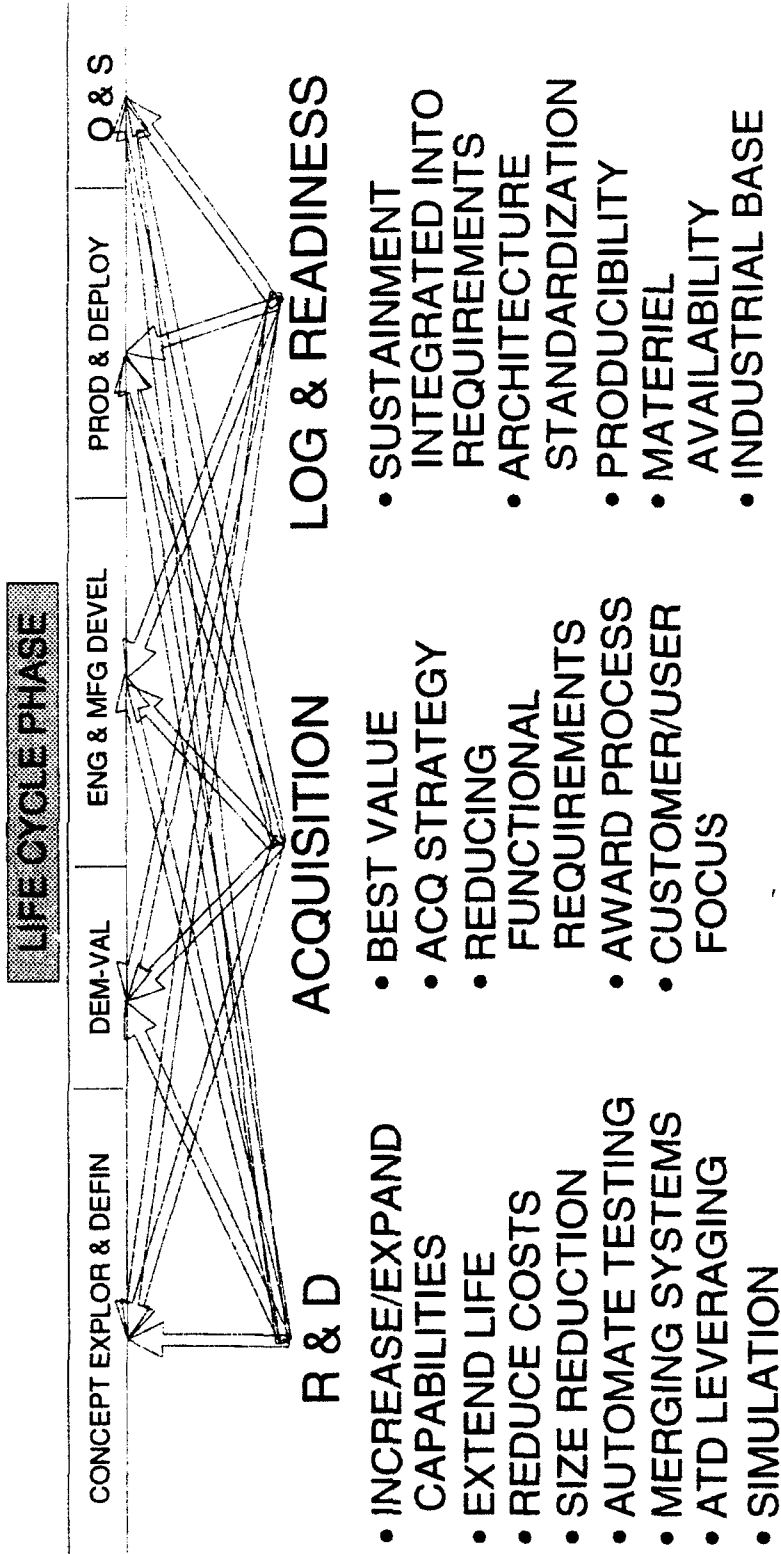
TEAMING



ACQIFAM2

HOW WE WILL MEET THE CHALLENGE

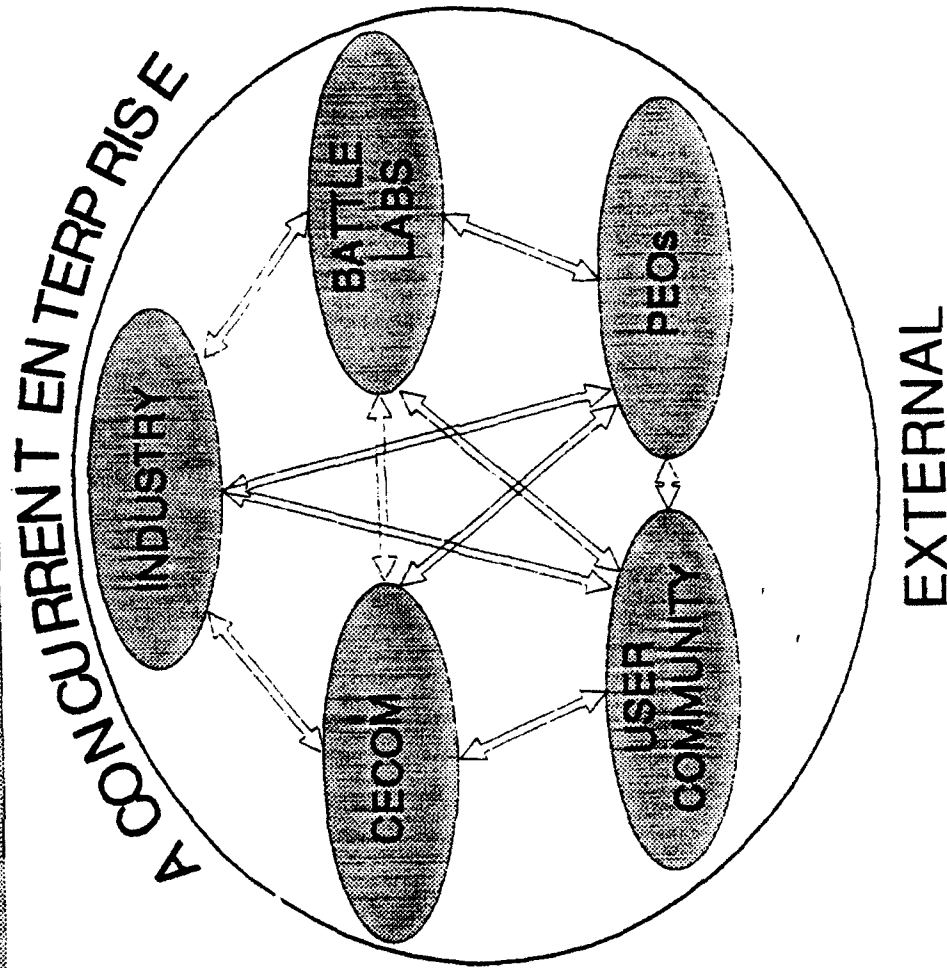
INTEGRATION OF TEAM IN ACQUISITION PROCESS



PROVIDE SUSTAINABLE, INTEROPERABLE, FLEXIBLE, AND TECHNOLOGICALLY SUPERIOR EQUIPMENT

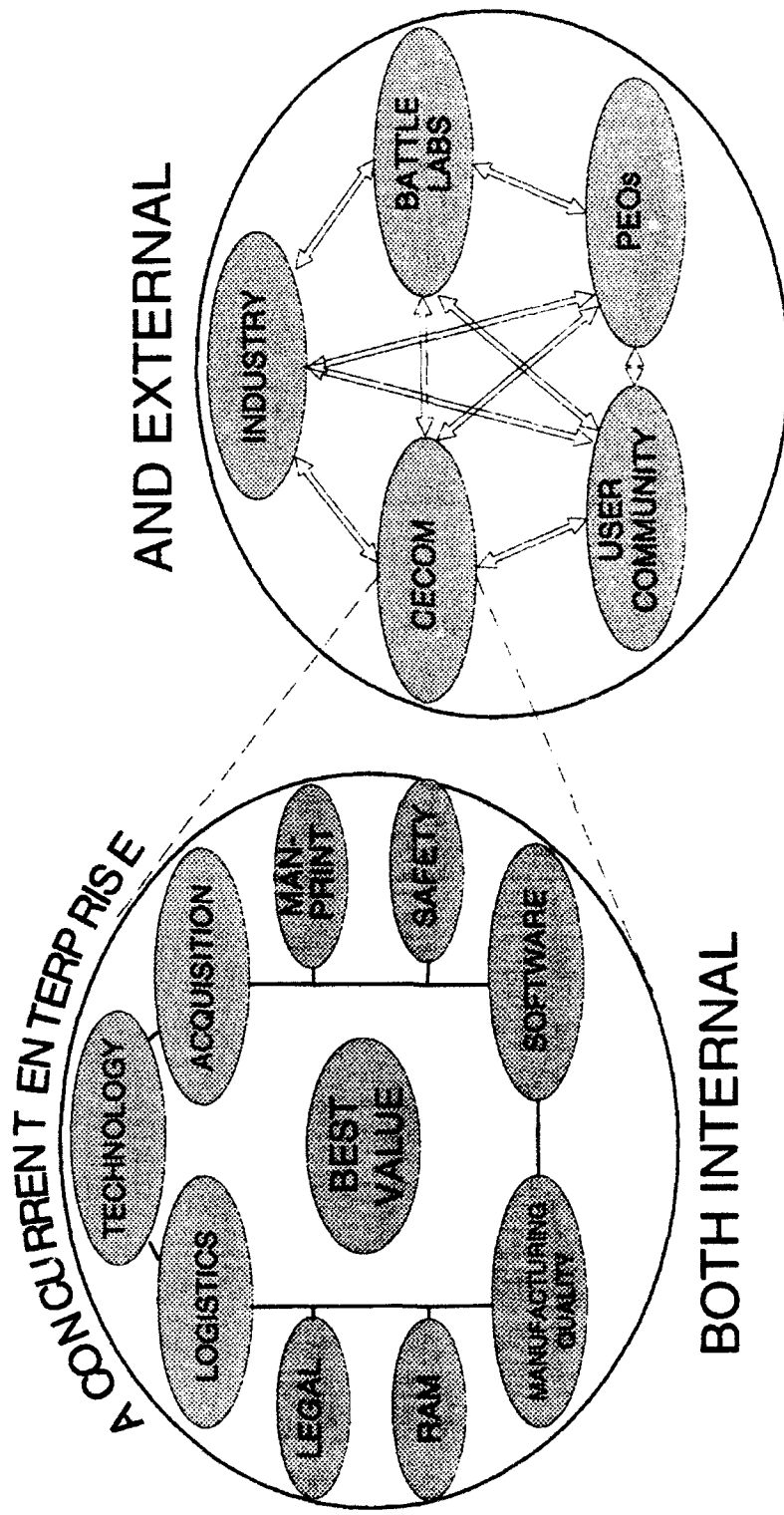
HOW WE WILL MEET THE CHALLENGE

TEAMING



ACQTEAM3

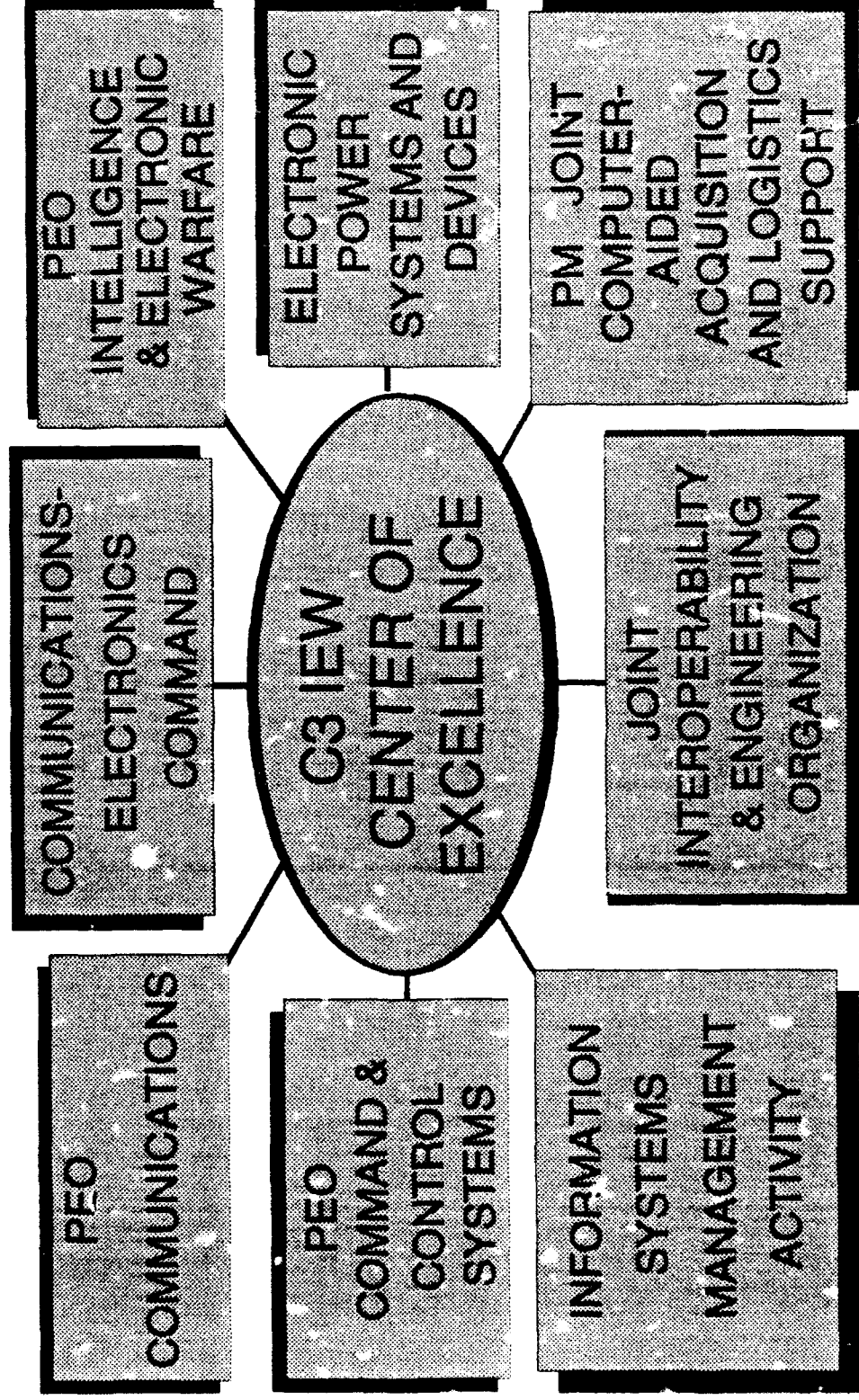
HOW WE WILL MEET THE CHALLENGE BALANCE AND AFFORDABILITY THROUGH TEAMING



BRINGING TECHNOLOGY RAPIDLY TO THE SOLDIER THROUGH TEAMING

ACOTE AMT

APPLYING NEW IDEAS



APPLYING NEW IDEAS



INDUSTRIAL BASE

- Depots & Arsenals to Commercial?
- Depots & Arsenals Government Operated?
- What's the Role of Small Business?

COMMERCIAL STANDARDS



& PRACTICES

- Commercial Accounting
- Ownership Rights
- Government Audit/Oversight



ENVIRONMENTAL ISSUES

- Evaluation Criteria in Source Selection
- Base Closures Must Address Cleanup Levels

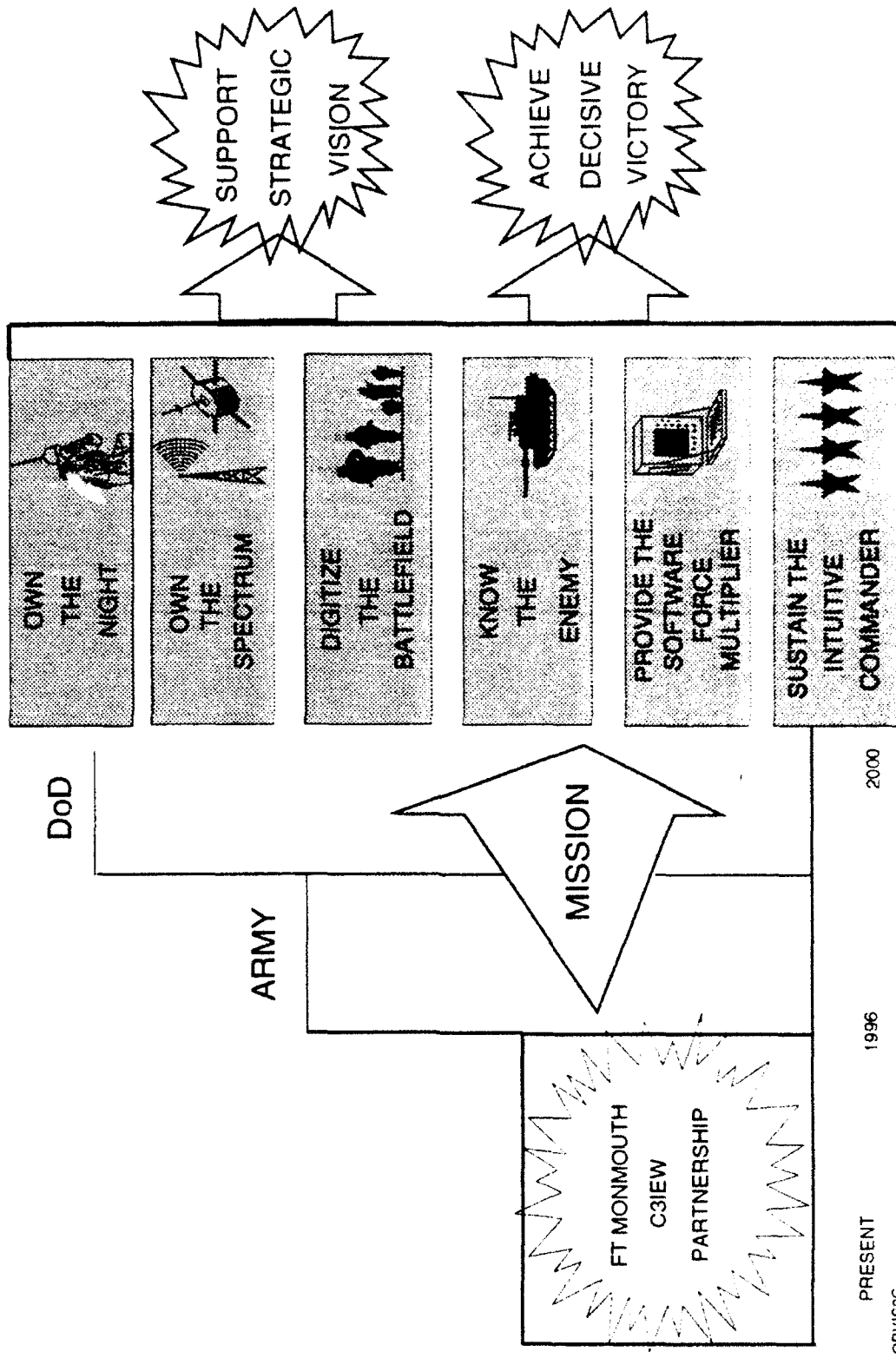


GOVERNMENT ORGANIZATIONS

- Streaming & Consolidate
(Defense Contract Management Command)
- "Purple" Organizations

APLW

CONCLUSION: WHAT ARE WE TRYING TO ACHIEVE?



CONCLUSION

HORIZONTALLY & VERTICALLY INTEGRATE THE BATTLEFIELD

CONUS

C4I FOR THE WARRIOR...
ARMY ENTERPRISE STRATEGY

TOTAL VERTICAL &
HORIZONTAL COMMUNICATION
& SITUATION AWARENESS
FROM ECHELON ABOVE CORPS
TO SQUAD

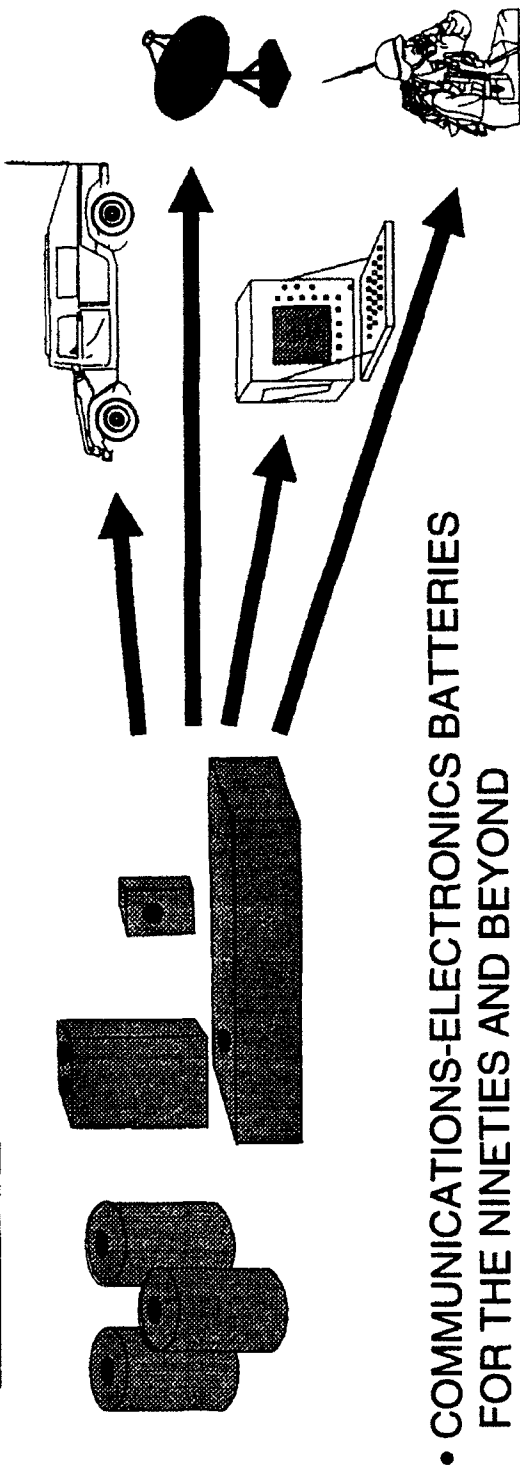
ENEMY

INTEGR

CONCLUSION

BATTERIES - POWERING THE FUTURE

APBI SESSIONS



• COMMUNICATIONS-ELECTRONICS BATTERIES
FOR THE NINETIES AND BEYOND

• REDUCTION OF BATTERY RELATED
OPERATION AND SUPPORT COSTS

• END ITEM POWER MANAGEMENT

• BUSINESS OPPORTUNITIES

CONBAT

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NOTES

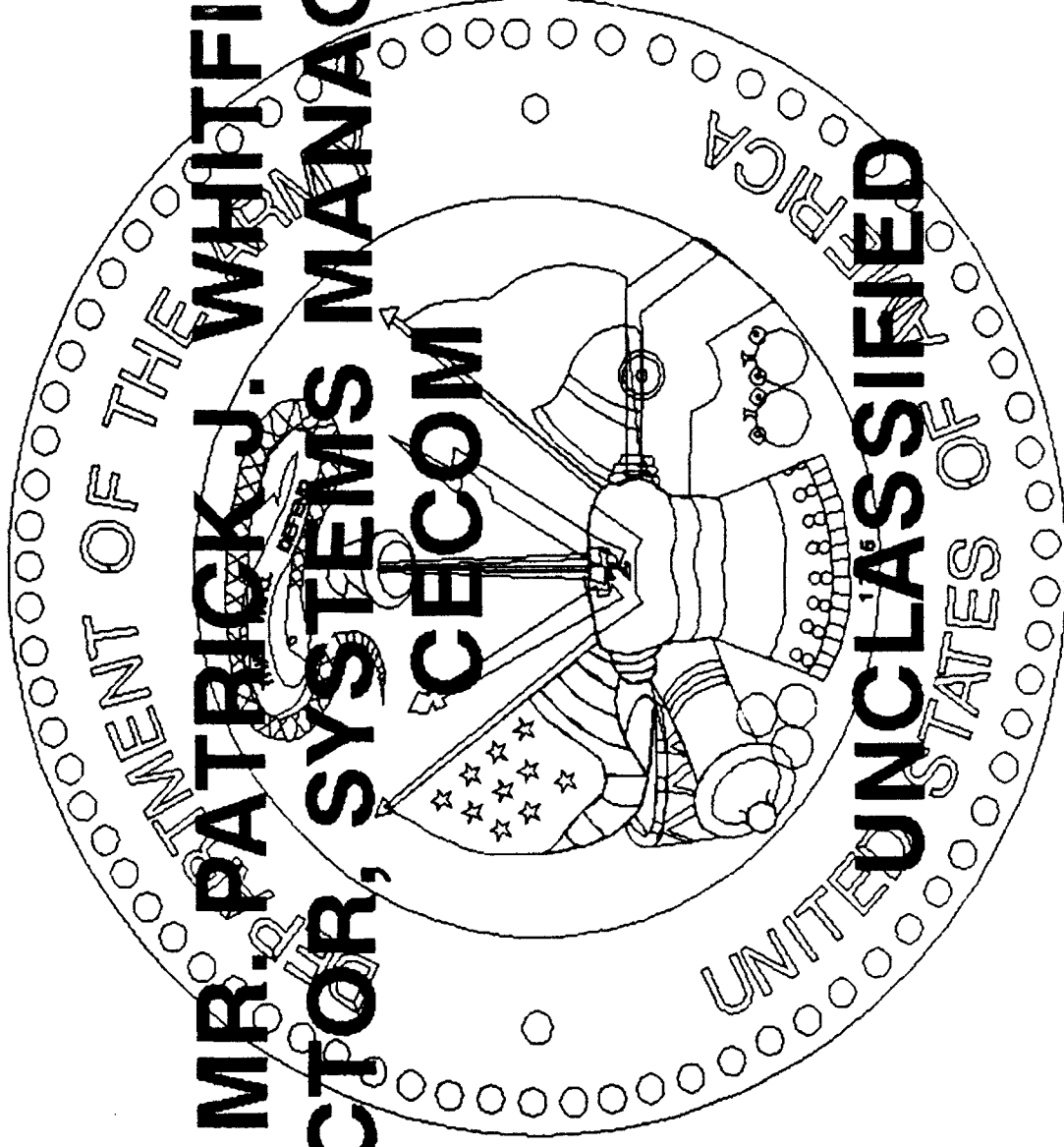


SESSION I

COMMUNICATIONS-ELECTRONICS BATTERIES FOR THE NINETIES AND BEYOND

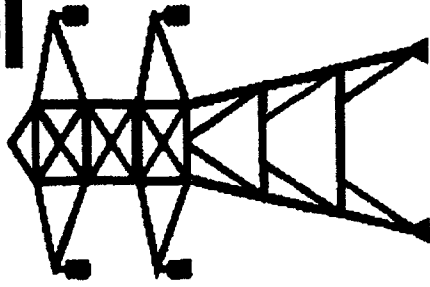
BATTERY PROGRAM GOALS

MR. PATRICK J. WHITFILL
DIRECTOR, SYSTEMS MANAGEMENT
CECOM

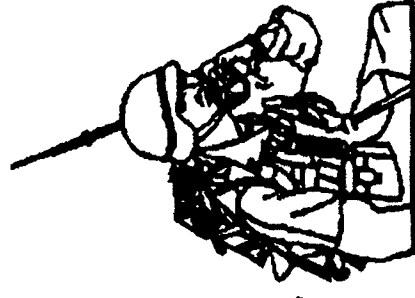
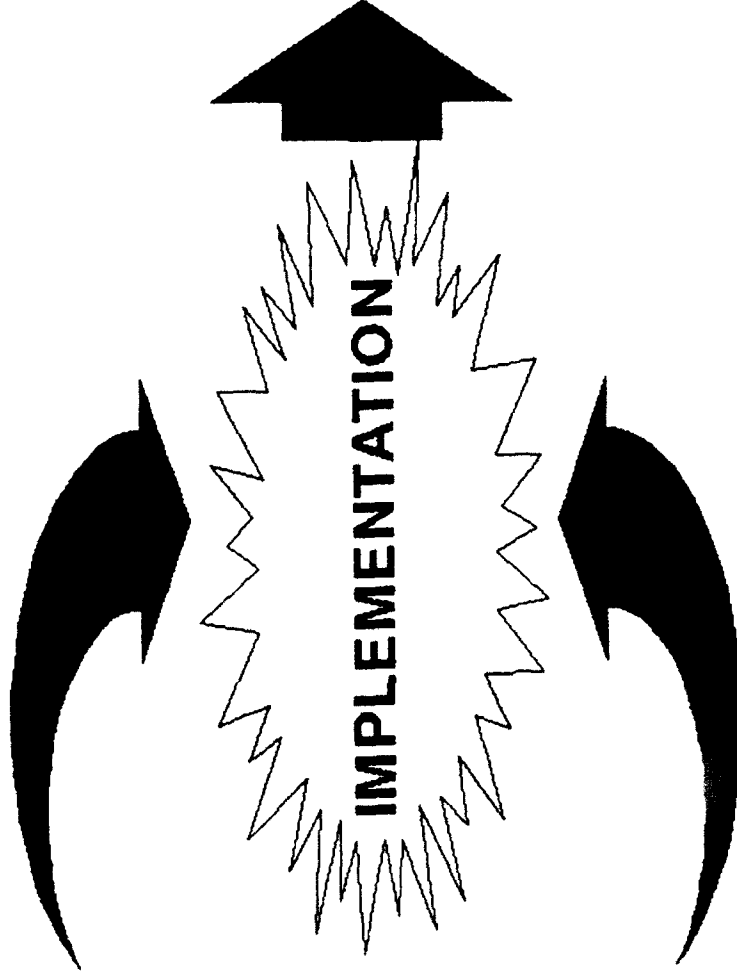


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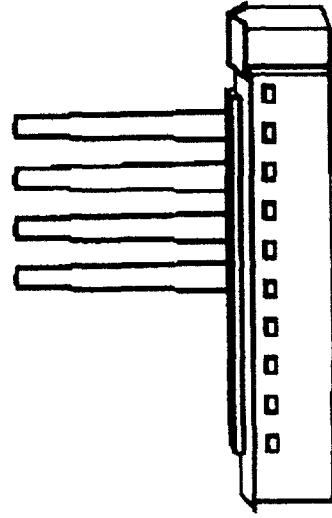
THE CHALLENGE



**POWER SOURCE
MASTER PLAN**

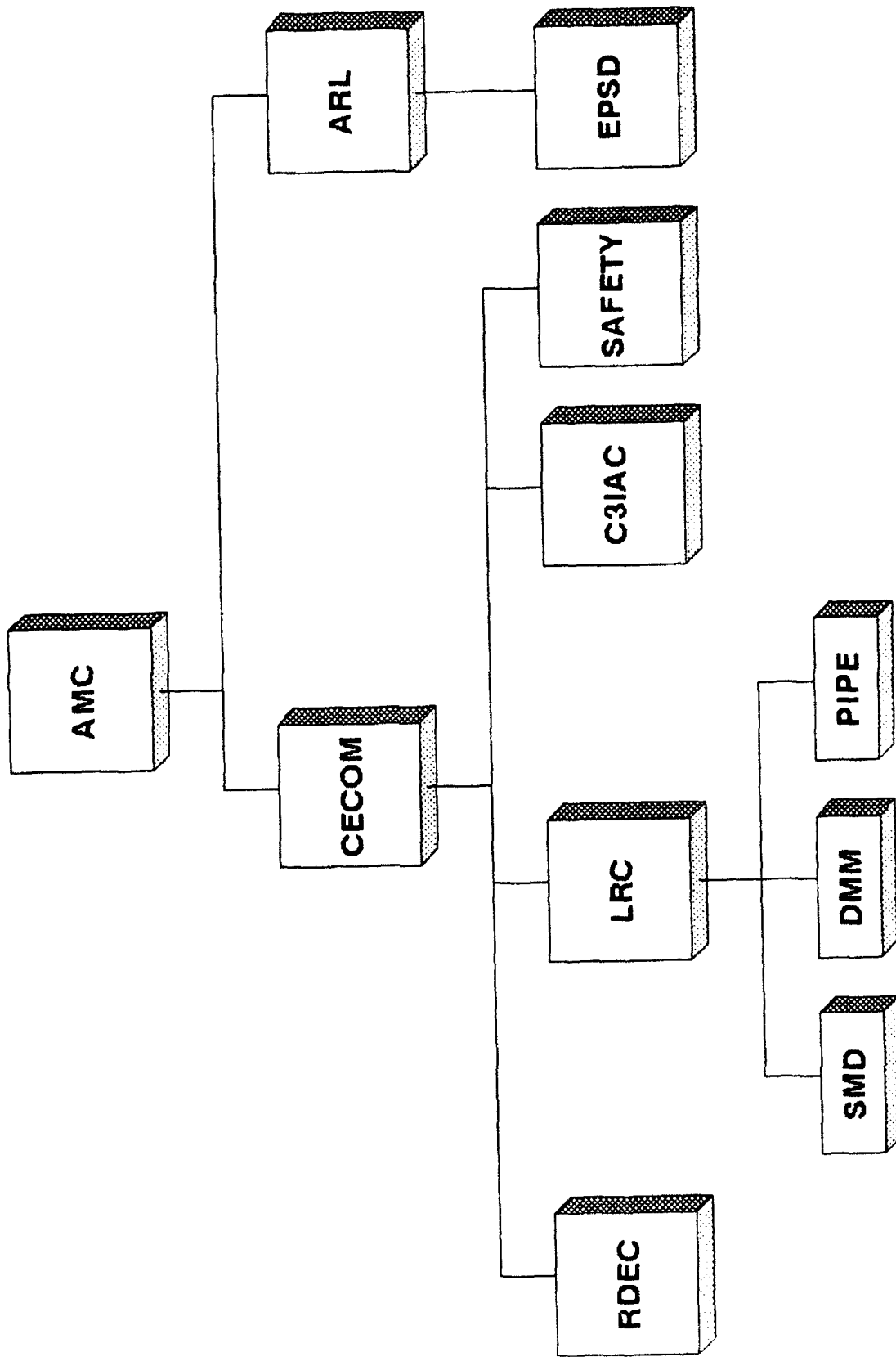


**POWER
SOURCES
FOR THE
SOLDIER**



**INDUSTRY
INVOLVEMENT**

POWER SOURCES TEAM



IMPLEMENTING THE VISION IN A CHANGING WORLD

POWER SOURCES MASTER PLAN

REDUCED
LIFE CYCLE
COSTS

DUAL USE
TECHNOLOGY

IMPROVED
PERFORMANCE

POWER
MANAGEMENT

AWARD
FEES

POWER SOURCES OF THE FUTURE

A CHANGING WORLD

1980s

1990s

RISING SALES

DROPPING SALES

**MILITARY UNIQUE
TECHNOLOGY**

**DUAL USE
TECHNOLOGY**

**GROWING
PRODUCTION BASE**

**SHRINKING
PRODUCTION BASE**

**INCREASING POWER
CONSUMPTION**

**POWER
MANAGEMENT**

GROWING BUDGETS

FISCAL CHANGES



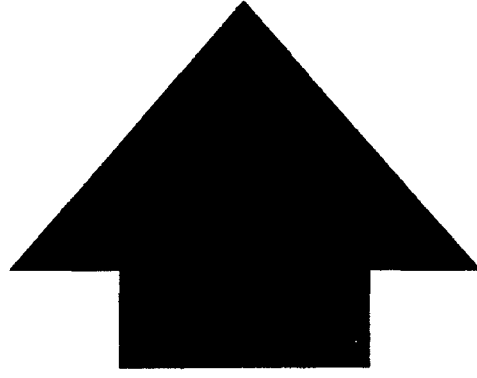
OVERALL GOALS

TODAY

MILITARY
UNIQUE
TECHNOLOGY

DEDICATED
PRODUCTION
BASE

HIGH
O&S
COSTS



TOMORROW

1. LOWER O&S
COSTS

2. DUAL USE

3. AUTOMATED
PRODUCTION

4. STANDARDIZED

5. SAFE

6. NO HARARDOUS
MATERIALS

BATTERY STRATEGY

SHORT RANGE GOALS

- * LI/SO₂
- * NICAD
- * SLAB

* LI/SO₂

* INTERIM

RECHARGEABLE

NO ARMY
SPONSORED R&D



IMMEDIATE O&S
COST REDUCTION

1993

LONG RANGE GOALS

1995

1999

20??

