National Defense Industrial Association

Tank-Automotive Division
Combat Vehicles Section

1998
Combat Vehicles Conference

Proceedings

September 21-23, 1998

US Army Armor Center
Fort Knox, Kentucky

Event #860

TOTAL P

FOR FURTHUR INFORMATION CONCERNING DISTRIBUTION CALL (703) 767-8040

Combat Vehicles Conference

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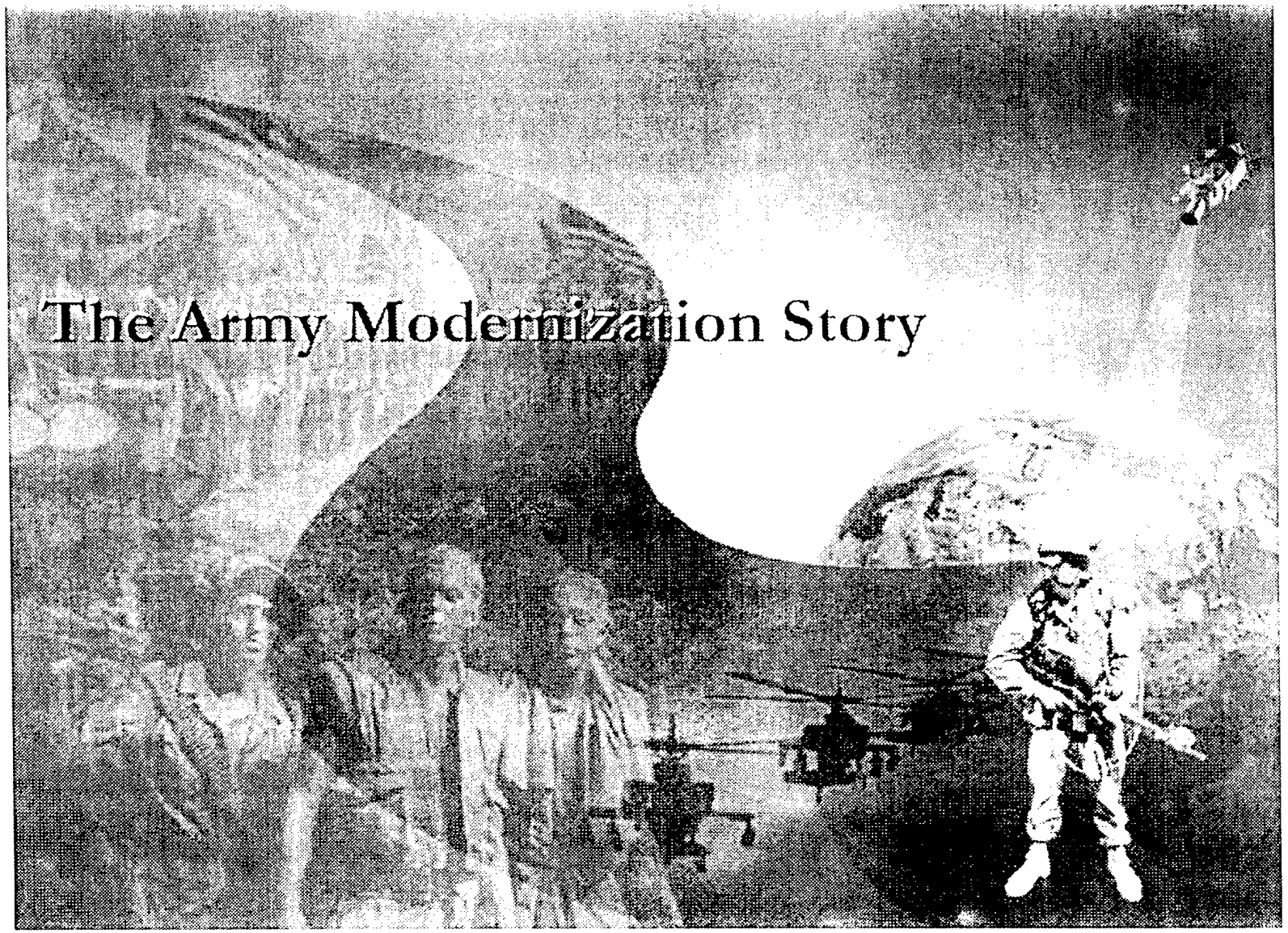
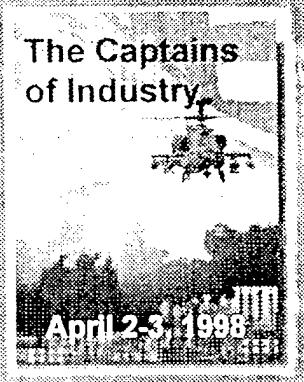
1 Oct 98

TABLE OF CONTENTS

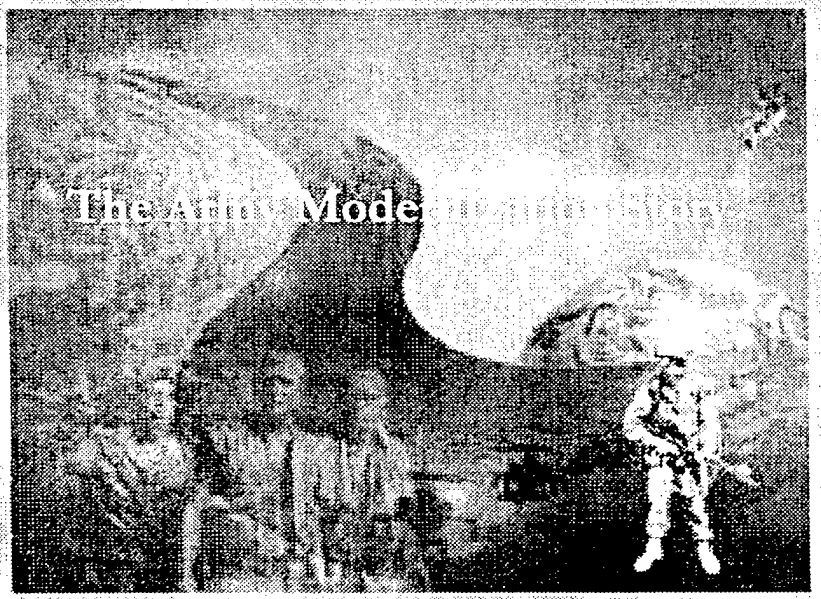

The Army Modernization Story

Objective



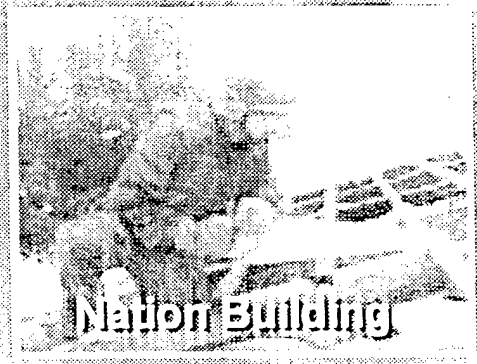
Tell the Army Modernization and Investment Strategies to Business and Industry Through Outreach Seminars.

Tell the Army Acquisition and Modernization Story Through Business and Industry Executive Boss to Army Leaders.



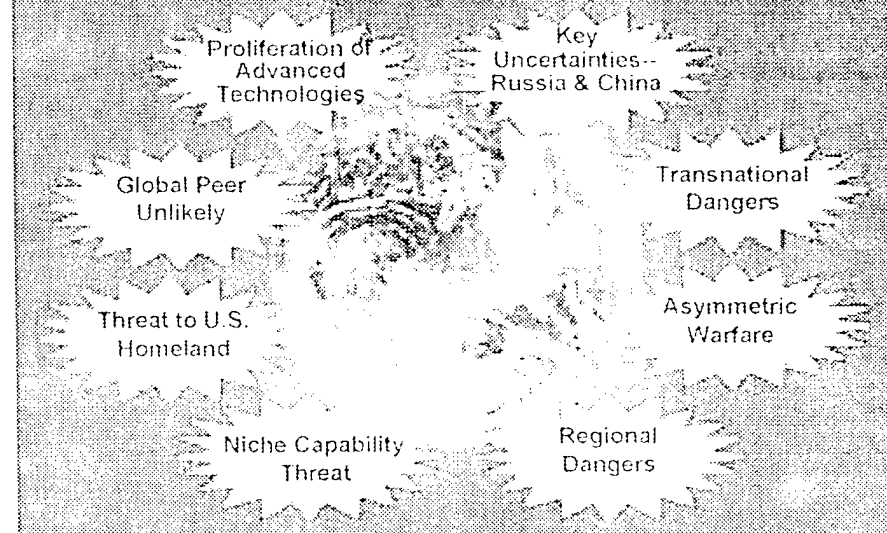
Why An Army . . .

Winning Wars



. . . to Meet the Nation's Needs Yesterday, Today and Tomorrow.

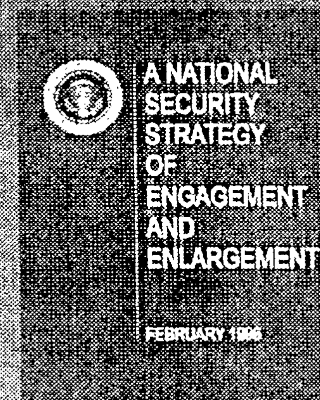
Geostrategic Environment Out to 2020



- Numerous Threats, Less Predictable
- Increased Potential for Asymmetric Threats
- Worldwide Influence Important to National Interests
- Opportunity and Responsibility to Meet the Challenges of the Next Century

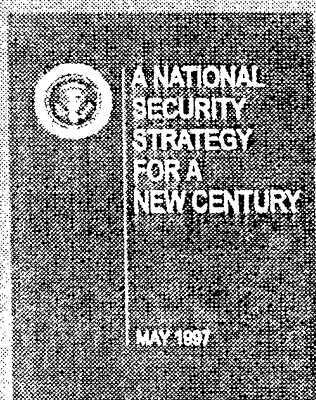
Prepare for the Way the World Is Likely to Be, Not as We Would Like It to Be.

The U.S. National Security Strategy Goals Have Changed . . .



1996

- Enhance Security by Maintaining a Strong Defense
- Bolster Prosperity by Working to Open Foreign Markets and Spur Economic Growth
- Promote Democracy

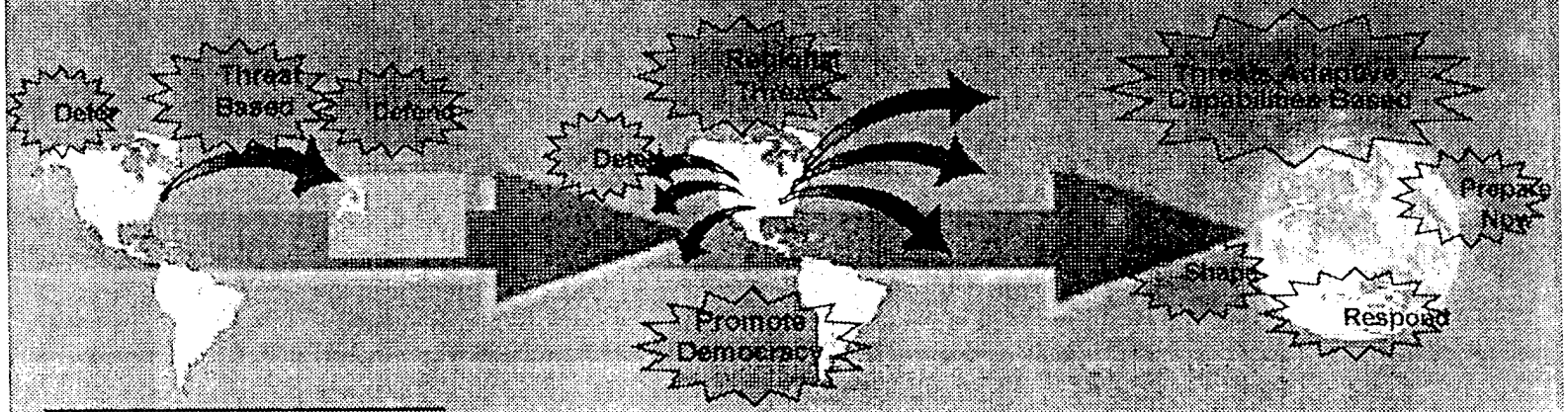


1997

- Ensure the Protection of Our Nation's Fundamental and Enduring Needs
- Protect the Lives and Safety of Americans
- Maintain the Sovereignty of the United States With its Values, Institutions, and Territory Intact
- Provide for the Prosperity of the Nation and its People

. . . To Prepare Now for an Uncertain Future.

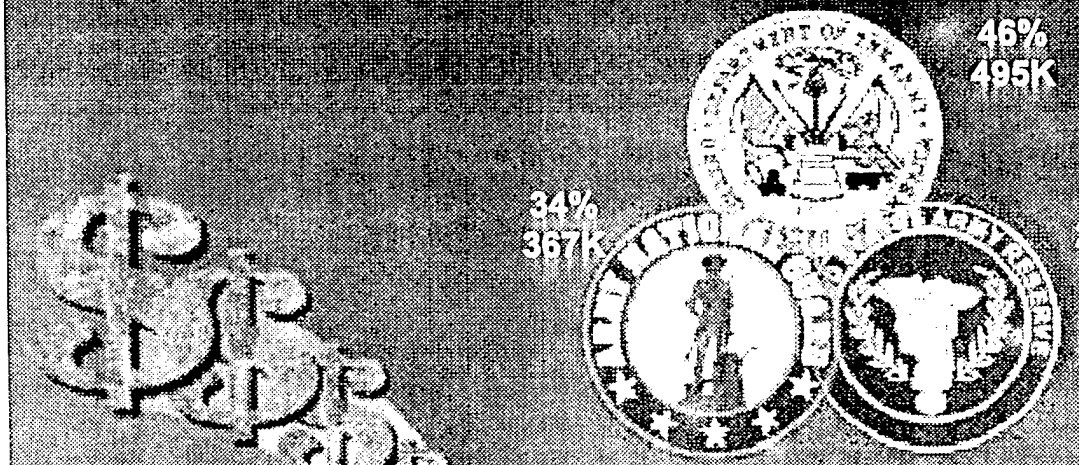
Defense Requirements Have Changed . . .



. . . From a "Threat-Based" Force to a Full-Spectrum, "Threats Adaptive, Capabilities-Based" Force.

The Army Has Changed . . .

Since the Fall of the Berlin Wall



- Diminished Resources
  - Total Army Personnel Reduced by 246,000
  - Budget Decreased 33%
  - Materiel Base Down 36%
  - 700 Installations Closed Worldwide

- Increased Integration of Active and Reserve Components

- Expanded Missions
  - 22,186 Soldiers Deployed to 32 Countries
  - 28 Operational Deployments

To Adapt to the New World Order

As the Nation's Force of Choice . . .

79% -- Panama
Operation Just Cause

57%
Operation Desert Storm

Quality Force

Leader Development

Training

Modern Equipment

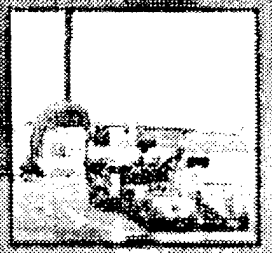
Force Mix

Doctrine

96% -- Haiti
Operation Uphold Democracy

87% -- Bosnia
Operation Joint Endea

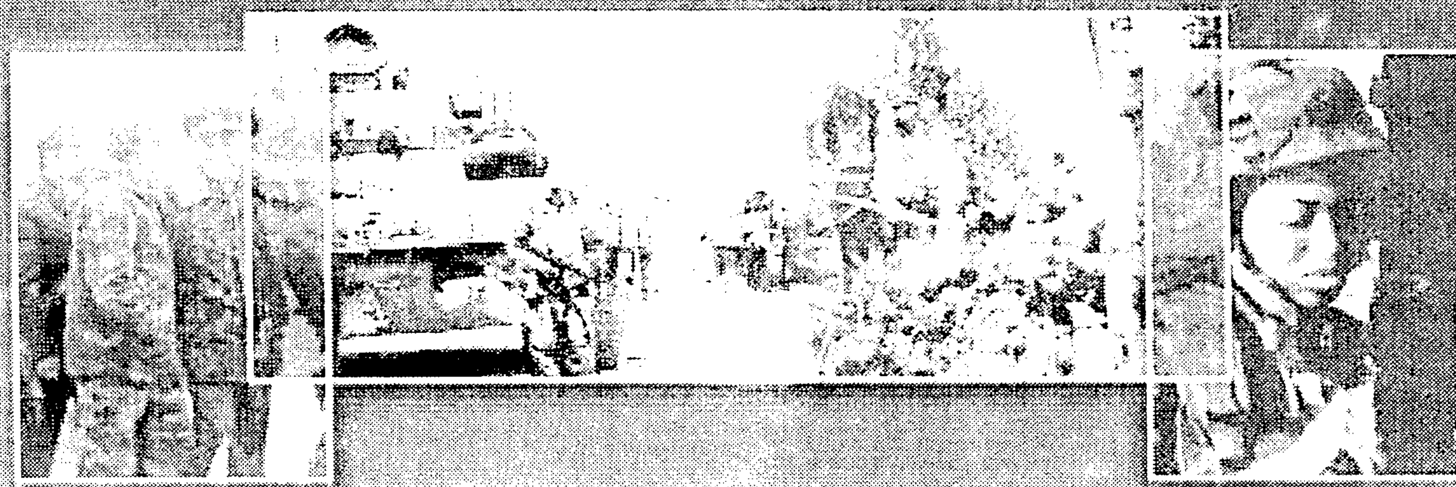
79% -- Kuwait
Operation Southern Watch



87% -- Kuwait
Operation Vigilant Warrior

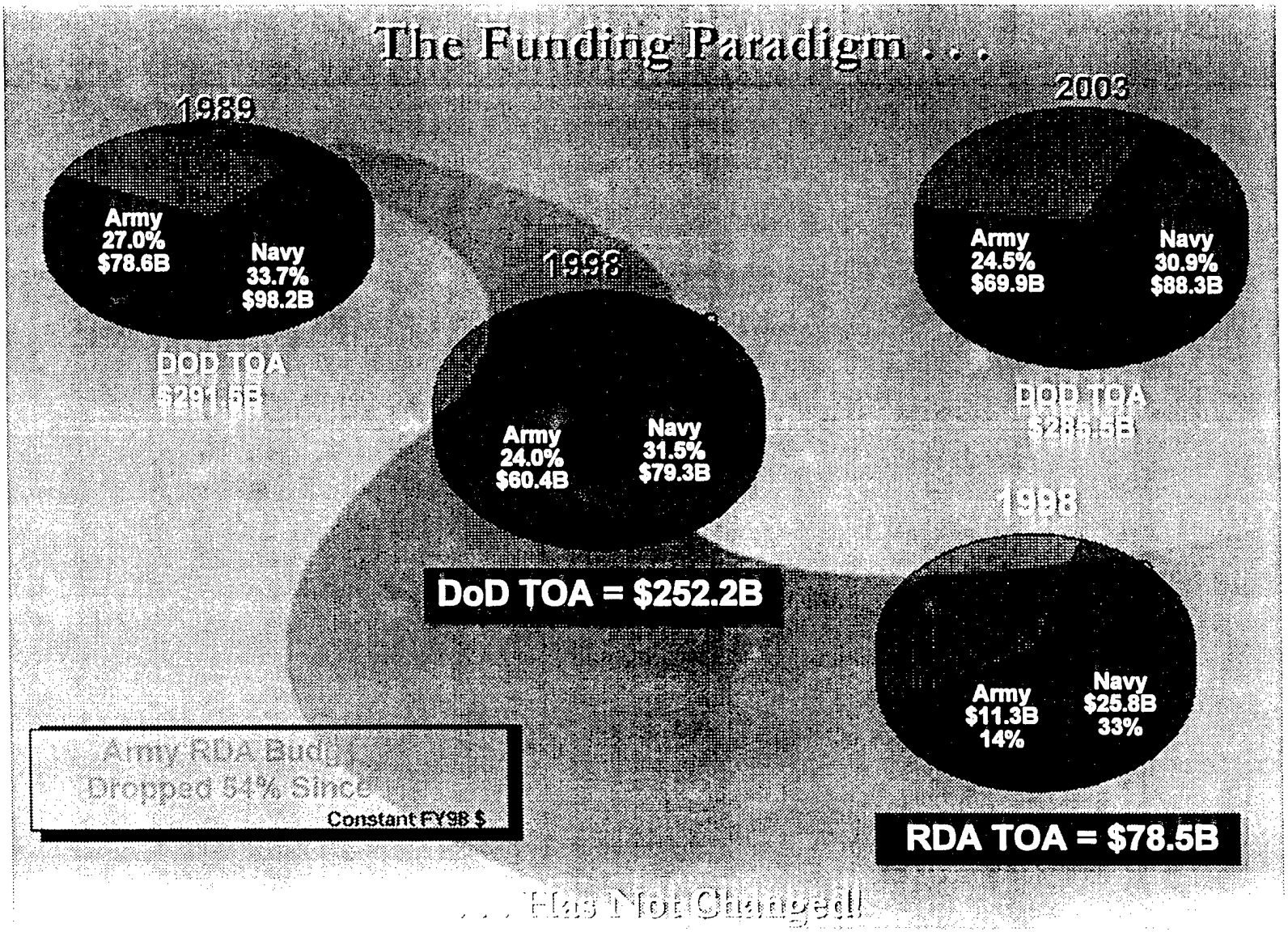
. . . The Army Provides the "Boots on the Ground."

The Bottom Line . . .

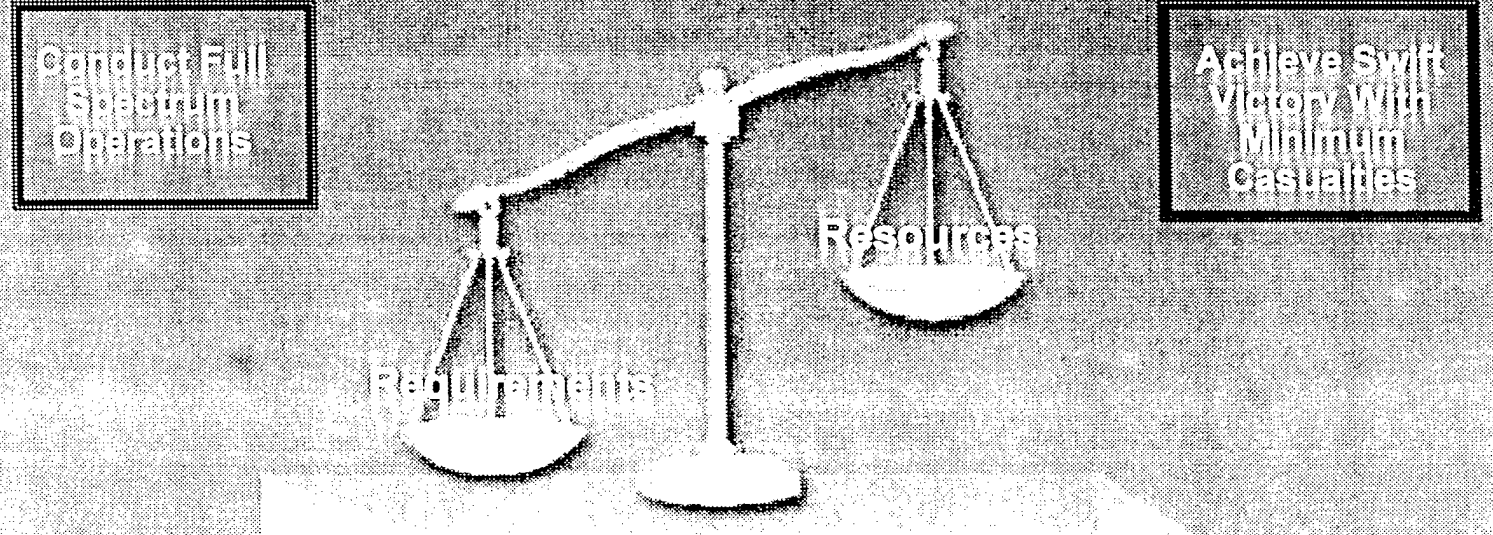


- Geostrategic Environment Has Changed
  - Our National Security Strategy Has Changed
    - Defense Requirements Have Changed
      - U.S. Army Has Changed

But . . .


The Funding Paradigm . . .
1989
Army
27.0%
$78.6B
Navy
33.7%
$98.2B
DOD TOA
$291.6B
1998
Army
24.0%
$60.4B
Navy
31.5%
$79.3B
DoD TOA = $252.2B
2003
Army
24.5%
$69.9B
Navy
30.9%
$88.3B
DOD TOA
$285.5B
1998
Army
$11.3B
14%
Navy
$25.8B
33%
RDA TOA = $78.5B
Army RDA Budg
Dropped 64% Since
Constant FY98 $
. . . Has Not Changed!

The Army's Dilemma . . .



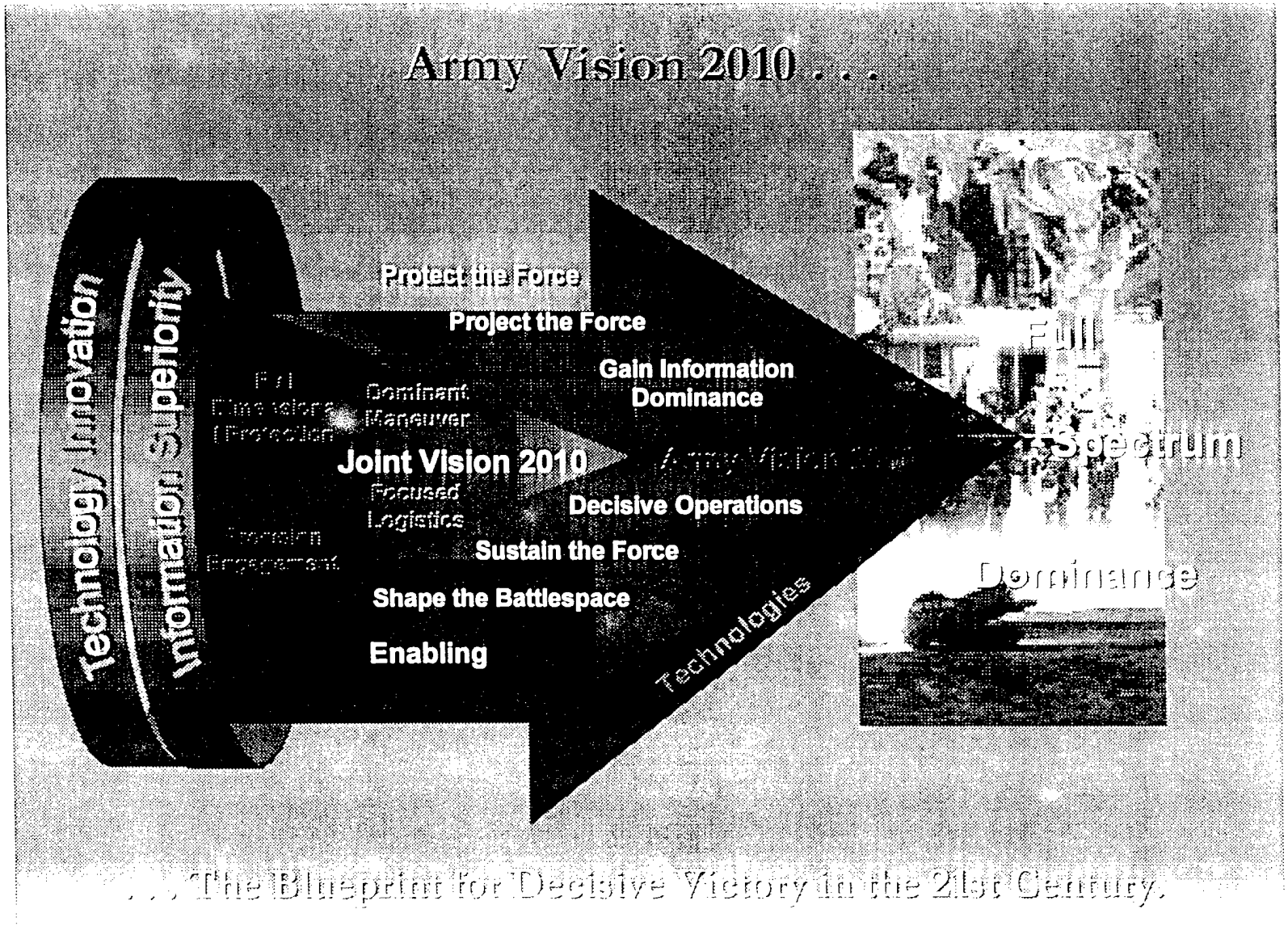
National Military Strategy

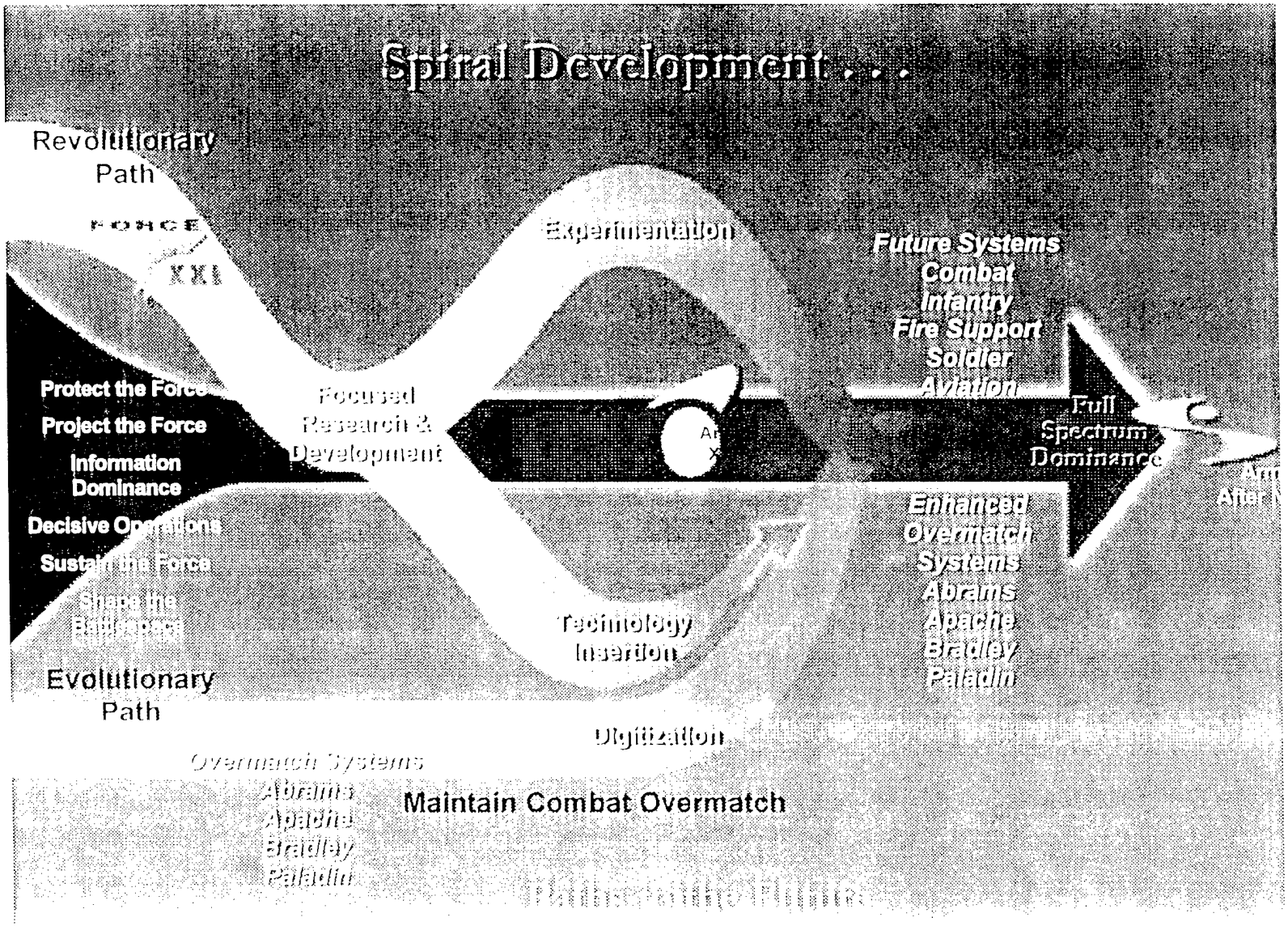
Shape

Respond

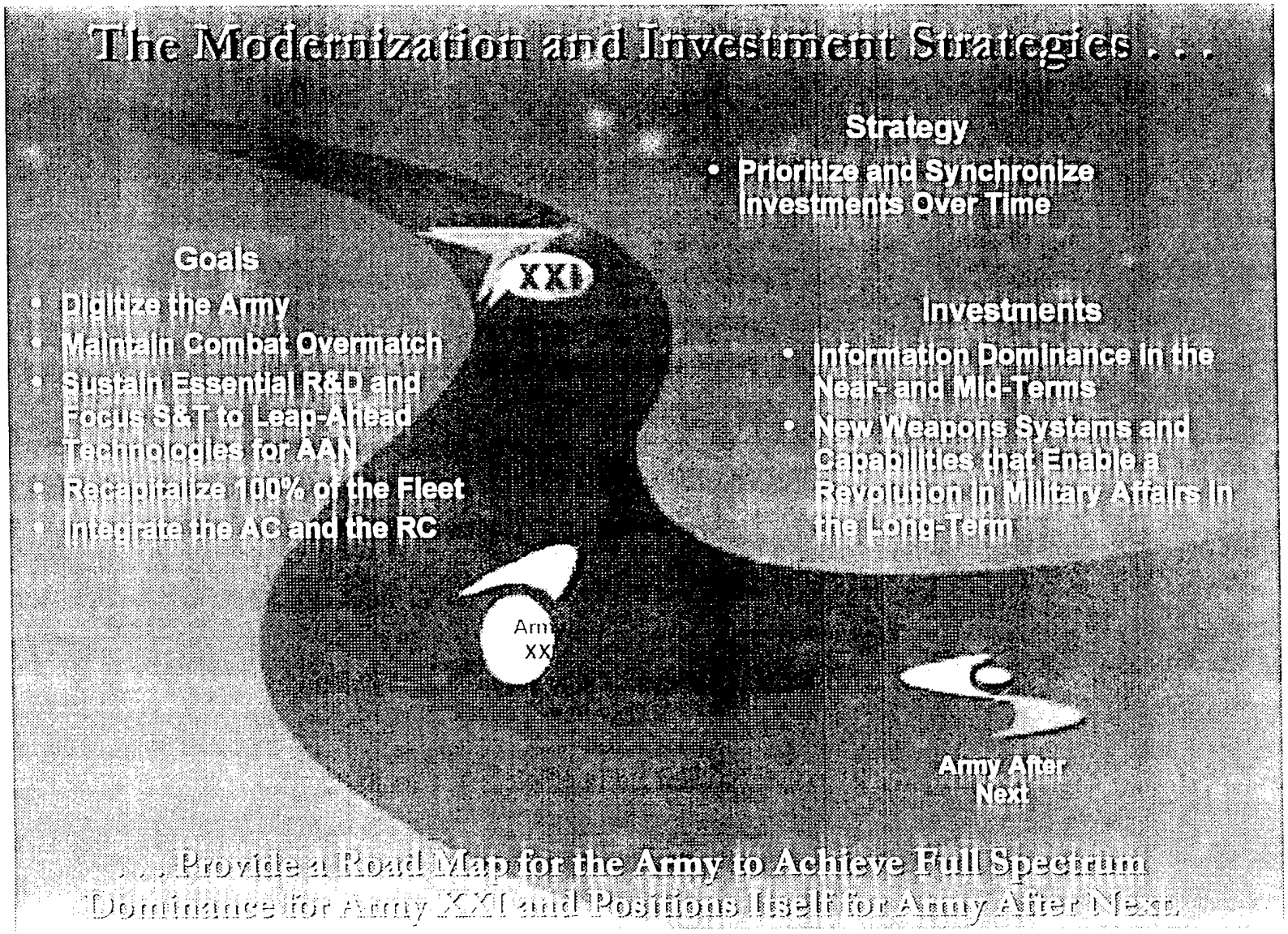
Prepare Now

. . . The Strategic Imbalance -- Requirements and Resources.


Army Vision 2010 . . .
Technology/ Innovation
Information Superiority
Protect the Force
Project the Force
Gain Information Dominance
Dominant Maneuver
Joint Vision 2010
Focused Logistics
Decisive Operations
Sustain the Force
Shape the Battlespace
Enabling
Technologies
Full Spectrum
Dominance
. . . The Blueprint for Decisive Victory in the 21st Century.


Spiral Development . . .
Revolutionary Path
Experimentation
Future Systems
Combat
Infantry
Fire Support
Soldier
Aviation
Protect the Force
Project the Force
Information Dominance
Decisive Operations
Sustain the Force
Focused Research & Development
Full Spectrum Dominance
Enhanced Overmatch Systems
Abrams
Apache
Bradley
Paladin
Technology Insertion
Evolutionary Path
Digitization
Maintain Combat Overmatch

The Modernization and Investment Strategies . . .



Goals

- Digitize the Army
- Maintain Combat Overmatch
- Sustain Essential R&D and Focus S&T to Leap-Ahead Technologies for AAN
- Recapitalize 100% of the Fleet
- Integrate the AC and the RC

Strategy

- Prioritize and Synchronize Investments Over Time

Investments

- Information Dominance in the Near- and Mid-Terms
- New Weapons Systems and Capabilities that Enable a Revolution in Military Affairs in the Long-Term

. . . Provide a Road Map for the Army to Achieve Full Spectrum Dominance for Army XXI and Position Itself for Army After Next.

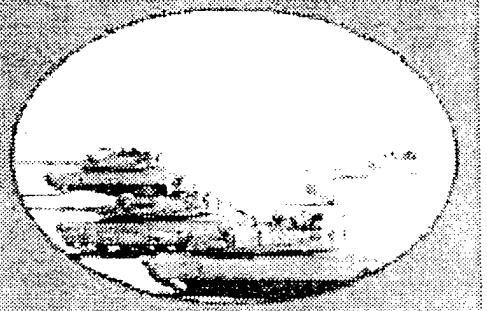
Information Dominance . . .

Where Am I?

- Global Positioning System
- Army Battle Command System

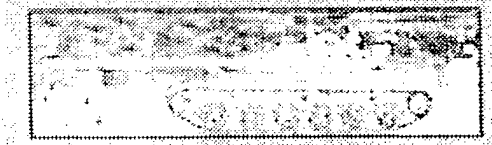
Where Are My Friends?

- Situational Awareness
- Combat ID
- Onboard Sensor Processing
- Future Digital Radio
- Power Protection C4I



Where Is the Enemy?

- Unmanned Aerial Vehicle
- Airborne Target Identification
- Seamless ISR Architecture
- Onboard Sensor Processing



Concept:

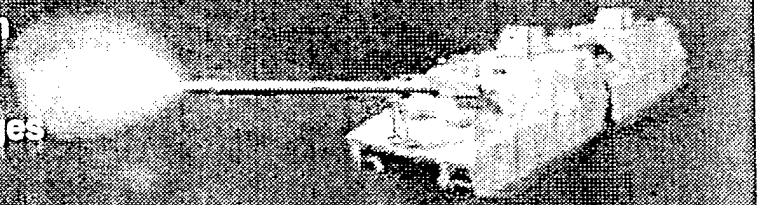
Provide the Commanders and Soldiers an Uninterrupted Flow of Information for Increased Situational Awareness to More Readily Seize and Retain the Initiative.

. . . Gives Commanders the Decisive Edge.

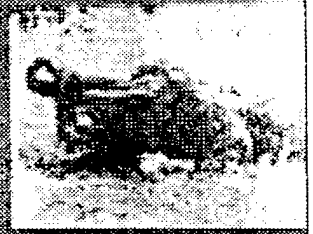
Combat Overmatch . . .

- Tailor Incremental Improvements to Retain Overmatch Against Potential Adversaries
- Continue to Evolve Force Structure Changes and Redesign
- Enhance Weapons Systems Capabilities

Crusader

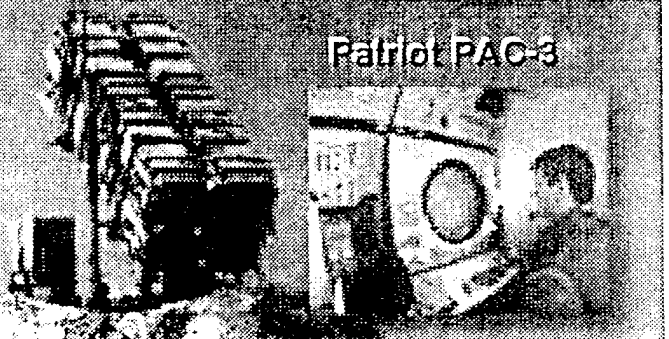


Javelin



Retain Superior Combat Capabilities Over Any Opponent by Virtue of Combat Systems Which Employ Advanced Technologies

Patriot PAC-3



. . . To Secure Swift Victory With Minimal Casualties.

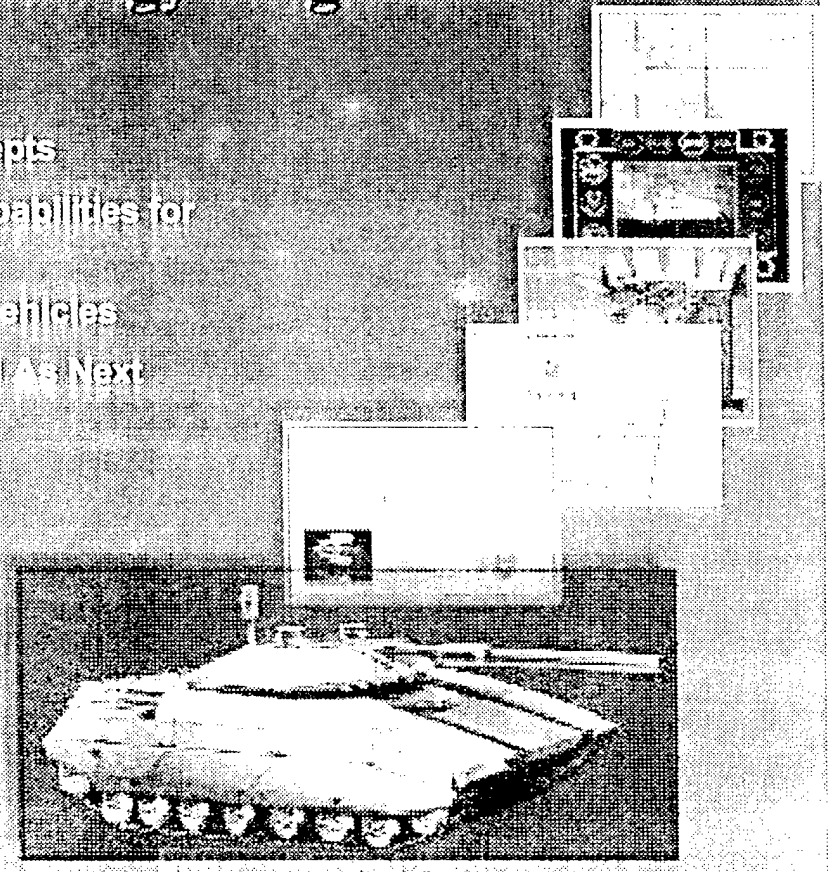
Science and Technology Programs . . .