UNIVERSAL
BATTERY



DUAL USE,
JOINT R&D

* OBJECTIVE
BATTERIES

SHORT RANGE GOALS

- REDUCE O&S COSTS
- FIELD INTERIM RECHARGEABLE BATTERY(IES)
- REPLACE MERCURY & ZINC-CARBON BATTERIES
- FIELD "IMPROVED" BATTERY CHARGERS & POWER SUPPLIES
- REDUCE HAZARDOUS WASTE STREAM
- REDUCE DISPOSAL COSTS
- REPLACE VENTED NICAD AIRCRAFT BATTERIES

LONG RANGE GOALS

- REDUCE O&S CCSTS
- FIELD OBJECTIVE FAMILY OF
 - .. PRIMARY BATTERIES
 - .. RECHARGEABLE BATTERIES
 - .. AIRCRAFT BATTERIES
- FIELD A UNIVERSAL BATTERY CHARGER
- MINIMIZE PROLIFERATION
- CONTINUE DEVELOPMENT OF "UNIVERSAL" BATTERY
- ELIMINATE HAZARDOUS WASTE
- STATE OF CHARGE INTERNAL TO END ITEM

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NOTES

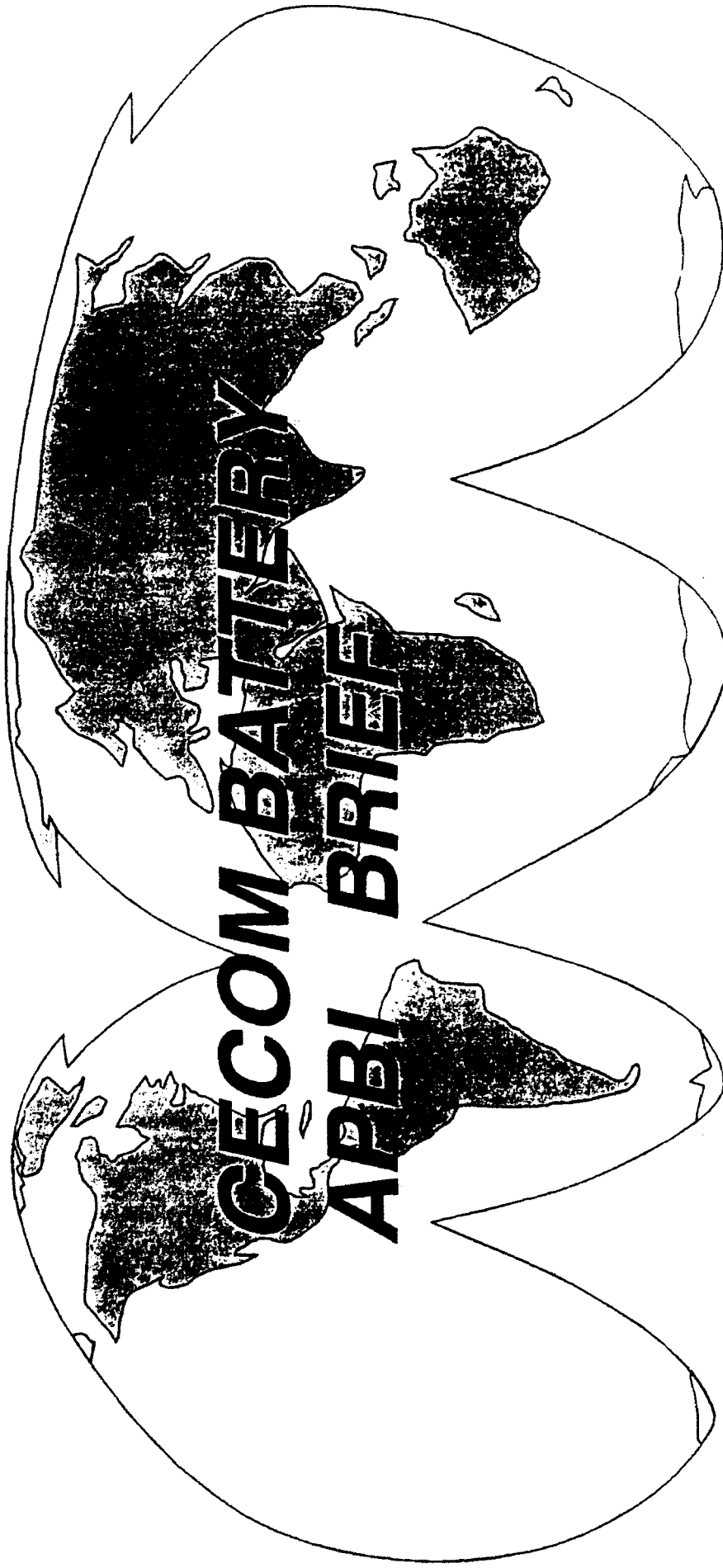


POWER SOURCES DIVISION



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES



DR. ROBERT P. HAMLEN
ARMY RESEARCH LABORATORY
FT MONMOUTH, NEW JERSEY



AGENDA



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

- **BACKGROUND ON POWER TRENDS AND POWER MANAGEMENT**
- **ADVANCES IN:**
 - **PRIMARY BATTERIES**
 - **RECHARGEABLE BATTERIES**
 - **RESERVE POWER SUPPLIES**
 - **PULSE POWER BATTERIES/CAPACITORS**
 - **FUEL CELLS**
 - **THERMOPHOTOVOLTAIC**
- **FUTURE PROGRAMS**



POWER SOURCES PROGRAMS



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

PRIMARY BATTERIES

- High Energy Density
- Low Cost

RECHARGEABLE BATTERIES

- Improve Energy Density
- Low Cost

RESERVE BATTERIES

- Lithium Based
- Longer Operating Life

PULSE POWER BATTERIES AND CAPACITORS FOR ELECTRIC WEAPONS

- Very High Discharge Rates
- Long Cycle Life

FUEL CELLS

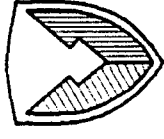
- Compact and Portable
 - Soldier System
- Silent Diesel Operation
 - Tank Silent Watch
 - Field Power Generation

ALTERNATIVE POWER SOURCES

- Thermophotovoltaic Power Generation



POWER REQUIREMENT ADVANCES

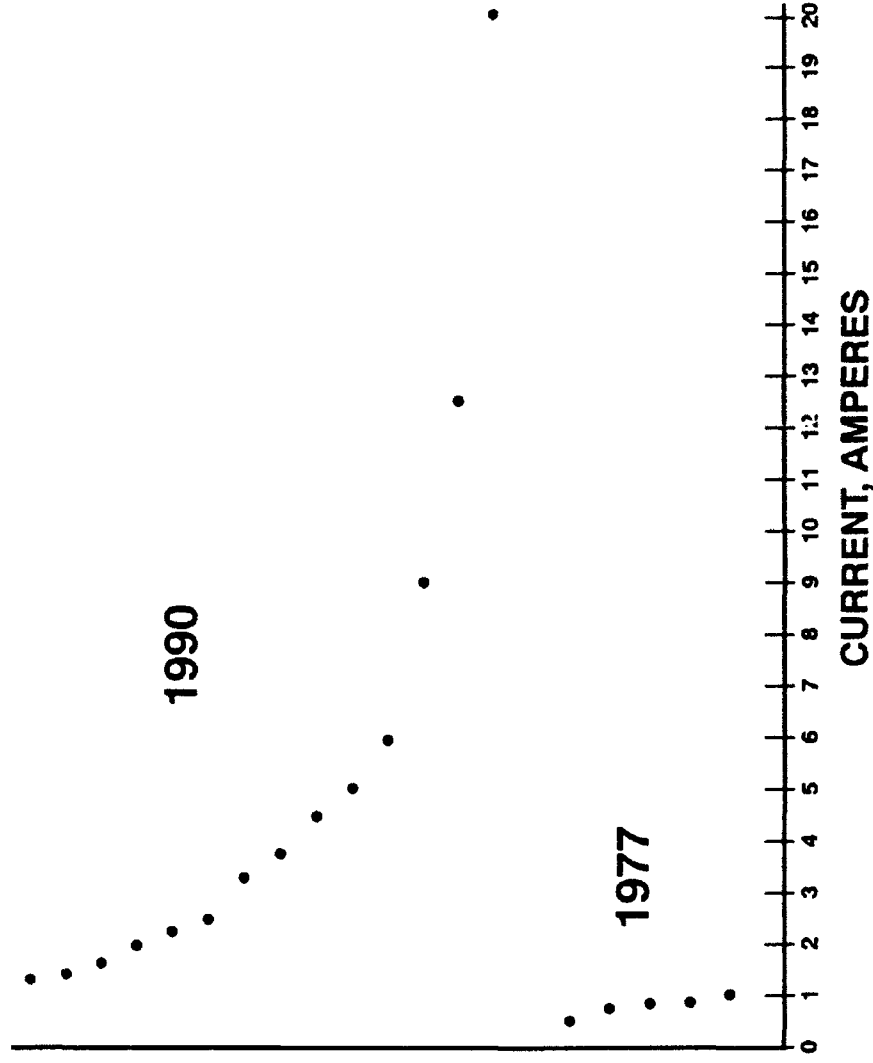


US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

CHEMICAL AGENT MONITOR
DRAGON NIGHT SIGHT
AUDIOPACK, P.A. SYSTEM
AN/PRC-113 UHF RADIO
THERMAL WEAPON SIGHTS
LST-5B SATELLITE RADIO
AN/PRC-119 SINGARS RADIO
AN/URC-100,101,110 RADIOS
AN/PSC-3 SATELLITE RADIO
AAWS-M ANTITANK WEAPON
AN/PAQ-1 LASER DESIGNATOR
MICROCLIMATE COOLING
AN/UIH-6 P.A. SYSTEM
AN/TVQ-2 LASER DESIGNATOR

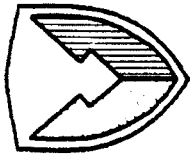
AN/PPS-15 RADAR
RT-1175/GSQ REPEATER
AN/PRD-1 DIRECTION FINDER
AN/PRC-77 RADIO
KY-38 ENCRYPTION DEVICES



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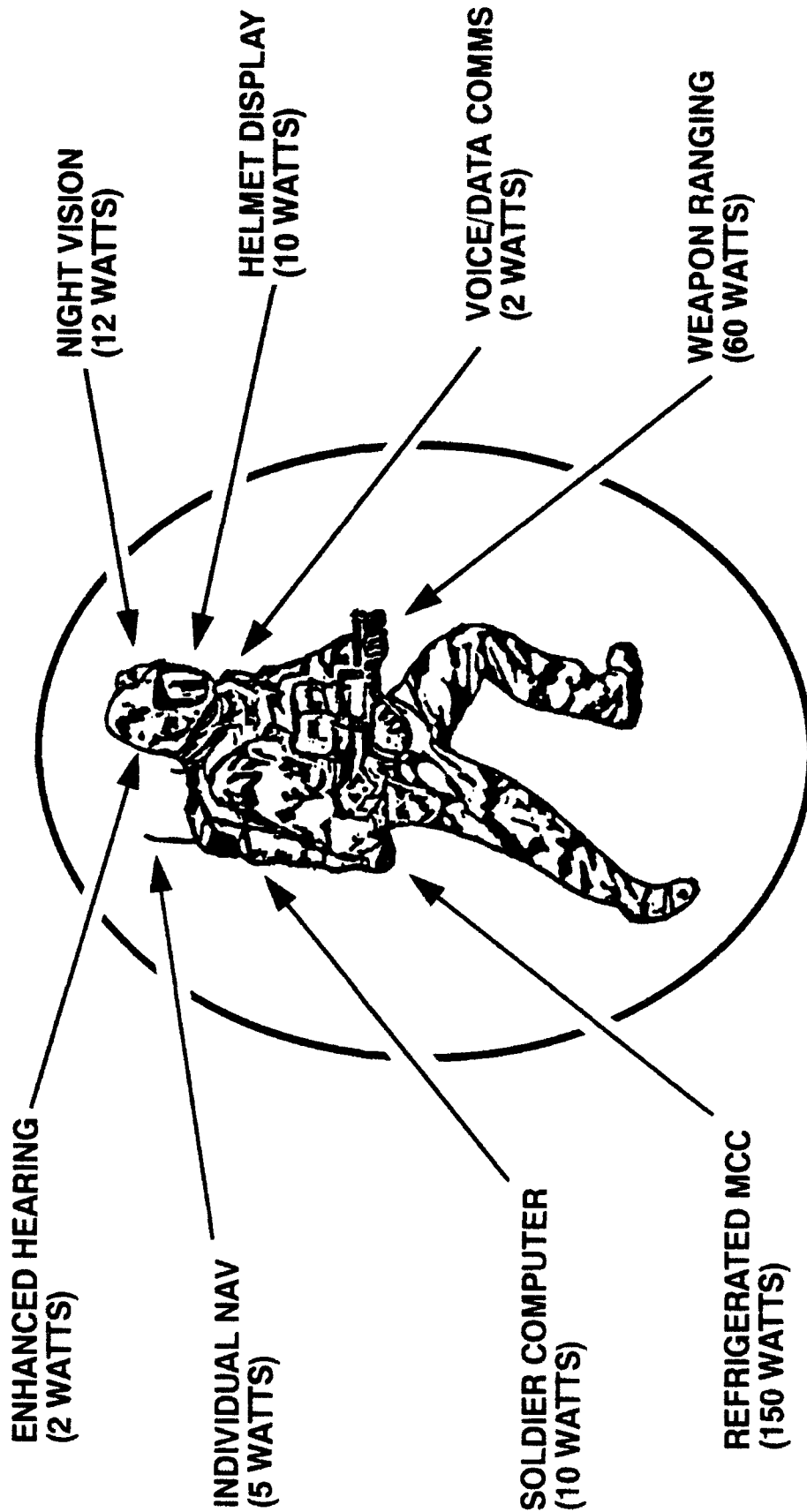


LIGHT WEIGHT STEALTHY POWER SOURCES FOR SOLDIER SYSTEM



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

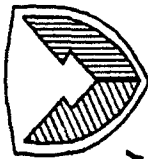


* THE FUTURE SOLDIER SYSTEM: EXOSKELETON (4500 WATTS)

SOLDIER/11-12-92/203/MT

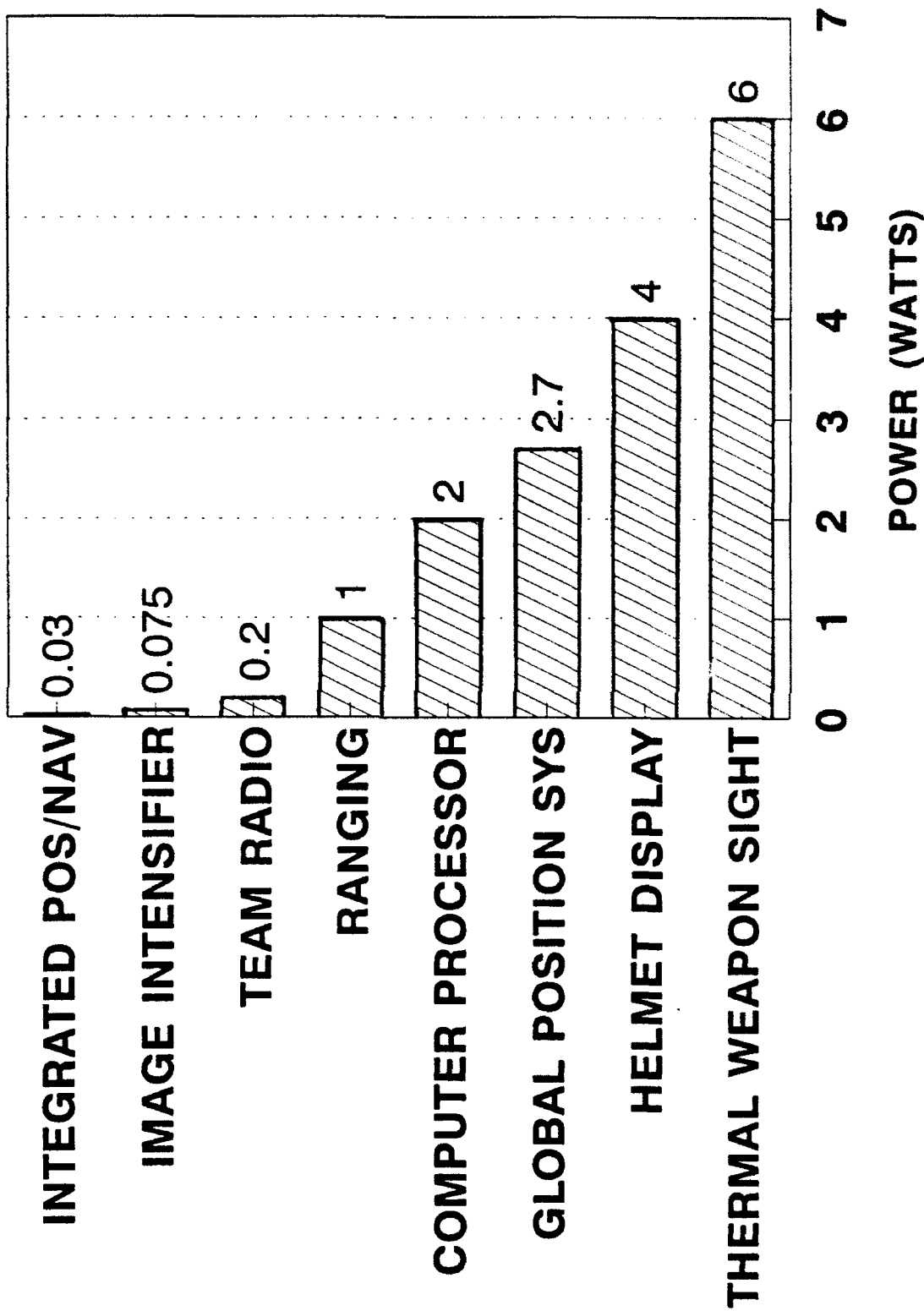


21ST CENTURY LAND WARRIOR TOTAL ELECTRONICS POWER



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES



PRIMARY BATTERIES



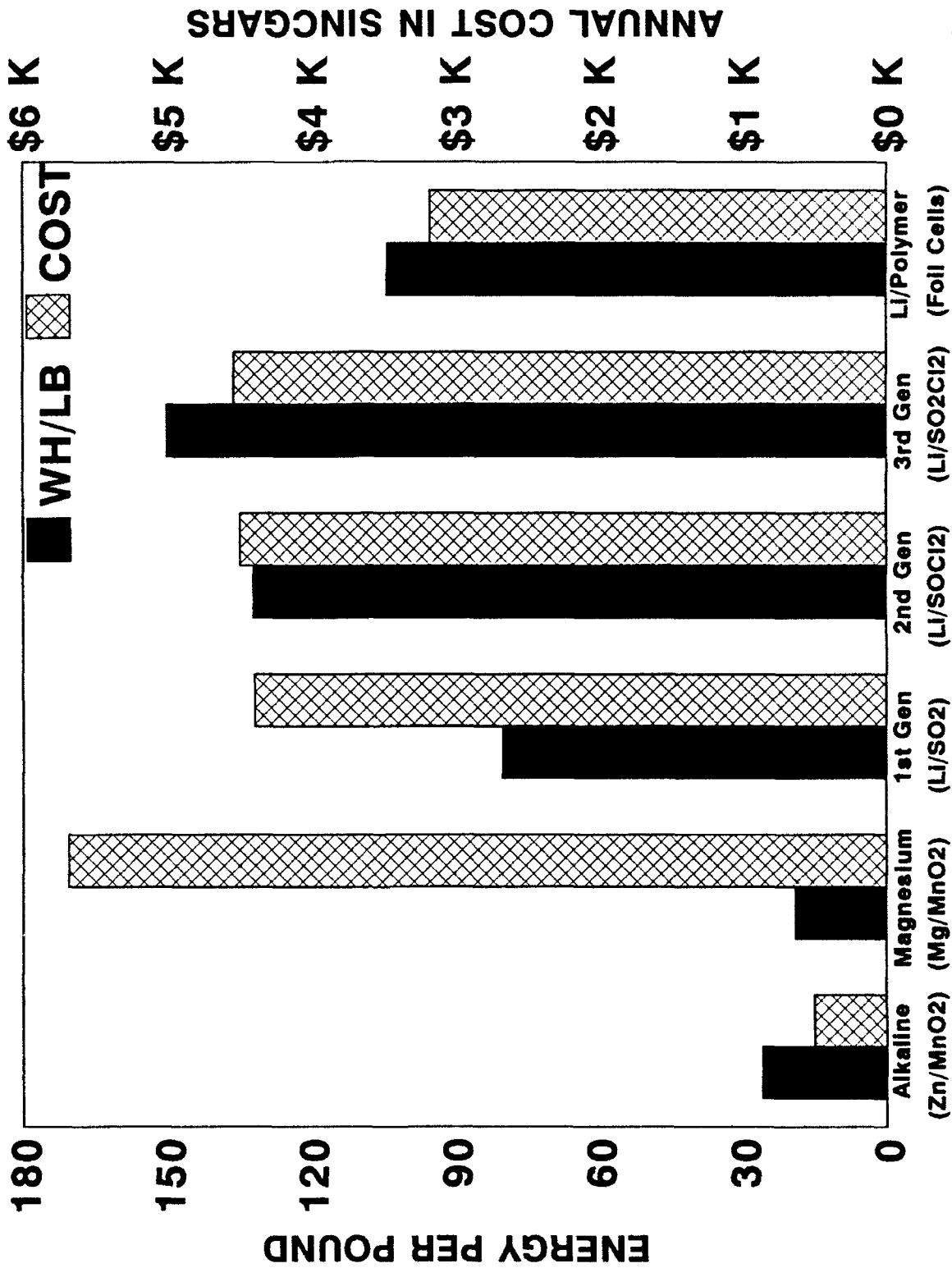


ADVANCES IN PRIMARY BATTERIES

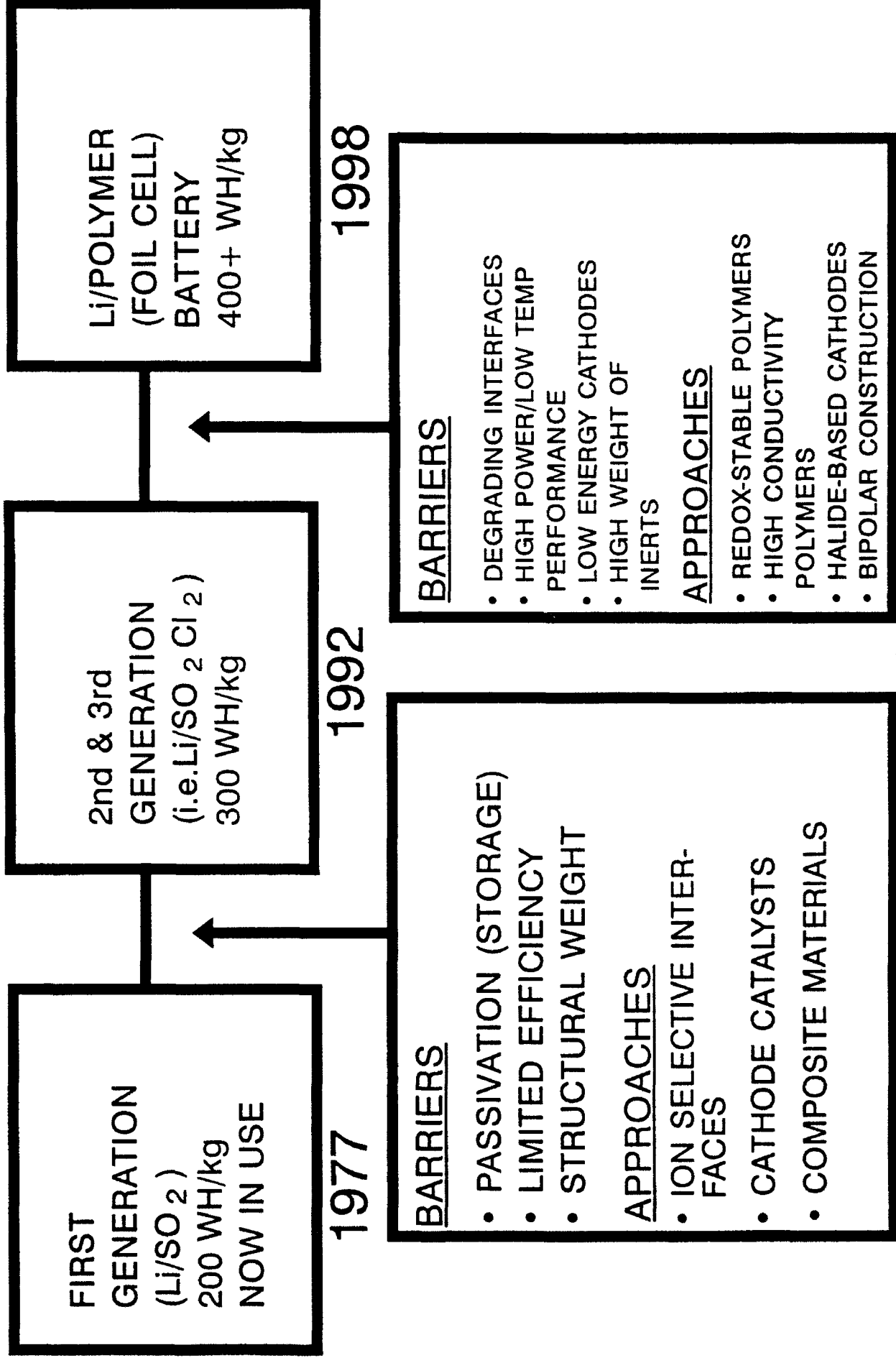


US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

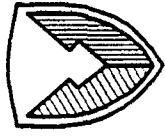


PRIMARY BATTERIES



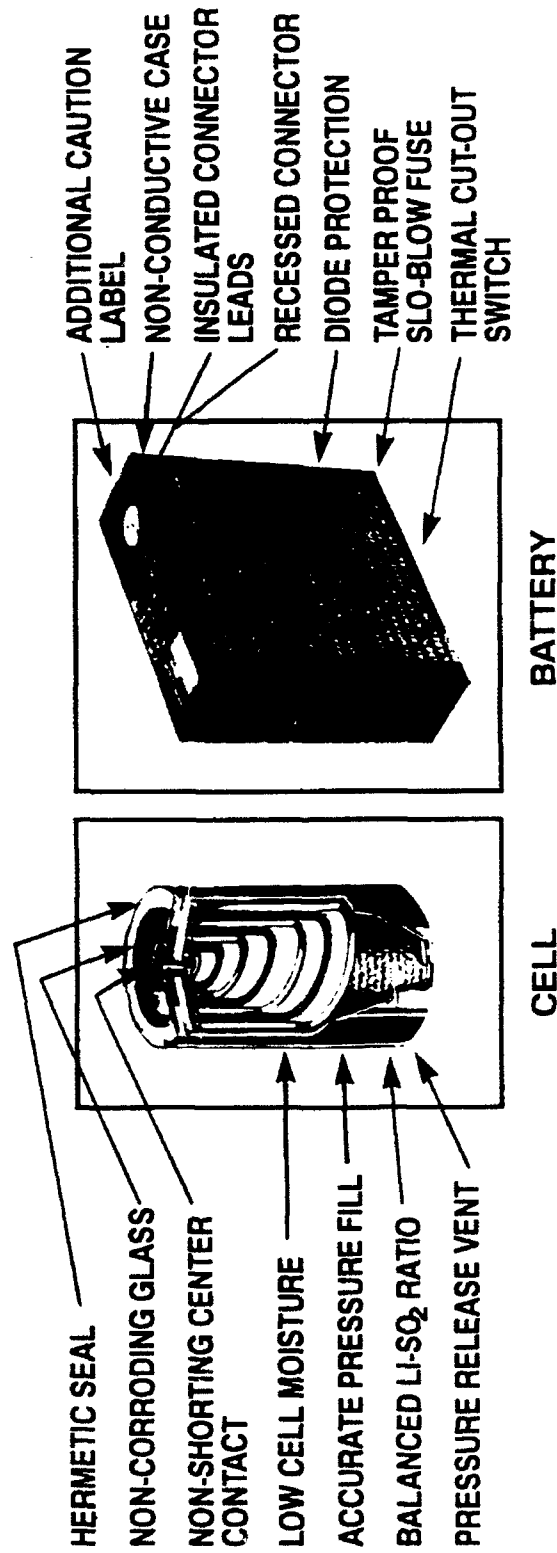


BUILT-IN LITHIUM BATTERY SAFETY FEATURES



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES



- STRESS TEST AND ANALYZE SAMPLE BATTERIES
- ESTABLISH QUALITY PROGRAM PLAN
- ADDED Q.C. ABUSE TESTS

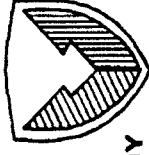
BATTERY/052793//206/SP

RECHARGEABLE BATTERIES





RECENT ARMY TRAINING BATTERY REQUIREMENTS



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

- RESULT FROM INCREASED EQUIPMENT POWER DEMANDS
 - EQUIPMENT USES MORE POWER
 - BATTERIES COST MORE
- NEEDS:
 - VEPY LOW COST PRIMARY BATTERY
 - LOW COST, LIGHT WEIGHT RECHARGEABLE BATTERY
 - HIGHER CAPACITY/CYCLE RECHARGEABLE BATTERY

TRAINREQ

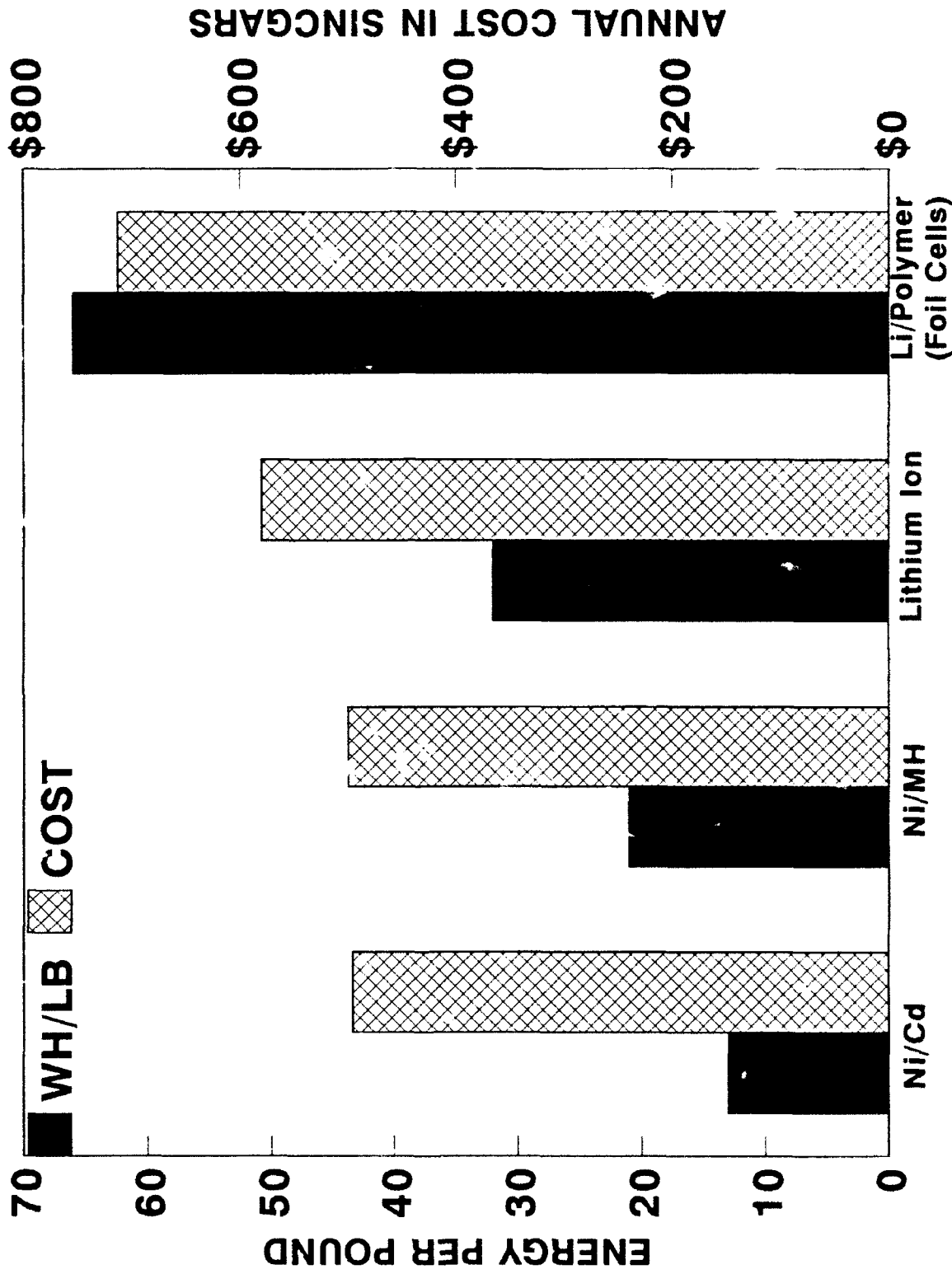


ADVANCES IN RECHARGEABLE BATTERIES



US ARMY
RESEARCH LABORATORY

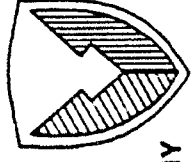
ELECTRONICS and POWER SOURCES





Comparison of Existing and Future Rechargeable Batteries

BB590 size, 2.45x5x4.4"-24V



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

	<u>Wh/Kg</u>	<u>AH</u>	<u>Safety Cycles</u>	<u>Comments/Limitation</u>
--	--------------	-----------	----------------------	----------------------------

Products Available

Ni Metal Hydride

40	3.0	+	150+	Potential for improvement
----	-----	---	------	---------------------------

NiCd

30	2.0	+	200+	Heavy/Low mission life
----	-----	---	------	------------------------

Lead-Acid

25	1.6	+	100	Heavy/Low mission life
----	-----	---	-----	------------------------

Silver-Zinc

110	6.0	+	50	1 year shelf life
-----	-----	---	----	-------------------

Future Production

Li-ion

100	3.5	?	200+	Low weight, long life/safety unresolved
-----	-----	---	------	---

Nickel-Zinc

60	2.8	+	100+	Requires a product development
----	-----	---	------	--------------------------------

Alk Manganese

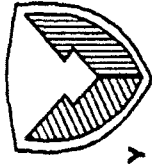
40	2.5	+	20	Under dev./Not yet available
----	-----	---	----	------------------------------

Metallic Li

160	7.0	?	50	Safety/risk to be determined
-----	-----	---	----	------------------------------



CHARACTERISTICS OF NICKEL - METAL HYDRIDE BATTERIES



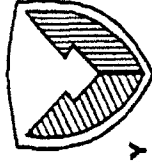
US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

- 50% INCREASE IN ENERGY CONTENT PER VOLUME OF NiCd
- VERY SIGNIFICANT OPERATING COST BENEFIT OVER PRIMARY BATTERIES
- UTILIZES NO TOXIC HEAVY METALS
- UTILIZES TECHNOLOGY THAT HAS COMMERCIAL APPLICATIONS
- RELATIVELY SAFE TECHNOLOGY
- FUTURE IMPROVEMENT POTENTIAL i.e. UP TO 4-5 AHR



CHARACTERISTICS OF LITHIUM-ION BATTERIES

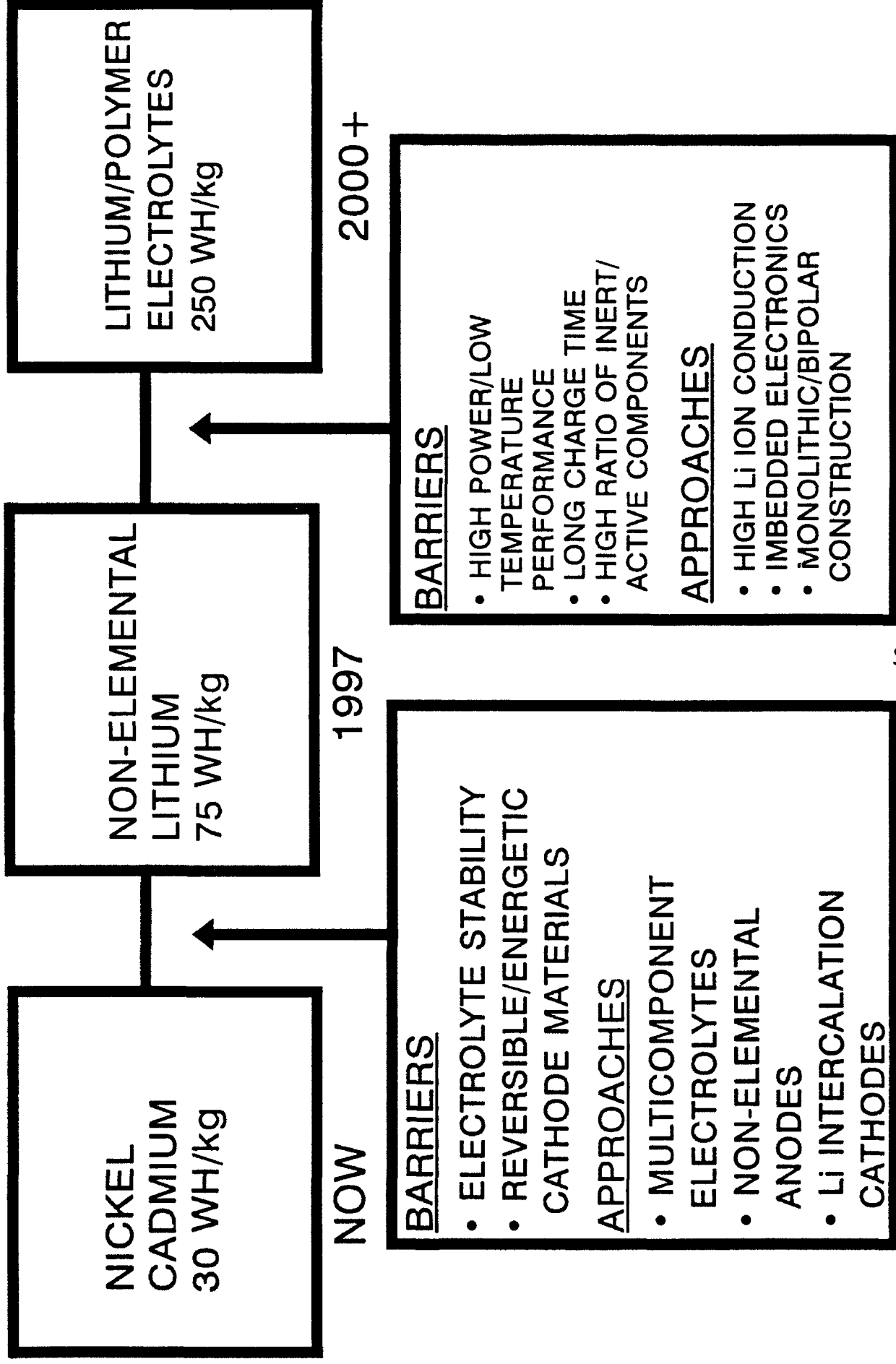


US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

- OVER THREE TIMES ENERGY CONTENT PER WEIGHT OF NiCd
- VERY SIGNIFICANT OPERATING COST BENEFIT OVER PRIMARY BATTERIES
- NO FREE LITHIUM METAL - ENVIRONMENTALLY LESS REACTIVE
- LOW POWER, COMMERCIAL APPLICATIONS IDENTIFIED
- LIMITED COMMERCIAL PRODUCTION BASE
- CYCLE-LIFE EQUAL TO NiCd

RECHARGEABLE BATTERIES





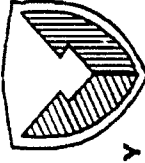
OTHER POWER SOURCES



SMART WEAPONS AND FUZE POWER SUPPLIES

ELECTRONICS and POWER SOURCES

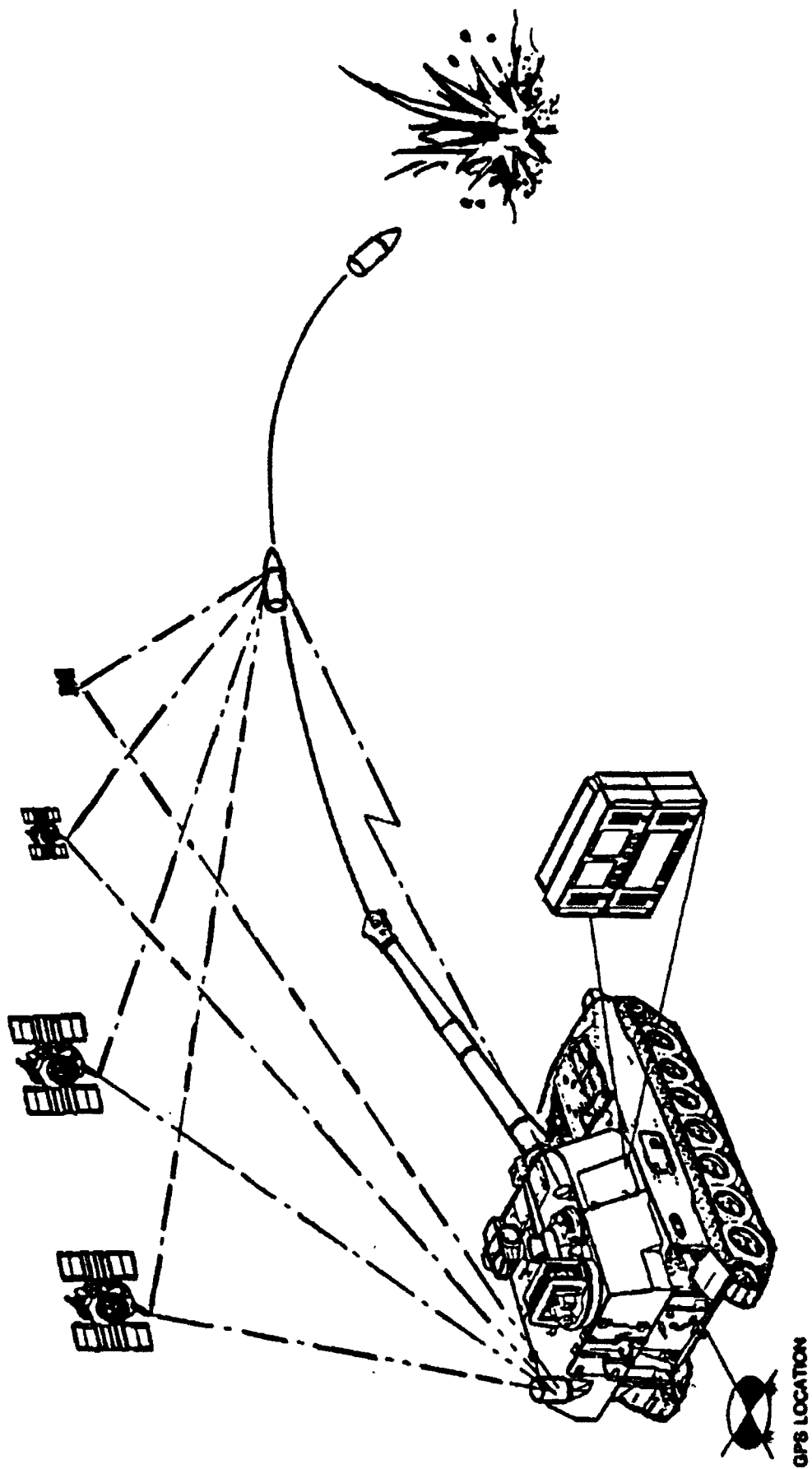
US ARMY
RESEARCH LABORATORY



RESERVE POWER SUPPLIES

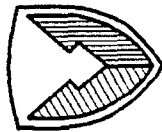
TWO GENERAL TYPES

- LIQUID ELECTROLYTE RESERVE BATTERIES
FOR SPIN-STABILIZED ORDNANCE
- THERMAL RESERVE BATTERIES FOR NON-SPIN
ORDNANCE



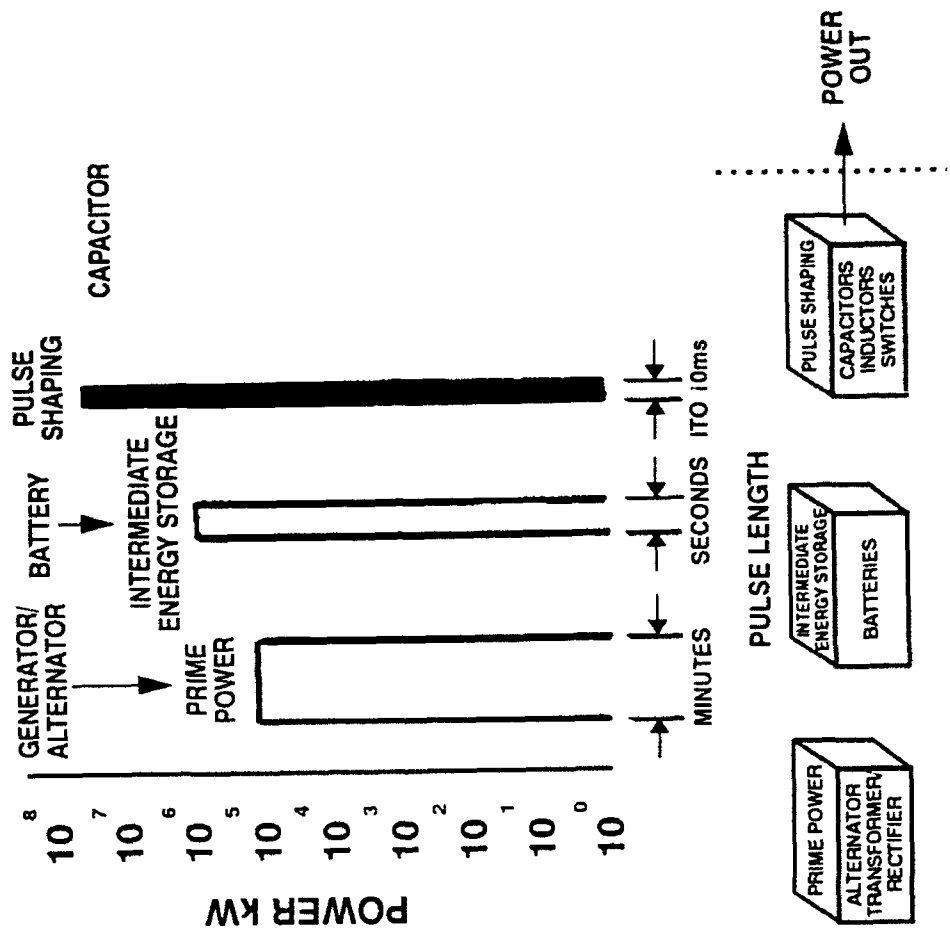


BATTERY/CAPACITOR-BASED POWER FOR TACTICAL ELECTRIC GUNS



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES



BATCAP/9/28/92/#8 (TEMP)/SP

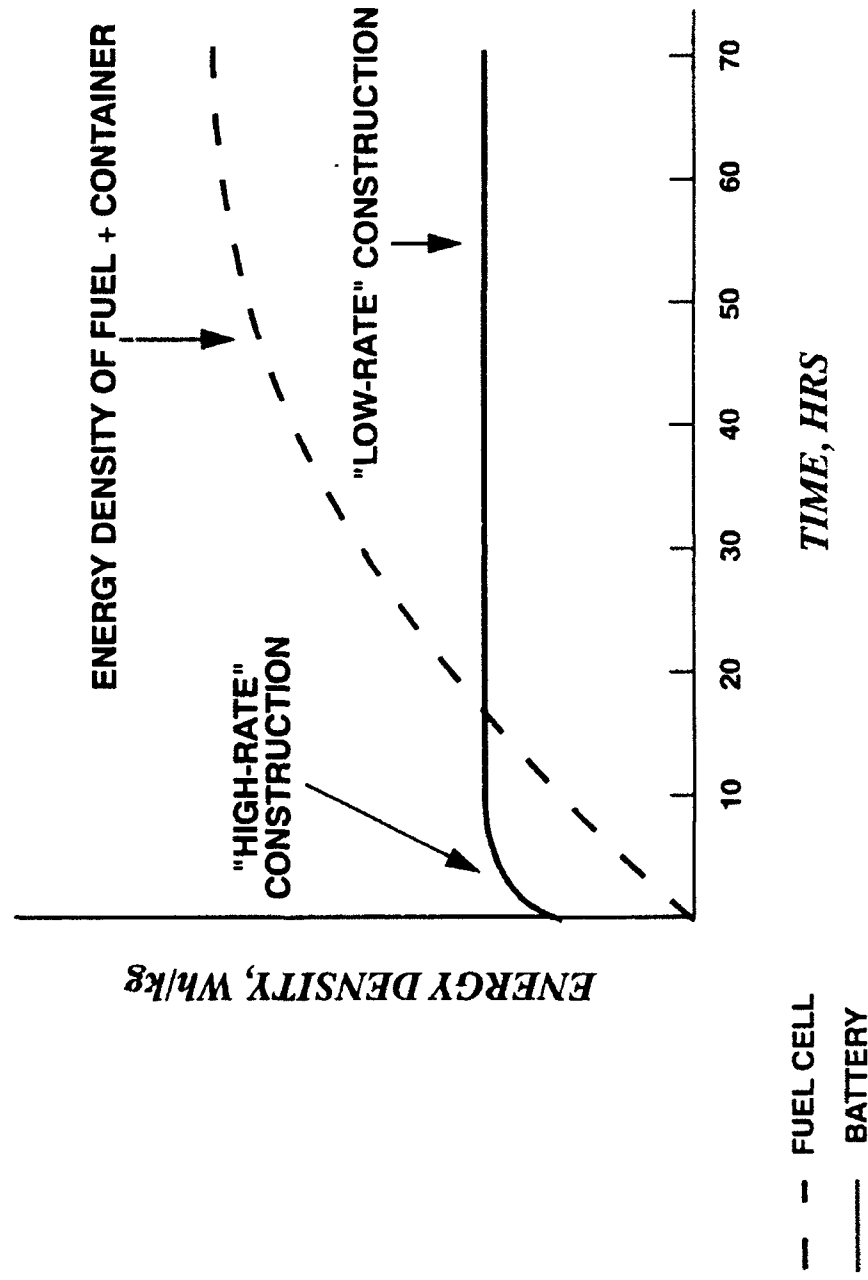


FUEL CELLS

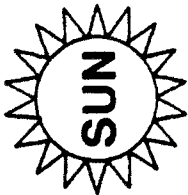


US ARMY
RESEARCH LABORATORY

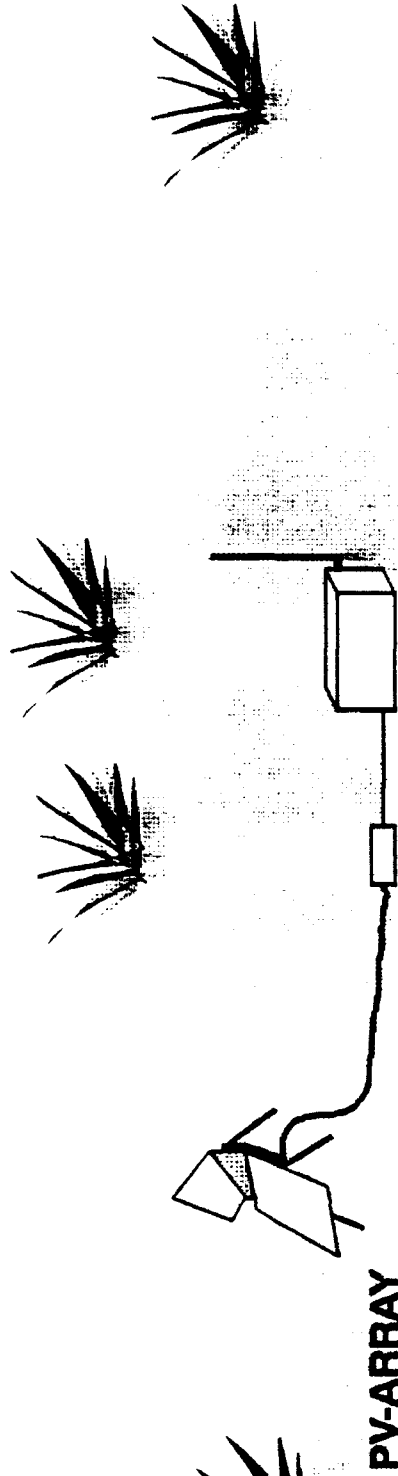
ELECTRONICS and POWER SOURCES



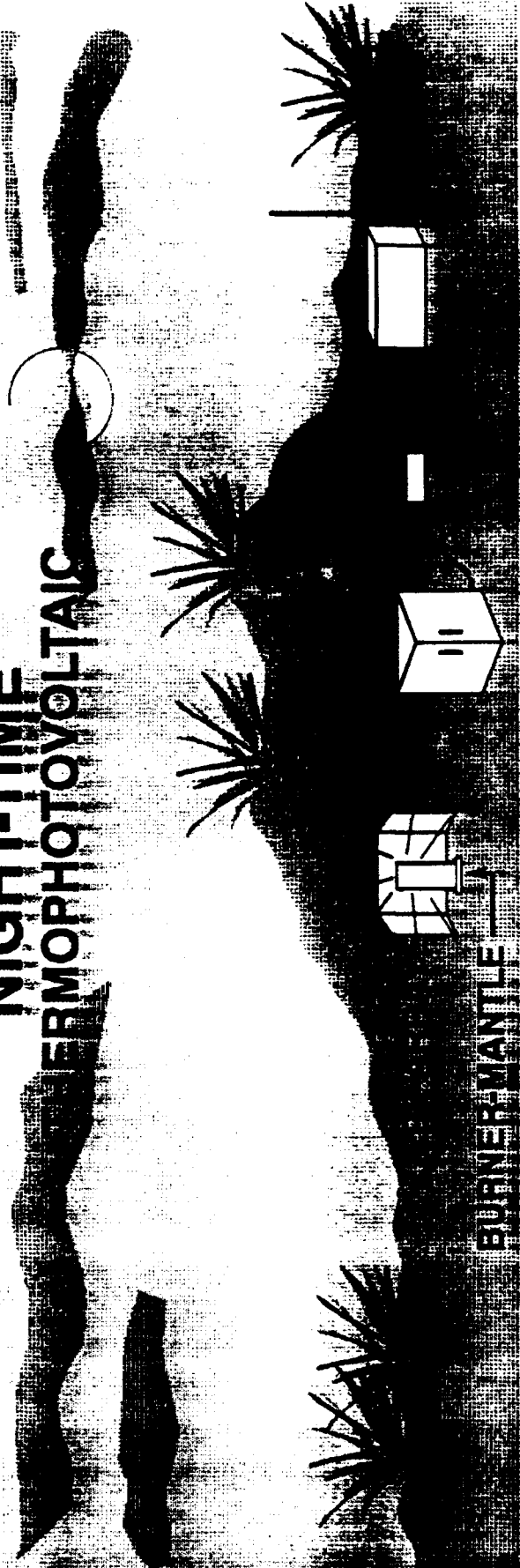
GR341B/012293/#5/SP



DAYTIME PHOTOVOLTAIC



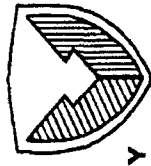
NIGHT-TIME THERMOPHOTOVOLTAIC



BAA'S AND SBIR'S



PRESENT AND FUTURE BAA'S



US ARMY
RESEARCH LABORATORY

ELECTRONICS and POWER SOURCES

FY93

- HIGH ENERGY - HIGH POWER NONRECHARGEABLE (24)
- FUEL CELL HYDROGEN GENERATOR & CELL STACK (24)
- LITHIUM - ION, BB-X590 (18)
- RECHARGEABLE ZINC - ALKALINE (24)

FY 94

- LITHIUM-ION, FAMILY (24)
- HIGH TEMPERATURE SOLID OXIDE FUEL CELL (48)
- NICKEL-METAL HYDRIDE POUCH BATTERY (24)

()MONTHS



PRESENT AND FUTURE SBIR PROPOSALS



**US ARMY
RESEARCH LABORATORY**

ELECTRONICS and POWER SOURCES

FY 93

- POLYMER ELECTROLYTES FOR PRIMARY
AND RECHARGEABLE BATTERIES**
- POLYMER ELECTROLYTE MEMBRANES FOR
FUEL CELLS AND BATTERIES**

FY 94

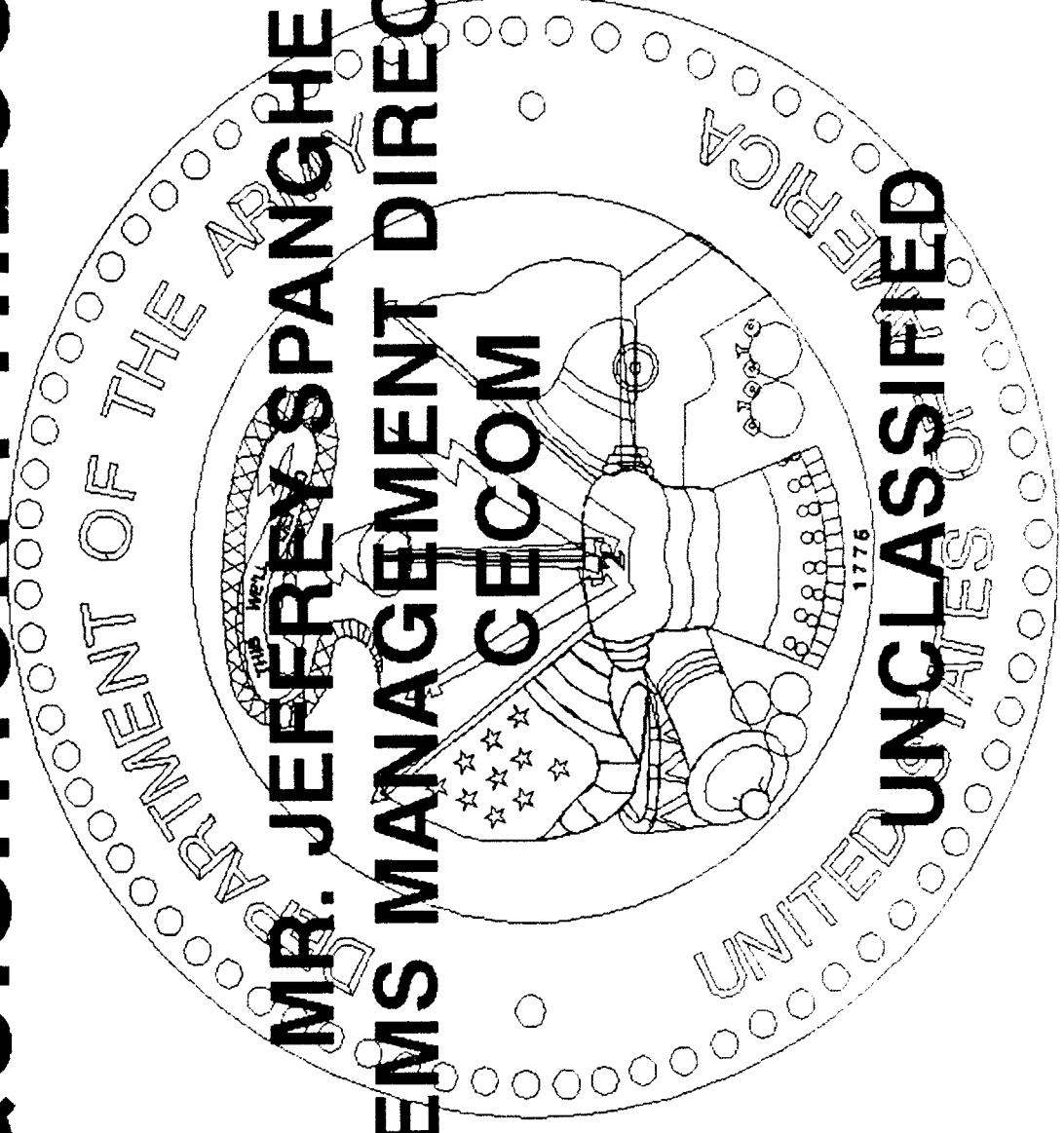
- POLYMER ELECTROLYTES FOR PRIMARY
AND RECHARGEABLE BATTERIES**
- METHANOL FUEL CELL ELECTROLYTES
AND MODULES**