Speed and Knowledge

- Support Emerging Army After Next Concepts
- Bridge Fielding Gap With Leap-Ahead Capabilities for Army Vision 2010
- Lighter, More Mobile, More Supportable Vehicles
- Provide Continued Improvements As Well As Next Generation Capabilities

Concept:

Funding and Focusing Science and Technology and the Industrial Base to Provide Leap-Ahead Systems to Support the Future Army

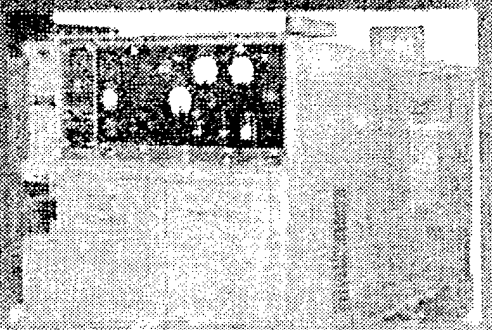


Future Combat System

. . . Provide a Significant, Revolutionary Improvement Over Current Capabilities.

Equipment Recapitalization . . .

- Replacement
- Extended Service Programs (ESP)
- Preplanned Product Improvements (P3I)
- Service Life Extension Program (SLEP)
- Depot Rebuild
- Technology Insertion—Horizontal Technology Integration (HTI)



Generator

Chinook

Concept:

Replace or Retrofit Existing Systems to Guard Against the Effects of Mechanical Aging, Technical Obsolescence, or Excessive Expense to Maintain

. . . Seeks to Guard Against Obsolescence and the High Costs of Aging.

Contributing Capabilities . . .

- Non-TOE Equipment
- Safety
- Logistics
- Environmental Compliance
- Facilities

Logistics

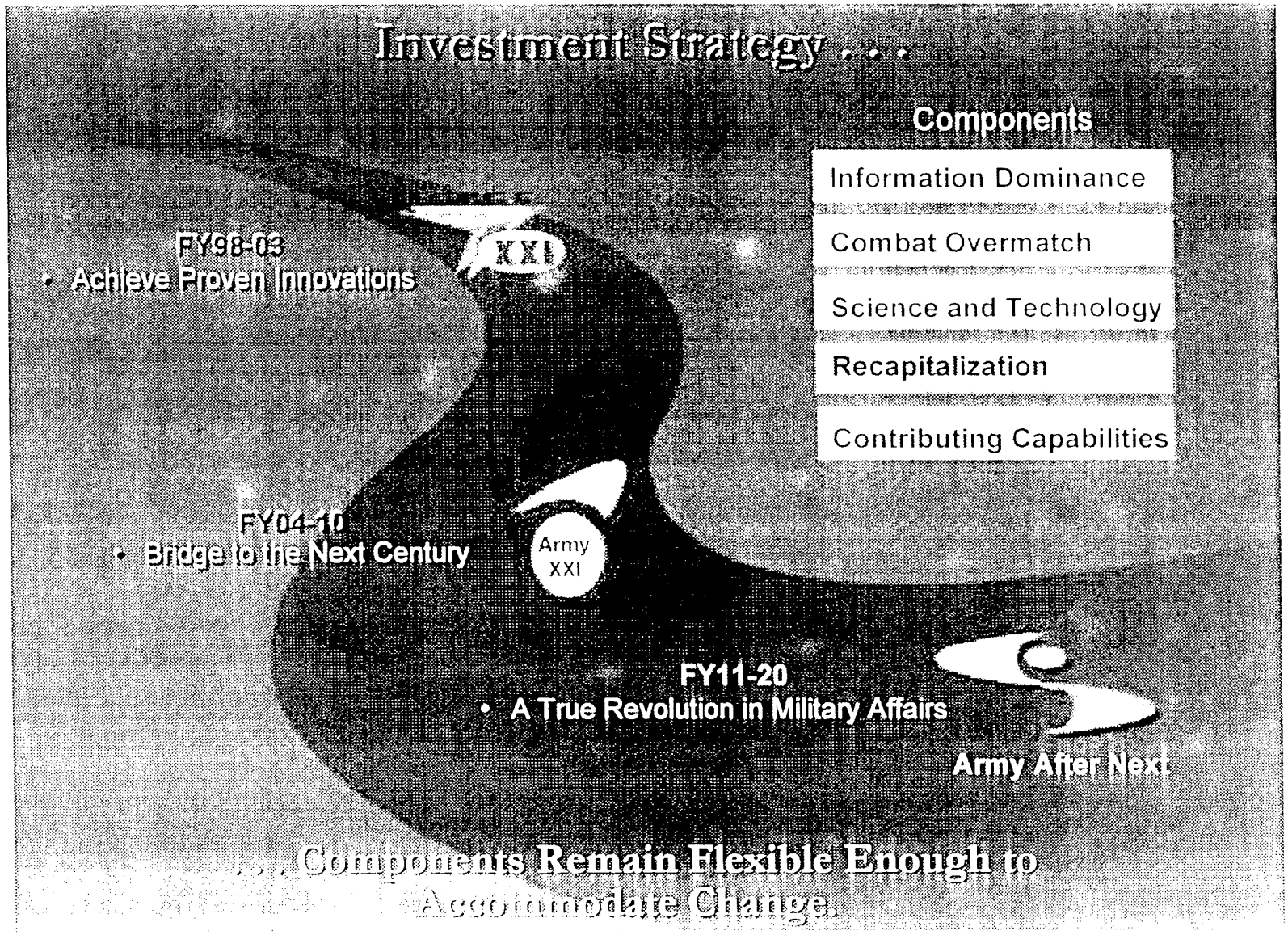
Facilities

Concept:

Capabilities and Infrastructure Necessary to Conduct Fundamental Operations.

. . . Are Essential to Properly Field, Equip, Sustain, and Train the Force.

Investment Strategy . . .



. . . Components Remain Flexible Enough to Accommodate Change.

Near-Term . . . Fiscal Years 1998 to 2003

Warfighting Programs
- Army Battle Command Systems
- Warfighter Information Network--Terrestrial Transport
- Command and Control Warfare--C2 Protect & C2 Attack
- JSTARS Common Ground Station
- Power Projection C4I

Information Enhanced Systems
- Abrams
- Bradley
- Land Warrior
- AH-64 Apache Longbow
- Future Scout Cavalry System (Advanced Technology Demonstration)

- 2nd Generation Forward Looking Infra-Red (FLIR)
- AH-64 Apache Upgrade
- Javelin

- PATRIOT Upgrade
- M1A2 SEP
- Sense and Destroy Armor (SADARM)

- Battlefield Combat ID
- Power Efficiencies (Batteries)
- Low Cost Missile Guidance

- Titanium/Composite Components
- Smart Barrel Actuation
- Enhanced Lethality

- Tactical Vehicle
- Medium Truck SLEP

- Tactical Quiet Generators
- Command and Control Vehicle (C2V)

- Rail Cars
- C-17s

- Roll-On/Roll-Off Ships
- Logistics-Over-the-Shore Equipment

Mid-Term . . . Fiscal Years 2004 to 2010

- Joint Tactical Radio
- Comanche
- All Source Analysis System (ASAS) Block II

- Crusader
- High Mobility Artillery Rocket System (HIMARS)
- Follow-On to TOW (FOTT)
- Theater High-Altitude Area Defense (THAAD)
- Army Tactical Missile System (ATACMS)/Brilliant Anti-Armor Submunition (BAT)

- Dynamic Obstacles
- Precision Systems
- Precision Munitions

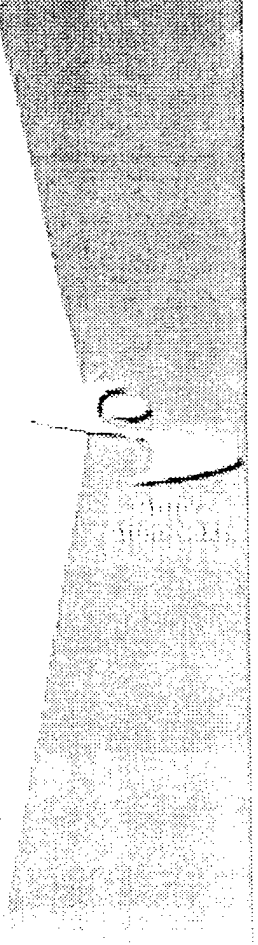
- Lightweight Materials
- Active/Passive Efficiencies

- Tactical Internet/SINCGARS
- Target Acquisition Systems (Q36/37)
- Integrated System Control (ISYSCON)

- Stinger Block II
- UH-60 Blackhawk
- HEMTT II

- Total Asset Visibility (TAV)

- Material Handling Equipment



Far-Term . . . Fiscal Years 2011 to 2020

Information Dominance

- All Source Analysis System (ASAS) P3I
- Firefinder P3I

Combat Overmatch

- Future Direct Support Weapon
- Future Infantry Vehicle
- Future Combat System
- 3rd Generation FLIR
- Laser Decoy
- Active Protection

Science and Technology

- Electric Propulsion
- Lightweight Materials
- Self-Sufficient Autonomous Battle Systems
- Brilliant Munitions

Force Projection

- Multiple Launch Rocket System
- CH-47D Chinook
- OH-58D Kiowa Warrior
- Palletized Loading System
- Bradley Linebacker
- PATRIOT

Force Sustainment

- Armored Medical Treatment Vehicle
- Deployable Medical Systems
- Reverse Osmosis Water Purification Unit

Industry-Army Team

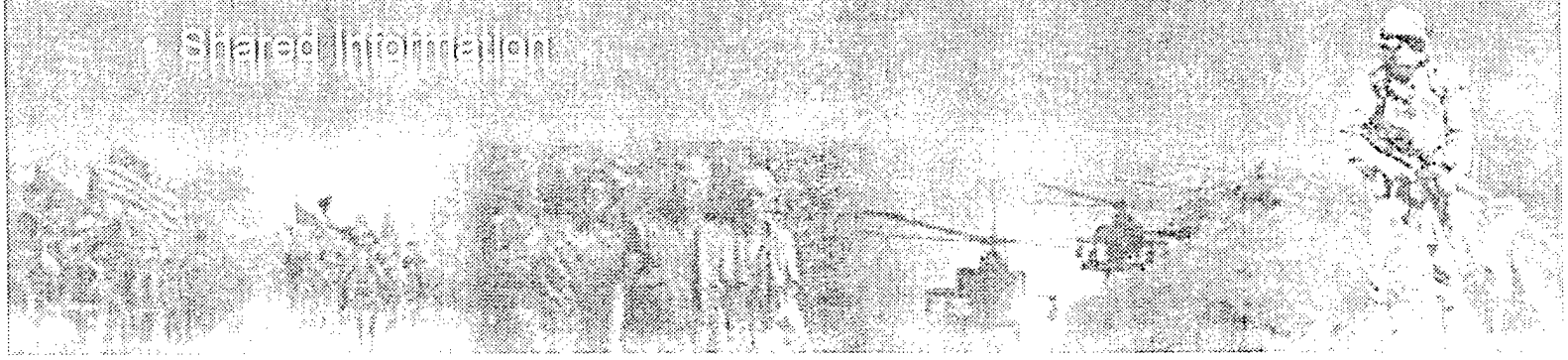
New Weapons Systems and Equipment Must . . .

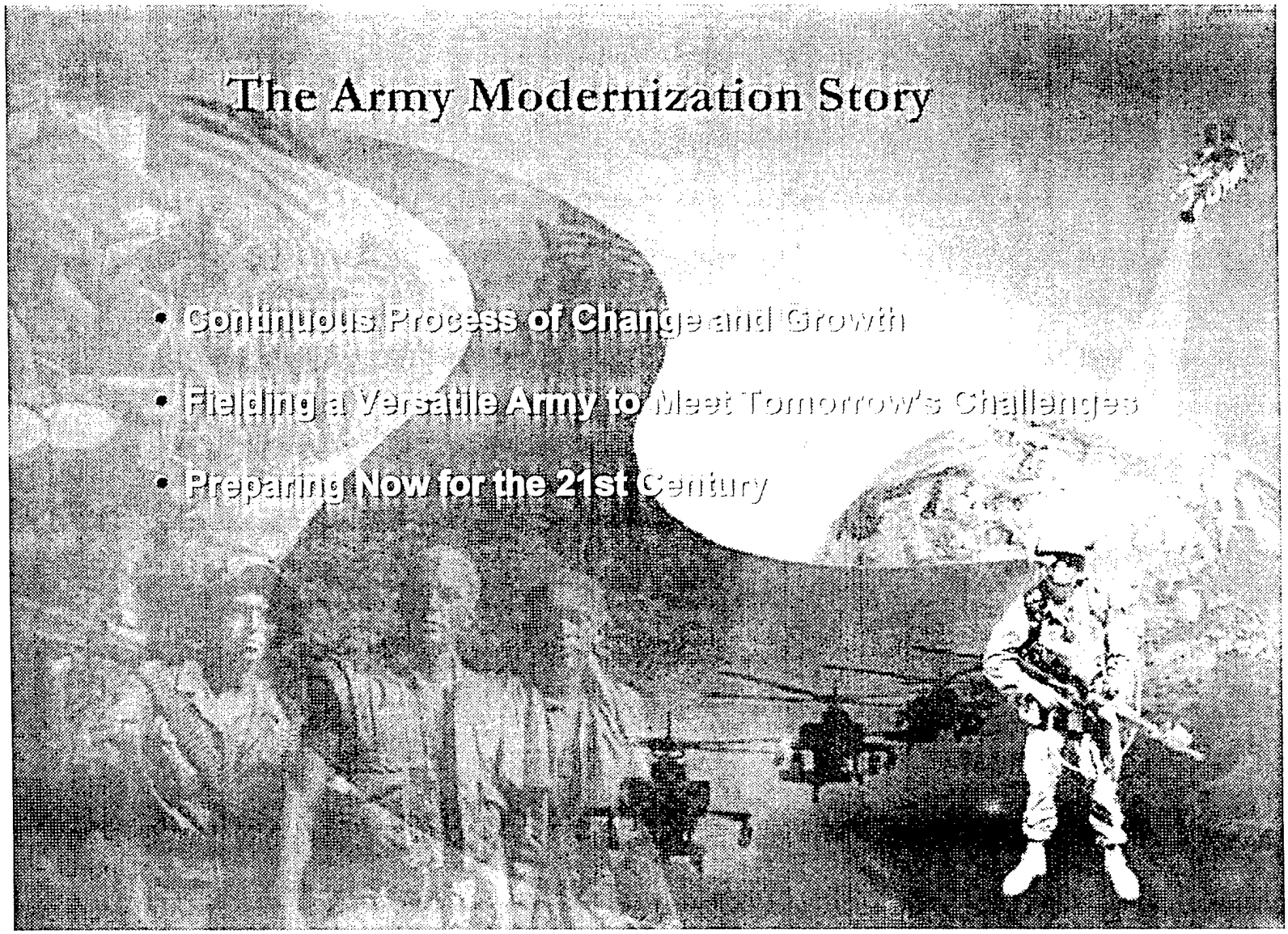
- Be Cost-Efficient and Relevant
- Be Lighter, Faster, More Lethal Multipurpose Weapons Platforms
- Provide Leap-Ahead Capability
- Maintain Baseline Interoperability for the Total Force
- Leverage Improvement to Provide True Overmatch

Army Initiatives

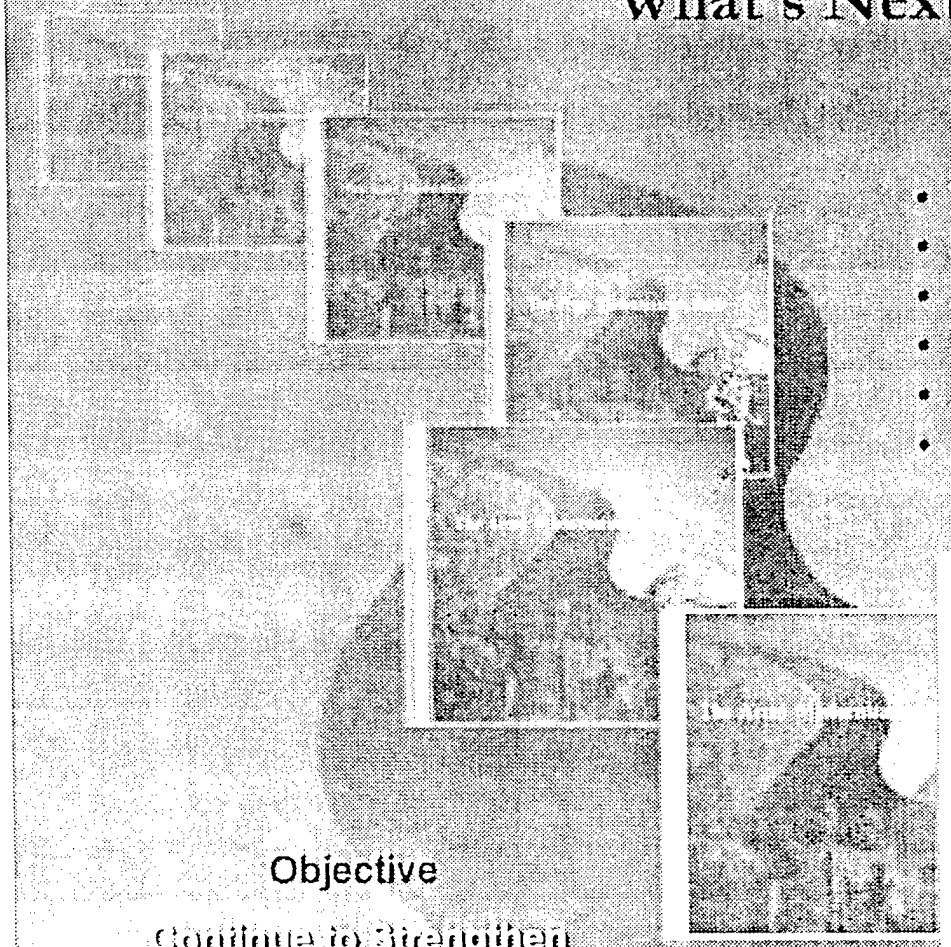
- Streamline Acquisition
- Partnership
- Acquisition Reform
  - Tools
  - Eliminate Barriers
  - Reduce Overhead
  - Streamline Processes
- Paperless Acquisition
- Shared Information

- **Streamline System**
- **Reduce Process Costs**
- **Reduce Cost to Supplier Base**



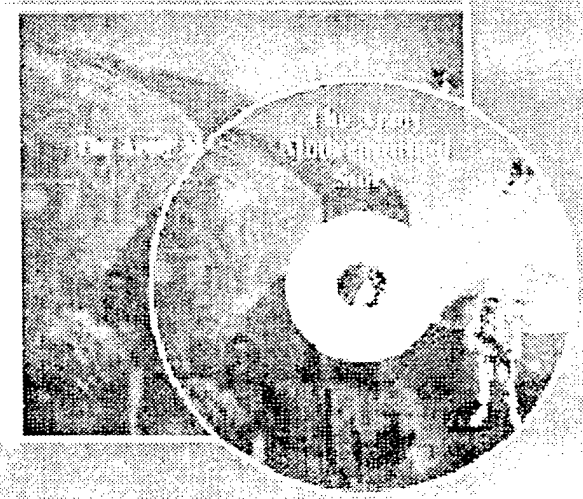

The Army Modernization Story
• Continuous Process of Change and Growth
• Fielding a Versatile Army to Meet Tomorrow's Challenges
• Preparing Now for the 21st Century

What's Next . . .



Contents

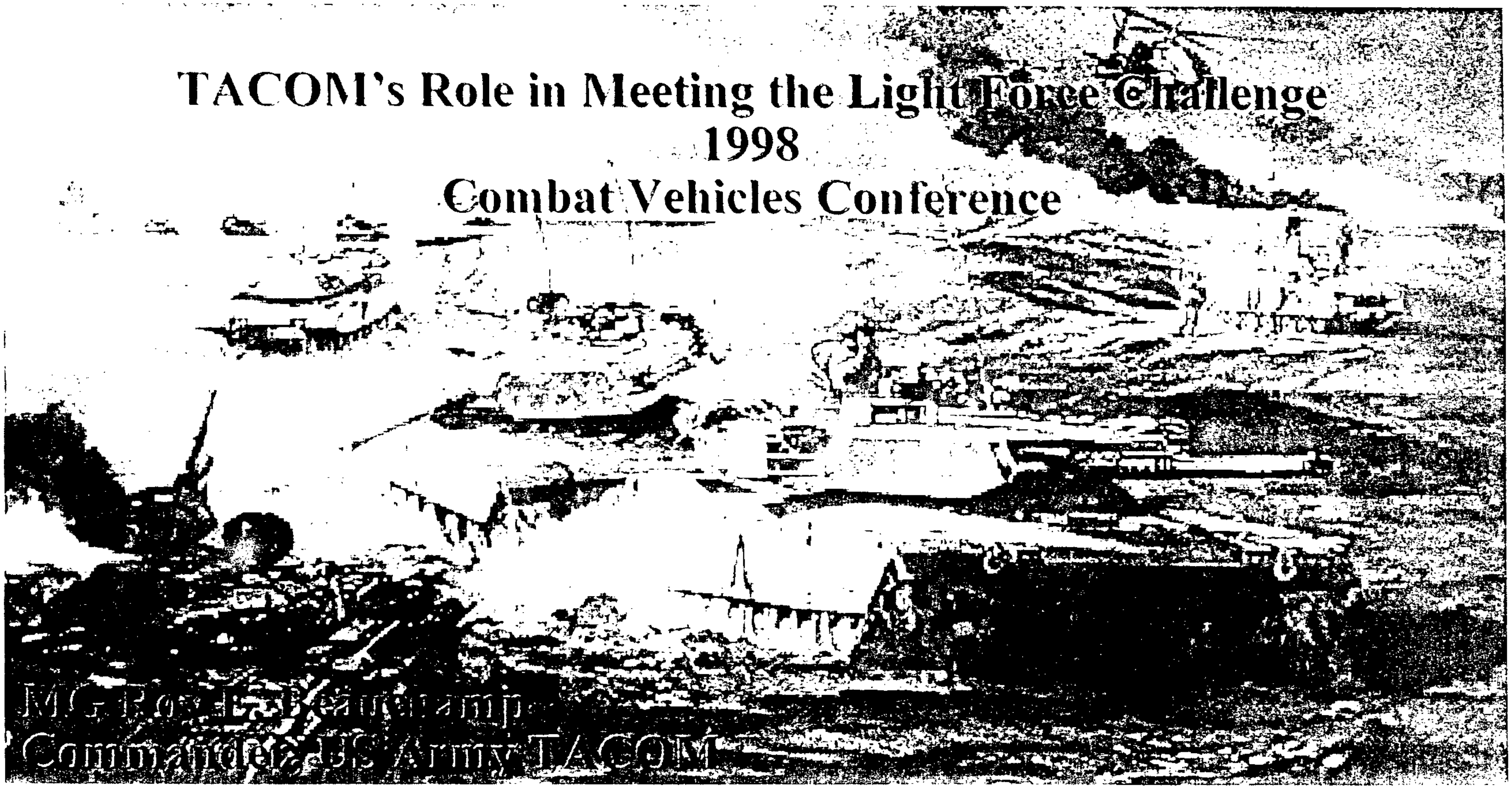
- The Army Modernization Story
- Joint Vision 2010
- Army Vision 2010
- SMDC Vision 2010
- Army Modernization Strategy
- 1998 Weapon Systems Handbook



Objective

Continue to Strengthen
the Industry-Army Relationship

TACOM
Mobility and Firepower for America's Army



TACOM's Role in Meeting the Light Force Challenge
1998
Combat Vehicles Conference

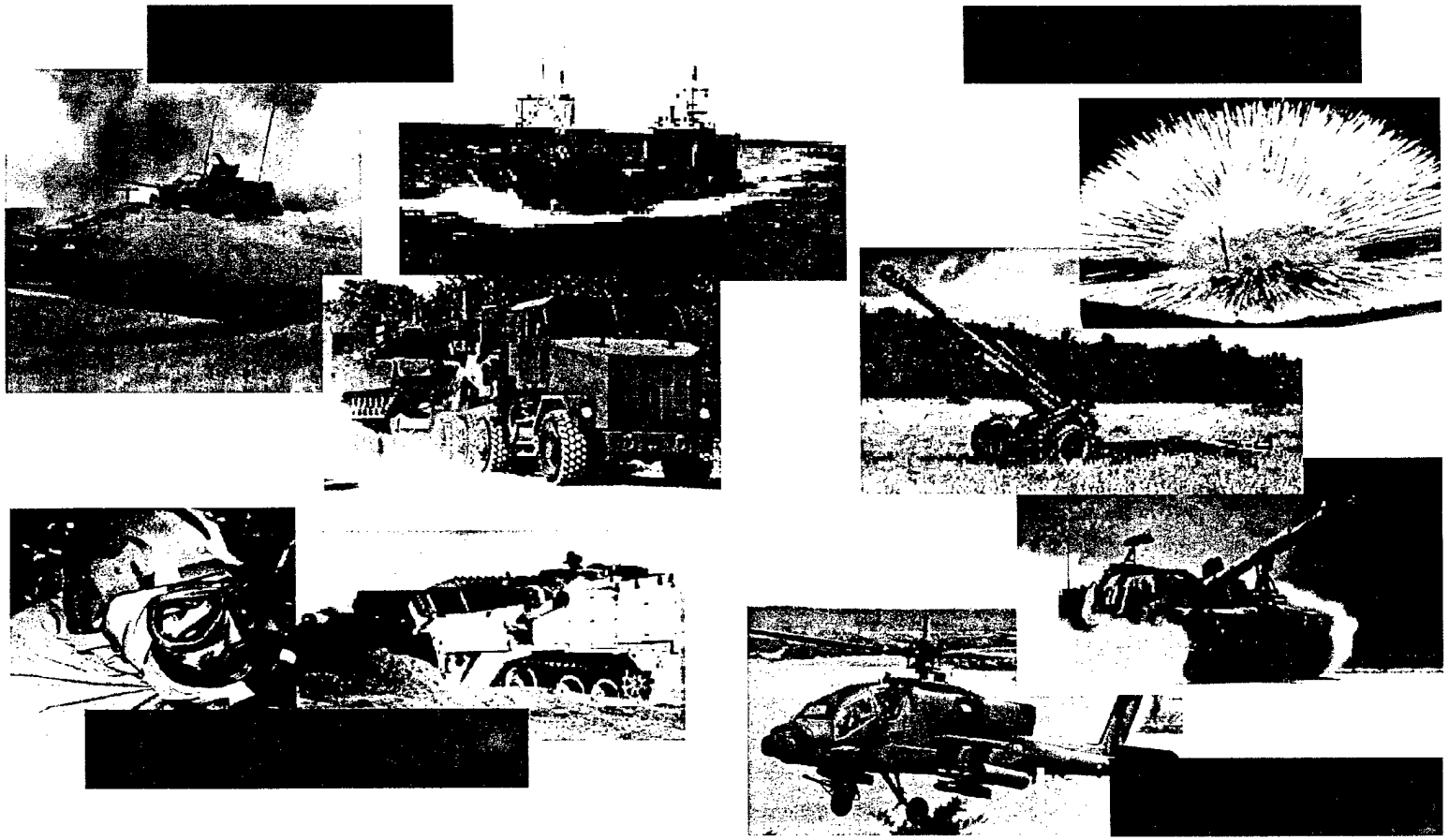
MG Roy E. Beauchamp
Commander, US Army TACOM

Committed to Excellence

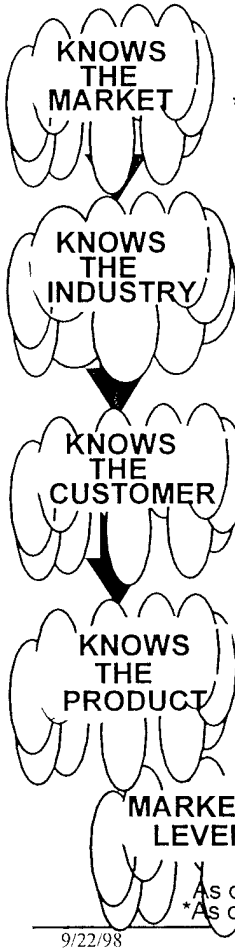
Agenda

- TACOM Overview
- Quick Look Back
- Changing Environment
- Support to Future Armored Systems
- TACOM Technology
- Summary

TACOM is ...



What Is TACOM?
...A Public Corporation...



* Buys material used by Army, other DoD and FMS... 92,270 contractual actions in 97
- Stocks material ... $4.276B*
- Supports Weapon System Readiness for 3,341 Systems (NSNs)

* Receives & Fills Customer Orders ...$1198.3M
Army $850.9M NGB $117.1M Marines $57.7M
Foreign Customers/SSA $142.6M Other $30.0M

* Manages Stock Numbers in the DoD System
- 34,138 NSNs... consumable/reparable items

* Performs Technical Support to (TDPs):
(In support of FY98 procurement actions)
- IMMC/ACALA 6000
DLA Centers 1210
- Maintain Tech Data...7.5M drawings
- Coordinates with services on engineering issues
- Insures technical conformance / quality assurance

* Research and Development
- 80 Tech Base Programs
- 93 Engineering Development Programs

* 15 Project/Product Managers - Over 300 systems
- Combat Vehicles - Commercial items
- Tactical Systems

ATDs 5
STOs 29
ICTs 21
CRADAs 79

12.4 M Sq. Ft. Facilities ($2.4B)

33% of TOTAL AMC SALES

964,000 NSNs SUPPORTED BY ENGR

ADVANCE USE OF DUAL USE TECHNOLOGIES

MANAGES 33% OF THE ARMY INVENTORY

MARKETPLACE LEVERAGE

QUALITY

PRODUCT CONFORMANCE

PRODUCT INTEGRITY

LEGAL ASSISTANCE

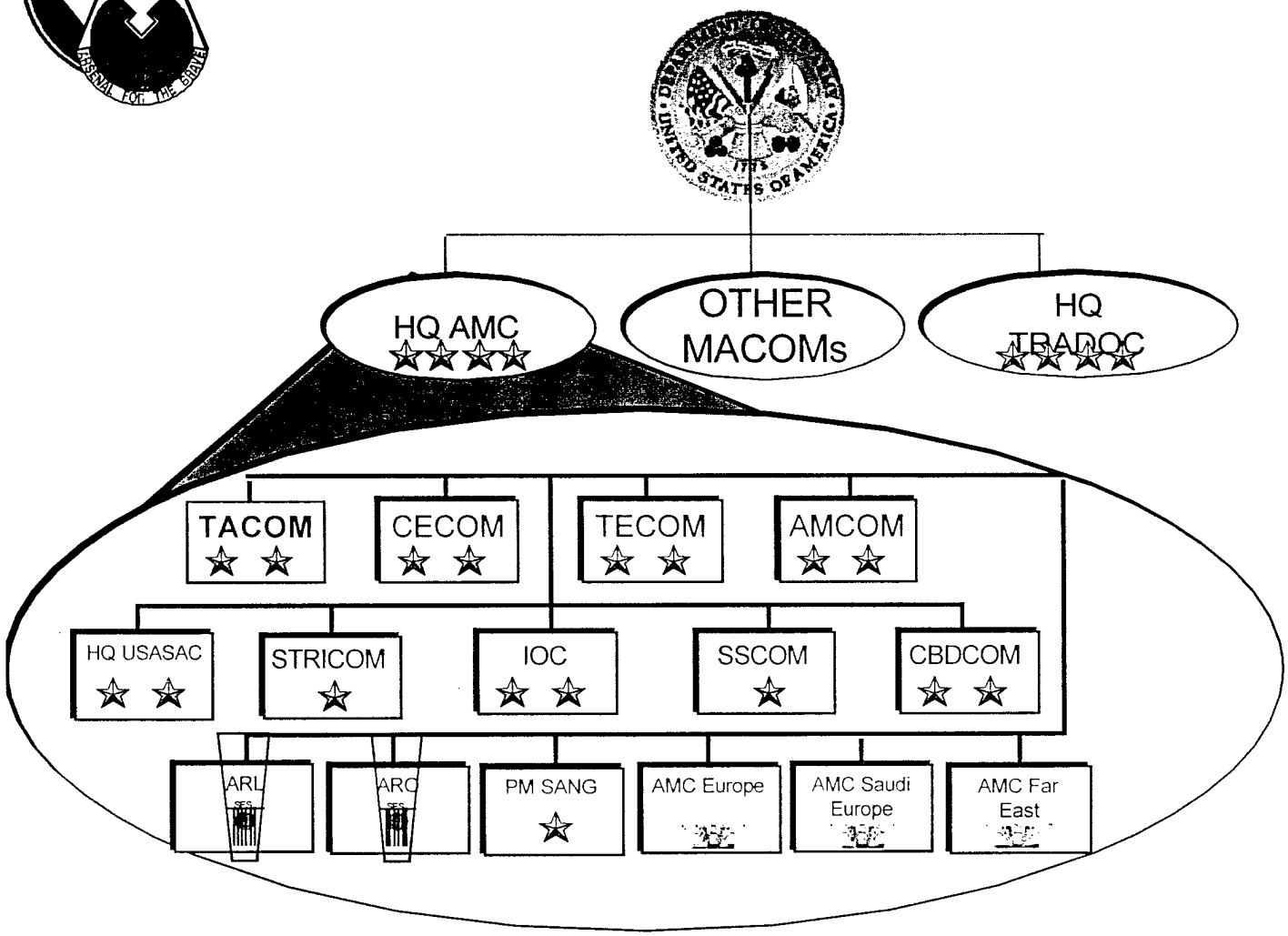
GO TO WAR PARTNERSHIP

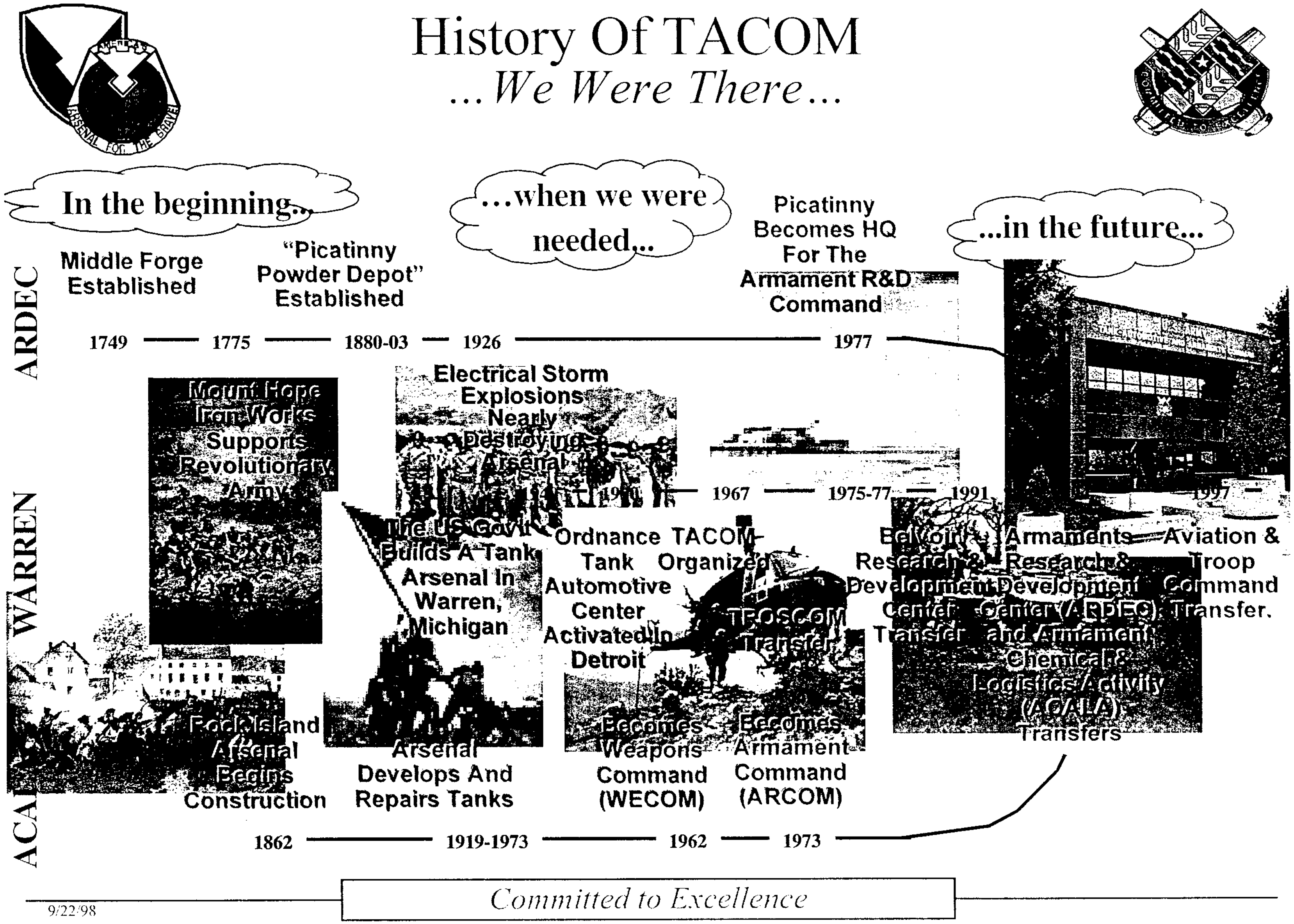
As of Feb 98
*As of Sep 97

9/22/98

Committed to Excellence

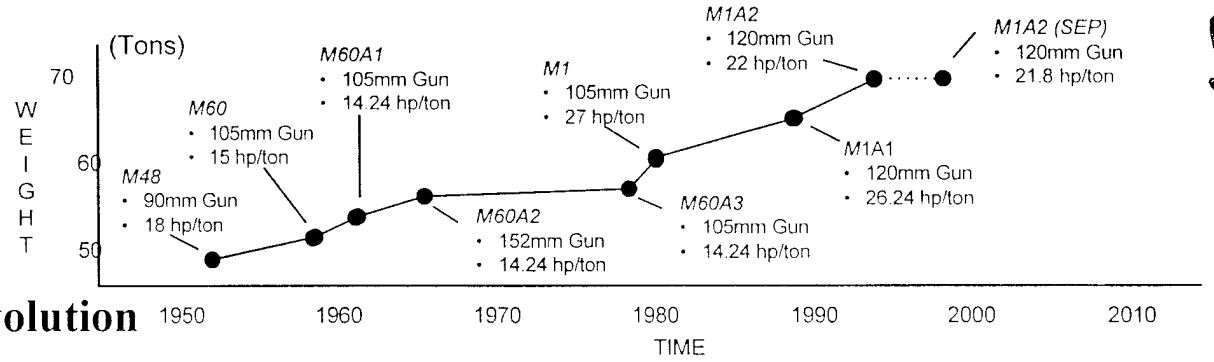
Department Of The Army



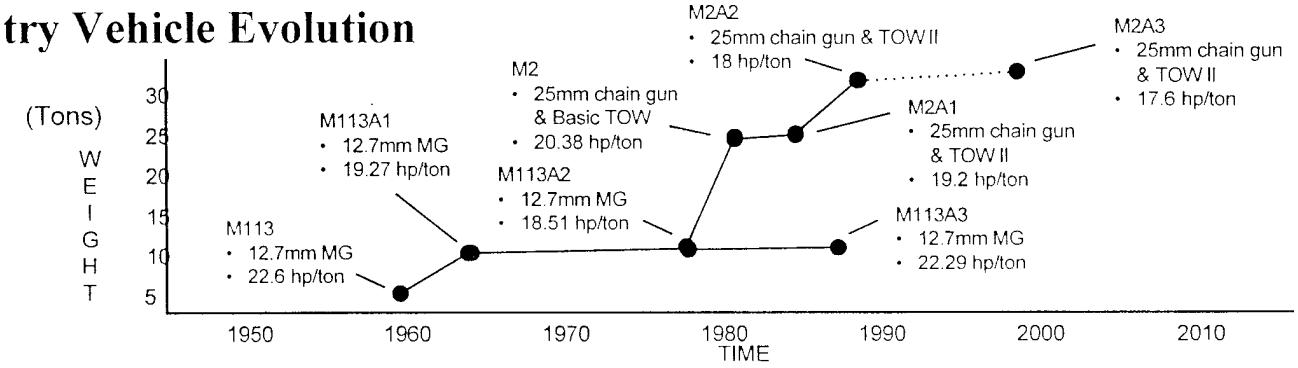

History Of TACOM
...We Were There...
In the beginning...
...when we were needed...
...in the future...
ARDEC
WARREN
ACAL
Middle Forge Established
"Picatinny Powder Depot" Established
Picatinny Becomes HQ For The Armament R&D Command
1749 — 1775 — 1880-03 — 1926 — 1977
Mount Hope Iron Works Supports Revolutionary Army
Electrical Storm Explosions Nearly Destroying Arsenal
The US Gov't Builds A Tank Arsenal In Warren, Michigan
Ordnance Tank Automotive Center Activated In Detroit
TACOM Organized
TROSCOM Transfer
Belvoir Research & Development Center Transfer
Armaments Research & Development Center (ARDEC) and Armament Chemical & Logistics Activity (ACALA) Transfers
Aviation & Troop Command Transfer.
1967 — 1975-77 — 1991
1997
Rock Island Arsenal Begins Construction
Arsenal Develops And Repairs Tanks
Becomes Weapons Command (WECOM)
Becomes Armament Command (ARCOM)
1862 — 1919-1973 — 1962 — 1973
Committed to Excellence
9/22/98

Vehicle Evolution

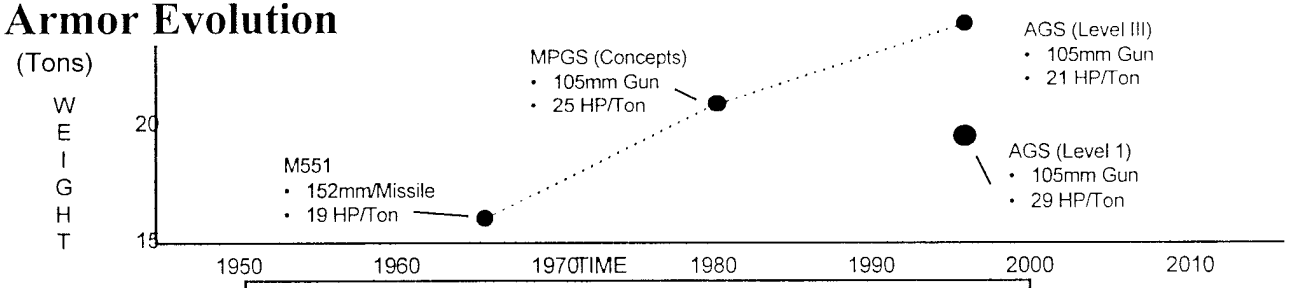
Tank Evolution



Infantry Vehicle Evolution



Light Armor Evolution



The Strategic Environment Has Changed

Yesterday

Threat Based

Forward Deployed w/Fixed Pre-Po

Deter, Defend, Contain

Monolithic Soviet Threat

Indications & Warning

Global Nuclear War Focus

Threat Defined

Today & Tomorrow

Capabilities Based

- Conus Based Power Projection w/ Pre-Po Afloat
- Prepare, Shape, Respond
- Asymmetric Full Spectrum Threats
- "Come as You Are" Contingencies
- Focus on Regional Threats, Major Regional Competitors

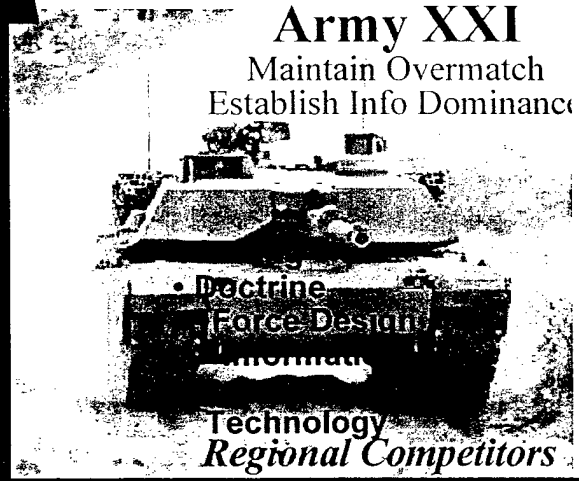
Threat Undefined

Changing To Meet The Nation's Needs
Today & Tomorrow

Fielding Force XXI while focusing on the Army After Next

CAPABILITY

Army XXI
Maintain Overmatch
Establish Info Dominance

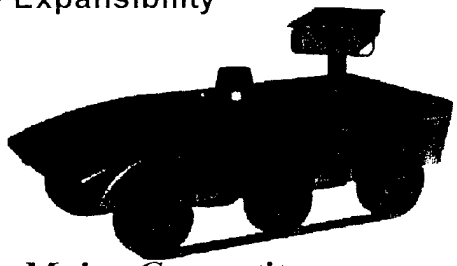


Regional Competitors to Major Competitors

Army After Next
Knowledge & Speed
Full-Spectrum Dominance

Revolutionary Change...