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NOTES

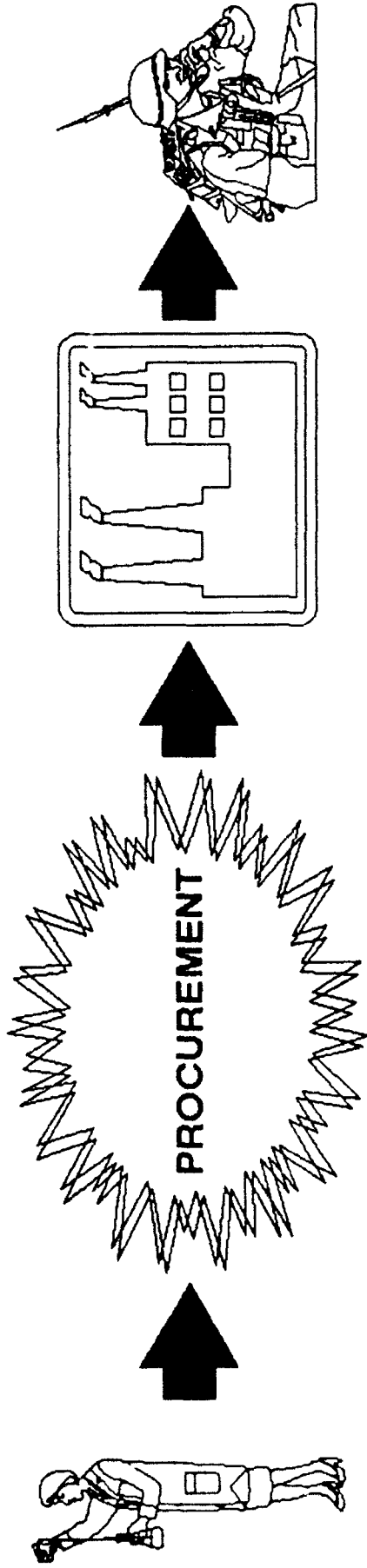
ACQUISITION PHILOSOPHY

MR. JEFFREY SPANGHER
SYSTEMS MANAGEMENT DIRECTORATE
CECOM



UNCLASSIFIED

BRINGING POWER TO THE USER



**RESEARCH &
DEVELOPMENT**

**ACQUISITION
PHILOSOPHY**

PRODUCTION

FIELDING

STEPS TO THE NEXT GENERATION

LITHIUM
SO₂



INTERIM
REPLACEMENT
OF NICADS



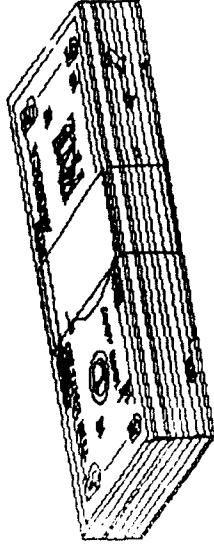
OBJECTIVE:
* RECHARGEABLE
* PRIMARY
* AIRCRAFT

INTERIM
OMNIBUS
AIRCRAFT

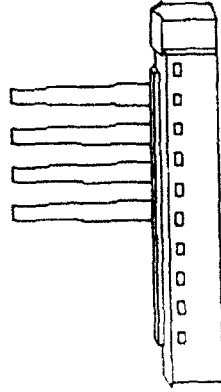


ACQUISITION PHILOSOPHY

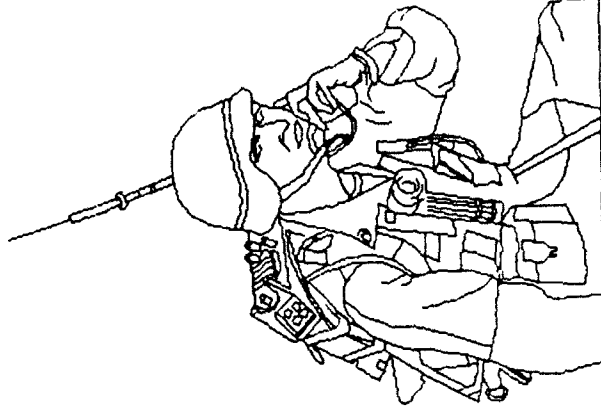
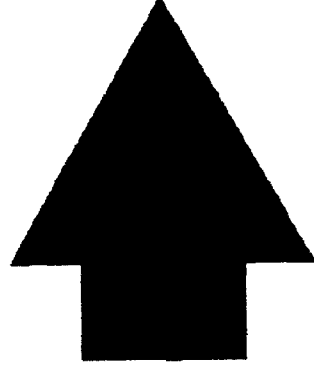
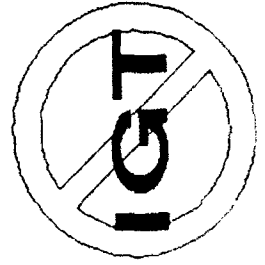
GOALS



LOW UNIT PRICE
COST EFFECTIVE



DUAL USE TECHNOLOGY
AUTOMATED FACILITIES
RAPID SURGE PRODUCTION



TOMORROW'S
POWER
SOURCES

OTHER CONSIDERATIONS

- RECYCLING:
 - BATTERY CASES
 - BATTERY ELECTRONICS
 - RAW MATERIALS
- DIRECT SHIPMENT FROM CONTRACTOR TO USER
- PERFORMANCE ORIENTED SPECIFICATIONS
- "D CELL" CONCEPT
- CONTRACT INCENTIVES

SCHEDULE

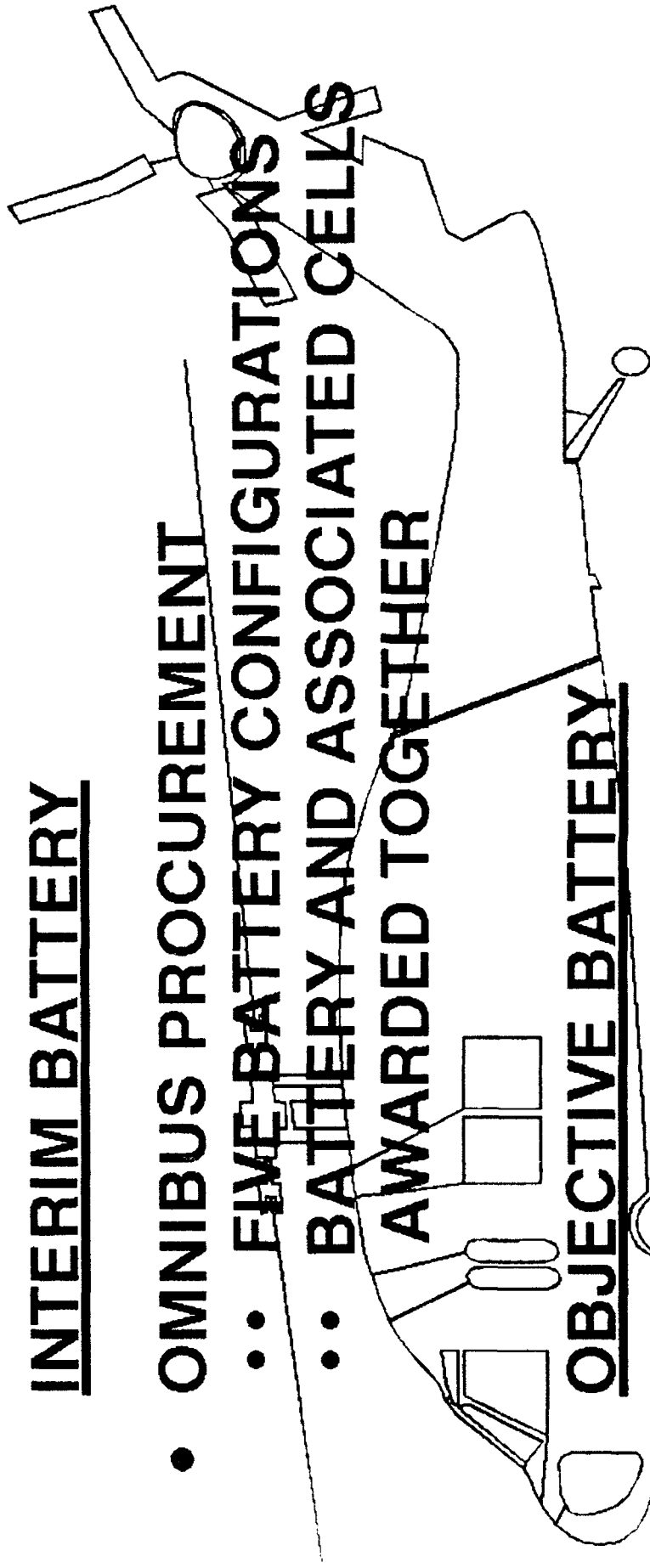
ACTION	FY94	FY95	FY96	FY97	FY98
<u>AIRCRAFT</u>					
INTERIM	A	F			
OBJECTIVE			A	F	
<u>REPLACE NICAD</u>					
INTERIM	A	F			
OBJECTIVE			A	F	
<u>REPLACE LI/SO2</u>					
OBJECTIVE			A	F	

A = CONTRACT AWD, F = AVAILABLE TO FIELD

AIRCRAFT BATTERIES

INTERIM BATTERY

- OMNIBUS PROCUREMENT
 - FIVE BATTERY CONFIGURATIONS
 - BATTERY AND ASSOCIATED CELLS AWARDED TOGETHER

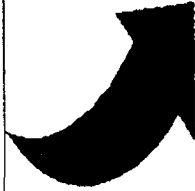


OBJECTIVE BATTERY

- ACTUAL CHEMISTRY DETERMINED BY FLY OFF

INTERIM RECHARGEABLE BATTERIES

IDENTIFY
POTENTIAL DUAL
CHEMISTRIES



IDENTIFY
CELL CONFIGURATION/
BATTERY MATCHES



PROCURE
AVAILABLE
CELL/BATTERY
MATCHES

DUAL USE
TECHNOLOGY

STANDARD
CHEMISTRY



CONTINUED
PRODUCT
IMPROVEMENT

OBJECTIVE PRIMARY AND RECHARGEABLE BATTERIES

EVALUATE
POTENTIAL
CHEMISTRIES

DUAL USE
TECHNOLOGY

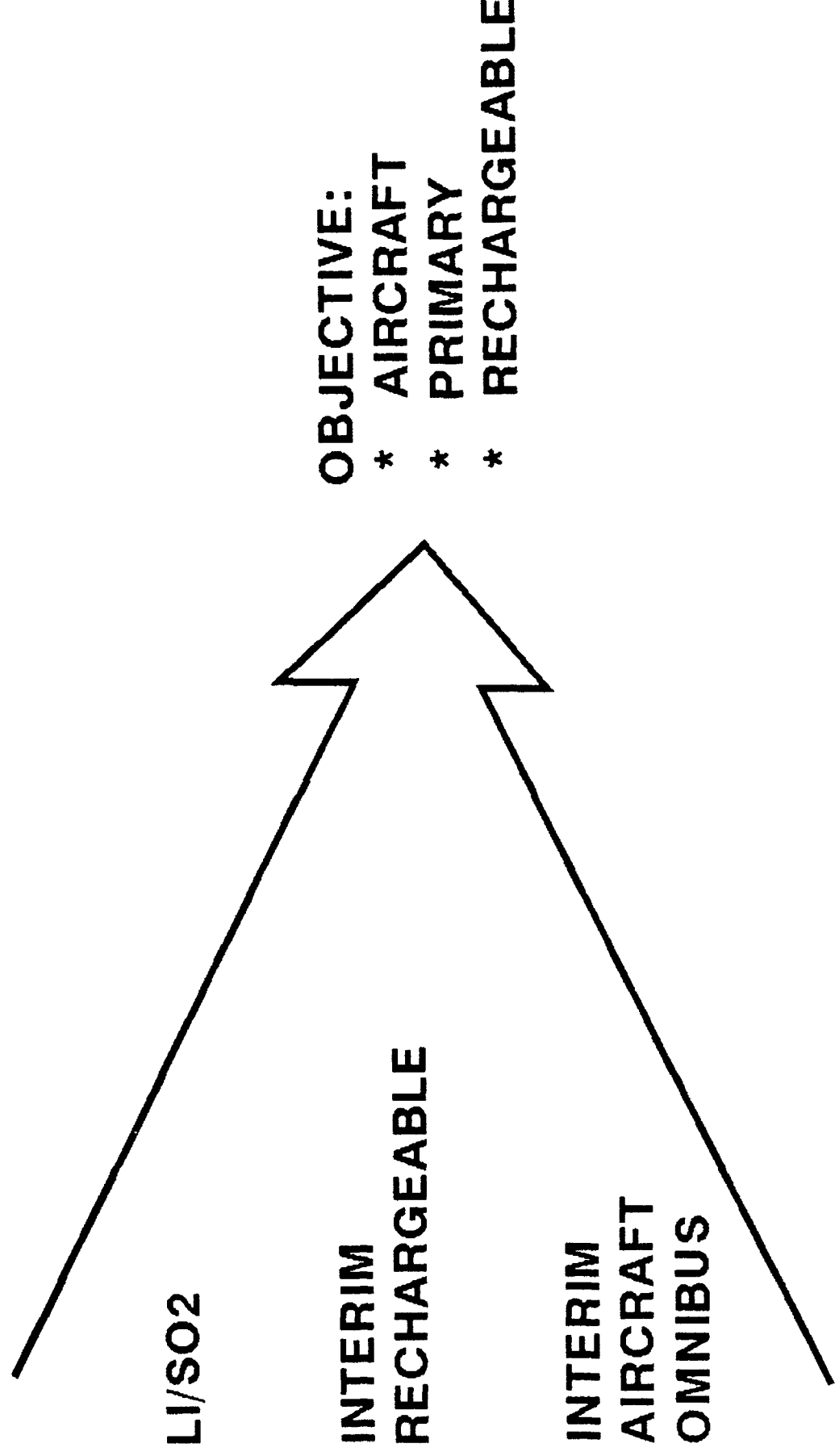
DETERMINE
BEST
CANDIDATES

COMPETE
BEST
CANDIDATES

STANDARD
CHEMISTRY

REPLACE
ENTIRE
FAMILY

ACQUISITIONS





NOTES

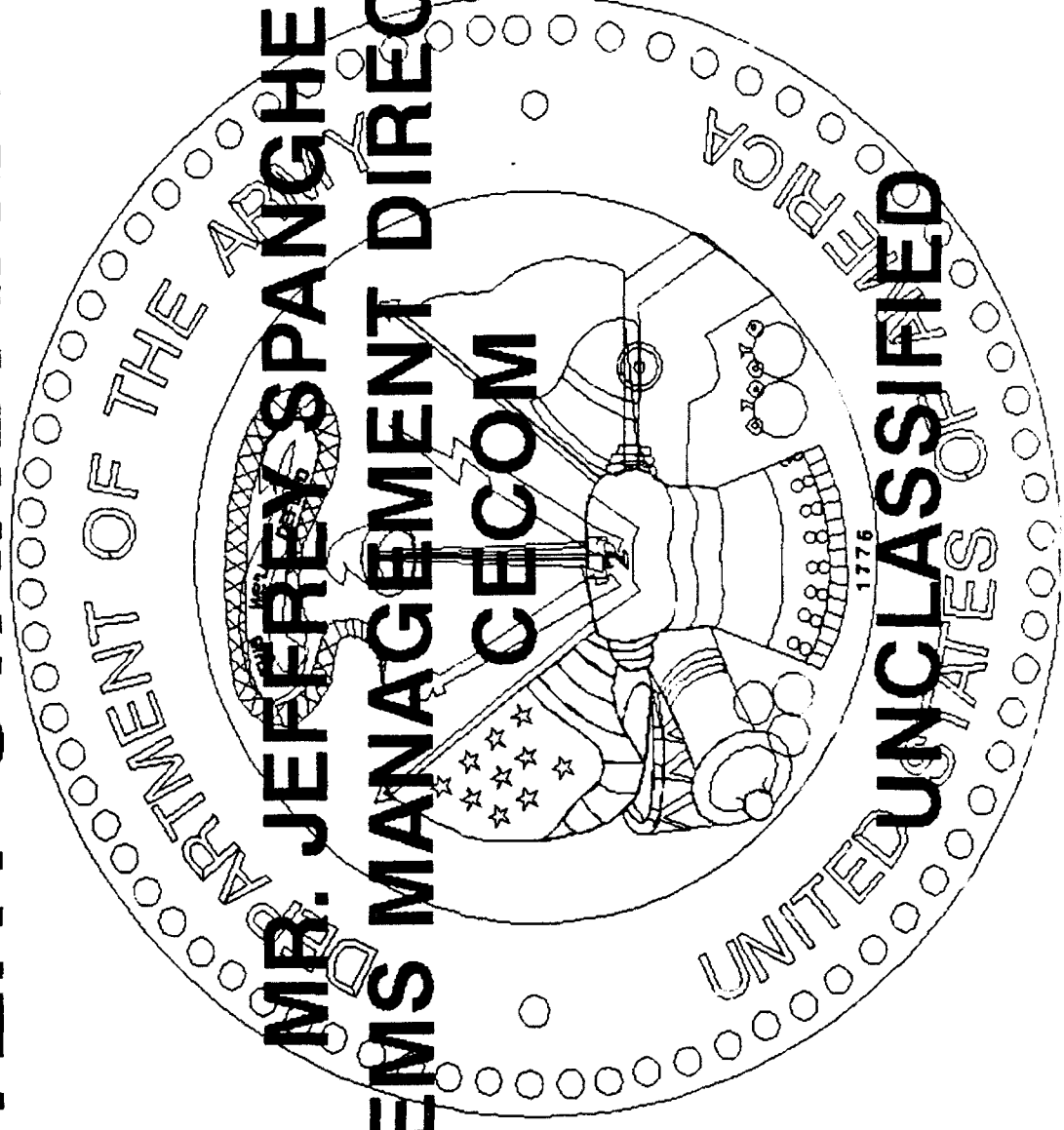


SESSION II

REDUCTION OF BATTERY RELATED OPERATING AND SUPPORT COSTS

BATTERY STANDARDIZATION

MR. JEFFREY SPANGHER
SYSTEMS MANAGEMENT DIRECTORATE
CECOM



UNCLASSIFIED

BATTERY STANDARDIZATION GOALS

**REDUCE NUMBER
OF BATTERIES**

**ONE BATTERY
PER VOLTAGE**

**INFLUENCE END
ITEM DESIGN**

**ELIMINATE BATTERY
PROLIFERATION**

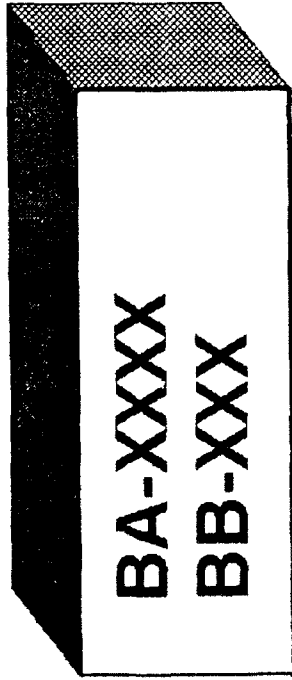
**REDUCE BATTERY
RELATED O&S
COSTS**



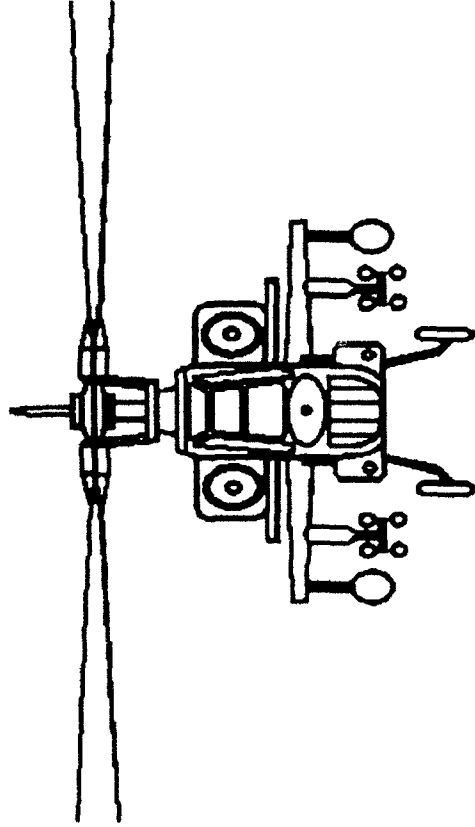
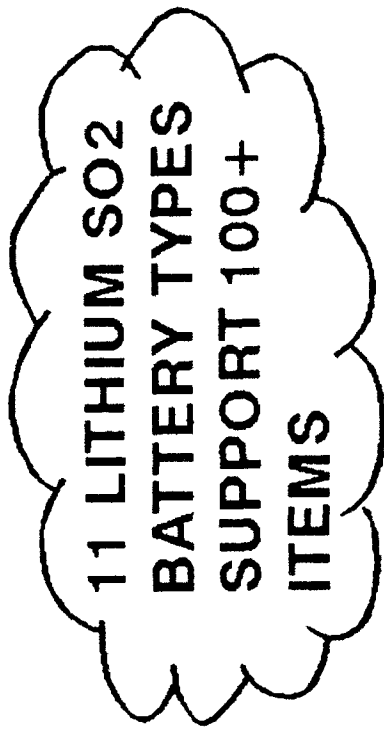
**STANDARD
CHEMISTRIES &
CONFIGURATIONS**

CECOM MANAGED BATTERIES

C/E BATTERIES



213 BATTERY TYPES
SUPPORT 500+ END
ITEMS



9 BATTERY TYPES
9 AIRCRAFT

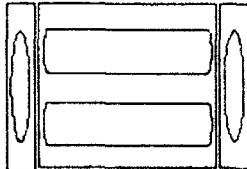
BATTERY PROLIFERATION

CAUSES:

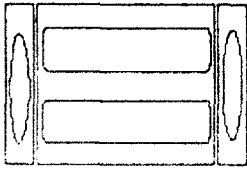
- ✓ USER REQUIREMENTS
- ✓ CONTRACTOR DESIGN SOLUTIONS
- ✓ NDI PROCESS

IMPACT:

- ✓ INCREASE IN NUMBER OF BATTERY TYPES
- ✓ HIGH UNIT PRICE
- ✓ INCREASED O&S COSTS
- ✓ LIMITED PRODUCTION CAPABILITY
- ✓ INCREASED LOGISTICAL BURDEN



BATTERY STANDARDIZATION



LOWERS
O&S COSTS

DECREASES
UNIT PRICE

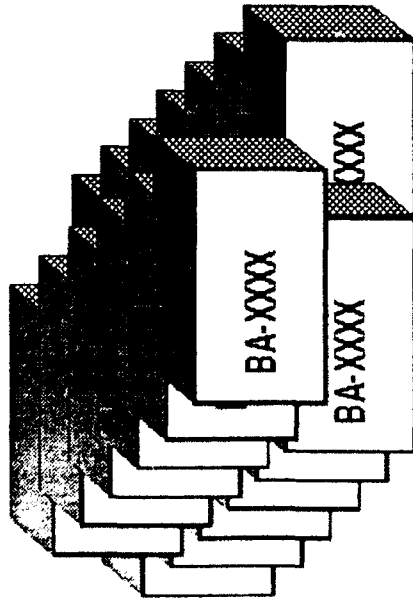
REDUCES
LOGISTICS
BURDEN

REDUCES
ADMIN BURDEN

IMPROVES
SURGE
PRODUCTION

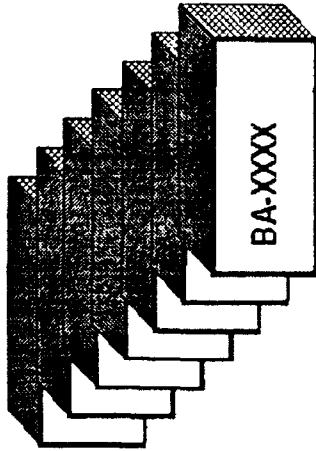
C/E BATTERY STANDARDIZATION

YESTERDAY



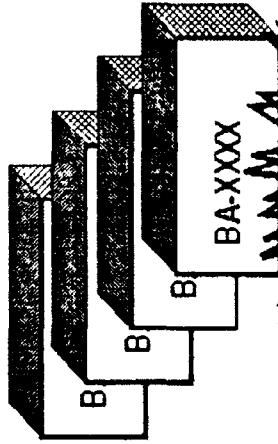
UNCONTROLLED
PROLIFERATION

TODAY



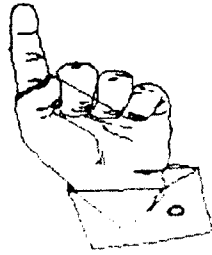
STANDARD
LI/SO2
BATTERIES

TOMMORROW



4 STANDARD
BATTERIES

FUTURE STANDARDIZATION



MOST DESIRABLE:

USE OF STANDARD CONSUMER
CONFIGURATIONS (A, C, D, 9V CELLS)



ACCEPTABLE:

USE OF MILITARY STANDARD BATTERY
ALREADY IN INVENTORY

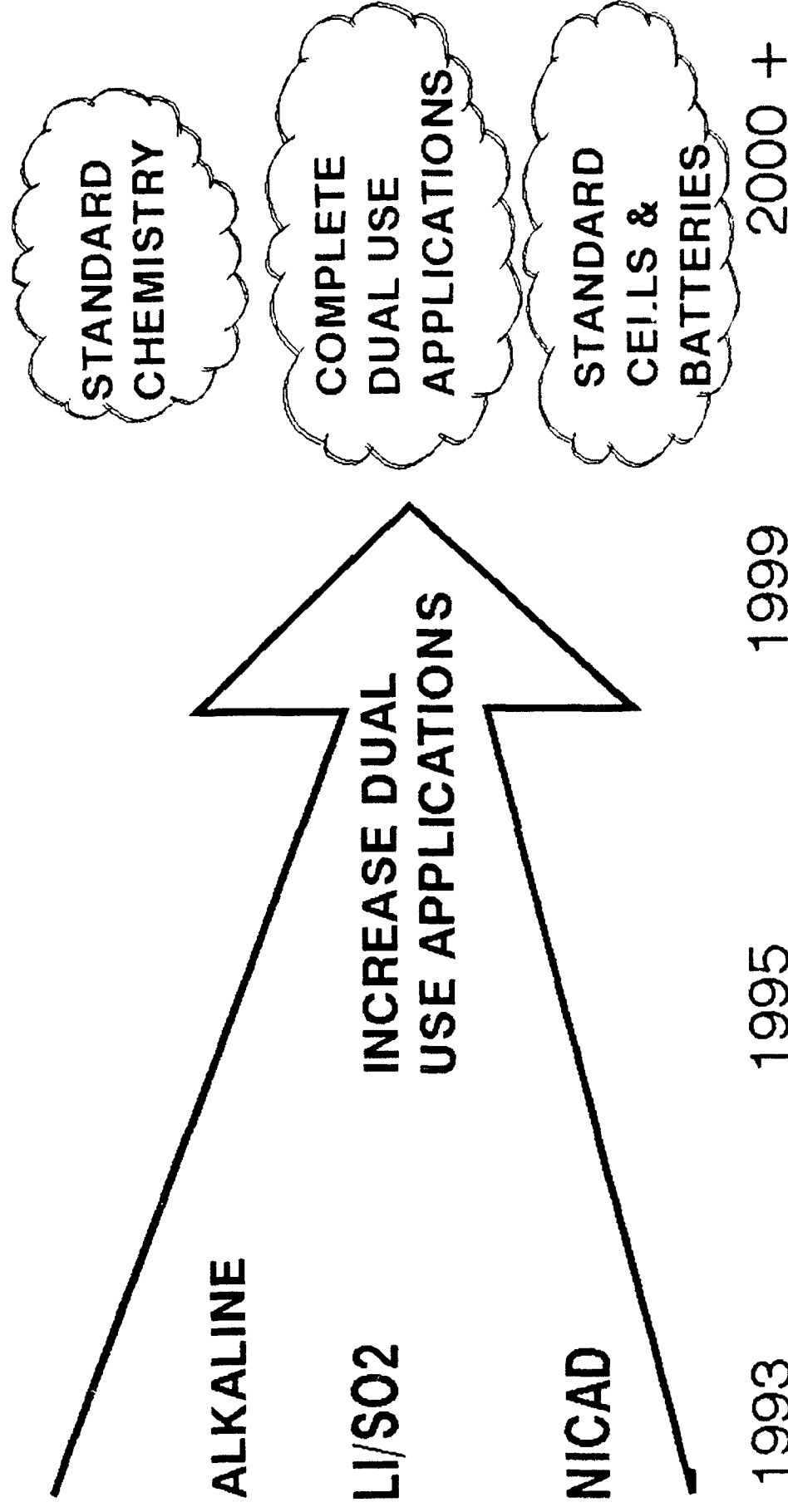


UNDESIRABLE

- USE OF NEW DESIGN
- USE OF NEW MILITARY UNIQUE CHEMISTRY



BATTERY STANDARDIZATION



BATTERY STANDARDIZATION IS AN ONGOING EFFORT



NOTES

**DEPARTMENT OF DEFENSE
AVIATION BATTERY SYSTEMS
STANDARDIZATION (AVBATTSS)**



**MR. DAN KIEFFNER
CHAIRMAN, AVBATTSS
(812) 854-1593**

UNCLASSIFIED

OUTLINE

- * AVBATTSS BACKGROUND**
- * COOPERATIVE EFFORTS TO DATE**
- * PRESENT PROGRAMS**
- * FUTURE ACTIONS**

DOD BATTERY BACKGROUND

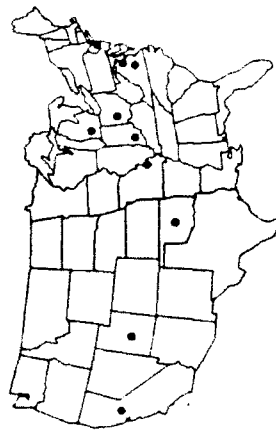
- * PRESENT IN ALL WEAPONS SYSTEMS AND MANY SUBSYSTEMS**
- * ANNUAL PROCUREMENT $\geq$ \$250M**
- * VIRTUALLY UNCONTROLLED PROLIFERATION**
- * TECHNOLOGICAL OBSOLESCENCE**

AVIATION BATTERY SYSTEMS STANDARDIZATION SUBGROUP (AVBATTSS)

- CHARTERED BY AVIATION ACQUISITION CMDRS. ★★ ★
(NAVAIR, AFMC/ASC, ATCOM)

- PARTICIPATING ORGANIZATIONS:

ATCOM	AFMC/ASC	NAVAIR
ARL	WRIGHT LABS	NSWC CRANE
CECOM	SACRAMENTO ALC	NAVSUP
DGSC	OKLA. CITY ALC	CASC
OGDEN ALC		



- CHARTERED AVBATTSS TO COORDINATE
ALL AVIATION BATTERIES

(MAIN, SUPPORT EQUIP, AVIONICS,
MUNITIONS, LIFE SUPPORT/SURVIVAL)

AVBATTSS MISSION

- **ELIMINATE DUPLICATE EFFORTS**
- **REDUCE PROLIFERATION**
- **REDUCE OPERATING & SUPPORT COSTS**
- **JOINT SPECS/PROCUREMENTS**
- **COORDINATE WITH OTHER JACG
SUBGROUPS**
- **INCREASE BATTERY RELIABILITY**
- **UNIFIED APPROACH TO HANDLING
HAZARDOUS BATTERY MATERIALS**

EARLY SUCCESSES

- ARMY STANDARD BATTERIES IN JTIDS, SSBA,
AN/AVS-5, SFIR, OTHERS (BA-5XXX SERIES)
- USE OF OTHER SERVICES' CAPABILITIES
- TRI-SERVICE DATABASE
USED BY DoD, OEMs FOR BATTERY SEARCHES
CONTAINS TECHNICAL ATTRIBUTES BY NSN
77 DATACALLS IN LAST 12 MONTHS
- NETWORKING

CURRENT EFFORT: NI-CD VENT CAPS

- BEFORE:

**DIDN'T RETAIN ELECTROLYTE
DIDN'T EXCLUDE CONTAMINANTS
DIDN'T VENT PROPERLY**

- AFTER:

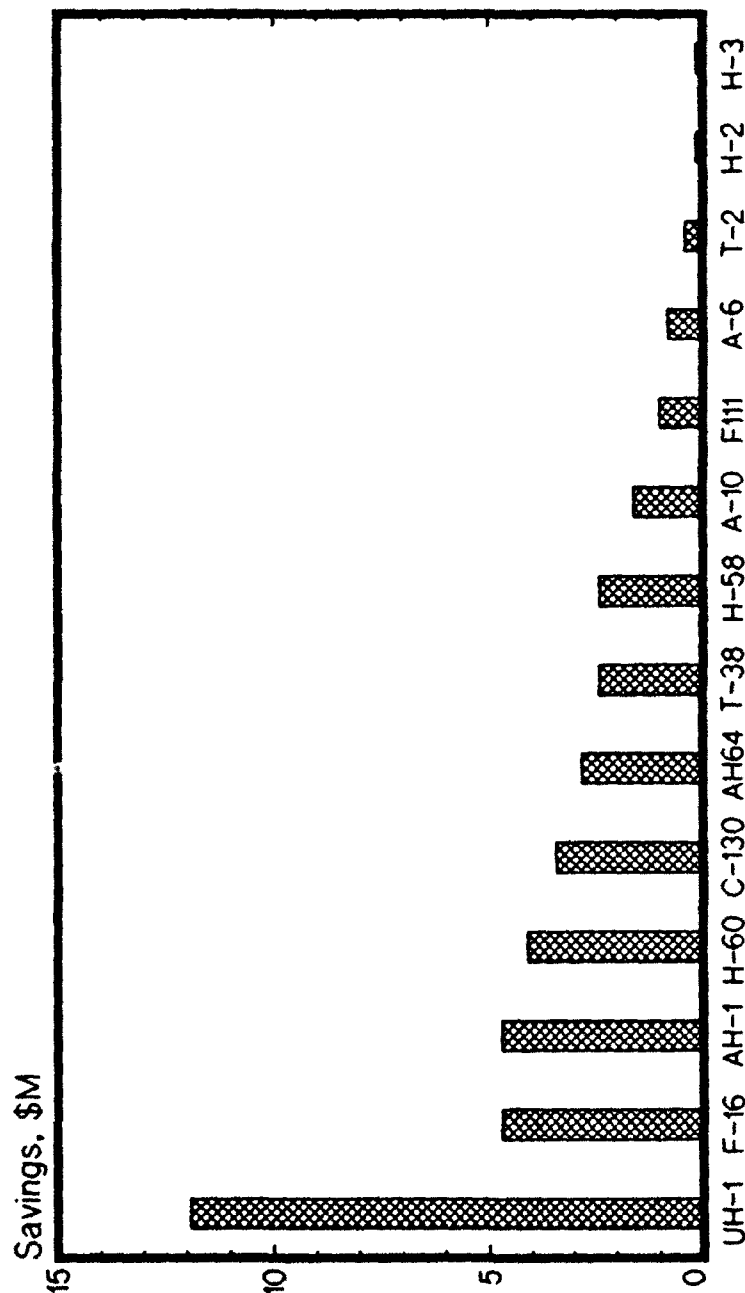
**GENERAL PURPOSE DESIGN
AEROBATIC DESIGN**

- EFFECT:

POTENTIAL COST AVOIDANCE OF \$38M / YR

POTENTIAL SAVINGS (DUE TO VENTCAPS) BY AIRCRAFT

ANNUAL
SAVINGS



AIRCRAFT

SAVINGS DUE TO REDUCED SCHEDULED AND UNSCHEDULED MAINTENANCE

CURRENT EFFORT: MULTISERVICE PROCUREMENT INITIATIVES

- PROBLEM:

**DIFFERENT SERVICES PURCHASE
SIMILAR BATTERIES
(EX.: 30AH NI-CD, H-60 BATTERIES)**

- SOLUTION:

**RESOLVE TECHNICAL DIFFERENCES
COMBINE PURCHASES OF BATTERIES**

BATTERY STANDARDIZATION

- **PROBLEM:**

UNIQUE SPECS/BATTERIES FOR SYSTEMS

- **SOLUTION:**

**COMBINE EXISTING SPECS
CONTROL NEW BATTERIES**

- **SPEC REVIEW:**

**PRESENT - 16 MAIN ACFT BTRY. SPECS
FUTURE - 3 MAIN ACFT BTRY. SPECS**

- **GUIDE TO PM's AND DESIGNERS
FOR BATTERY SYSTEM SELECTION**

LISTS SPECS, PROVIDES POCs

CURRENT EFFORT: STANDARD AIRBORNE CHARGER

- **WL / ARPA / CHRYSLER COORDINATED**
- **MODULAR TECHNOLOGY
ADD PARALLEL MODULES FOR MORE POWER**
- **TECHNOLOGY DUAL-USE:
AIRCRAFT & ELEC. VEHICLES**
- **CHARGER RFP EXPECTED 2ND HALF CY 93**
- **OPPORTUNITIES:**

CHARGER AND COMPONENTS

**CURRENT EFFORT:
NI-CD O&S IMPROVEMENTS**

- **GOAL: INCREASE MAINTENANCE INTERVAL**

- **TECHNOLOGY FLIGHT TESTS**

SAFT ULM: UH-1

EPI SEALED NI-CD: E-8

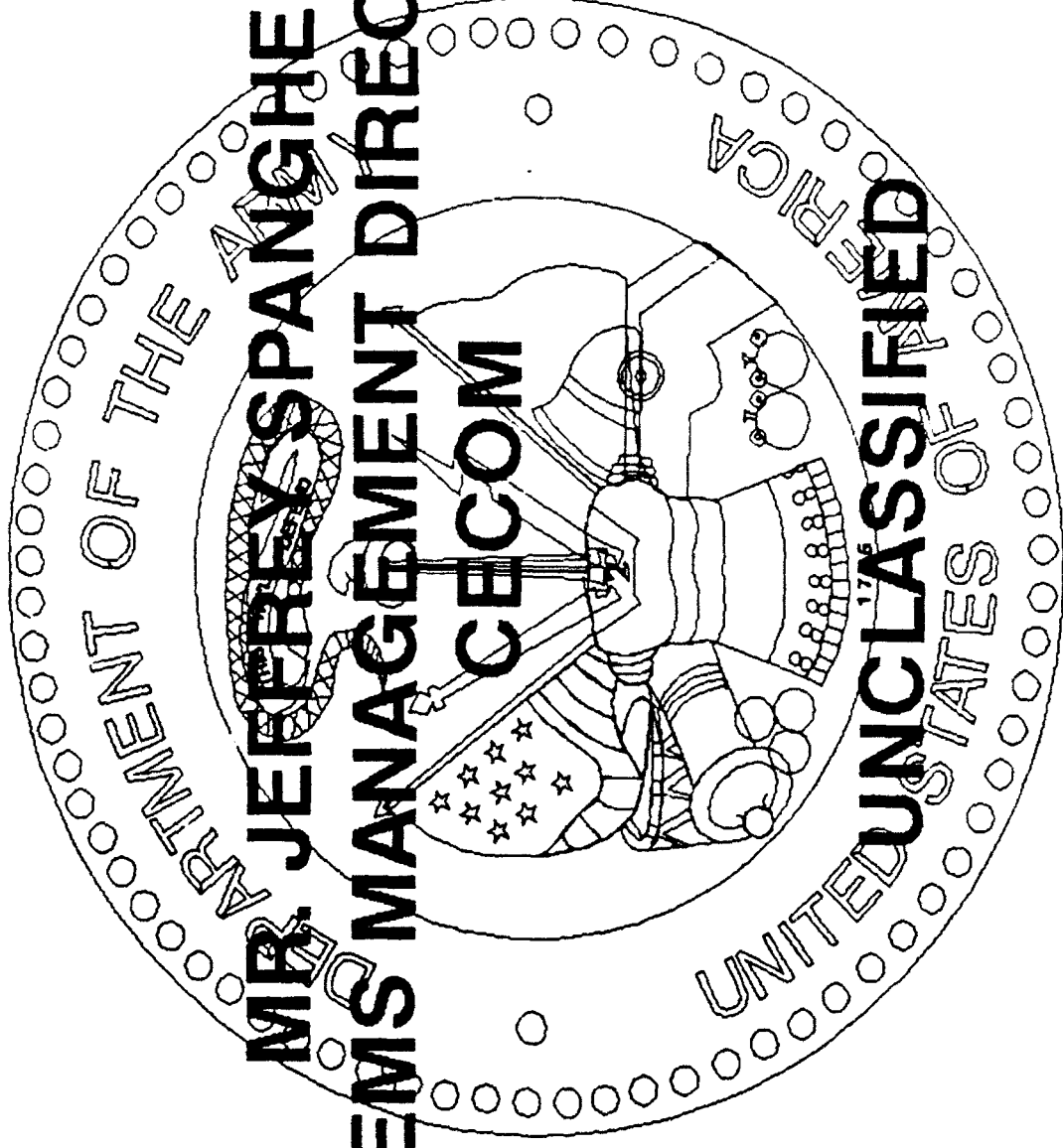
ACME FNC: UH-60, AH-64

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NOTES

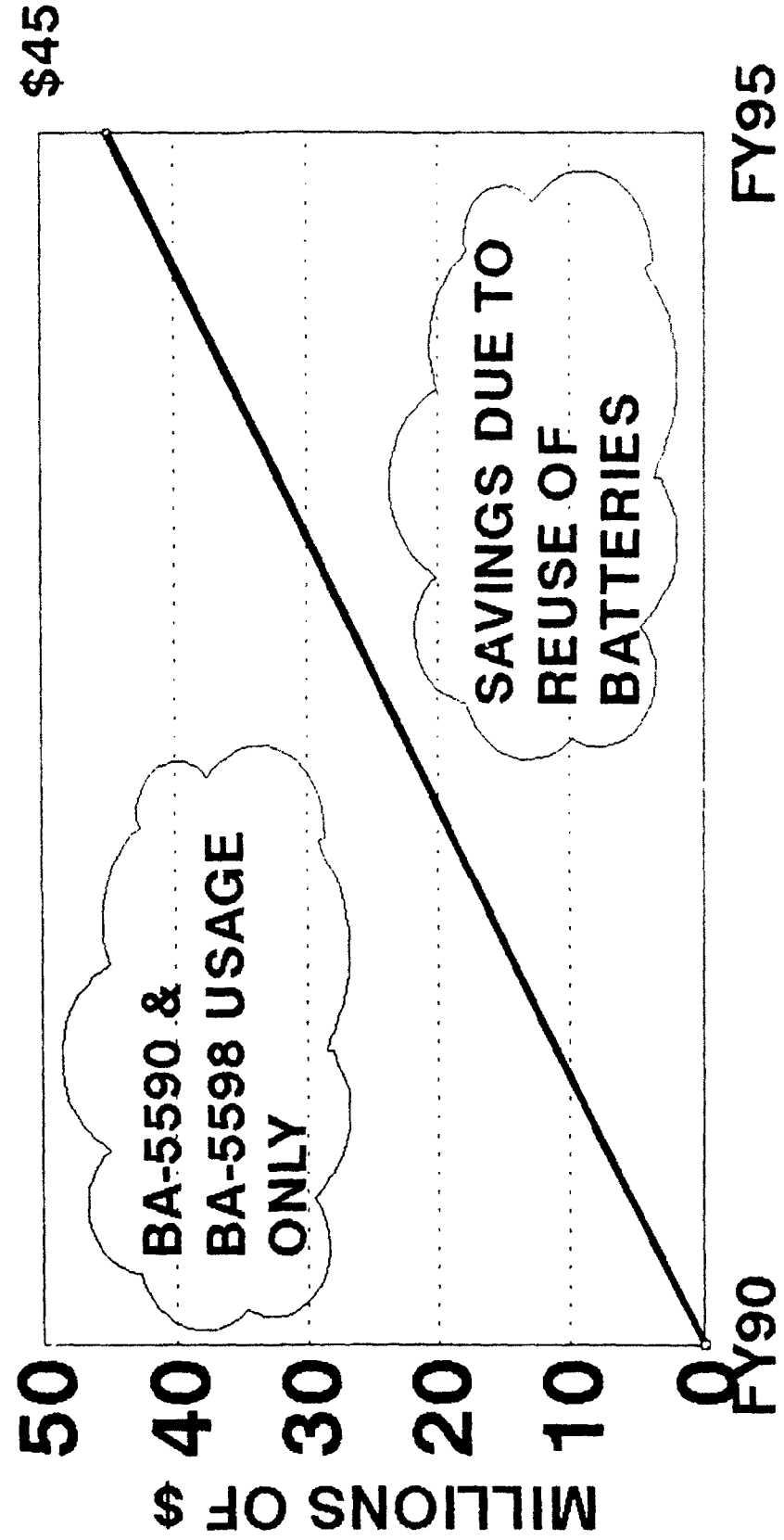
STATE OF CHARGE TECHNOLOGY

MR. JEFFREY SPANGHER
SYSTEMS MANAGEMENT DIRECTORATE
CECOM



UNCLASSIFIED

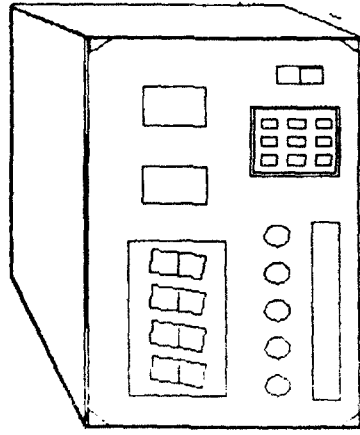
PROJECTED O&S SAVINGS STATE OF CHARGE METER



FISCAL YEAR

STATE OF CHARGE TECHNOLOGY

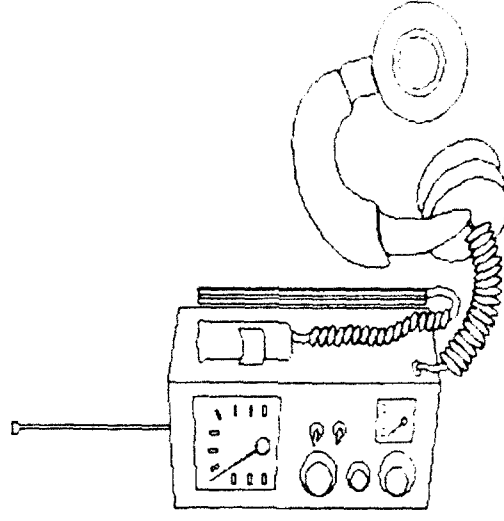
FORMATS



TS-4403



"SMART BATTERY"



INTERNAL TO
END ITEM

STATE OF CHARGE TECHNOLOGY

IS-4403

- MEASURES REMAINING CAPACITY OF
BA-5590, BA-5598, BA-5588
- CAPACITY INDICATED IN 10% INCREMENTS
- USER FRIENDLY - BUT REQUIRES REMOVAL
OF BATTERY FROM EQUIPMENT
- MUST BE SEPARATELY TRANSPORTED
AND MAINTAINED

STATE OF CHARGE TECHNOLOGY

INTERNAL TO BATTERY

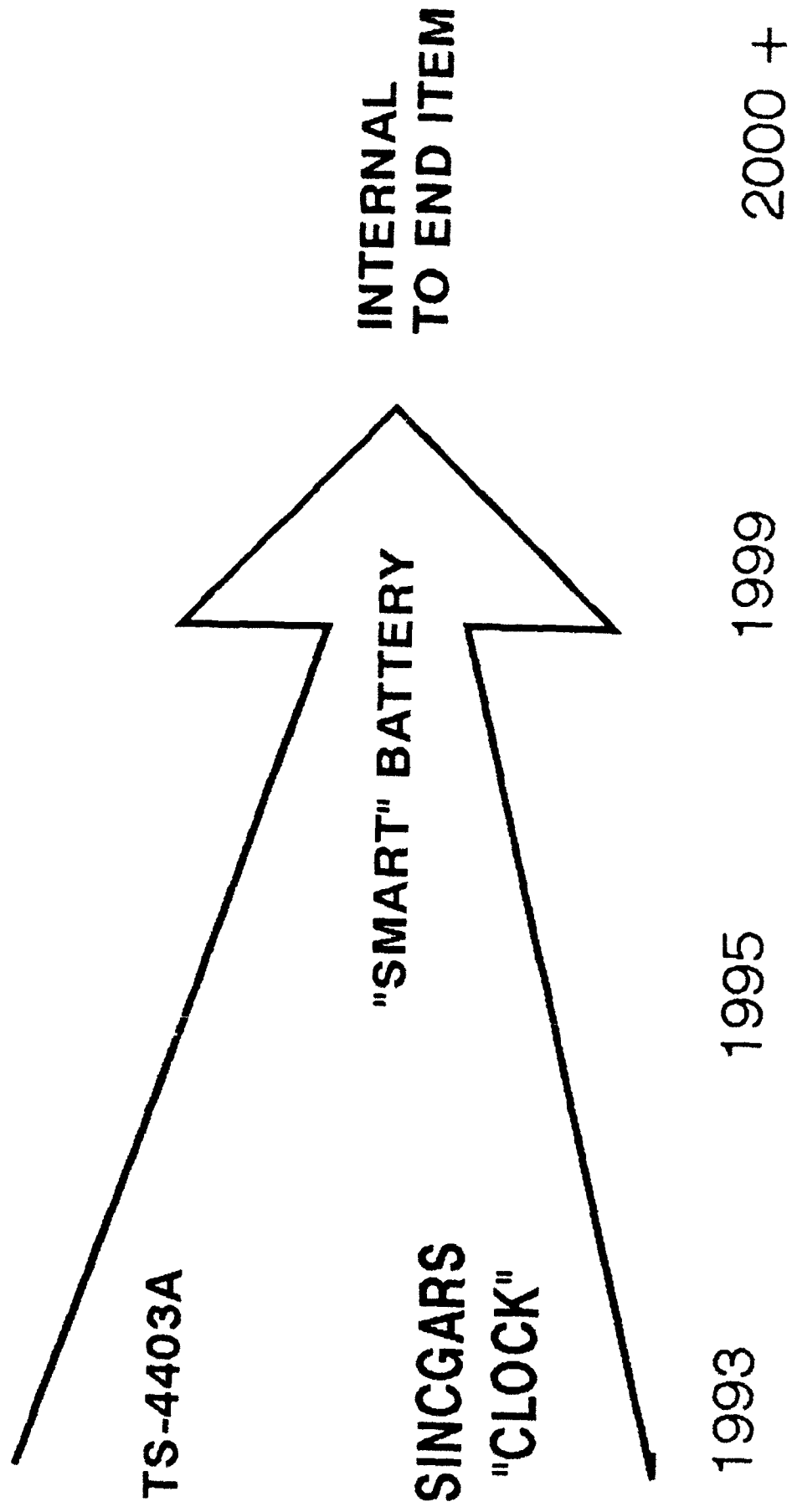
- TWO IDENTIFIED POSSIBILITIES
 - FUEL GAUGE (SIMILAR TO TS-4403A)
 - GO/NO GO LIGHTS
- BOTH REQUIRE ADDITIONAL CIRCUITRY IN BATTERY
- MUST BE COMPATIBLE WITH SOC TECHNOLOGY INTERNAL TO END ITEM
- MUST BE PROVEN COST EFFECTIVE COMPARED TO EXTERNAL METER (TS-4403A) USAGE

STATE OF CHARGE TECHNOLOGY

INTERNAL TO END ITEM

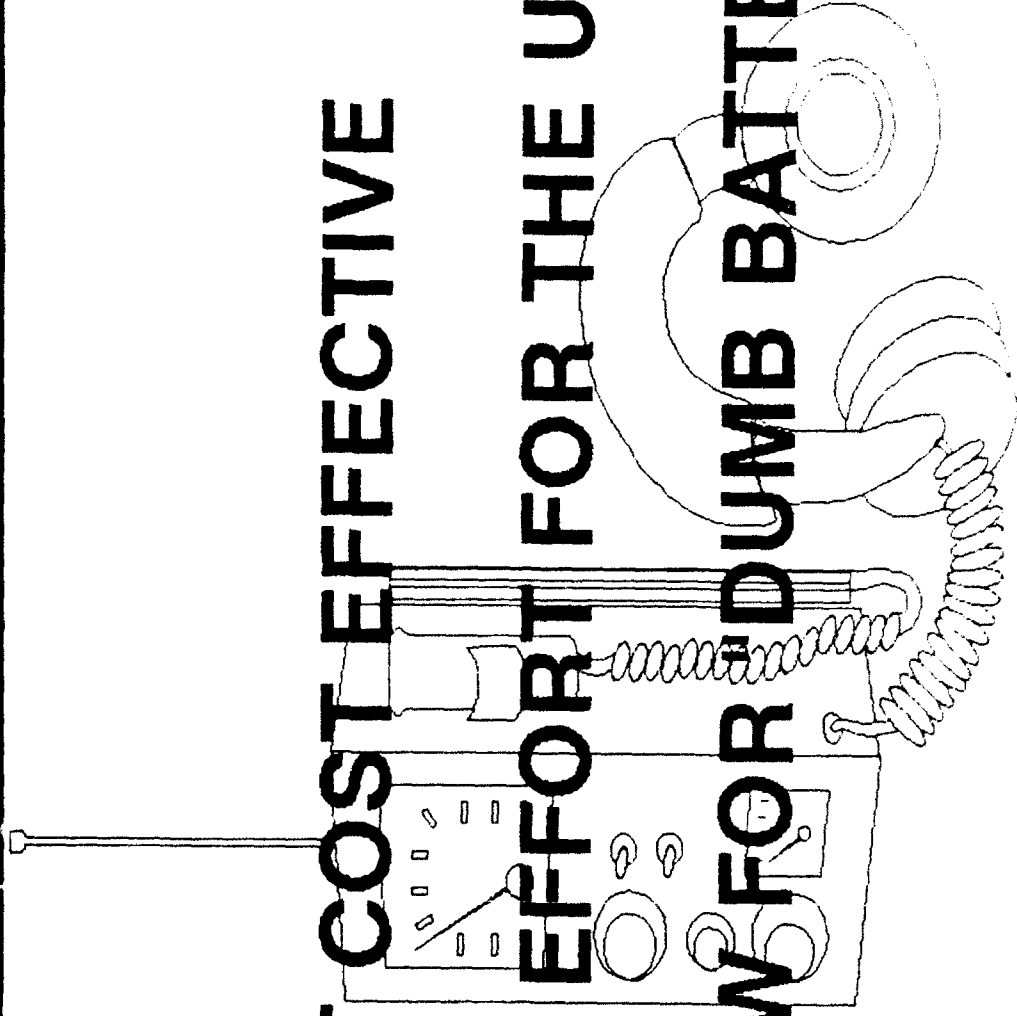
- MOST COST EFFECTIVE
- TWO FORMATS
 - FUEL GAUGE
 - CLOCK
- SINGARS (CLOCK)
 - ONLY FIELDDED INTERNAL TECHNOLOGY
 - ROUGHLY MEASURES BATTERY USE
- "INTERNAL METER" MAY REQUIRE
ADDITIONAL CIRCUITRY IN BATTERY
- ZERO EFFORT FOR THE USER

STATE OF CHARGE TECHNOLOGY



ULTIMATE GOAL INTERNAL TO END ITEM

- MOST COST EFFECTIVE
- ZERO EFFORT FOR THE USER
- ALLOW FOR "DUMB BATTERY"



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NOTES

EPA/DISPOSAL ISSUES

Mr. Christopher Kencik
Chief, Environmental Engineering Branch
CECOM Safety Office

UNCLASSIFIED

Environmental Requirements

- Federal Environmental Laws
 - Resource Conservation and Recovery Act (RCRA) - 1976
 - Pollution Prevention Act (PPA) - 1990
- Army Program
 - AR 200-1, Environmental Protection and Enhancement
 - AR 70-1 (Interim), Army Acquisition Process
 - Hazardous Waste Minimization (HAZMIN) Program

Pollution Prevention

- RCRA:
 - Establishes guidelines/standards
 - Generator requirements, identification, storage, recycling, treatment, and disposal
- PPA: Mandates source reduction in:
 - Manufacturing process
 - Equipment life cycle
- Army Implementation
 - AR 200-1
 - AR 70-1
 - HAZMIN Program

Army Program Objective

- Minimize adverse effects on:
 - Personnel
 - Safety and health
 - Environment
- Economically utilize resources
- Ensure compliance with regulations
 - Federal Facilities Compliance Act - 1992

Cost Reduction

- Through Hazardous Waste (HW) Reduction:
 - Material selection
 - Battery design
 - Design for recycling
 - Design components for reuse
 - Rechargeable batteries

DoD Disposal Costs for HW

- BA-5590/U batteries:
 - Annual procurement costs: \$8.6M
 - Estimated disposal Costs: \$2.4M

Sample Disposal Cost Comparison

- Disposal of lithium batteries
at Ft. Monmouth as HW = \$220K/year
- Disposal of lithium batteries
at Ft. Monmouth as
Non-hazardous Solid Waste
(NHSW) = \$ 75K/year
- SAVINGS = \$145K/year

Needs

- In order to :
 - Reduce disposal costs
 - Minimize hazardous and solid waste
- Batteries should be:
 - Environmentally friendly
 - Easy to dispose
 - Removed from waste stream

Future Requirements

- Hazardous Waste:
 - Bioassay (e.g., California)
- Reduction of hazardous materials utilized in batteries
- Design for recycling (40 CFR 273)
 - Increased state requirements (e.g., New Jersey)
- Design components for reuse

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NOTES



COMMERCIAL BATTERIES

Mr. Richard O. Banyard
Chief, CCS/Avionics Division
Product Integrity and Production Engineering

UNCLASSIFIED

COMMERCIAL BATTERIES PROBLEM

MERCURY & CARBON-ZINC BATTERIES NO LONGER
SUITABLE FOR THE ARMY

MERCURY BATTERIES

- ENVIRONMENTALLY EXPENSIVE
 - MANUFACTURE
 - DISPOSAL
- DECLINING AVAILABILITY
- POOR PERFORMANCE
 - LOW TEMPERATURE OPERATION
 - SHELF LIFE
 - WEIGHT

MERCURY BATTERIES TODAY

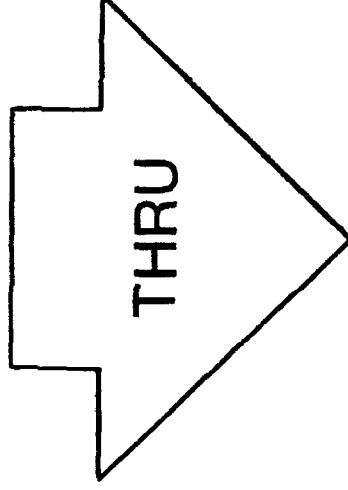
- CHARACTERISTICS
 - UNIQUE LOW CELL VOLTAGE
 - FLAT DISCHARGE VOLTAGE
 - RELATIVELY HIGH ENERGY DENSITY
- POSSIBLE ALTERNATIVES
 - ALKALINE
 - LITHIUM/MANGANESE DIOXIDE
 - OTHER CHEMISTRIES

**MERCURY BATTERIES
GOAL**

ELIMINATE MERCURY BATTERIES

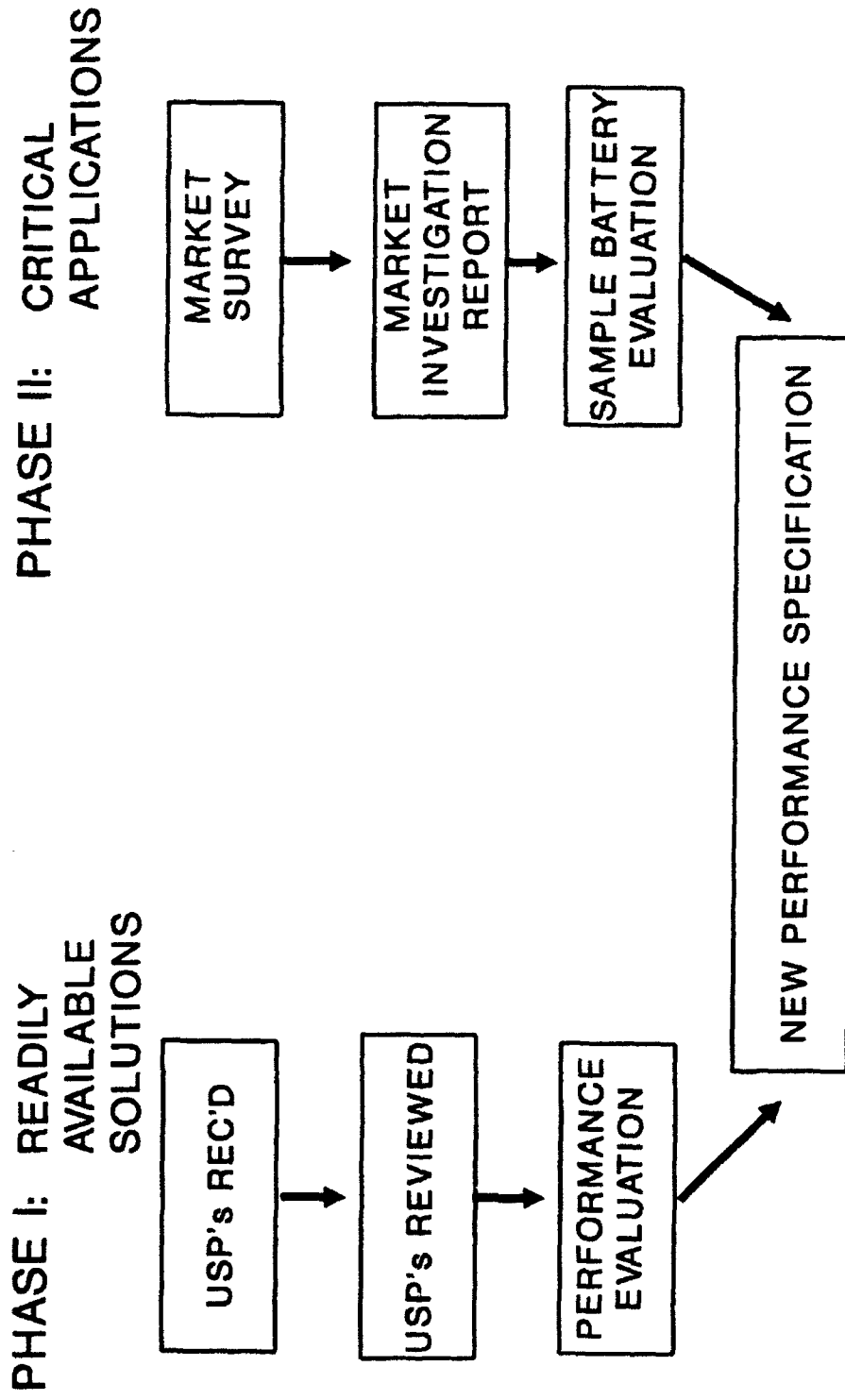
MERCURY BATTERIES OBJECTIVES

- AT LEAST ONE SOLUTION PER BATTERY
- LOWER DISPOSAL COST
- REDUCED ENVIRONMENTAL IMPACT
- IMPROVED SHELF LIFE



WORKING WITH INDUSTRY

MERCURY BATTERIES ELIMINATION PROCESS



PHASE III: ALL OTHER MERCURY BATTERIES

MERCURY BATTERIES

PHASE I BATTERIES

<u>BATTERIES</u>	<u>REPLACEMENTS</u>
BA - 1006/U	Alkaline
BA - 1318/U	Alkaline
BA - 1363/U	Alkaline
BA - 1372/U	Alkaline *
BA - 1100/U	Alkaline (Under Evaluation)

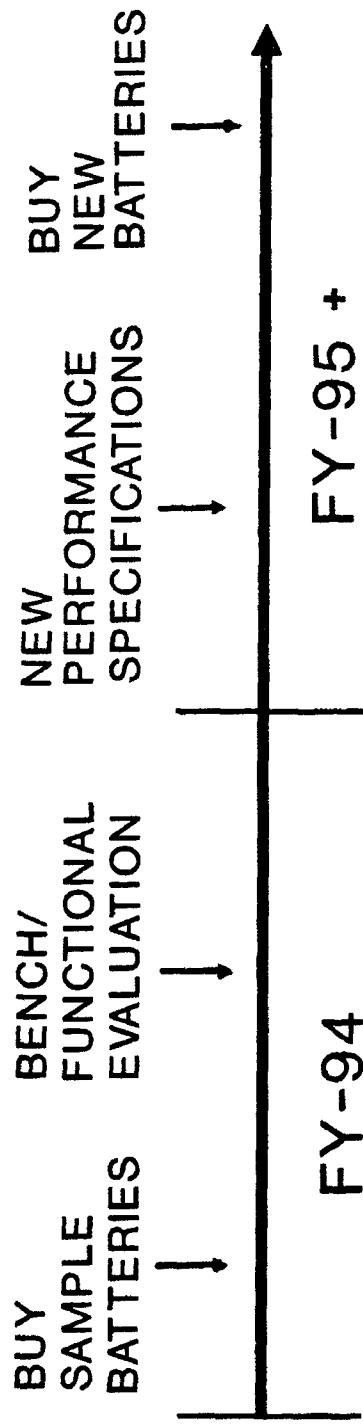
* Lithium/MnO₂ exist also (BA - 5372)