- Greater Lethality
- Greater Strategic / Operational Mobility
- Logistically Unencumbered
- Greater Versatility
- Narrow gap between Heavy / Light Capability
- Lethal / Non-lethal
- Expansibility



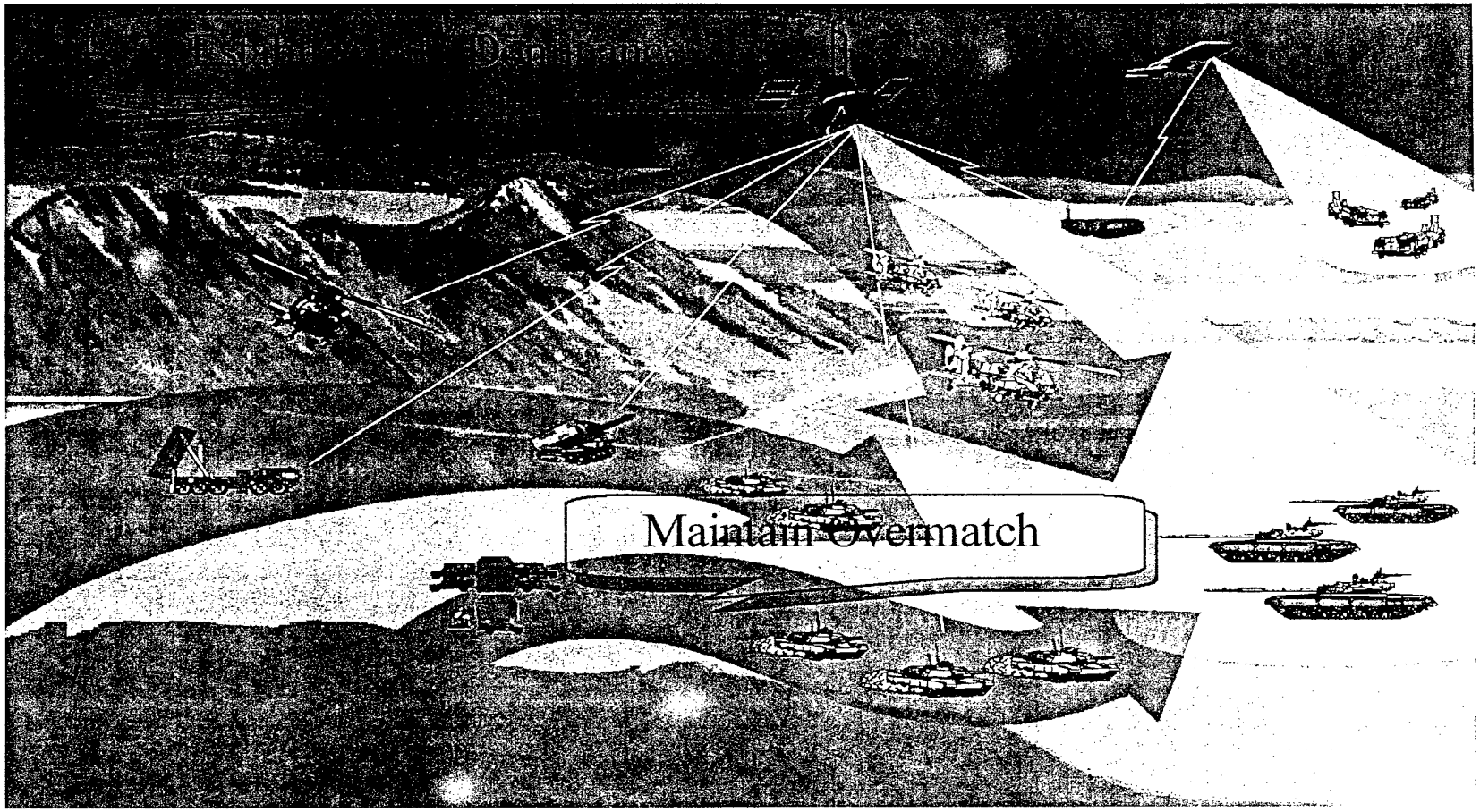
1997 2010 TIME 2020 2025

To achieve continuous full-spectrum dominance

Committed to Excellence

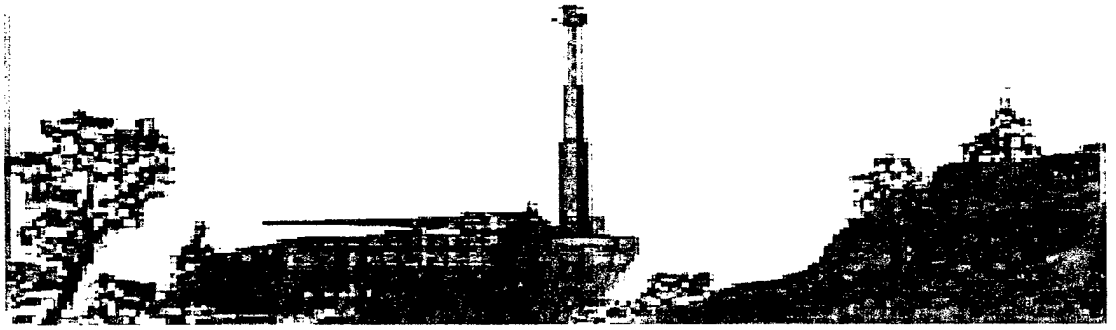
9/22/98

Army XXI



Future Scout And Cavalry System (FSCS)

Bridge to the Army After Next



Tactical Reconnaissance Armoured Combat Equipment Requirement (TRACER) Programme

Mounted Scouts & Cavalry In Force XXI and Beyond

Gain Information Dominance

Project the Force

Protect the Force

Cavalry and Scout Forces Provide the Commander the Capability to:

- **Create Time and Space**
- **Obtain/Verify Current Information**
- **Preserve Combat Power**
- **Facilitate Movement**

Shape the Battlespace

Sustain and Transition

Decisive attack

Critical Technologies

Bridge to AAN

Potential Horizontal Applications

SENSORS

- Mast Mounted FLIR with Extended Range Optics
- Multi-Function Laser
- Acoustic Sensors
- Active Emitter

SURVIVABILITY

- Signature Management
- HTI Hit Avoidance
- Armor

MOBILITY

- Electric or Conventional Drive
- Semi-active Hydropneumatic Suspension
- Band Track

C4I/ELECTRONICS

- Advanced Crew Station
- Open Electronic Architecture
- Multi-band, Multi-mode Radio
- Fully Integrated into Digital Battlefield

ARMAMENT

- Medium Caliber Weapon
- Advanced Fire Control

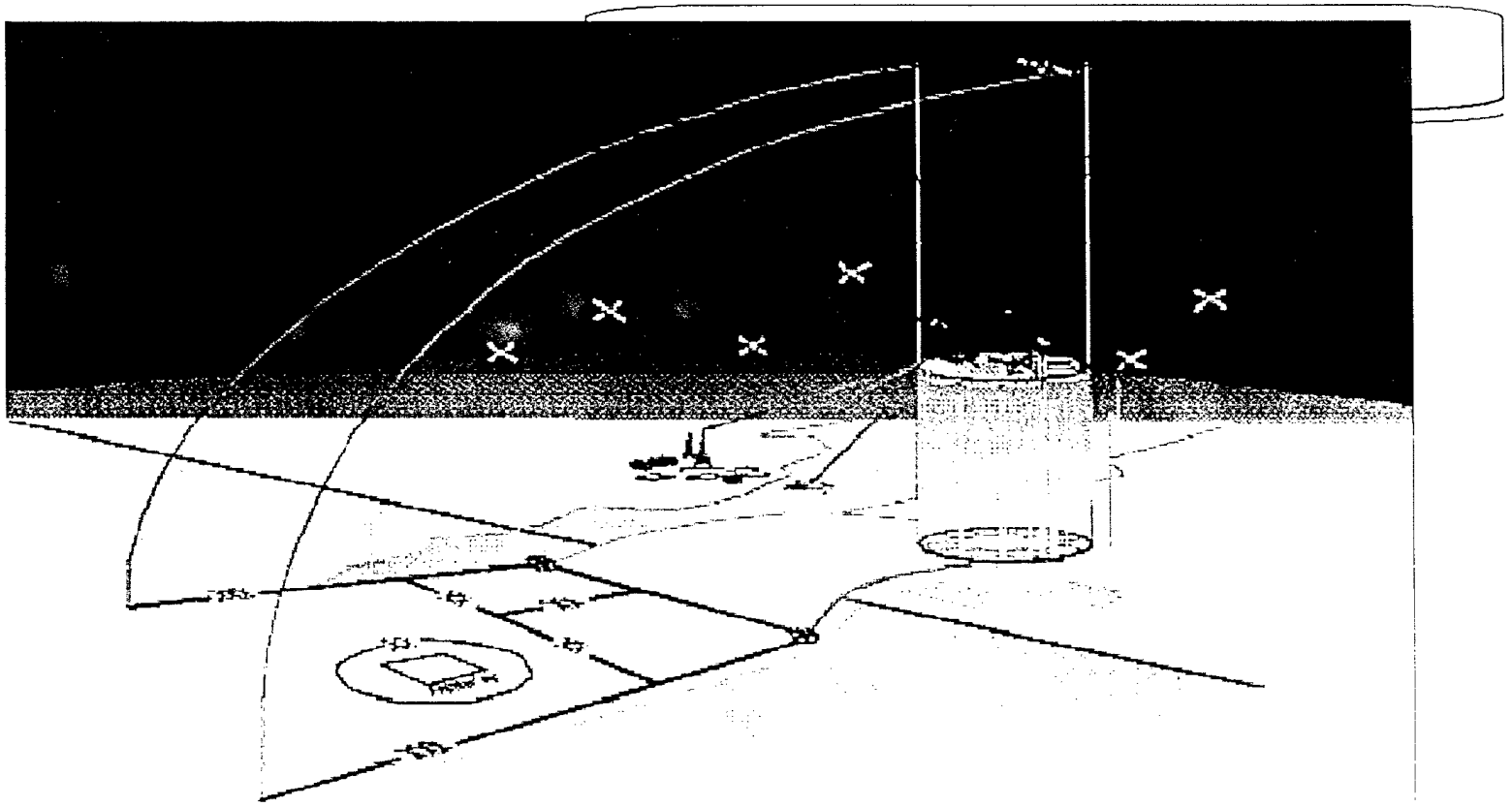
SYSTEM/DEPLOYABILITY

- Advanced Structure
- Hybrid Power System

FSCS - A Key Technology Carrier

Committed to Excellence

Army After Next

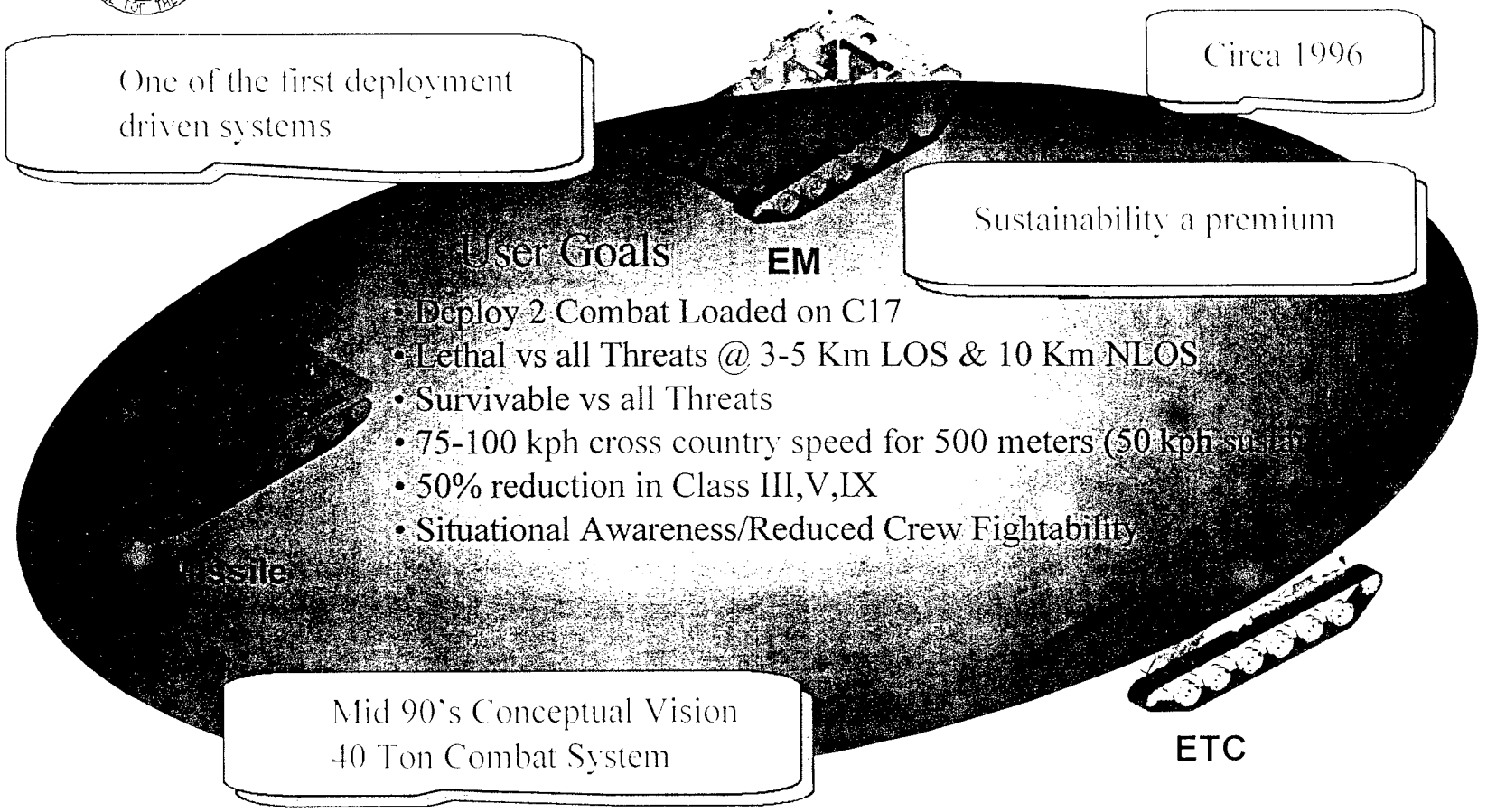


FCS Pre-AAN
(2015)

One of the first deployment driven systems

Circa 1996

Sustainability a premium

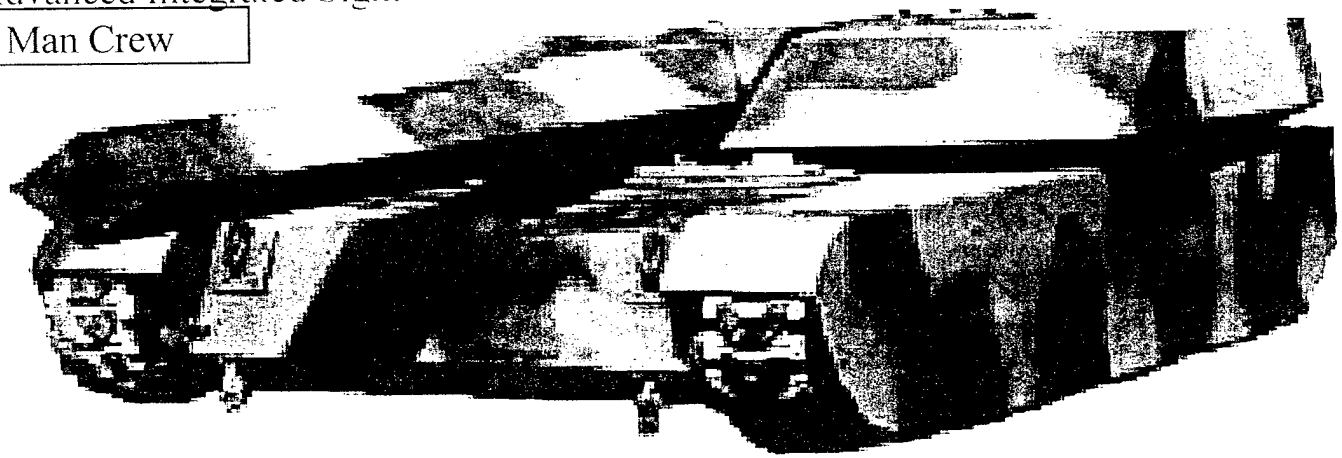


Mid 90's Conceptual Vision
40 Ton Combat System

40T Concept Vehicle

- Remote Turret
- High Pressure 120mm Gun
- Advanced Integrated Sight
- 2 Man Crew