MERCURY BATTERIES

PHASE II BATTERIES

<u>BATTERY</u>	<u>VOLTS</u>	<u>BATTERY</u>	<u>VOLTS</u>
BA - 1396/U	5.40	BA - 1006/U	1.35
BA - 1288/U	1.35	BA - 1312/U	1.35
BA - 1533/U	2.70	BA - 1098/U	4.05
BA - 1106/U	4.05	BA - 1373/U	2.70
BA - 1574/U	5.40	BA - 1105/U	1.35
BA - 1568/U	13.50	BA - 1425/U	1.35
BA - 1318/U	1.35	BA - 1093/U	8.10
BA - 1389/U	10.80	BA - 1086/U	12.15
BA - 1328/U	1.35	BA - 1087/U	4.05
BA - 1090/U	8.40	BA - 1393/U	13.50

MERCURY BATTERIES TIMELINE



CARBON-ZINC BATTERIES TODAY

- SOME CELLS NO LONGER PRODUCED
- POOR SHELF LIFE
- LOW CAPACITY
- POOR LOW TEMPERATURE PERFORMANCE
- FIELD CONFUSED

CARBON - ZINC BATTERIES

SOLUTION

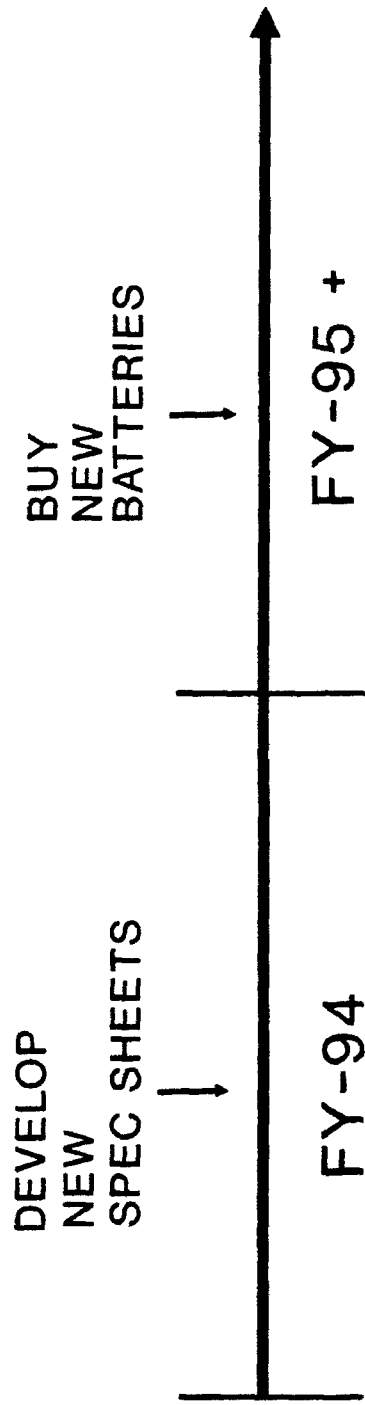
- ALKALINE REPLACEMENTS
- SAME ENVELOPE AND CONNECTOR REQUIREMENTS
- IMPROVED CAPACITY

CARBON-ZINC BATTERIES

CURRENT LISTING

CECOM CARBON-ZINC BATTERIES			
<u>BATTERY</u>	<u>VOLTS</u>	<u>BATTERY</u>	<u>VOLTS</u>
BA-15A	1.5	BA-411/U	6/4.5/3/1.5
BA-41/U	60/30/25.5/4.5	BA-417/U	22.5
BA-44/U	6.0	BA-471/U	7.5/6/1.5
BA-63/U	45/22.5	BA-803/U	6.0
BA-200/U	6.0	BA-804/U	7.5
BA-225/U	3.0	BA-806/U	45.0
BA-261/U	22.5	BA-808/U	7.5
BA-270/U	90/45/1.5/-4.5	BA-811/U	9.0
BA-305/U	30.0	BA-813/U	7.5/4.5
BA-310/U	6.0	BA-815/U	6.0
BA-332/U	15.0	BA-818/U	13.5
BA-334/U	30.0		

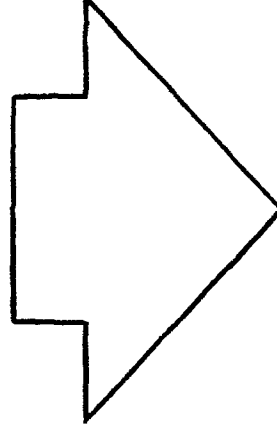
CARBON-ZINC BATTERIES TIMELINE



MERCURY & CARBON-ZINC BATTERIES SUMMARY

REPLACE MERCURY & CARBON-ZINC BATTERIES
TO REDUCE COSTS FOR

- PURCHASING
- STORAGE
- DISPOSAL
- INVENTORY



AFFORDABILITY



NOTES

POWER SUPPLIES AND BATTERY CHARGERS

Mr. Richard O. Banyard
Chief, CCS/Avionics Division
Product Integrity and Production Engineering

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POWER SUPPLIES AND BATTERY CHARGERS

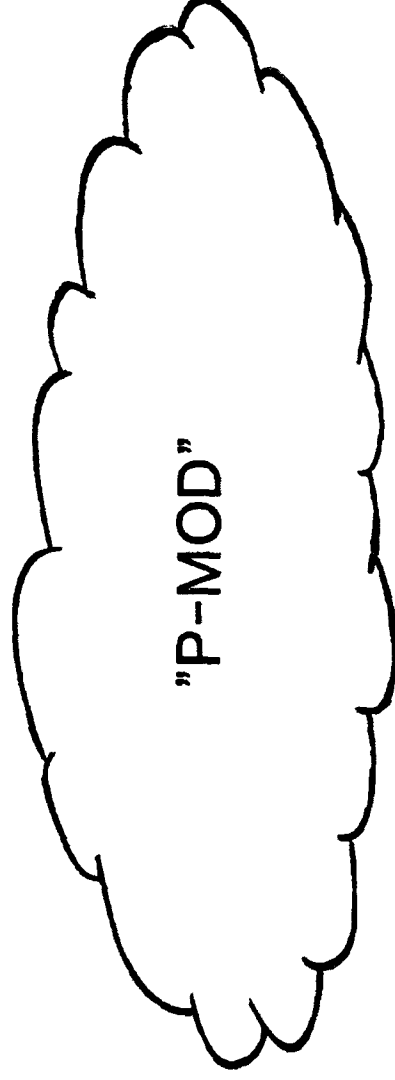
TODAY

- OLD TECHNOLOGY
- HEAVY
- EXPENSIVE TO BUY AND MAINTAIN
- OVERLAPPING CAPABILITY
- CAN'T TAKE ADVANTAGE OF STATE OF THE ART

POWER SUPPLIES AND BATTERY CHARGERS

NEED

POWER SUPPLY MODERNIZATION



POWER SUPPLY MODERNIZATION

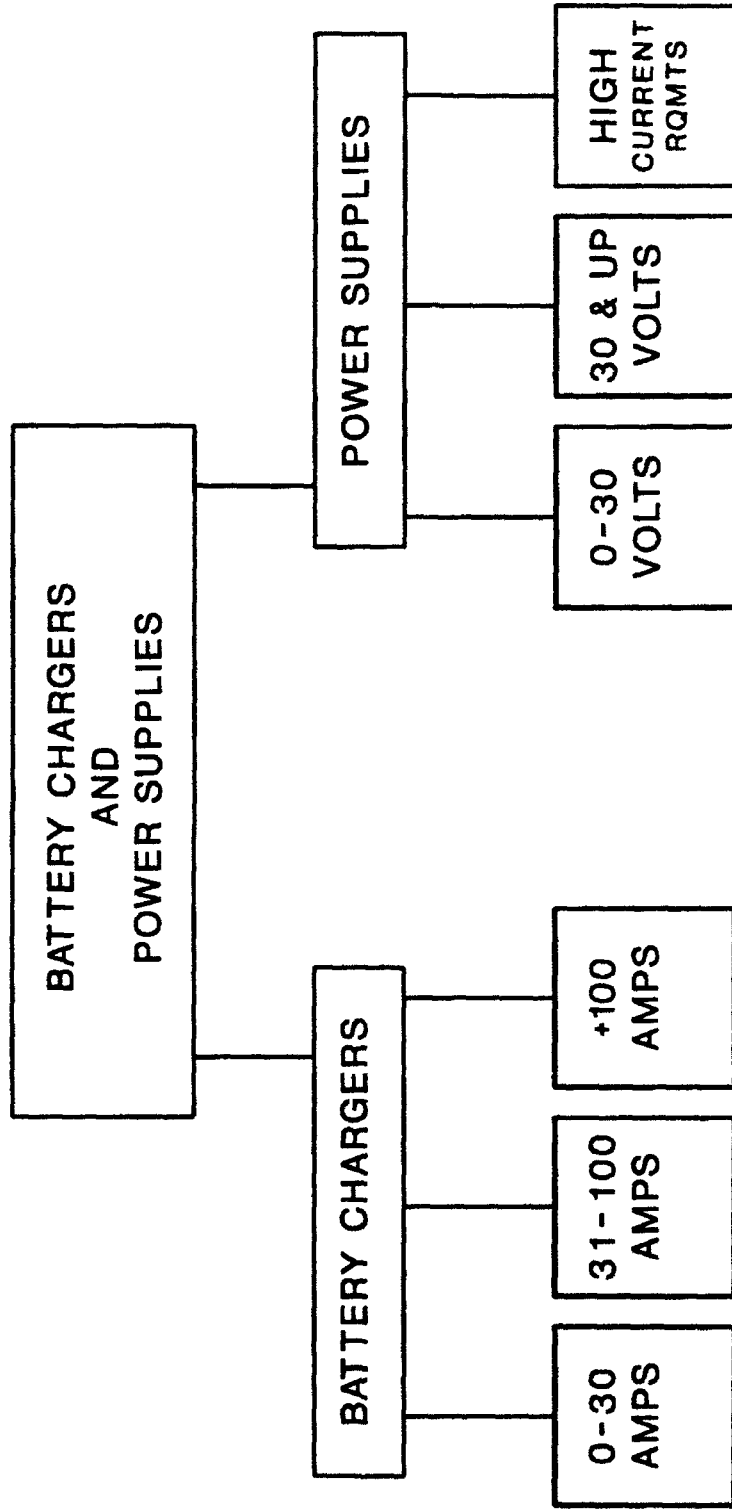
TOMORROW

- ELIMINATE AGING DESIGNS FROM INVENTORY
- REDUCE OVERLAP BETWEEN TYPES
- USE MODIFIED COMMERCIAL
- SWITCH TO PERFORMANCE SPECIFICATIONS

"BETTER FOR CHEAPER"

POWER SOURCES MODERNIZATION

APPROACH



REDUCE 17 ITEMS TO AS FEW AS 6

POWER SOURCES MODERNIZATION POSSIBLE EQUIPMENT GROUPS

CHARGERS

0 - 30 Amps

PP-6241
PP-7286
PP-6259

30 - 100 Amps

PP-34
PP-1659
PP-1660

+ 100 Amps

PP-2926

POWER SUPPLIES

0 - 30 Volts

PP-2953
PP-6148
PP-3514
PP-6224
PP-1104
PP-4763

30+ Volts

PP-2309
PP-3940
PP-7545

High Current

PP-4606

POWER SOURCES MODERNIZATION EQUIPMENT COMPARISON EXAMPLE

Today

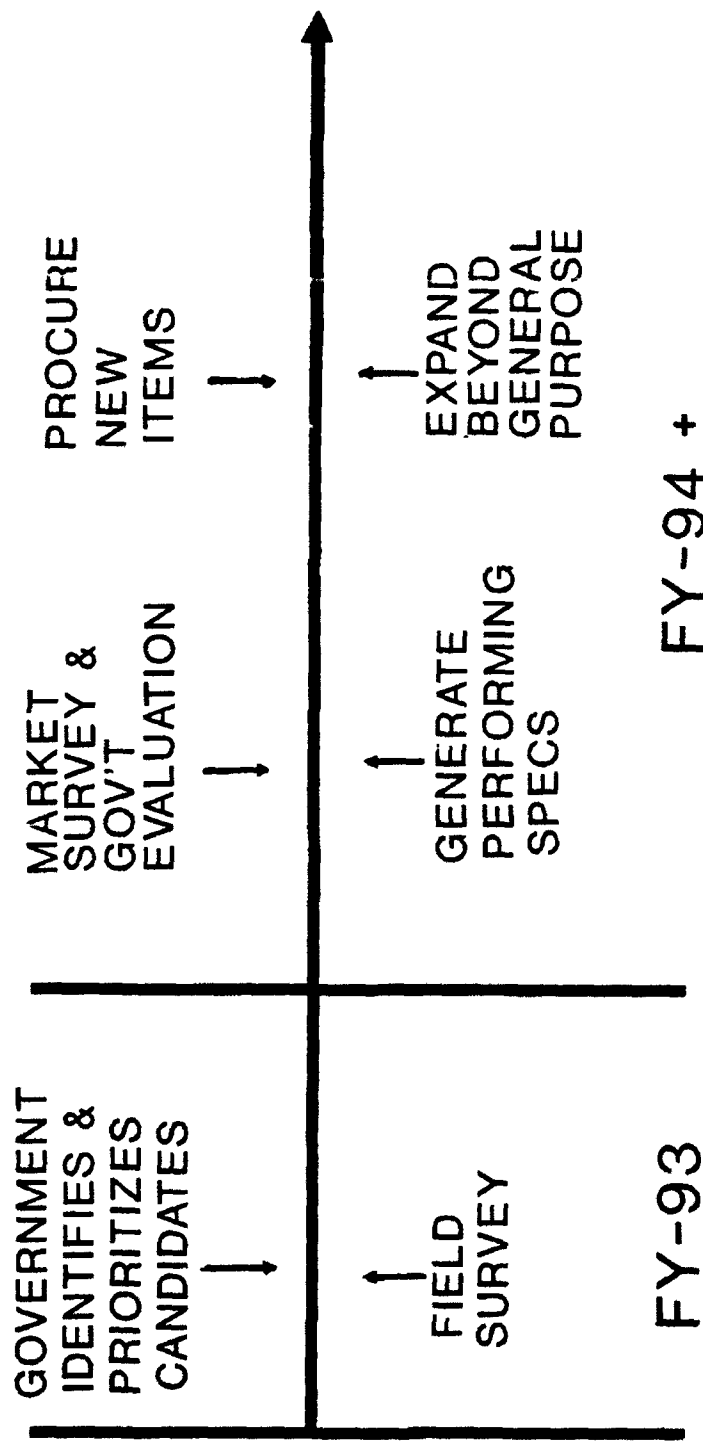
EQUIPMENT	INPUT	OUTPUT VDC	AMPS	ENVIRONMENTS
PP-2309	115/230 VAC 47-63Hz	2-36	0-15	SHELTERS SHOPS
PP-3946	115 VAC 47-420Hz	0-40	0-6	60 F - 100 F
Tomorrow PP-XXXX	115/230 VAC 47-420Hz	0-40	0-15	AMBIENT

POWER SOURCES MODERNIZATION EQUIPMENT COMPARISON EXAMPLE

Today

EQUIPMENT	INPUT	OUTPUT VDC	OUTPUT AMPS	ENVIRONMENTS
PP-1659	115 VAC	2-30	0-50	VAN
PP-1660	115 VAC	6/14/24	75/75/40	PORTABLE
Tomorrow PP-YYYY	115 VAC	12/24	30-75	MOD OTS PORTABLE

POWER SOURCES MODERNIZATION TIMELINE



POWER SOURCES MODERNIZATION BOTTOM LINE

ARMY POWER SOURCES THAT ARE:

- SAFE
- INEXPENSIVE
- MEETS CURRENT MISSION NEEDS
- STATE-OF-THE-ART

"BETTER FOR CHEAPER"

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NOTES



SESSION III

END ITEM POWER MANAGEMENT

POWER DESIGN CONSIDERATIONS FOR SINGARS FIELD REALITIES OF BATTERIES

**Mr. DOUG ANTISELL
CHIEF, CONFIGURATION CONTROL BRANCH
PM SINGARS**

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FIELD REALITIES OF BATTERIES

OUTLINE

- **SINGGARS MANPACK REQUIREMENTS**
- **FIELD REALITIES**
- **BATTERY COST SAVINGS MEASURES**
- **SINGGARS/INDUSTRY CHALLENGES**

SINGGARS MANPACK REQUIREMENTS

- 24 HOUR CONTINUOUS OPERATION
- LESS THAN 20 POUNDS WEIGHT
- HIGH/LOW TEMPERATURE OPERATION
- 4 WATTS TRANSMIT POWER AT THE ANTENNA

FIELD REALITIES

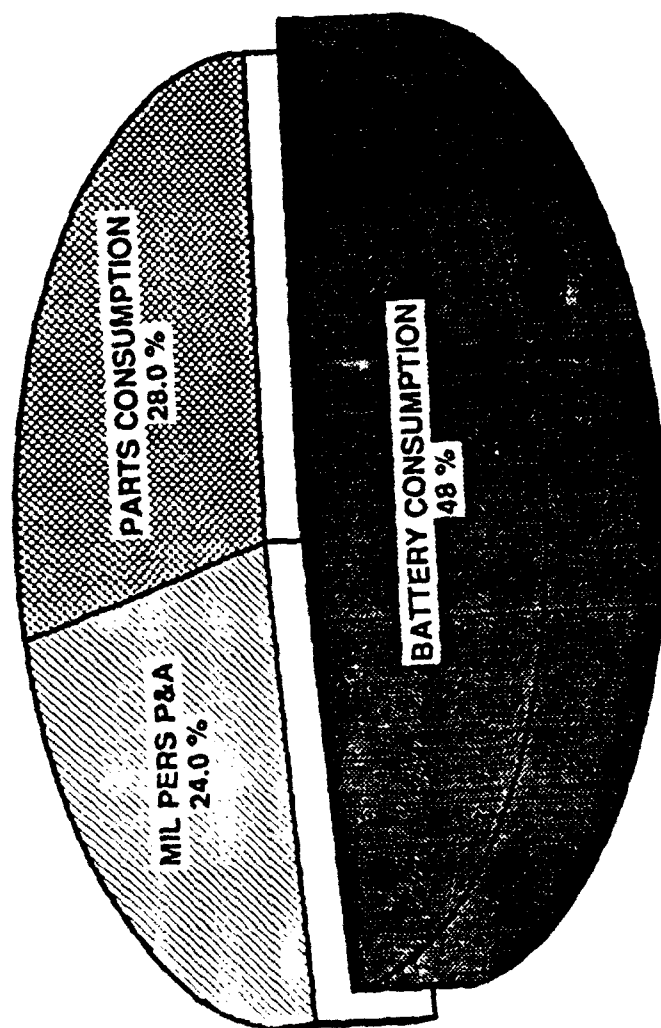
**LITHIUM IS THE ONLY
AVAILABLE BATTERY TECHNOLOGY
THAT MEETS THE
SINGGARS MISSION REQUIREMENTS**

FIELD REALITIES WEIGHT

**BATTERIES ARE 12% OF
MANPACK WEIGHT**

FIELD REALITIES

O&S COSTS



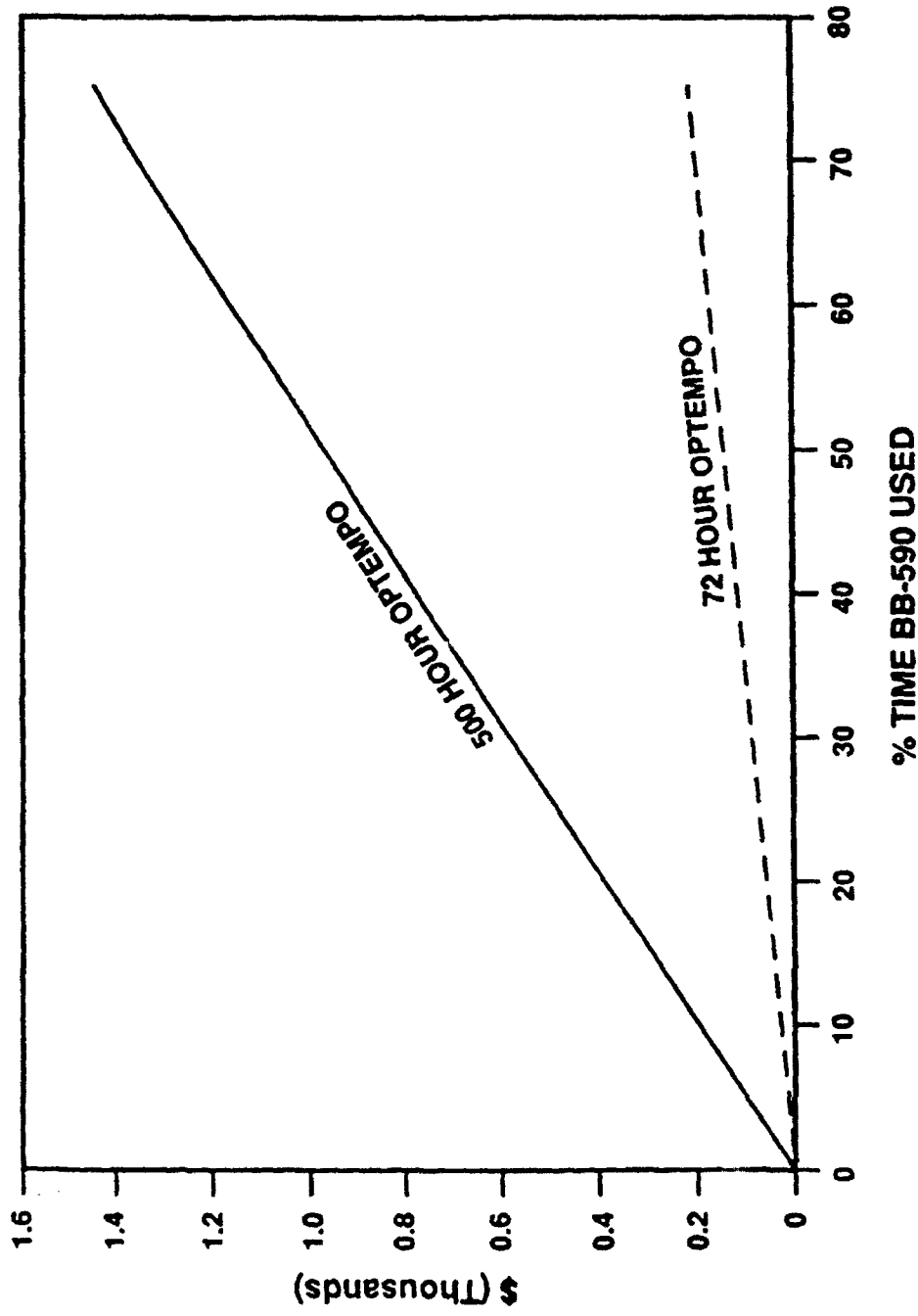
**BATTERY CONSUMPTION REPRESENTS 48%
OF THE O&S COSTS**

BATTERY COST SAVINGS MEASURES

- **USE RECHARGEABLE BATTERIES**
- **BATTERY MANAGEMENT**
- **USE STATE OF CHARGE METER**
- **FIELDING CONSIDERATIONS**
- **RADIO IMPROVEMENTS**

BATTERY COST SAVINGS MEASURES

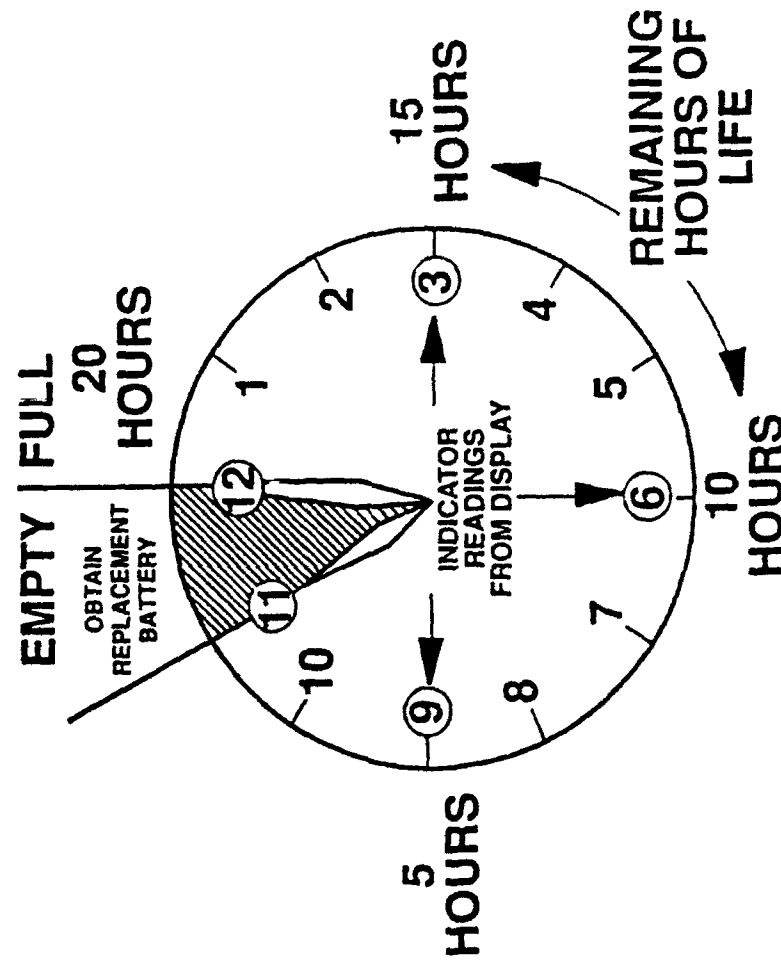
RECHARGEABLE BATTERIES



**PROJECTED SAVINGS OF RECHARGEABLE
BATTERIES WITHIN LIGHT INFANTRY DIVISION**

BATTERY COST SAVINGS MEASURES

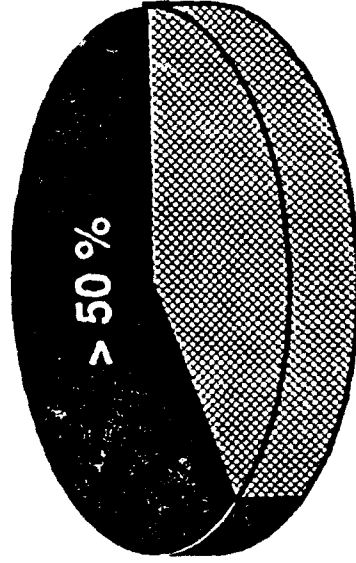
BATTERY MANAGEMENT



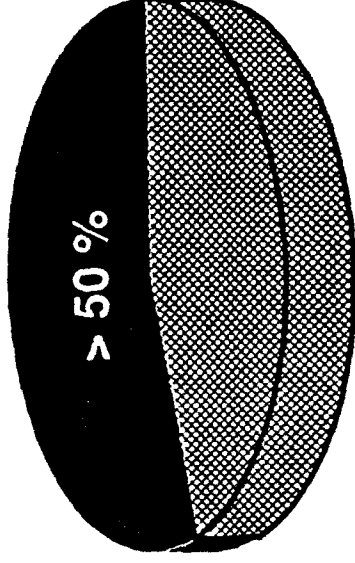
RT MEASURES TIME USING ACTUAL DUTY CYCLE

BATTERY COST SAVINGS MEASURES

SAMPLE DATA COLLECTION
CAPACITY REMAINING IN
BATTERIES SLATED FOR DISPOSAL



BA-5590/U
FORT BRAGG



BA-5590/U
FORT LEWIS

**MORE THAN 1/2 THE BATTERIES TESTED
HAD > 50 % CAPACITY LEFT**

BATTERY COST SAVINGS MEASURES

FIELDING CONSIDERATIONS

**GIVE COMMANDERS FLEXIBILITY
TO SELECT BEST MIX OF BATTERIES**

BATTERY COST SAVINGS MEASURES

RADIO IMPROVEMENTS

- **ELECTRICAL DESIGN CHANGES**
 - 5.7 VDC BACKPLANE POWER DISTRIBUTION**
 - ICOM POWER SUPPLY REGULATION**
 - ASIC TECHNOLOGY IMPLEMENTATION**
 - IMPROVE RT POWER SUPPLY EFFICIENCY (65 to 79%)**
 - REDUCE PARTS COUNT**
 - ACTIVE DUTY CYCLE (1:3:6) & IDLE MODE**

- **BENEFITS**
 - 28% IMPROVEMENT IN BATTERY LIFE (25 to 32 hrs)**
 - 17% REDUCTION IN MANPACK WEIGHT (19 to 16 lbs)**

SINGGARS/INDUSTRY CHALLENGES

- **LOW POWER COMPONENTS**
- **LIGHTER BATTERIES**
- **LOW COST MONITORING**
- **LONG LIFE RECHARGEABLE BATTERIES**
- **LOW COST BA-5590 REPLACEMENT**

SINGGARS/INDUSTRY CHALLENGES

LOW POWER COMPONENTS

**SINGGARS PRIME CONTRACTORS
DESIGNING LOW POWER CIRCUITRY**

**LOW POWER COMPONENTS ARE
NEEDED FROM VENDOR BASE**

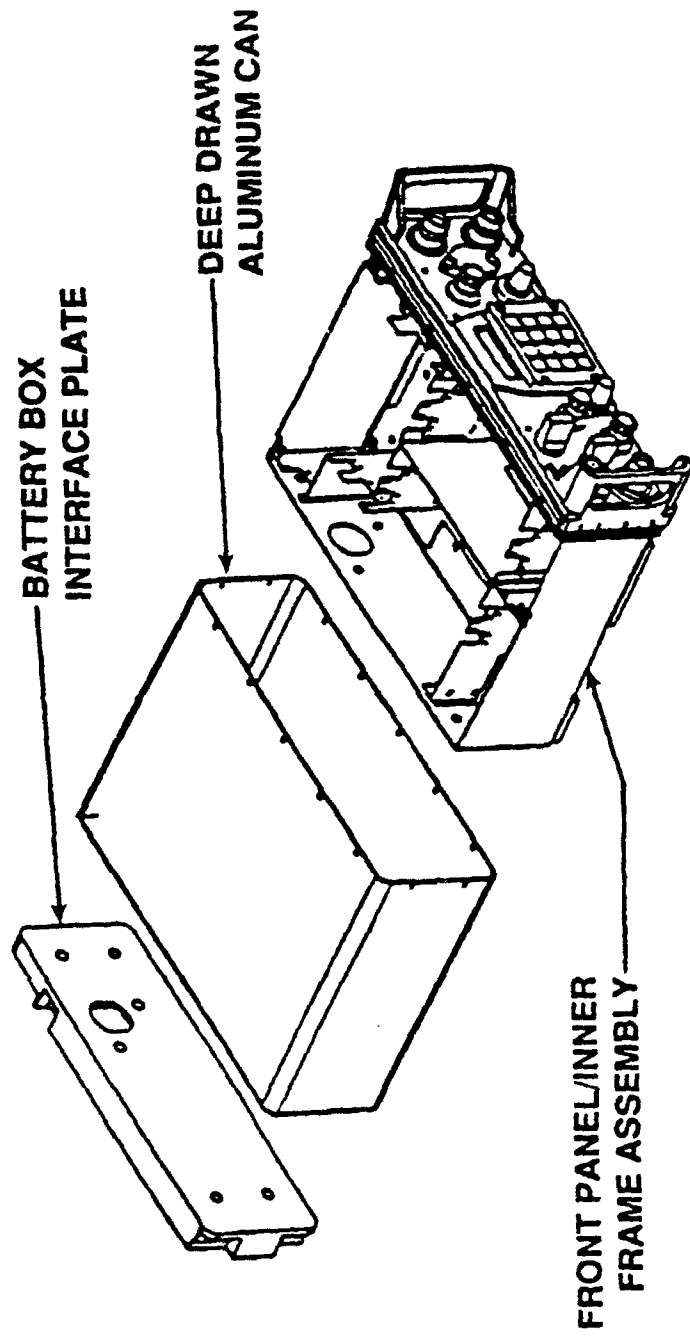
SINGGARS/INDUSTRY CHALLENGES

WEIGHT

RT WEIGHT CAN BE REDUCED WITH

MODEST DESIGN CHANGES

- MECHANICAL CHANGES ONLY
- NO MODULE CHANGES



LIGHTER BATTERIES FROM SUPPLIERS

SINGGARS/INDUSTRY CHALLENGES

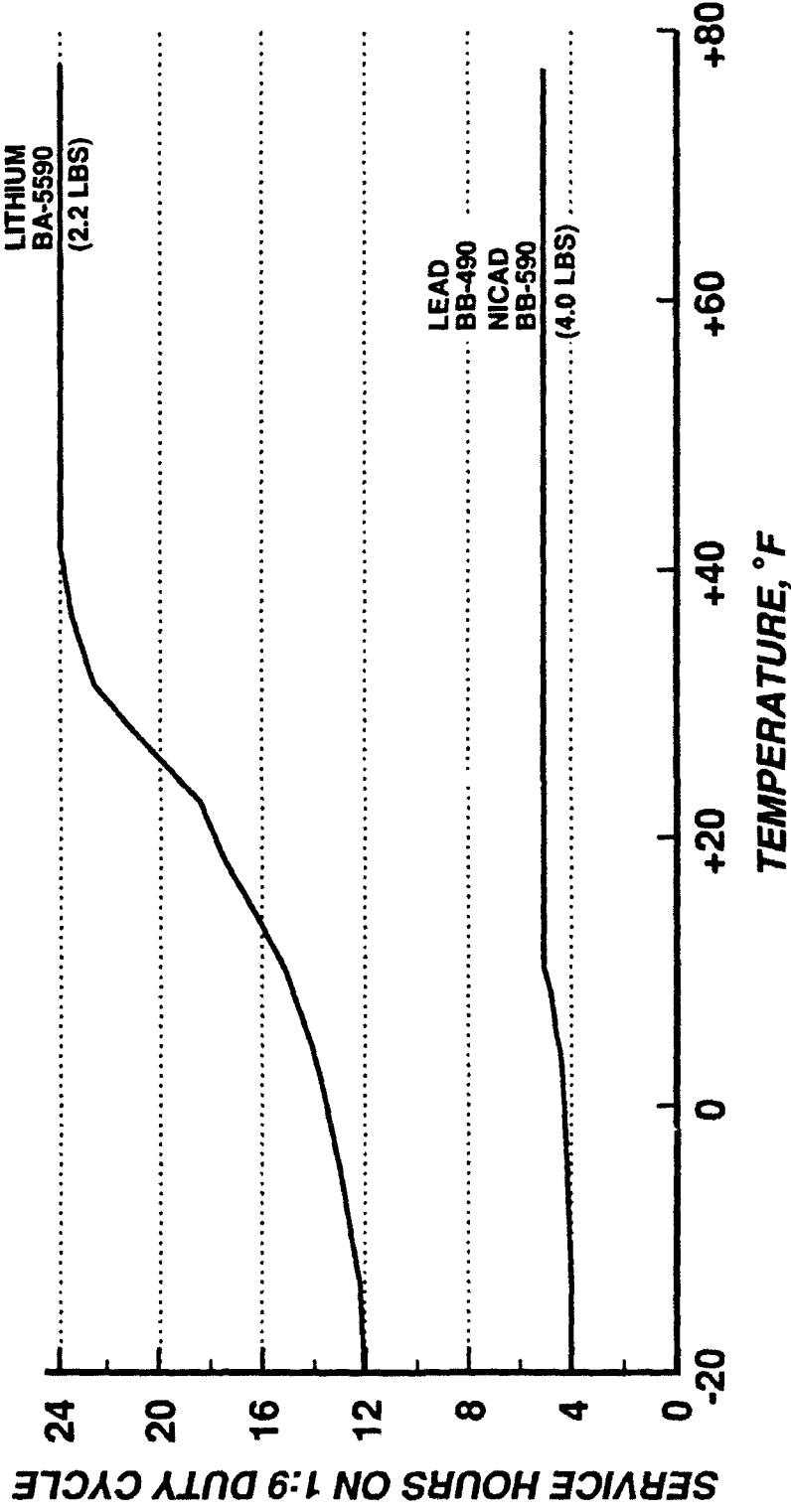
BATTERY MONITORING

- **RADIOS PROVIDE FOR INTERNAL BATTERY MONITORING**
- **WILL PROVIDE INTERFACE WITH EXTERNAL MONITORING DEVICE**

***LOW COST MONITORING DEVICES
NEEDED FROM INDUSTRY***

SINGGARS/INDUSTRY CHALLENGES

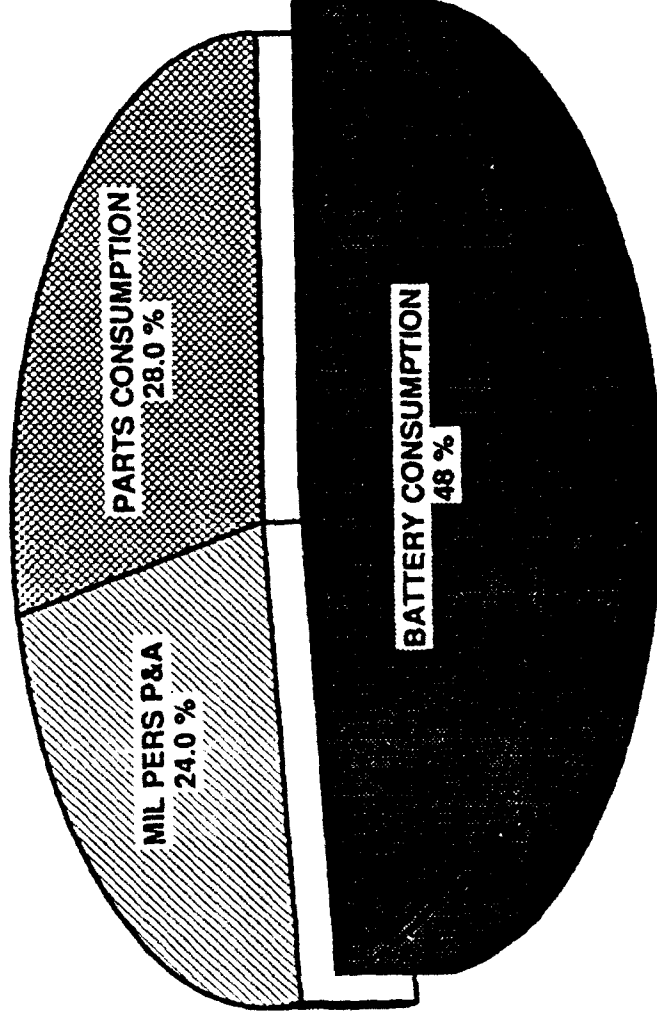
THE FIELD IS USING RECHARGEABLE BATTERIES



**LONGER LIFE RECHARGEABLE BATTERIES
NEEDED FROM SUPPLIERS**

SINGGARS/INDUSTRY CHALLENGES

PM SINGGARS IS WORKING HARD
TO REDUCE THE O&S COSTS



**LOW COST BATTERY NEEDED
FROM SUPPLIERS**



NOTES

END ITEM EQUIPMENT DESIGN REQUIREMENTS

PERRY W. HUGO

ELECTRONICS ENGINEER

**U.S. ARMY COMMUNICATIONS-ELECTRONICS COMMAND
RESEARCH, DEVELOPMENT & ENGINEERING CENTER**

UNCLASSIFIED

END ITEM EQUIPMENT DESIGN REQUIREMENTS

AGENDA

- **INTRODUCTION**
- **EQUIPMENT DESIGN & OPERATIONAL CONSTRAINTS**
- **LOW POWER EQUIPMENT DESIGN TECHNOLOGY**
- **RESEARCH, DEVELOPMENT & ACQUISITION EFFORTS**
- **SUMMARY**

END ITEM EQUIPMENT DESIGN REQUIREMENTS

CUSTOMER NEEDS

- **USE OF STANDARD ELECTRIC POWER SOURCES**
- **ENERGY EFFICIENT & LOW POWER EQUIPMENT
DESIGNS**
- **ALTERNATIVE ELECTRIC POWER SOURCES &
EQUIPMENT POWER SYSTEM DESIGN METHODS**

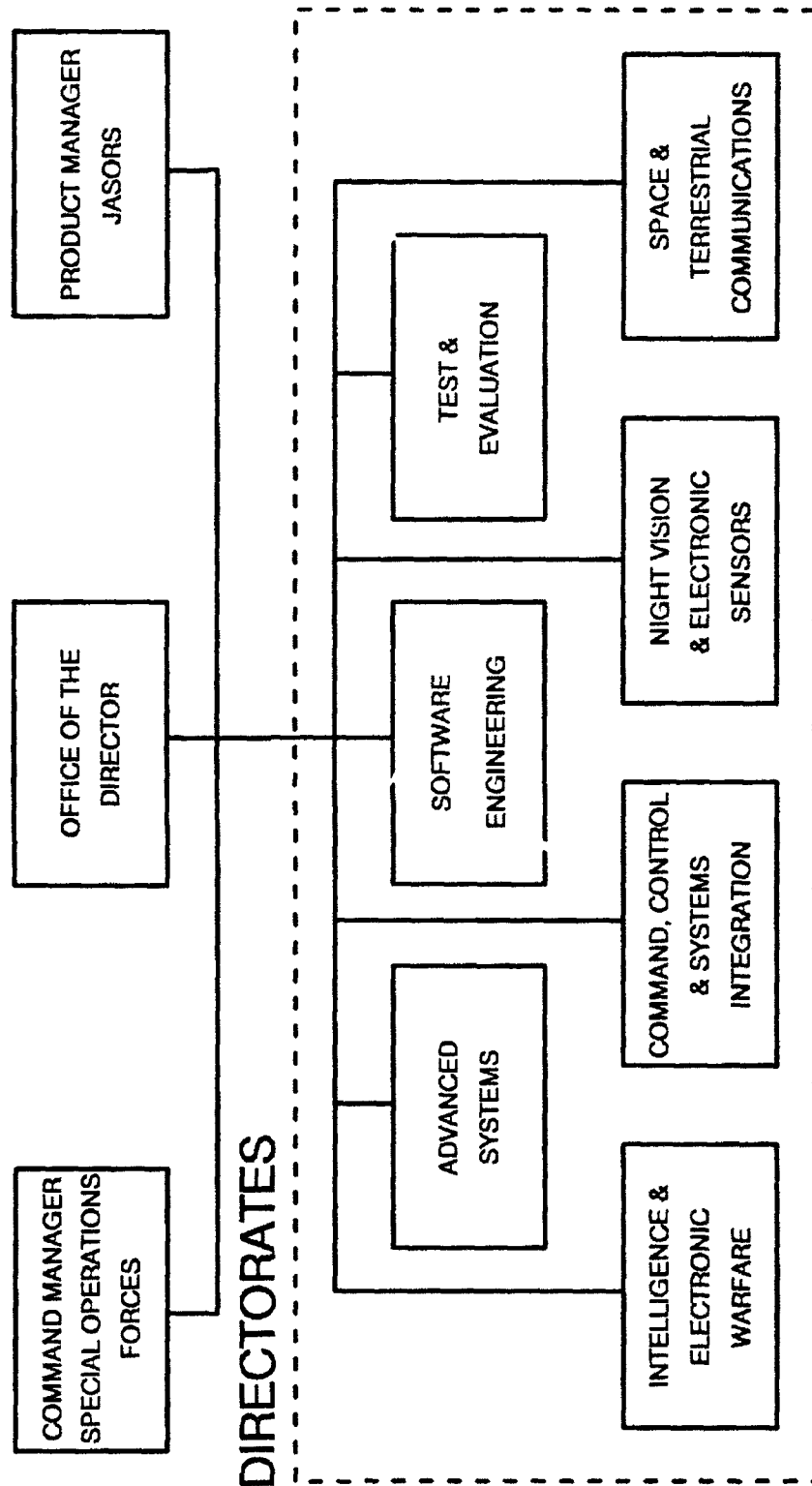
END ITEM EQUIPMENT DESIGN REQUIREMENTS

OBJECTIVES

- C4I EQUIPMENT ENERGY CONSIDERATIONS
 - POWER CONSUMPTION
 - ENERGY EFFICIENCY
 - AVAILABLE POWER SOURCES
- REDUCE POWER DEMAND
- REDUCE PROLIFERATION OF POWER SOURCES
- AVAILABILITY OF POWER SOURCE ALTERNATIVES

END ITEM EQUIPMENT DESIGN REQUIREMENTS

CECOM RDEC ORGANIZATION



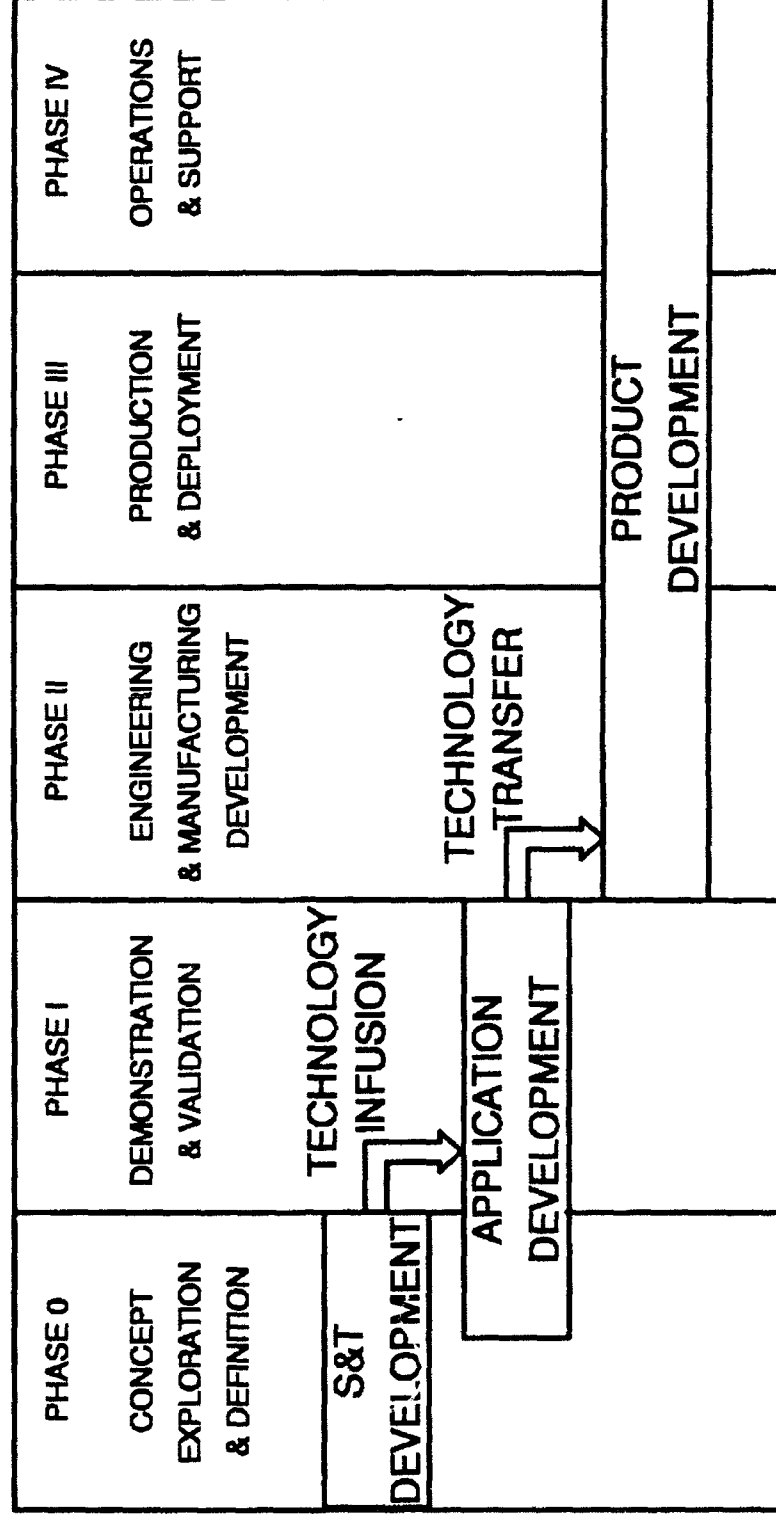
END ITEM EQUIPMENT DESIGN REQUIREMENTS

CECOM RDEC FUNCTIONS

- **SCIENCE & TECHNOLOGY BASE SURVEILLANCE**
- **RESEARCH & DEVELOP MATERIEL SOLUTIONS**
- **TECHNOLOGY INFUSION INTO APPLICATIONS**
- **TECHNOLOGY TRANSFER TO PRODUCTS**

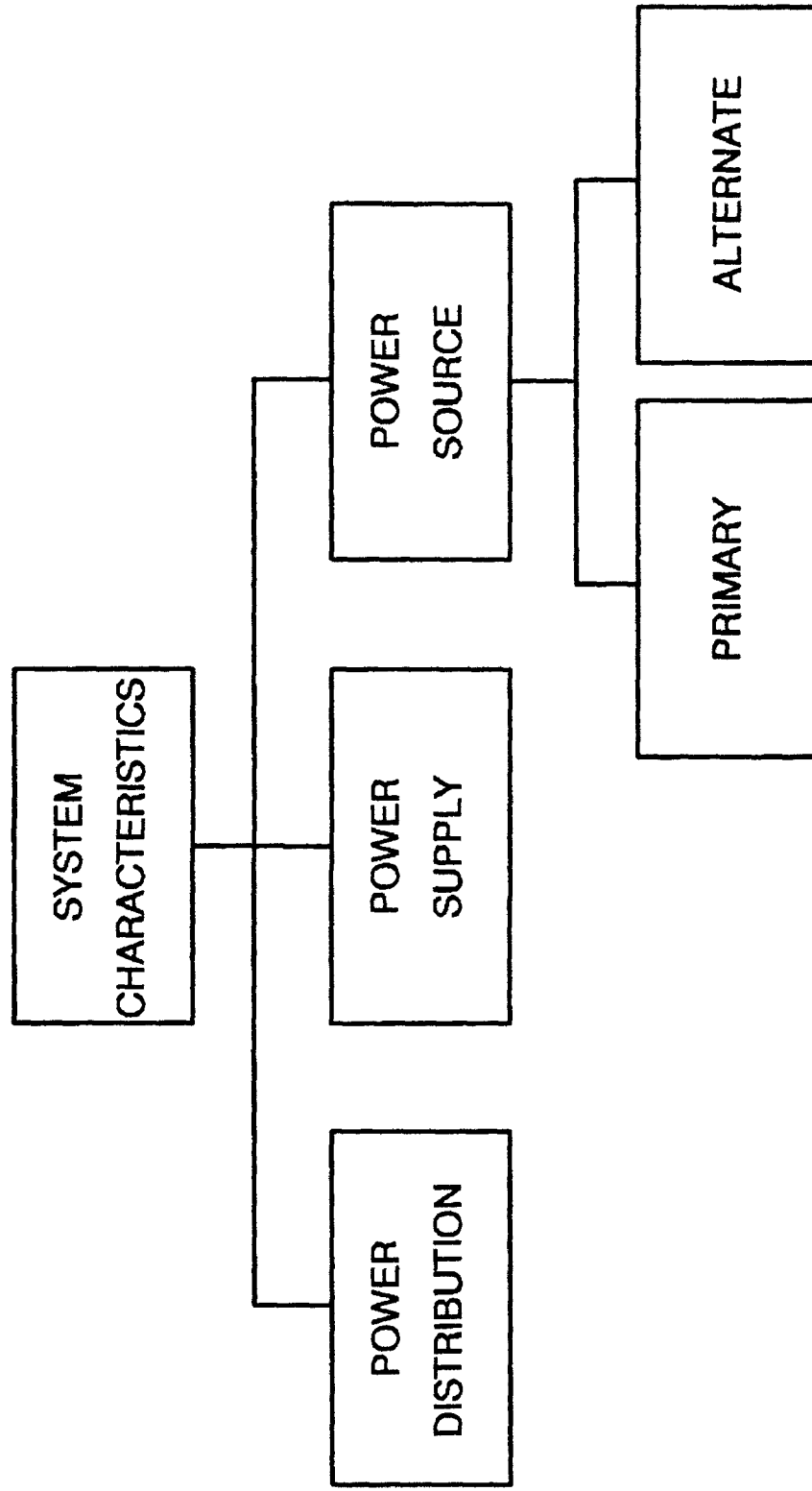
END ITEM EQUIPMENT DESIGN REQUIREMENTS

ACQUISITION LIFE CYCLE



END ITEM EQUIPMENT DESIGN REQUIREMENTS

POWER SYSTEM DESIGN



END ITEM EQUIPMENT DESIGN REQUIREMENTS

OPERATIONAL CONSTRAINTS

- **TRANSPORTABILITY**
- **SURVIVABILITY**
- **ENERGY NEEDS**
- **STANDARDIZATION & INTERFACE**
- **MANPOWER, PERSONNEL & TRAINING**
- **COMPATIBILITY & INTEROPERABILITY**

END ITEM EQUIPMENT DESIGN REQUIREMENTS

LOW POWER EQUIPMENT DESIGN TECHNOLOGY

- **ELECTRONIC COMPONENT & DESIGN TECHNOLOGIES**
- **ELECTRONIC MANUFACTURING & PACKAGING
TECHNIQUES**
- **EQUIPMENT POWER DISTRIBUTION & DISTRIBUTED
POWER ARCHITECTURES**
- **EQUIPMENT LOW POWER DISSIPATION DESIGN
TECHNOLOGY**
- **EQUIPMENT ENERGY CONSERVATION & POWER
MANAGEMENT TECHNIQUES**

END ITEM EQUIPMENT DESIGN REQUIREMENTS

RESEARCH, DEVELOPMENT & ACQUISITION EFFORTS

- **SINGLE CHANNEL ANTI-JAM MANPORTABLE (SCAMP)
TERMINAL BLOCK I/II**
Block I POC: Mr. Gary Martin, SFAE-CM-MSA, (908) 532-5232
Block II POC: Mr. Steve Waugh, AMSEL-RD-ST, (908) 532-2240
- **JOINT ADVANCED SPECIAL OPERATIONS RADIO
SYSTEM (JASORS)**
POC: Mr. Don Upmal, AMCPM-JA, (908) 532-2044
- **INTEROPERABLE POWER ADAPTER & CHARGER**
POC: Mr. Perry Hugo, AMSEL-RD-AS, (908) 544-2022

SINGLE CHANNEL ANTI-JAM MANPORTABLE (SCAMP) TERMINAL

SYSTEM ACQUISITION AND TECHNOLOGY INSERTION

- BLOCK I - EMD & PRODUCTION

- BLOCK II - DEMONSTRATION & VALIDATION

- REQUIREMENTS

BLOCK I

BLOCK II

Total Weight

< 30 lbs

12-15 lbs

Operating Time

12 hrs

24 hrs (required)
96 hrs (objective)

Setup/Teardown Time

10 minutes

5 minutes (objective)

MTBOMF

1200 hrs

1250-3000 hrs

IOC

FY98

1QFY02

Total Production Units

456

2549

BLOCK I/II PROGRAM SCHEDULE



JOINT ADVANCED SPECIAL OPERATIONS RADIO SYSTEM (JASORS)

RESEARCH, DEVELOPMENT & ACQUISITION PROGRAM

● SYSTEM CONCEPT EXPLORATION & DEFINITION

Team Digital Message Entry Device (DMED)

Manpack Radio (MPR)

InterTEAM Radio (ITR)

Transportable Base Station (TBS)

Integrable Base Station (IBS)

REQUIREMENTS	DMED	MPR	ITR
Total Size (inches)	4 x 6 x 2	3 x 7.25 x 11.2	3 x 10 x 1.5
Total Weight (pounds)	< 2	< 10.5	< 4

Operating Modes

Operational

Transportable

Cache

6-1 min. trans/day

45 days

180 days

Principle Electric Power Source - BA-5590/BB-590

INTEROPERABLE POWER ADAPTER & CHARGER (IPAC)

SMALL BUSINESS INNOVATIVE RESEARCH PROGRAM

CONCEPT EXPLORATION & DEFINITION

- Manportable, safe, survivable & efficient power supply design for use in tactical environments
- Interoperable with tactical electric power sources & secondary battery chemistries
- Horizontal integration with manportable C4I equipment
- Investigate power conversion, conditioning & charging technology; manufacturing & packaging techniques; and alternative power supply designs & methods

INTEROPERABLE POWER ADAPTER & CHARGER (IPAC)

END ITEM EQUIPMENT DESIGN REQUIREMENTS

SUMMARY

- **C4I EQUIPMENT DESIGNS ARE INFLUENCED AND
CONSTRAINED BY OPERATIONAL REQUIREMENTS**
- **LOW POWER & ENERGY EFFICIENT DESIGN
TECHNOLOGY MUST BE CONSIDERED PRIOR TO
TRANSFER TO PRODUCT APPLICATIONS**
- **POWER SYSTEM DESIGNS NEED TO BE ADEQUATELY
ADDRESSED IN REQUIREMENT & ACQUISITION
DOCUMENTS AND AT ALL MILESTONE REVIEWS**



NOTES

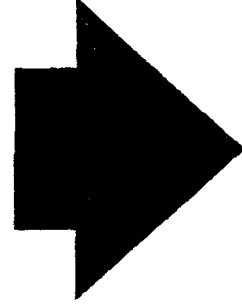
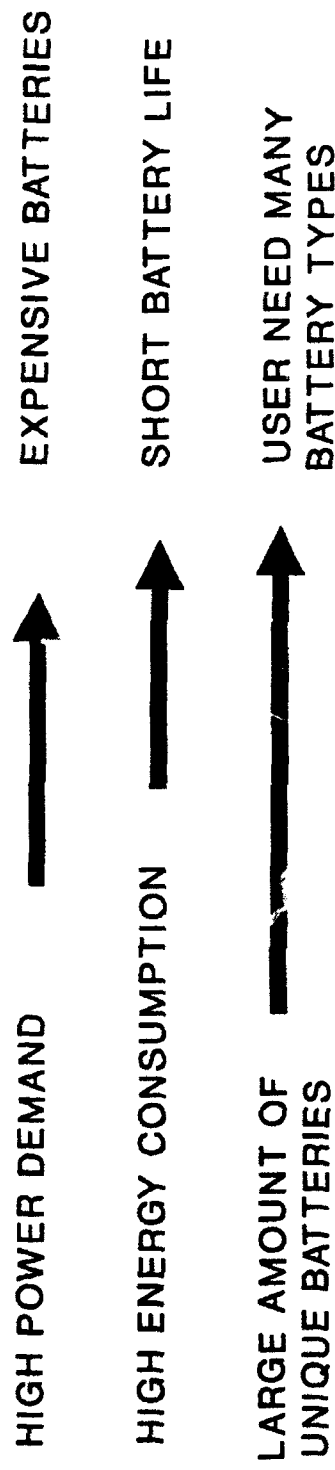


POWER SOURCES STATEMENT OF WORK

**Mr. Richard O. Banyard
Chief, CCS/Avionics Division
Product Integrity and Production Engineering**

UNCLASSIFIED

POWER SOURCES SOW PROBLEM



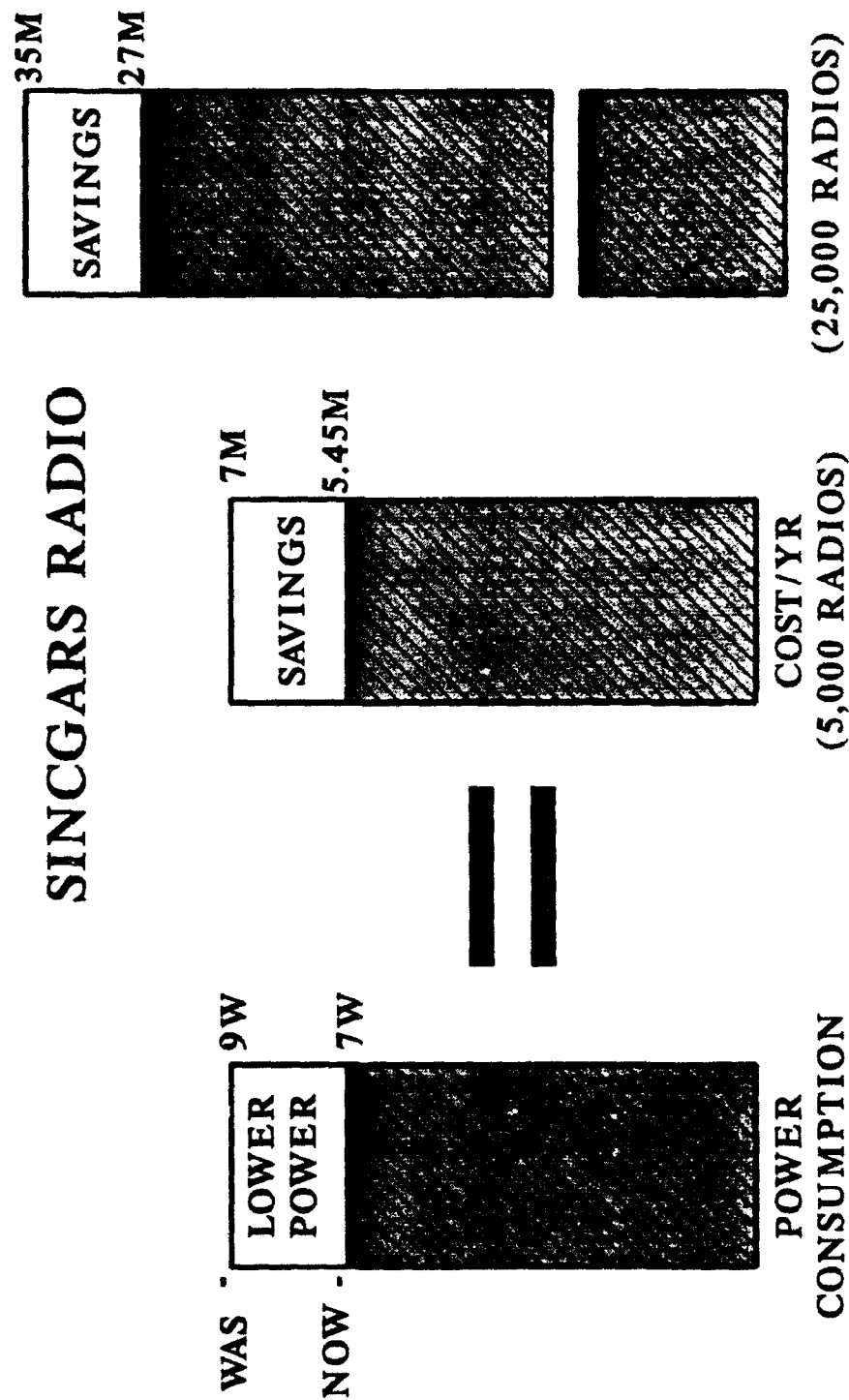
ARMY CANNOT AFFORD

POWER SOURCES SOW GOAL

DRIVE DESIGNS TO USE

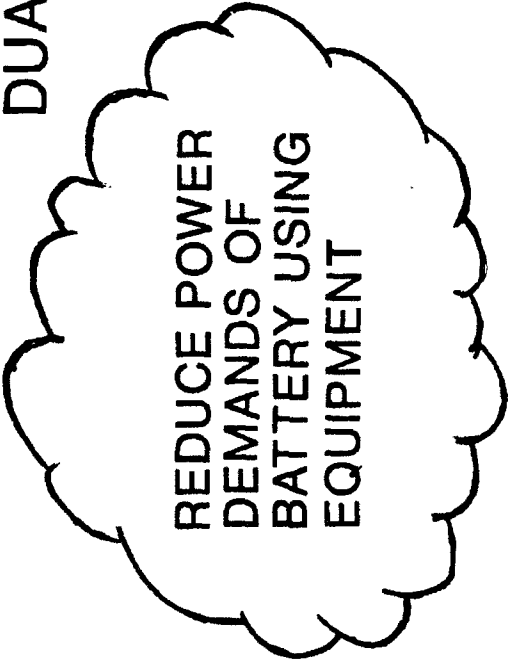
- LESS POWER
- STANDARD BATTERIES

POWER SOURCES SOW EXAMPLE

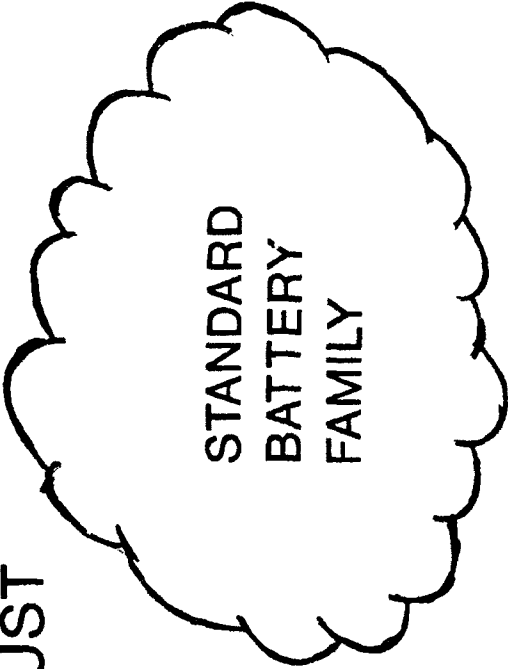


POWER SOURCES SOW SOLUTION

DUAL THRUST



REDUCE POWER
DEMANDS OF
BATTERY USING
EQUIPMENT



STANDARD
BATTERY
FAMILY

POWER SOURCES SOW REDUCE POWER DEMAND

NEW DESIGNS

**SOURCE SELECTION: BATTERY LIFE CYCLE COSTS A
SELECTION FACTOR.**

**CONTRACT EXECUTION: PROPOSAL DETAILS
BECOME A CONTRACT REQUIREMENT**

CURRENT DESIGNS

**CONTRACTOR: VECP COLLATERAL SAVINGS
GOVERNMENT: PRODUCT IMPROVEMENT PROGRAMS**

POWER SOURCES SOW
STANDARD POWER SOURCES

SELECT FROM:

STANDARD CONSUMER BATTERIES

-OR-

FAMILY OF STANDARD MILITARY BATTERIES

SELECTIONS SUBJECT TO ARMY APPROVAL

POWER SOURCES SOW PAYOFFS

- FEWER BATTERY TYPES - PARTICULARLY ON THE
BATTLEFIELD
- LESS BATTERIES USED - EXTENDED MISSION TIME
- COMMERCIAL BATTERY INDUSTRIAL BASE

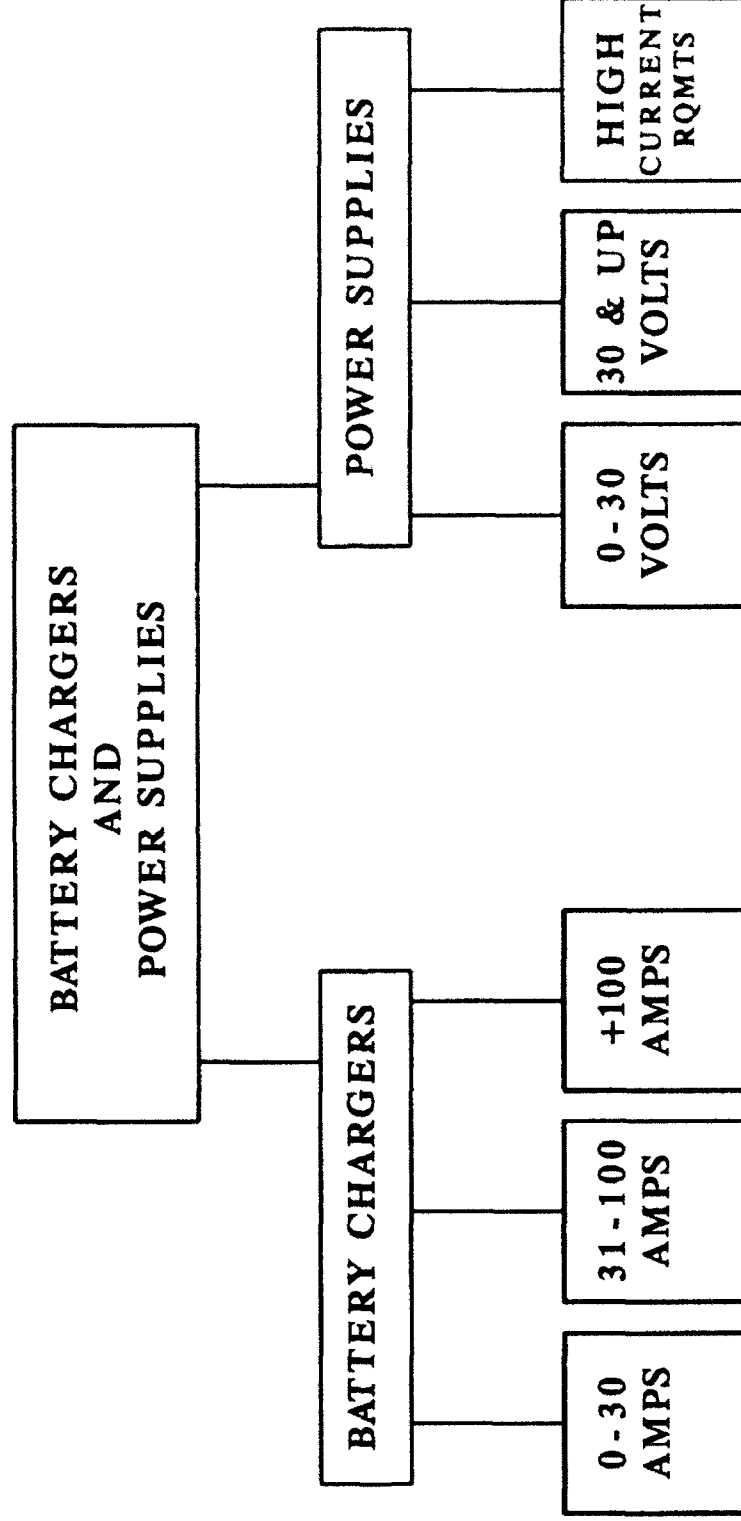
POWER SOURCES SOW BOTTOM LINE

ARMY IS SERIOUS ABOUT:

- DESIGNING FOR LOWER POWER
- SPENDING LESS ON BATTERIES

THE ARMY MUST LIVE WITHIN ITS MEANS

POWER SOURCES MODERNIZATION APPROACH



REDUCE 17 ITEMS TO AS FEW AS 6



NOTES



SESSION IV

BUSINESS OPPORTUNITIES

**APBI LEVEL II
BUSINESS OPPORTUNITIES**



**DR. JOSEPH M. BUCCIERI
C3I ACQUISITION CENTER**

AGENDA

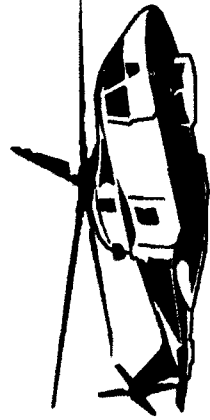
- ▶ **BASIC FORMATS**
- ▶ **INDIVIDUAL CONTRACT OPPORTUNITIES**
- ▶ **ELECTRONIC BULLETIN BOARD**
- ▶ **UNSOLICITED PROPOSALS**
- ▶ **COST REDUCTION OPPORTUNITIES**



BUSINESS OPPORTUNITIES

BASIC FORMATS

- **SEALED BID**
 - **USE OF HARDWARE SAMPLES**
 - **LONG TERM CONTRACT (2-5 YRS)**
 - **EXAMPLES:**
 - **LITHIUM S02**
 - **UNIQUE BATTERY TYPES**
- **FORMAL SOURCE SELECTION**
 - **BEST VALUE**
 - **AWARD FEE**
 - **USE OF HARDWARE SAMPLES**
 - **LONG TERM CONTRACT (2-5 YRS)**
 - **TYPE CONTRACTS INDEFINITE DELIVERY**
- **EXAMPLES:**
 - **OBJECTIVE PRIMARY**
 - **INTERIM AND OBJECTIVE RECHARGEABLE**



BUSINESS OPPORTUNITIES



CONTRACT OPPORTUNITY: AIRCRAFT
BATTERIES
FIVE DIFFERENT
BATTERIES
SIX DIFFERENT
CELLS

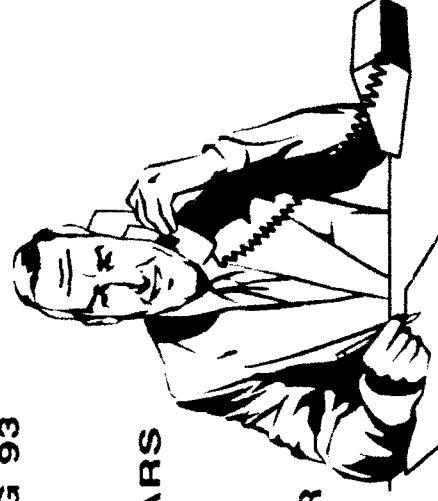
CONTRACT METHOD: SEALED BID

QUANTITIES: BATTERIES: 2,730
CELLS: 118,000

SCHEDULE: SOLICITATION DATE: AUG 93
AWARD DATE: DEC 93

ESTIMATED VALUE: BASIC - \$5.9M
100% OPTION FOR 2 YEARS

POC: ROBERT REAGAN
C3I ACQUISITION CENTER
908-532-5645

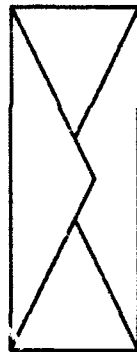


BUSINESS OPPORTUNITIES CON'T

CONTRACT OPPORTUNITY: LITHIUM THIONYL
CHLORIDE
BATTERY BA-6516



CONTRACT METHOD: SEALED BID WITH SAMPLES

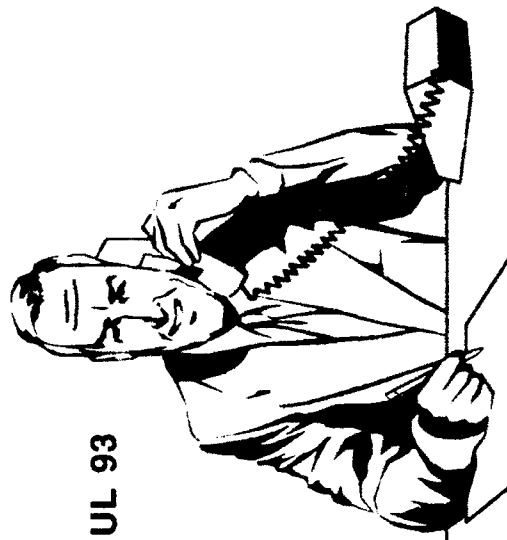


	MINIMUM	MAXIMUM
QUANTITIES: YR 1	500	4,500
YR 2 (OPT)	-0-	9,000
YR 3 (OPT)	-0-	9,000

SCHEDULE: SOLICITATION ISSUE DATE: JUL 93
AWARD DATE: NOV 93

ESTIMATED VALUE: \$75K \$675K

POC: ROBERT REAGAN
C3I ACQUISITION CENTER
908-532-5645

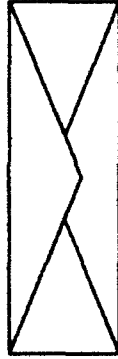


BUSINESS OPPORTUNITIES CON'T

CONTRACT OPPORTUNITY: LITHIUM
MANGANESE
DIOXIDE
BATTERY BA-5372



CONTRACT METHOD: SEALED BID WITH BID SAMPLES

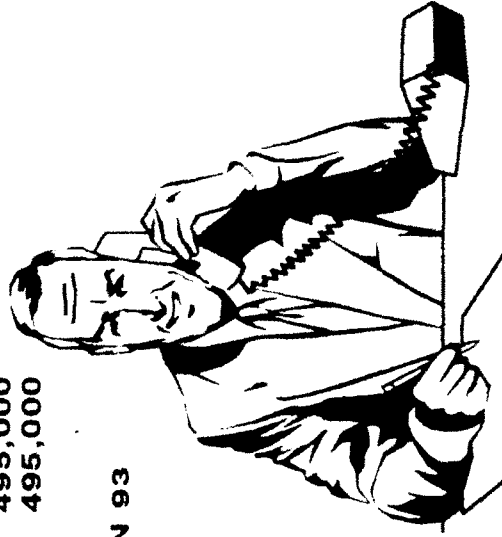


	MINIMUM	MAXIMUM
QUANTITIES: BASE	435,000	960,000
OPT 1	220,000	495,000
OPT 2	220,000	495,000

SCHEDULE: SOLICITATION DATE: JUN 93
AWARD DATE: SEP 93

ESTIMATED VALUE: \$4.3M \$9.7M

POC: ROBERT REAGAN
C3I ACQUISITION CENTER
908-532-5645

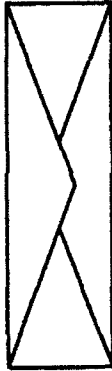


BUSINESS OPPORTUNITIES CON'T



CONTRACT OPPORTUNITY: LITHIUM SULFUR DIOXIDE
BATTERIES BA-5588,
BA-5599, BA-5557, BA-5598,
BA-5800, BA-5112

CONTRACT METHOD: SEALED BID WITH SAMPLES

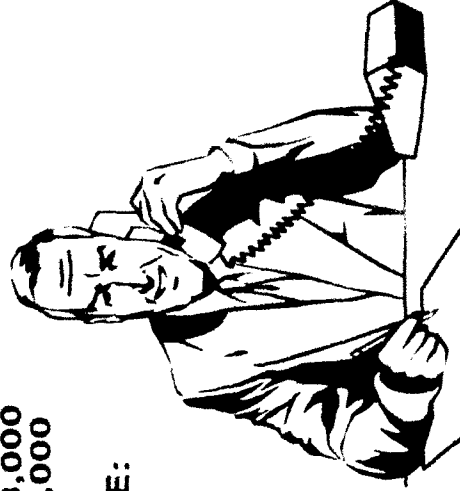


	MINIMUM	MAXIMUM
QUANTITIES:		
BA-5588	250,000	730,000
BA-5599	5,000	14,000
BA-5557	10,000	27,000
BA-5598	-0-	27,000
BA-5800	-0-	248,000
BA-5112	-0-	82,000

SCHEDULE: EBB SOLICITATION ISSUE DATE:
JUN 93
AWARD DATE: SEP 93

ESTIMATED VALUE:\$8.5M \$32.1M

POC: STEVEN LASCELLES
C3I ACQUISITION CENTER
908-532-4433

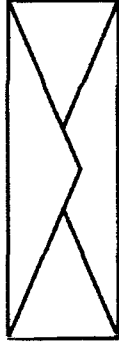


BUSINESS OPPORTUNITIES CON'T

CONTRACT OPPORTUNITY: REPLACEMENT FOR NICAD
BATTERY FAMILY
(INCLUDES BATTERY,
BATTERY CHARGER AND
POWER SUPPLY)



CONTRACT METHOD: INDEFINITE DELIVERY CONTRACT
FIVE YEARS



QUANTITIES: NOT YET DETERMINED

SCHEDULE: SOLICITATION DATE: AUG 93
AWARD DATE: JAN 94

ESTIMATED VALUE: \$5M

POC: ROBERT REAGAN
C3I ACQUISITION CENTER
908-532-5645

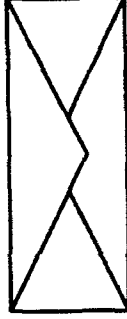


BUSINESS OPPORTUNITIES CON'T



CONTRACT OPPORTUNITY: MERCURY BATTERIES
BA-1082, BA-1085/U,
BA-1844/U

CONTRACT METHOD: SEALED BID - SBS/A

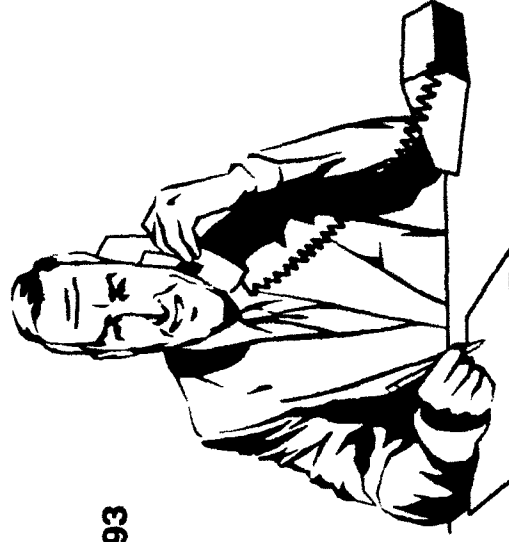


QUANTITIES: BA-1082: 1033
BA-1085/U: 4916
BA-1844/U: 1800

SCHEDULE: SOLICITATION DATE: JULY 93
AWARD DATE: OCT 93

ESTIMATED VALUE: \$347K \$1M

POC: ROBERT REAGAN
C3I ACQUISITION CENTER
908-532-5645



BUSINESS OPPORTUNITIES

CONTRACT BATTERY OPPORTUNITIES	SOLICITATION DATE	AWARD DATE
AIRCRAFT	AUGUST 93	DECEMBER 93
LITHIUM THIONYL CHLORIDE	JULY 93	NOVEMBER 93
LITHIUM MAGNESIUM DIOXIDE	JUNE 93	SEPTEMBER 93
LITHIUM SULFUR DIOXIDE	JUNE 93	SEPTEMBER 93
REPLACEMENT NICAD	AUGUST 93	JANUARY 94
MERCURY	JULY 93	OCTOBER 93

BUSINESS OPPORTUNITIES

SBIRs

► FY93

*** POLYMER ELECTROLYTES FOR BATTERIES (ARL)**

*** POLYMER ELCTROLYTE MEMBRANES FOR FUEL
CELLS AND BATTERIES (ARL)**

*** INTEROPERABLE POWER ADAPTER AND CHARGER
(CECOM RDEC)**

► FY94

*** POLYMER ELECTROLYTES FOR BATTERIES (ARL)**

*** METHANOL FUEL CELL ELECTROLYTES AND MODULES
(ARL)**

BUSINESS OPPORTUNITIES

ARL - BAAs

► FY93

*** HIGH POWER NONRECHARGEABLE BATTERY
HYDROGEN FUEL CELL**

*** LITHIUM ION, BB-X590**

*** RECHARGEABLE ZINC-ALKALINE**

► FY94

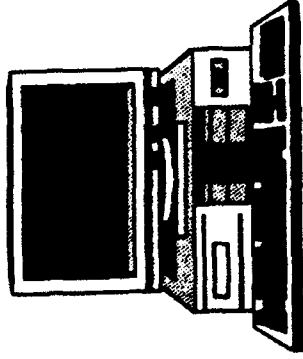
*** LITHIUM ION FAMILY**

*** SOLID OXIDE FUEL CELL**

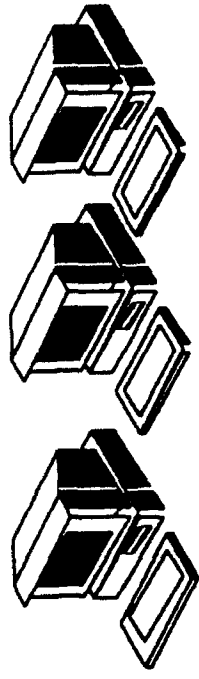
*** NICKEL METAL HYDRIDE**

ELECTRONIC BULLETIN BOARD

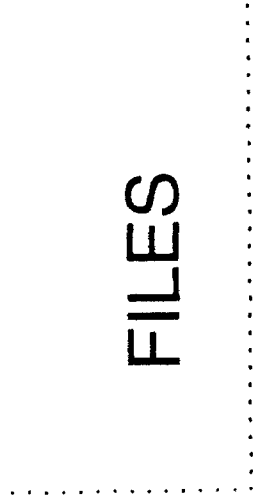
24 HOUR ACCESS



GOVERNMENT

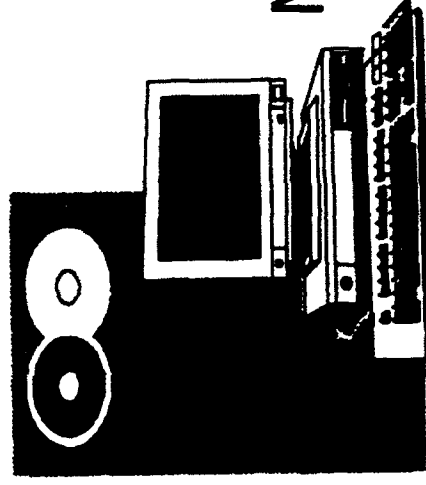


INDUSTRY



FILES

MESSAGES



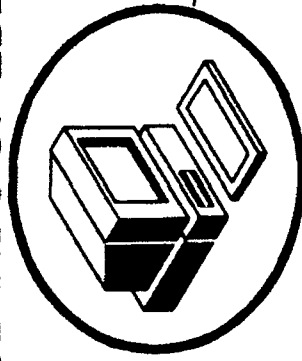
FILES

MESSAGES

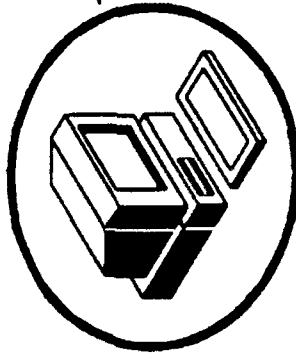
ELECTRONIC BULLETIN BOARD

TODAY:

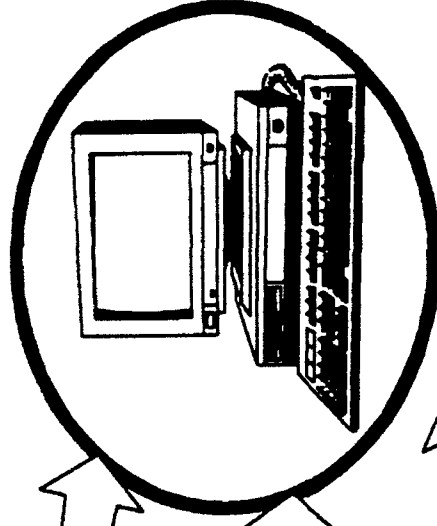
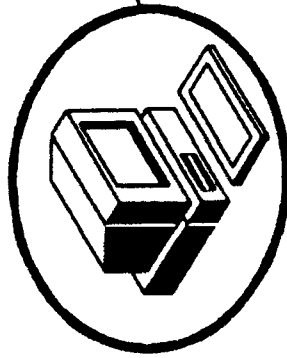
ISLANDS OF EBBS



MANY PHONE NUMBERS



MULTIPLE PASSWORDS

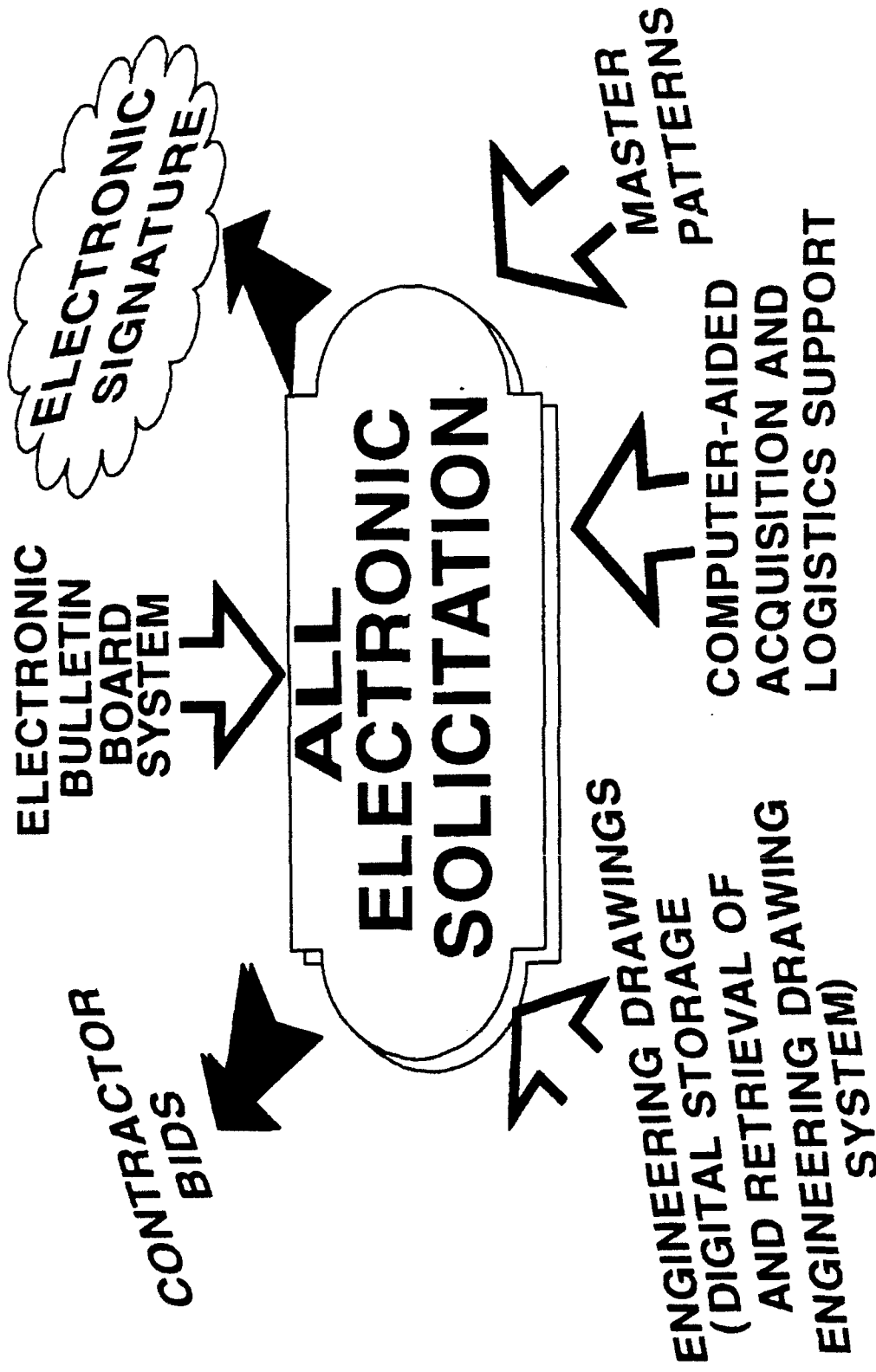


1 PHONE NUMBER

1 PASSWORD

UP TO 64 CONCURRENT USERS

ALL ELECTRONIC PROCUREMENT PROCESS



ELECTRONIC BULLETIN BOARD/ DIGITAL PROCUREMENTS

BENEFITS

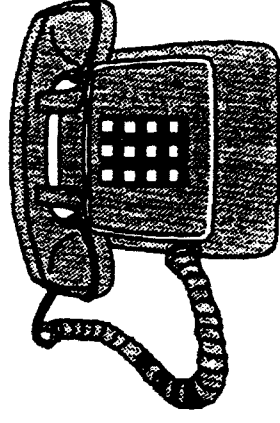


- ▶ STREAMLINES THE TRANSFER OF ELECTRONIC DATA BETWEEN GOVERNMENT AND INDUSTRY
- ▶ INFORMATION CAN BE EXTRACTED AND TRANSMITTED VIA INDUSTRY'S NETWORK TO MATRIX ORGANIZATIONS AND SUBCONTRACTORS
- ▶ ENHANCED SOLICITATION CLARITY AND QUALITY
- ▶ REDUCED PROPOSAL PREPARATION THROUGH INDUSTRY'S EARLY INVOLVEMENT
- ▶ ALLOWS MULTIPLE USERS TO SIMULTANEOUSLY DOWNLOAD FILES, ACCESS E-MAIL, CDRL TRACKING AND CORRESPONDENCES
- ▶ 24 HOUR ACCESS ELIMINATES TIME-ZONE HINDRANCES

ELECTRONIC BULLETIN BOARD/ DIGITAL PROCUREMENTS

POINTS OF CONTACT

**MR. DAVID FIELTSCHE
(908) 532-1912**

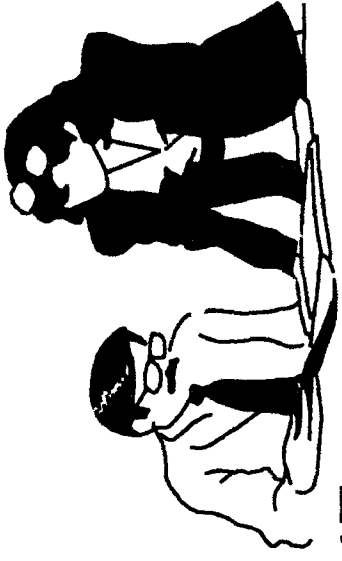


**MR. ROGER BERGER
(908) 532-1242**

UNSOLICITED PROPOSALS



UNSOLICITED PROPOSALS



ARE -

- ▶ A MEANS BY WHICH UNIQUE AND INNOVATIVE IDEAS ARE OFFERED TO THE ARMY
- ▶ INDEPENDENTLY ORIGINATED AND DEVELOPED BY OFFEROR
- ▶ PREPARED WITHOUT GOVERNMENT SUPERVISION

UNSOLICITED PROPOSALS

ARE NOT -



- ▶ CONTRIBUTIONS
- ▶ TECHNICAL CORRESPONDENCE
- ▶ ADVERTISING MATERIAL
- ▶ ADVANCED PROPOSALS FOR A KNOWN AGENCY REQUIREMENT THAT CAN BE ACQUIRED BY COMPETITIVE METHODS

GOVERNMENT EVALUATION

- ▶ **CRITERIA**
- ▶ **UNIQUE AND INNOVATIVE METHODS, APPROACHES OR CONCEPTS**
- ▶ **OVERALL SCIENTIFIC, TECHNICAL OR SOCIOECONOMIC MERITS**
- ▶ **POTENTIAL CONTRIBUTIONS TO THE EVALUATOR'S MISSION**
- ▶ **SUBMITTER'S CAPABILITIES, RELATED EXPERIENCE, FACILITIES, TECHNIQUES, OR UNIQUE COMBINATIONS OF THESE WHICH ARE INTEGRAL FACTORS FOR ACHIEVING THE PROPOSAL OBJECTIVES**

POINT OF CONTACT FOR

UNSOLICITED PROPOSALS

SUBMISSIONS AND QUESTIONS

CECOM USP MANAGER:

NANETTE MULLENAX

908-532-2671

OR

SANDRA VERMONT

908-532-2974



UNSOLICITED PROPOSALS

	FY91	FY92	FT93(OCT-MAR)
ON HAND	11	11	3
RECEIVED	61	37	16
REJECTIONS	51	44	13
ACCEPTED	10	1	1

BUSINESS OPPORTUNITIES

COST REDUCTION

▶ VALUE ENGINEERING CHANGE PROPOSALS (VECPs)

**POC: AL PALEY, VECF PROGRAM MGR
(908)532-2318**

▶ OPERATING AND SUPPORT COST REDUCTION(OSCR)

**POC: RICHARD SANDFORD, OSCF
PROGRAM MGR
(908)532-6815**

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NOTES

EXECUTIVE PANEL

Mr. Patrick J. Whitfill
Director, Systems Management
US Army Communications-Electronics Command

Dr. Robert P. Hamlen
Director, Power Sources Division
US Army Research Laboratory

Dr. Joseph Buccieri
Chief, Division B, C3I Acquisition Center
US Army Communications-Electronics Command

Mr. Richard O. Banyard
Chief, CCS/Avionics Division
Product Integrity and Production Engineering Directorate
US Army Communications-Electronics Command



CLOSING REMARKS

SUMMARY

- EMPHASIS ON REDUCING O&S COSTS
- NEXT GENERATION OF POWER SOURCES
BASED ON DUAL USE TECHNOLOGY
- DEVELOP IMPROVED, COST EFFECTIVE
POWER SOURCES
- INCREASED STANDARDIZATION EFFORTS
- EMPHASIZE BATTERY SELECTION AND
POWER MANAGEMENT IN INITIAL
END ITEM DESIGN EFFORTS
- NEED FOR INDUSTRY SOLUTIONS TO
THE PROBLEMS

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NOTES



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