- 2 Vehicles on C17 (38.7T)
- 50% Reduction in Fuel Consumption



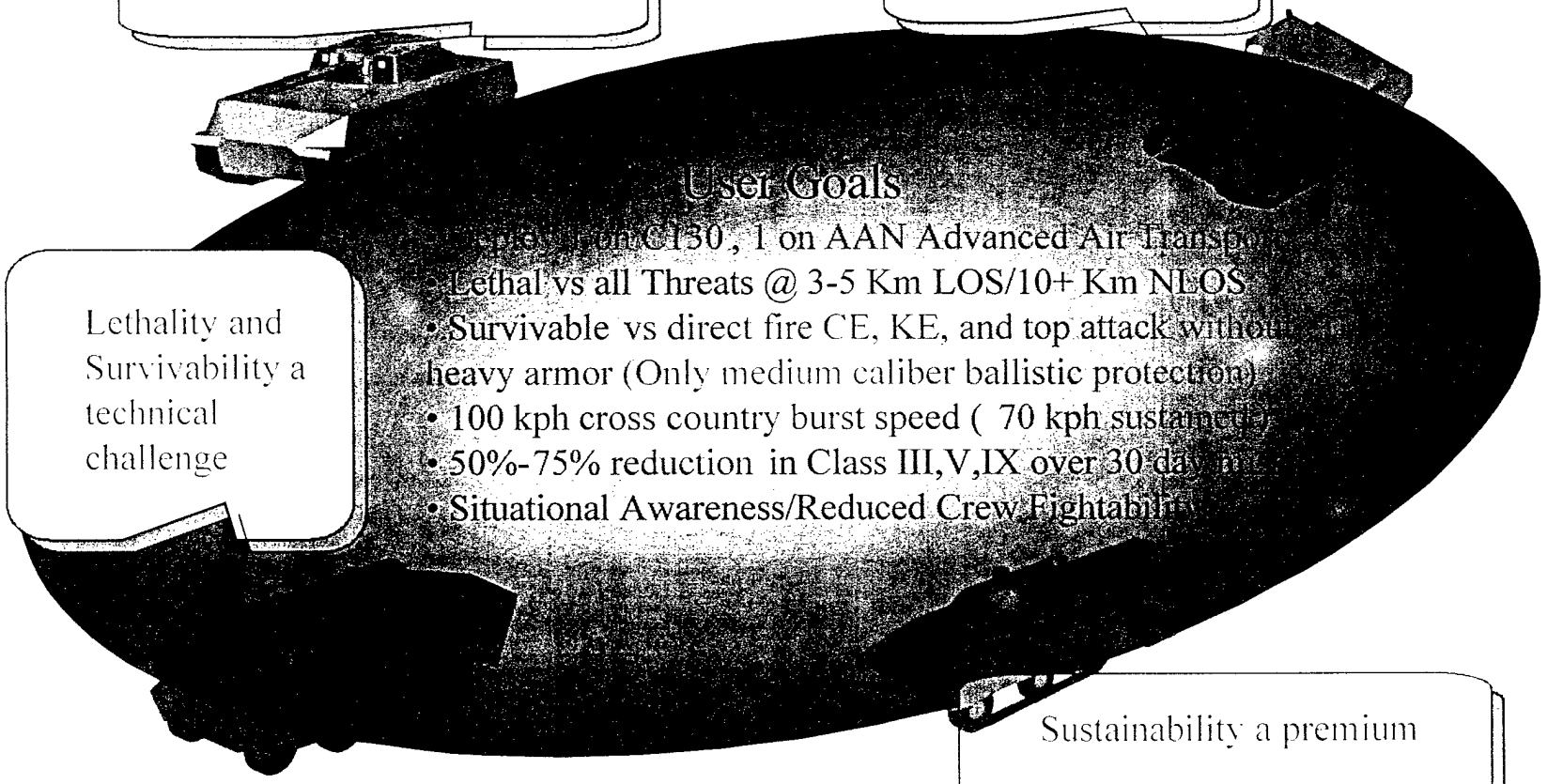
- Hit Avoidance
- Signature Management
- Active Protection
- Advanced Hybrid Armor

- Electric Drive
- Advanced Diesel or Turbine Engine
- Variable Height Semi-Active Suspension

FCS AAN (2020+)

Deployability a premium

20 Ton Variant



User Goals

- 1 per C130, 1 on AAN Advanced Air Transport
- Lethal vs all Threats @ 3-5 Km LOS/10+ Km NLOS
- Survivable vs direct fire CE, KE, and top attack without heavy armor (Only medium caliber ballistic protection)
- 100 kph cross country burst speed (70 kph sustained)
- 50%-75% reduction in Class III,V,IX over 30 days
- Situational Awareness/Reduced Crew Fightability

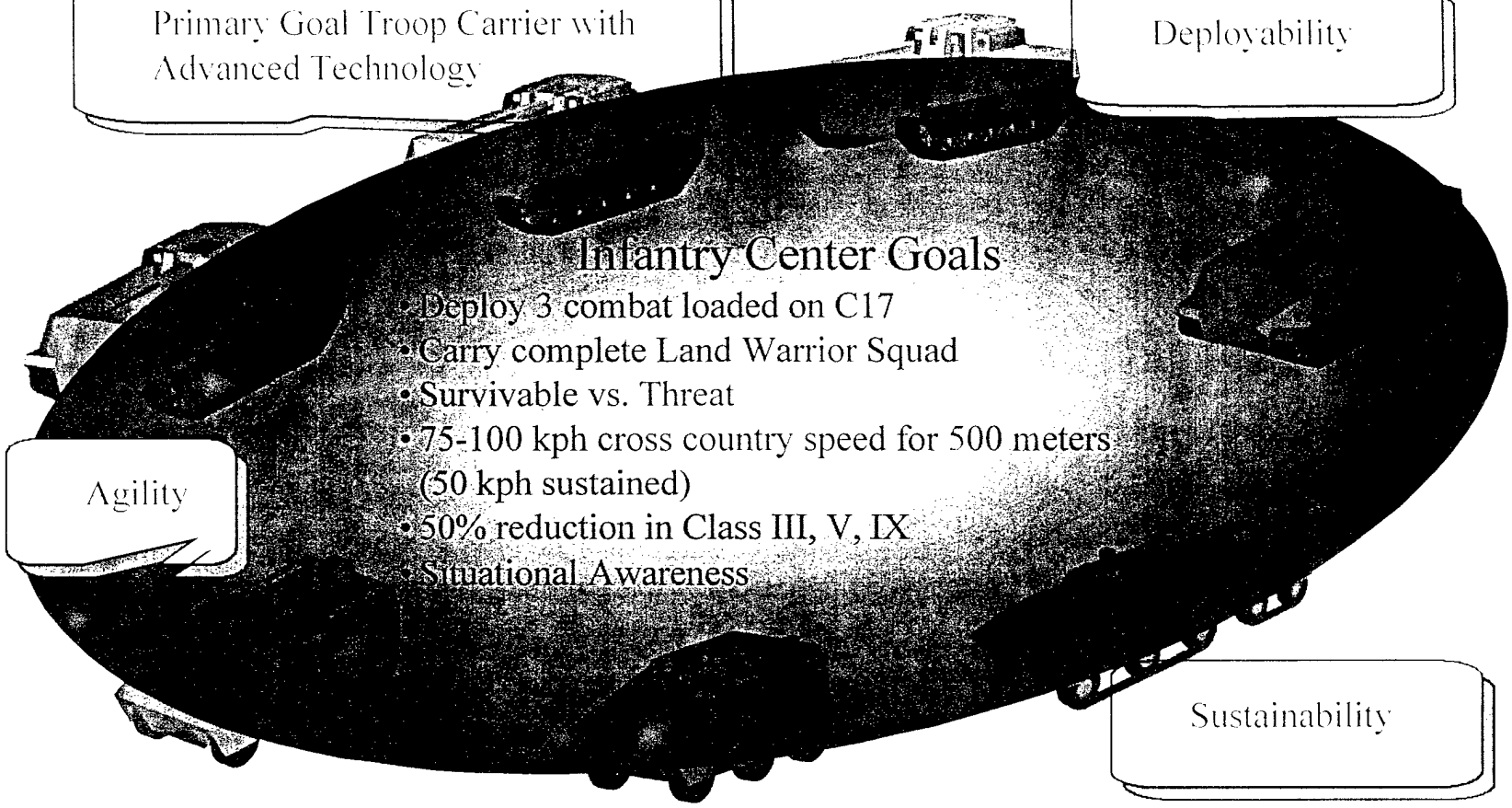
Lethality and Survivability a technical challenge

Sustainability a premium

Future Infantry Vehicle Concepts

Primary Goal Troop Carrier with Advanced Technology

Deployability

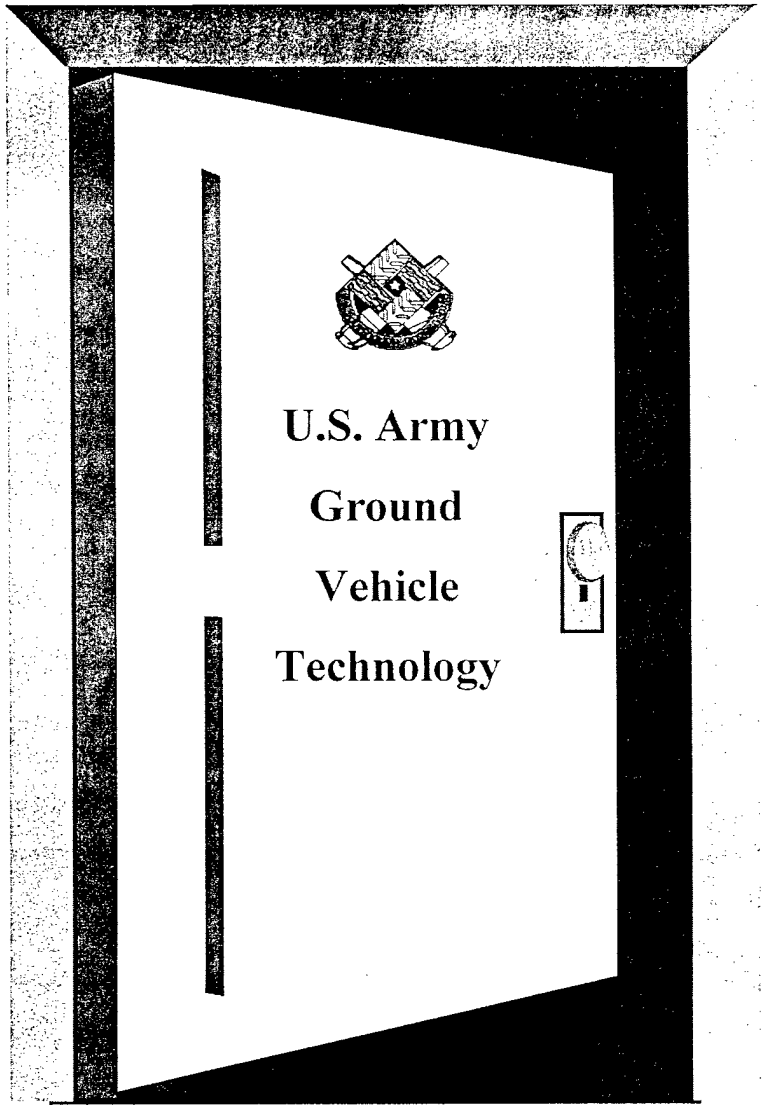


Infantry Center Goals

- Deploy 3 combat loaded on C17
- Carry complete Land Warrior Squad
- Survivable vs. Threat
- 75-100 kph cross country speed for 500 meters (50 kph sustained)
- 50% reduction in Class III, V, IX
- Situational Awareness

Agility

Sustainability

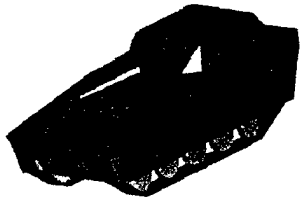

U.S. Army
Ground
Vehicle
Technology

Technology Investment Strategy

Key Issue: Integration

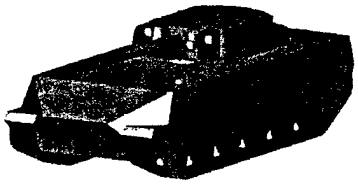
Lethality
- Electromagnetic (EM)
- Electrothermalchemical (ETC)
- Missile

Mid Term



Mobility
- Combat Hybrid Power System Demonstrator
- Semi-Active and Active Suspension
- Electric Drive
- Band Track

Mid Term

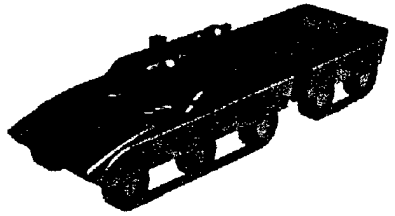


Structures
- Composites
- Lightweight Chassis & Turret
- Modular Removable Armor
- [illegible] Crew

Mid Term

Electronics
- Advanced Crew Station
- Weapon System Technical Architecture
- Ground Vehicle Robotics

Mid-Far Term



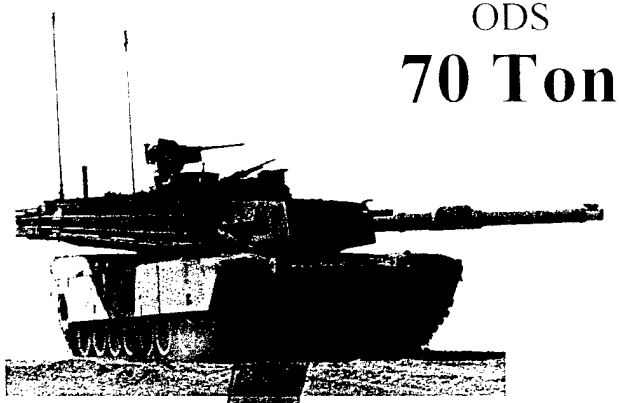
Survivability
- Future Light Vehicle Ballistic Protection
- Smart Armor
- Low Observables
- Full Spectrum Active Protection
- Laser Protection for Ground Vehicle Vision Systems

Mid Term

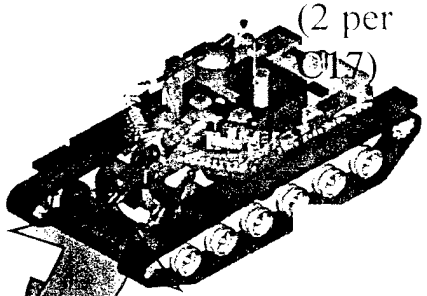
Legend
Current: 0-5 yrs
Near Term: 5-10 yrs
Mid Term: 10-15 yrs
Far Term: 15-20 yrs

Lethality Challenge

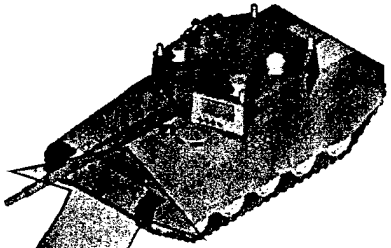
ODS
70 Tons



1996
40 Tons
(2 per C17)

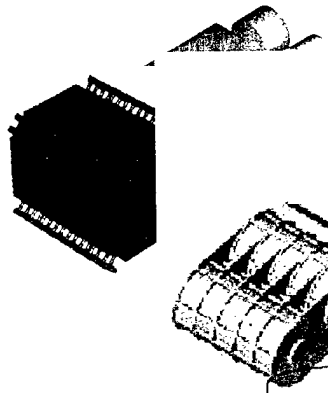


1998
20 Tons
(1 per C130)



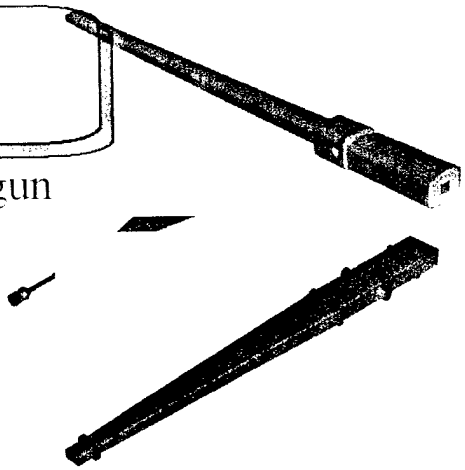
EM Armament

Pulsed Power & Cooling



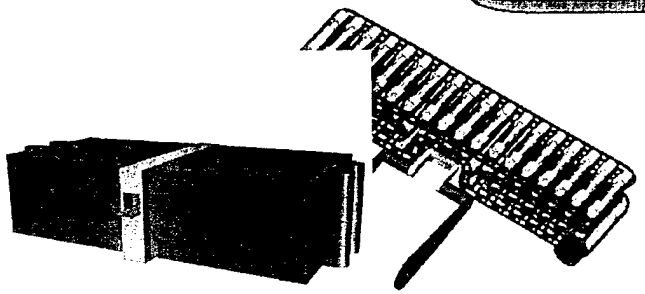
Today: 1 Semitrailer

Railgun

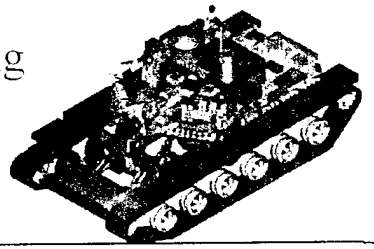


Mid-Term: 1 Conex

Autoloader & Ammo

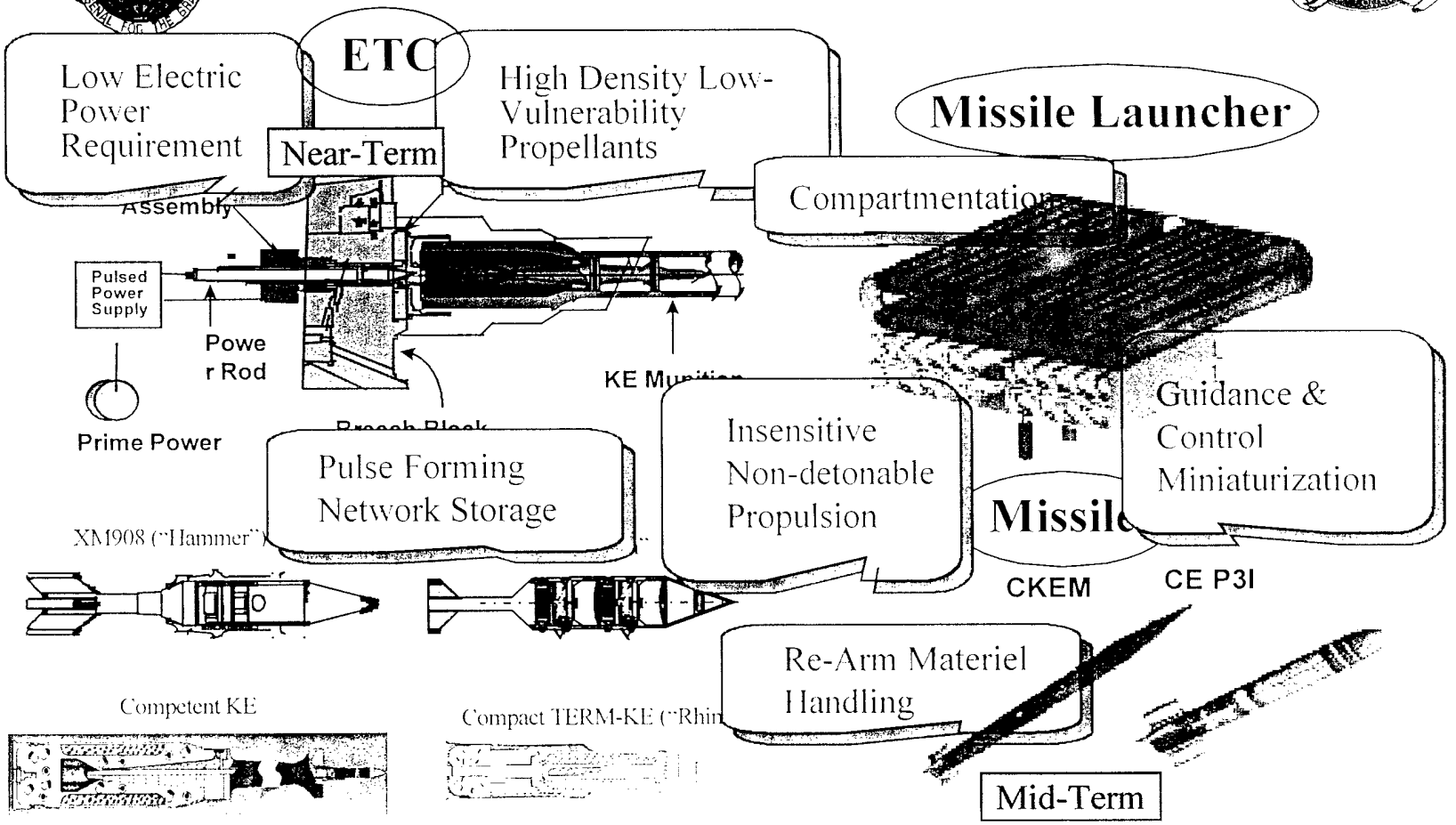


Packaging



2015 - 2025
Far Term: 1/2 Conex

ETC & Missiles (20 Ton)



VETRONICS

WEAPON SYSTEM TECHNICAL ARCHITECTURE (WSTA)

- Operational Architecture
- Systems Architecture
- Technical Architecture

Army Enterprise Architecture

CREW STATION TECHNOLOGY APPLICATION

- Where am I?
- Where are my Friends?
- Where is the Enemy?

Technology Challenges
- Cybernetics
- Voice Control
- 3D Audio
- Decision Aids
- Panoramic Displays
- Technical Architecture

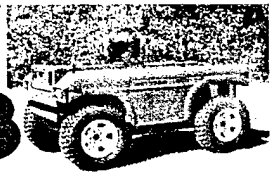
AVAILABLE FOR NEAR TERM TECH DEMOs

Universal Applications
- Soldier-Machine-Interface
- C^2 Tactical Display
- Technical Architecture

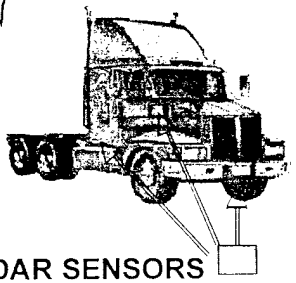
Increased Crew Effectiveness
- Potential Reduced Crew Size
- Reduced Vehicle Size/Weight

GROUND VEHICLE ROBOTICS APPLICATIONS

Semi-Autonomous Driving



Autonomous Recon



RADAR SENSORS

Collision Avoidance

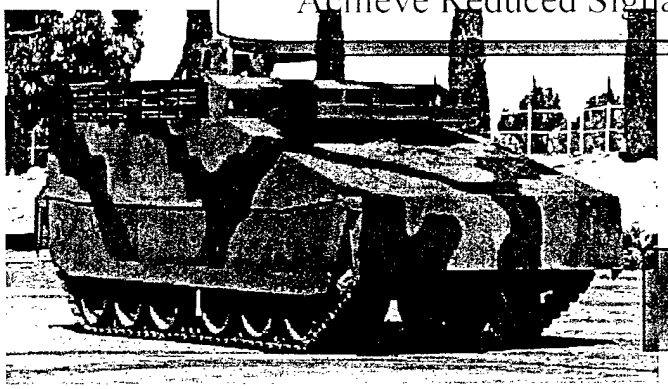
Mid-Term

Committed to Excellence

Structures

1996

Composite Armored Vehicle
Advanced Technology Demonstrator



Achieve Reduced Signatures

Monocoque

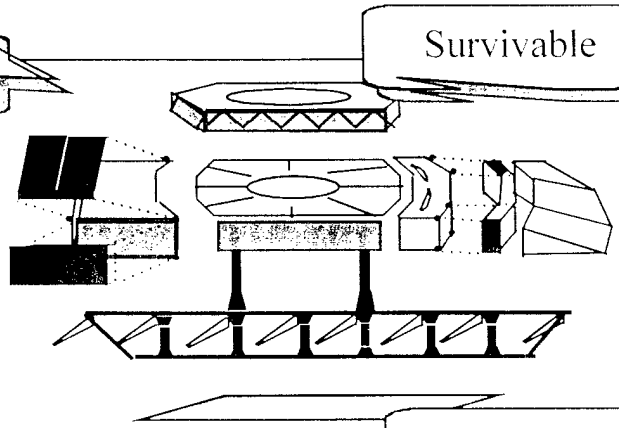
Demonstrated weight reduction of 33% of structure and armor when compared equivalent aluminum vehicle
Sandwich construction using layers of fiberglass, ceramic armor tile, and signature management materials
Encapsulated Crew

Mobile

Current

2010+

Light Weight Chassis & Turret



Survivable

Affordable

Space Frame

- **Demonstrate a 30% weight reduction improvement in the structure**
- **Modular Removable Armor**
- **Truss / Space Frame Structure**
- **Minimum Gage-Stiffened Skin Basic Vehicle Cover**
- **Encapsulated Crew**
- **Replaceable High Energy Belly Plate**

Far-Term

Enhanced Mobility Technologies

Band Track
Noise Signature Reduction 30% - 50%
Active Track Tensioner
4000 mile maintenance free

Near-Term

Durability

Maintainability

Semi-Active Suspension
40% cross country speed
increase in near ter

Near Term

Maximize cros
country mobility
with zero weight
and volume
impact

Active Suspension
Improve X-Country Speed 100%
Intelligent Preview Active Suspens

Terrain Sensing

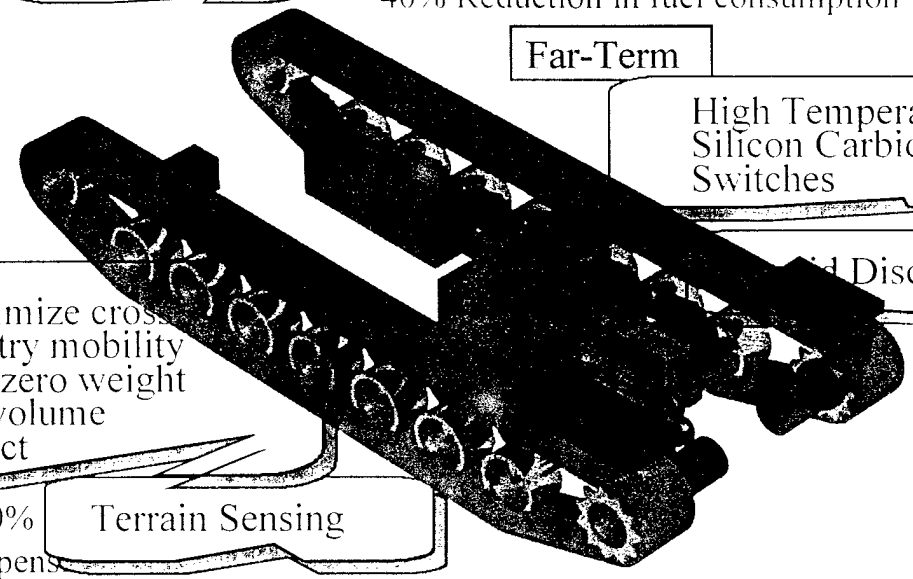
Energy Storage

Electric Drive
Increase Operating Range 50%
Increase Power Density (HP/ft³) 50%
Increase Power Electronics Capability 100%
40% Reduction in fuel consumption

Far-Term

High Temperature
Silicon Carbide
Switches

id Discharge



Electro-mechanical suspension to provide 100% increase in cross country speed by 2015

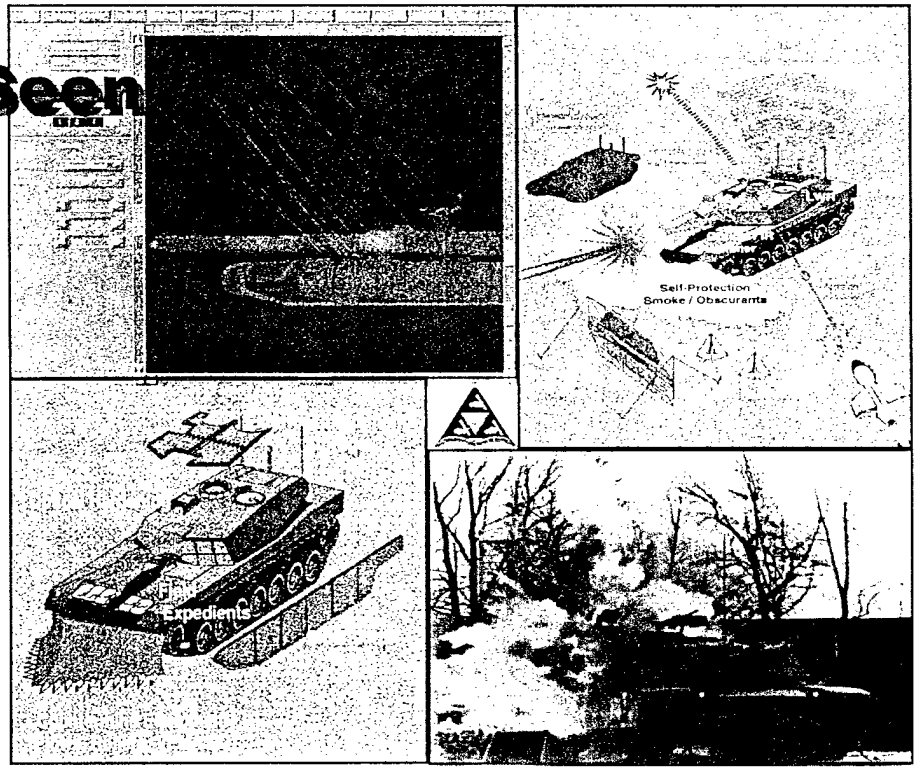
Mid-Term

Survivability

Don't Be Seen

- Low Observable Technology

- Advanced Light-Weight Armor



Don't Be Hit

- Active Protection Systems

- Automated Fire Suppression

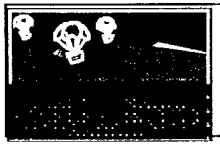
Signature Management

• Develop and demonstrate optimized vehicle components which will provide reduced signatures

- 50-75% Less Detectable = more survivable
- Signature/EW/Armor Integrated/Optimized Solution
- Optimization means less weight = mor
- Risk reduction for Future Systems

Threat Info
User Requirements

CAD/ Virtual Prototyping

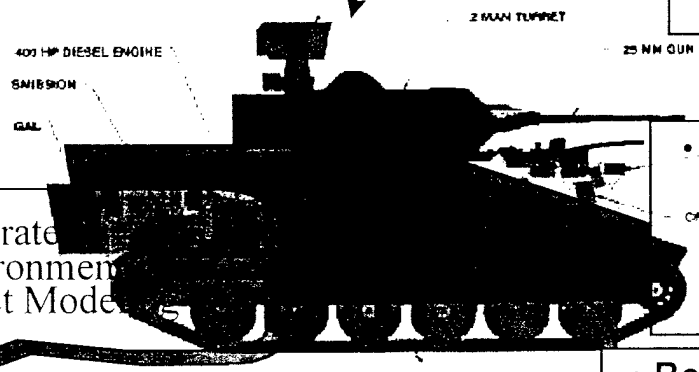


Modelin and Simulati

Fab and Demo/Test

Signature Management Treatment Durability

Accurate Environmen Effect Mode



Conceptual Future Scout Vehicle

Affordability

Typical Components

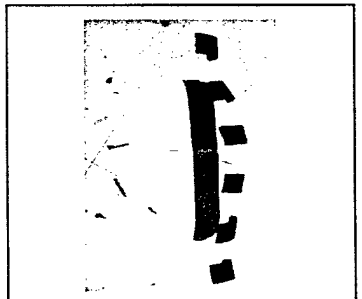
- Signature Reducing FLIR Micromesh window
- New lightweight low signature grille with improved ballistics
- Reduced Signature ballistic side panels with reduced weight

Committed to Excellence

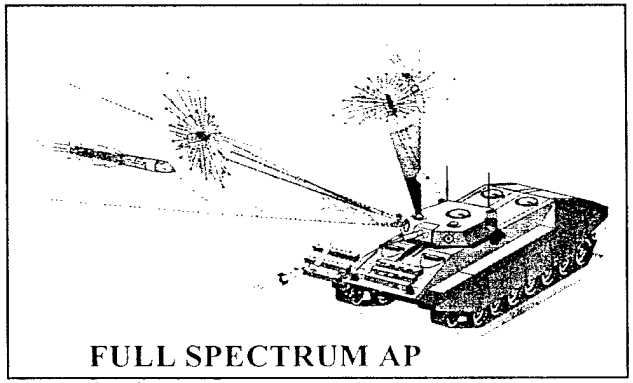
Full Spectrum Active Protection

Defeat CE

Near-Term



BAR COUNTERMEASURE DEPLOYING



FULL SPECTRUM AP SYSTEM

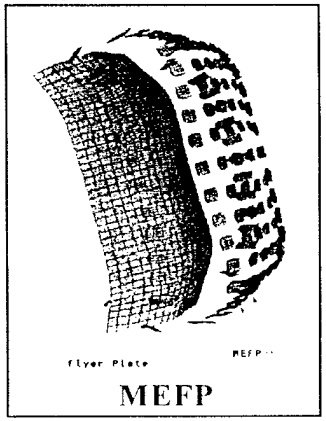
Defeat Tube Launched CE

Mid-Term

- Blast/Fragmentation
- High Velocity Bars and Plates
- Mini Explosively Formed Penetrators (MEFP)

Defeat Hemispherical CE + Tube Launched KE

Far-Term



MEFP

- Can be integrated onto current ground vehicle fleet
- Improve Vehicle & Crew Survivability
- Low Cost & Weight

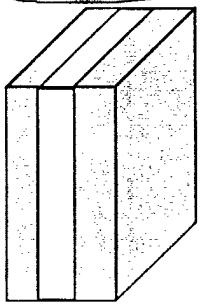
Key Enabler for Lightweight Combat Vehicles

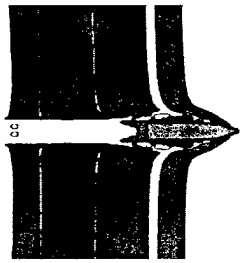
Future Light Vehicle
Ballistic Protection Technology

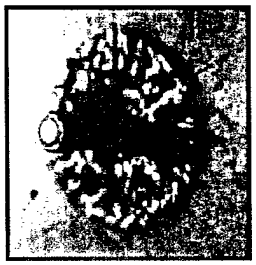
OBJECTIVE

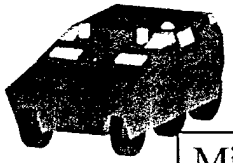
- Demonstrate new armor systems designed to provide vehicles in the 18-40 ton range protection against the future medium caliber cannon threat, light and medium shaped charge threats, top attack weapons, and mines
- Systems will be compatible with advanced structural technology likely to be used in future light vehicles
- Utilize advanced defeat mechanisms
- Designed to avoid adverse impacts on mission equipment and other survivability measures

At < 30 Tons
Defeat Medium
Caliber Threats







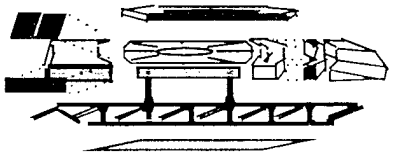


Mid-Term

Develop max protection possible for fixed areal density

Armor/structure integration & optimization

Develop minimum weight armor/structure for given protection requirement



Material Development

Modeling and Analysis

Experimental Validation

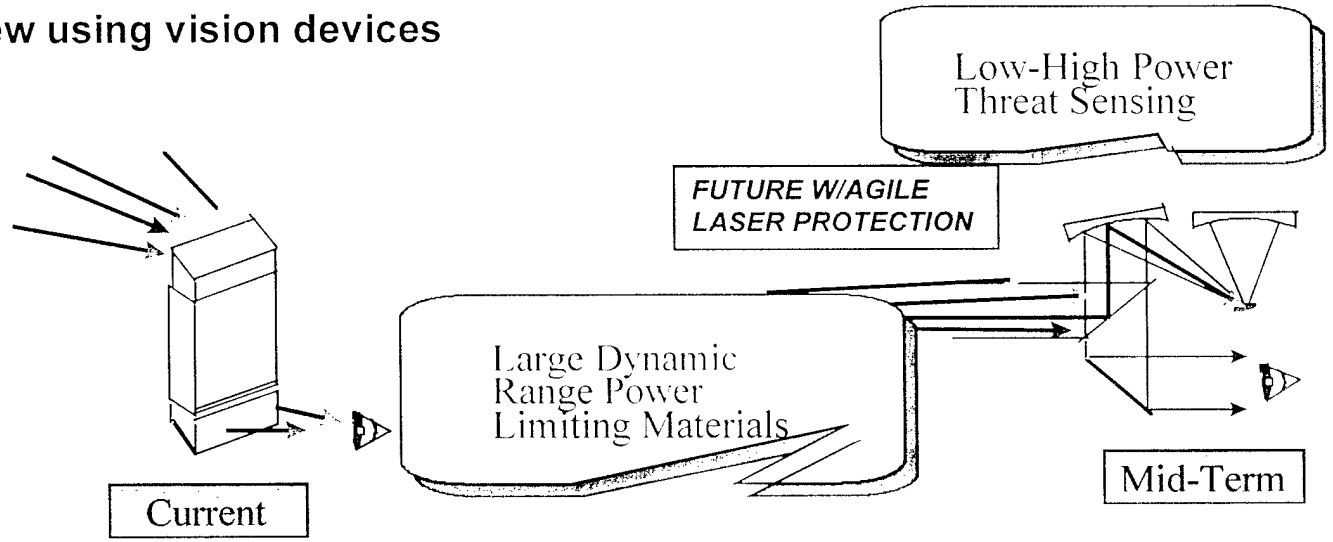
Weight/Space Efficient, Affordable Ballistic Protection

Advanced Structures

Laser Protection
For Ground Vehicle Vision Systems

Asymmetric Threat

PAYOFF: Provide positive protection against laser attack to vehicle crew using vision devices

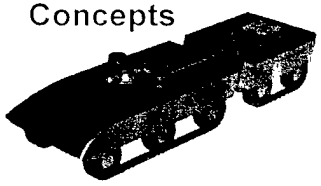


Modeling & Simulation

Survivability

Analytical Simulation

Concepts



Vetronics

Critical Enabler

Tools

Mobility

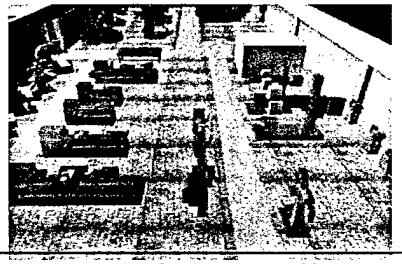
User

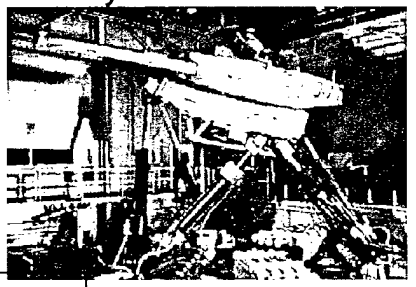
Key to Technology Integration, System Optimization, Affordability Tradeoffs

Design

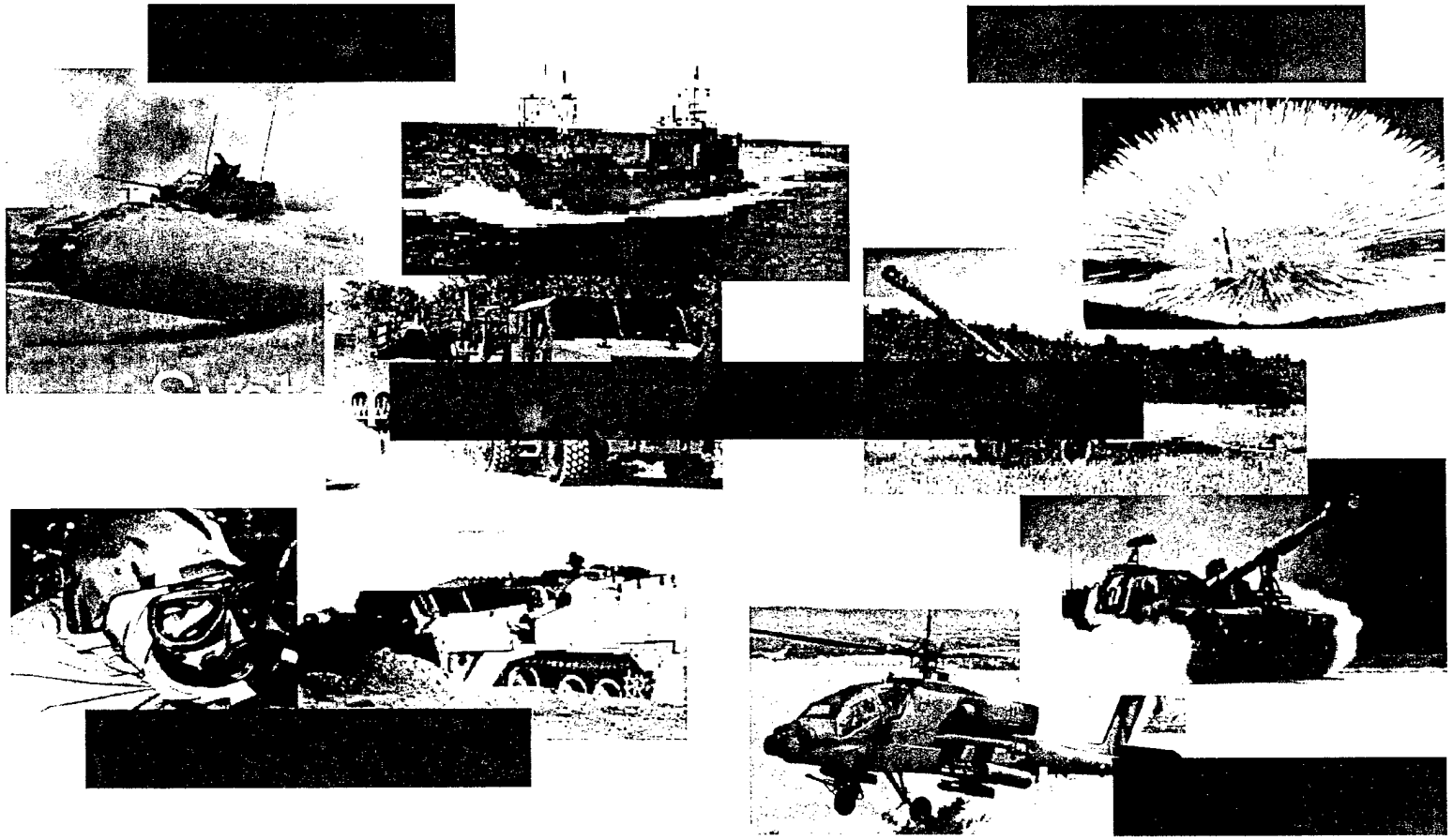
Manufacturing

Physical Simulation





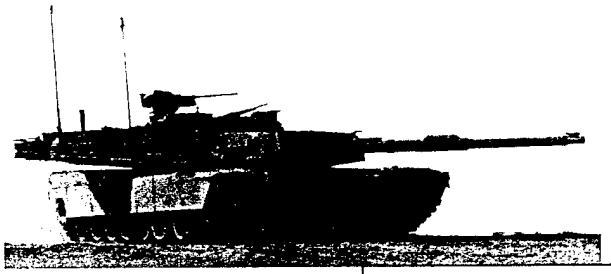
TACOM is ...

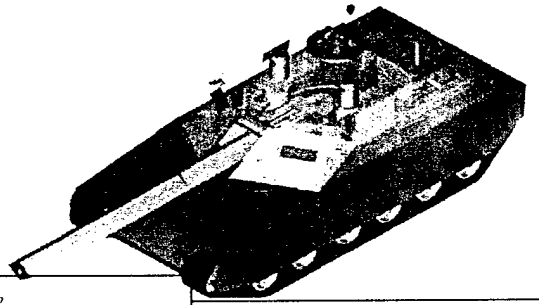


SUMMARY

- TACOM - A KEY PLAYER IN SUPPORT OF LEGACY SYSTEMS
- TACOM PROVIDES R&D TECH BASE VISION AND UNIQUE INTEGRATION EXPERTISE IN SUPPORT OF THE USER

TACOM WILL BE AN ACTIVE PARTNER NOW AND INTO THE FUTURE

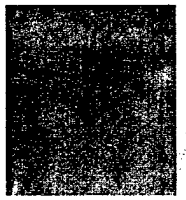
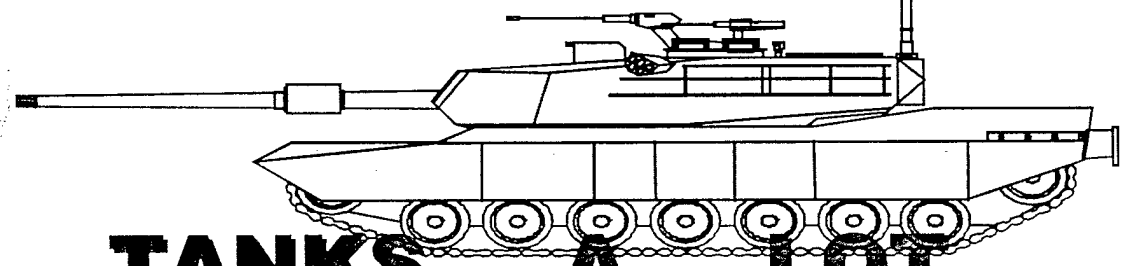




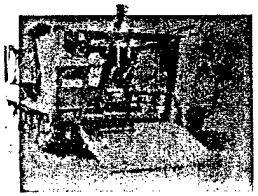
TACOM

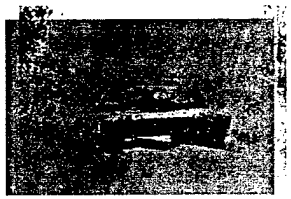
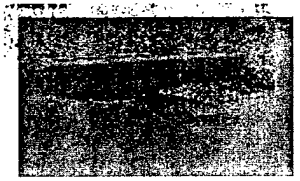
Mobility and Firepower for America's Army




TANKS A LOT

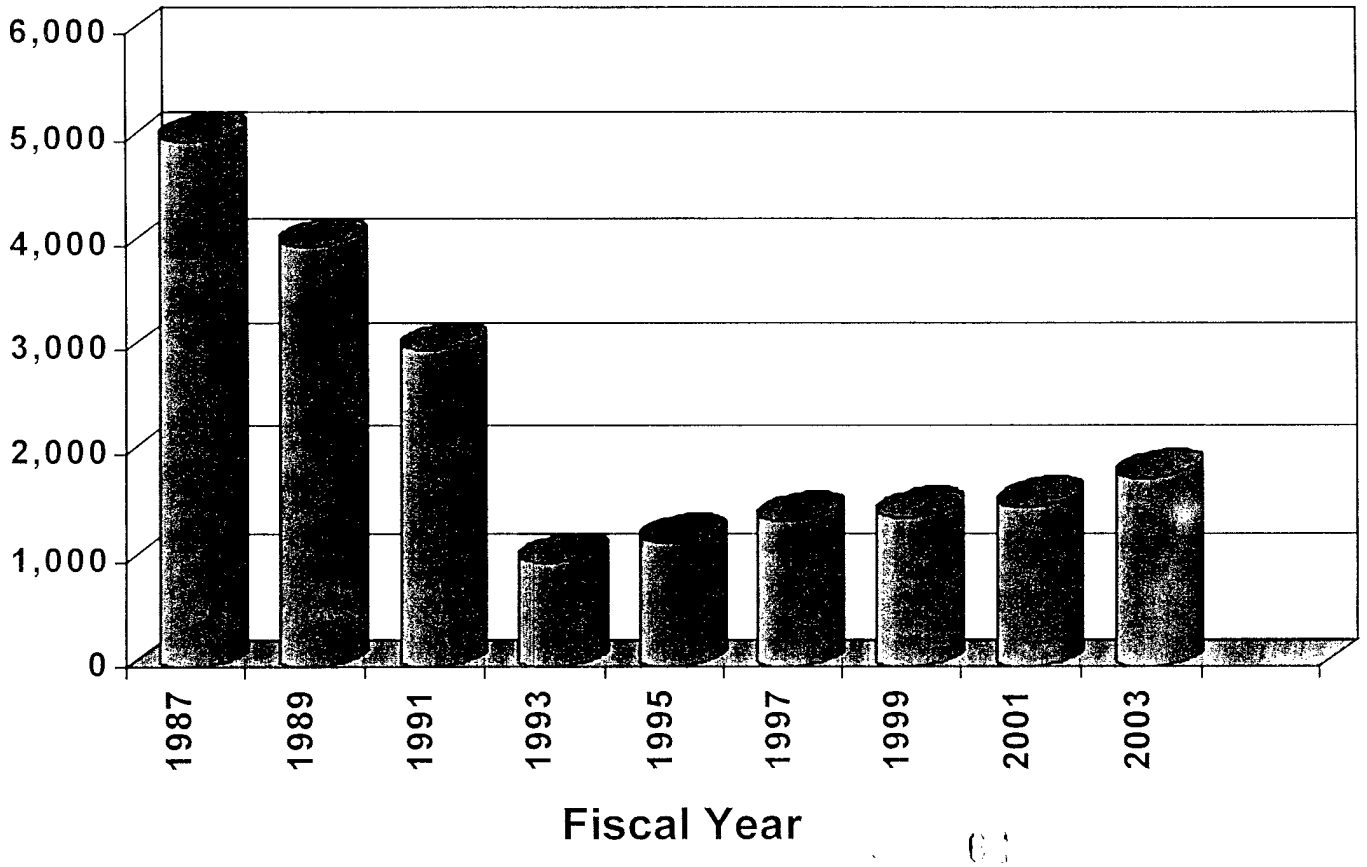

Mobility and Fire Power for America's Army

Sustaining the Combat Vehicle Industrial Base

"Why Care if the Combat Vehicle Industrial Base is Sustained?"

Tom Rabaut
President and CEO
United Defense L.P.
September 22, 1998

Tactical Combat Vehicle (TCV)
Procurement $M

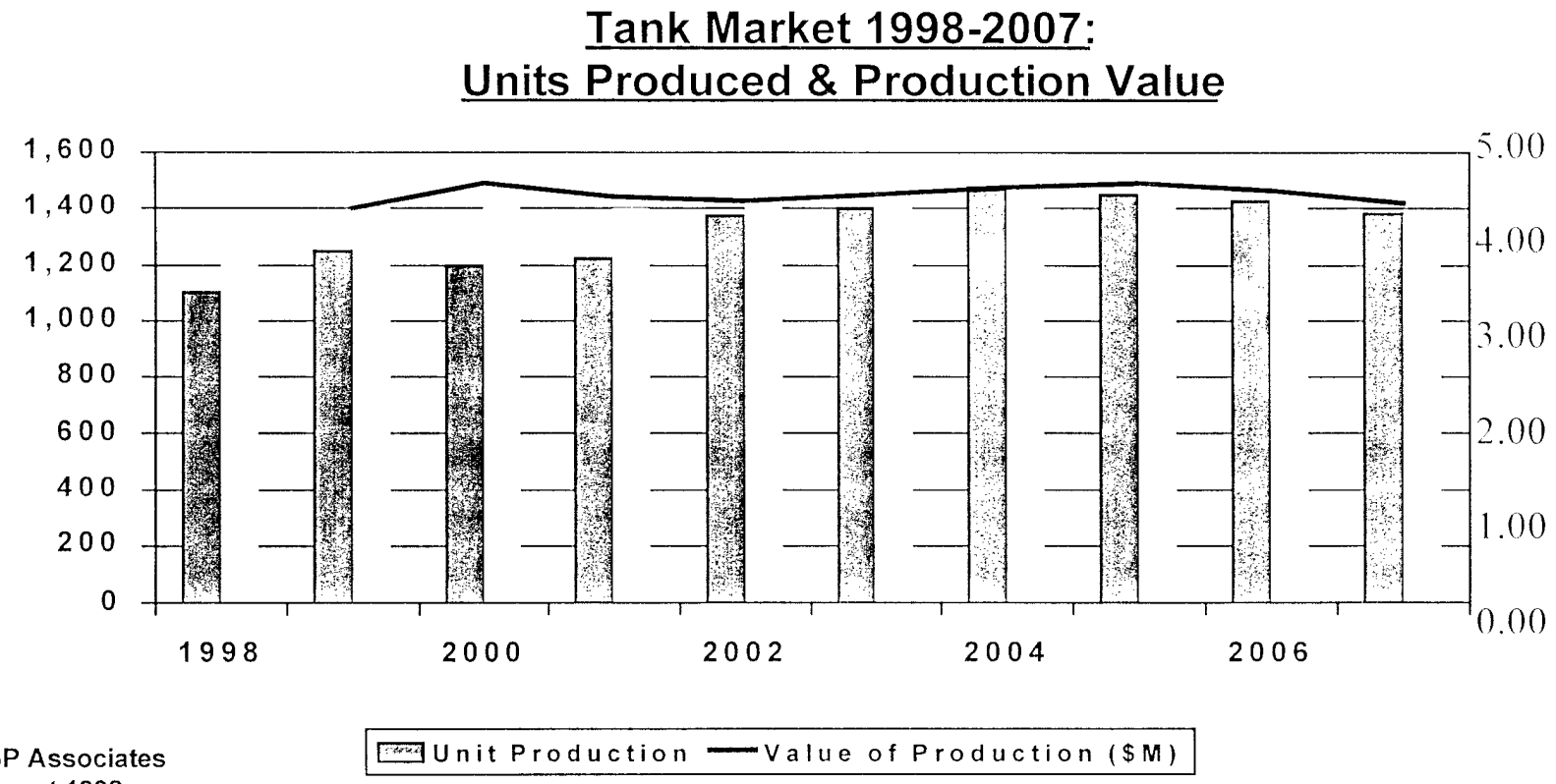


Tanks

Unt f ns

? Global demand for tanks remains steady

? Tank Market: $49B market over 10 years



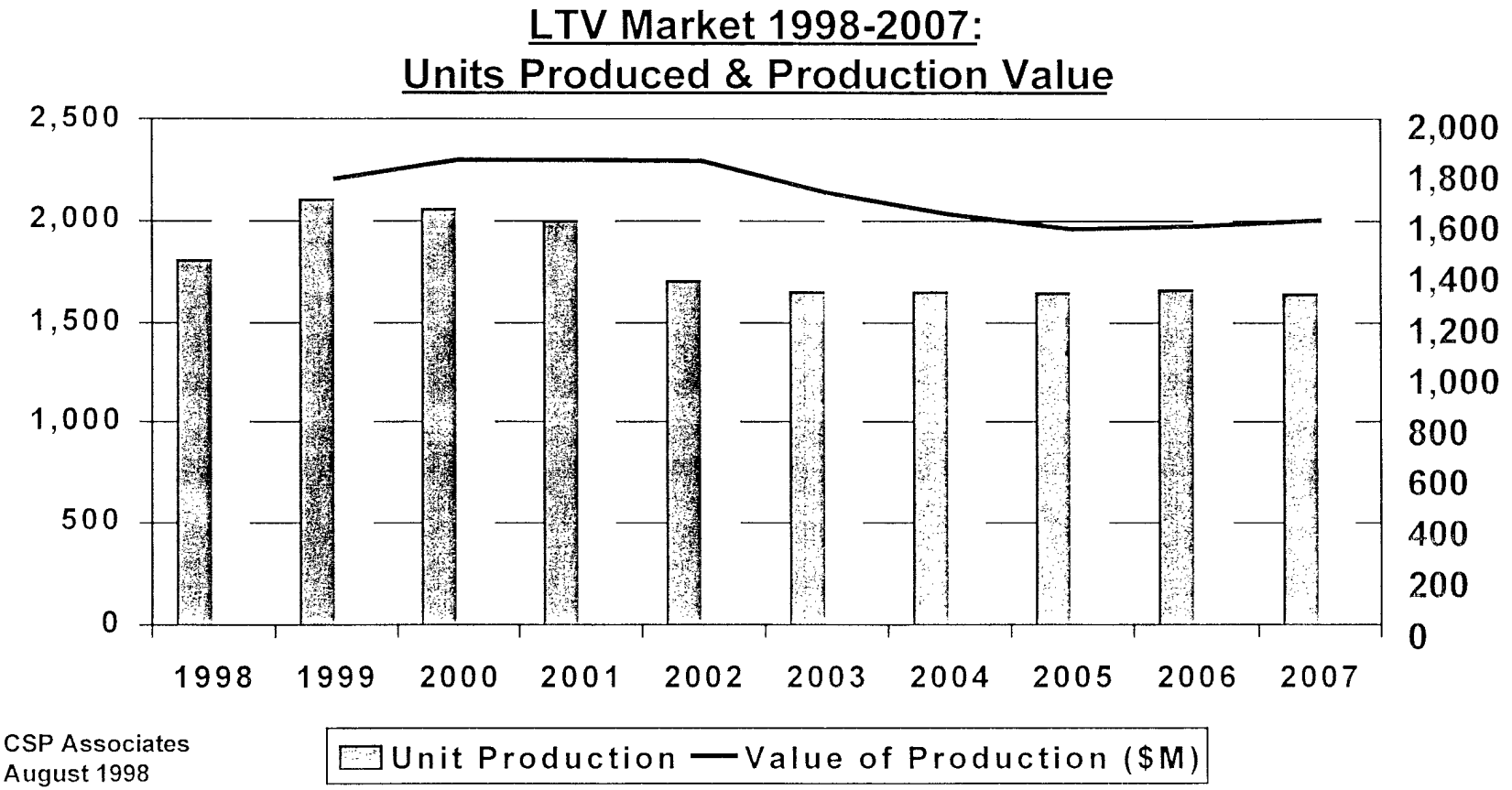
CSP Associates
August 1998

Light Tracked Vehicles (LTV)

Unt f ns

? Near term demand is healthy

? LTV market: $17.1B over 10 years



CSP Associates
August 1998

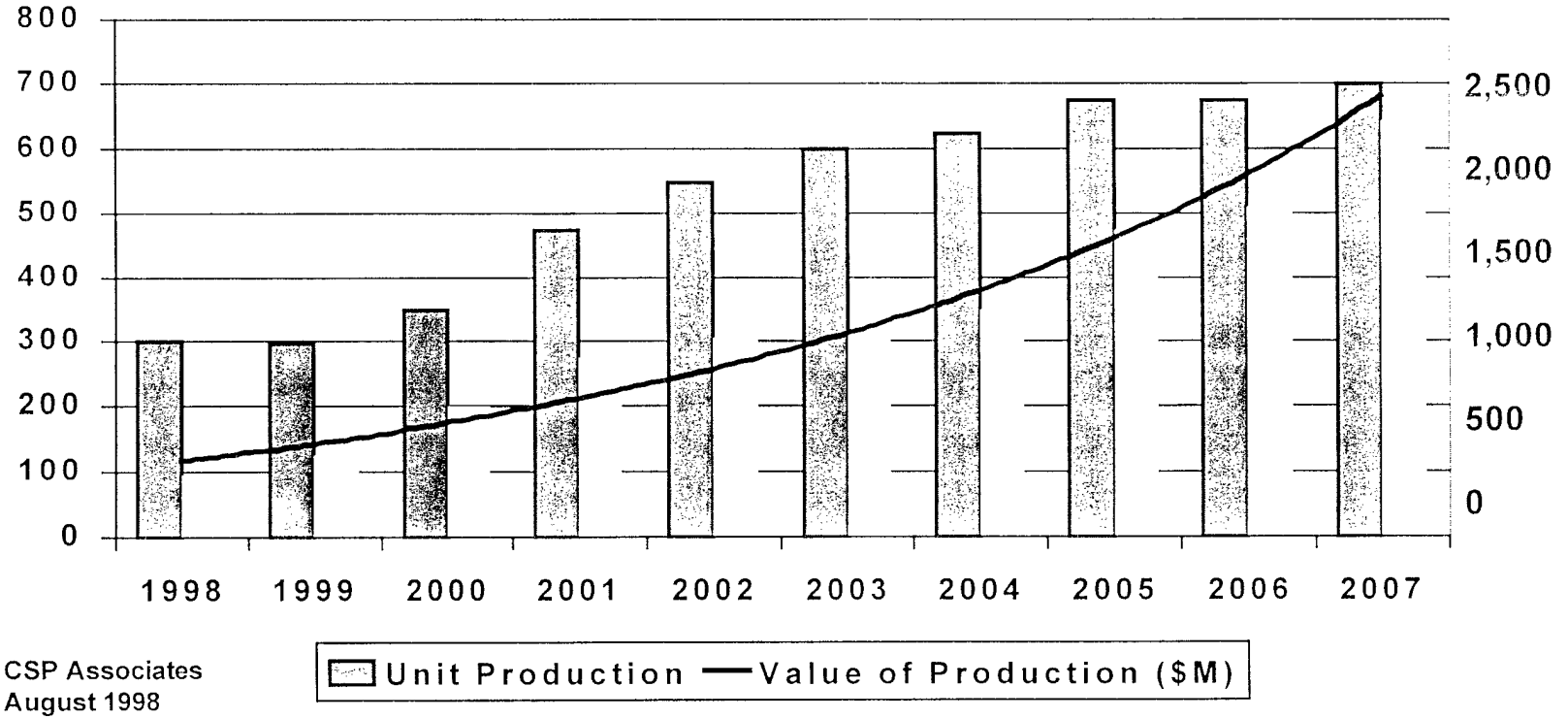
Self-Propelled Artillery Systems

Unt f ns

? Demand remains high

? Self-propelled artillery market: $10B over 10 years

Self-Propelled Artillery Market 1998-2007:
Units Produced & Production Value



CSP Associates
August 1998

GENERAL DYNAMICS
Land Systems

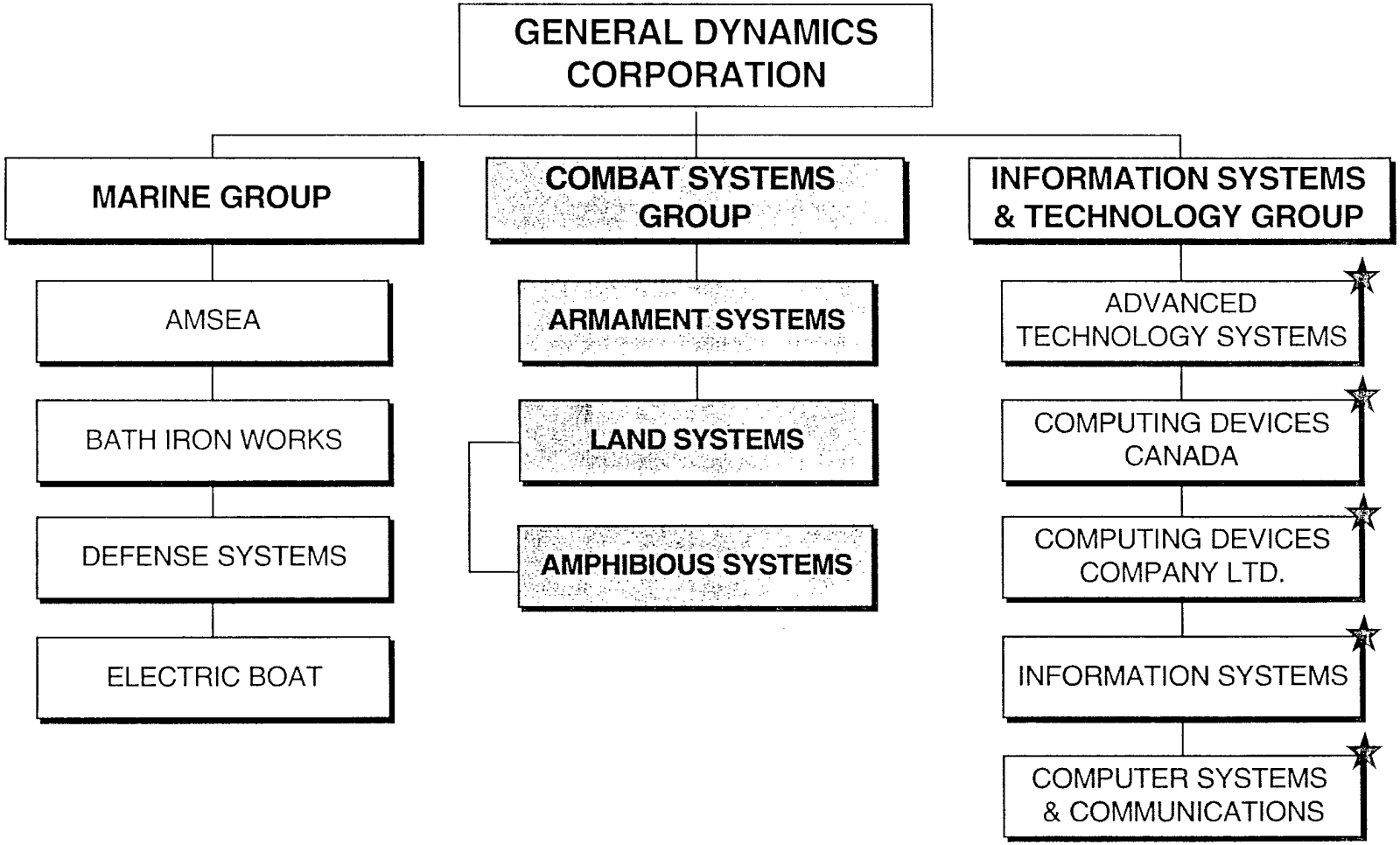
1998
COMBAT VEHICLE CONFERENCE

SUSTAINING THE COMBAT VEHICLE INDUSTRIAL BASE

Charles M. Hall
Vice President, Production and Delivery
General Dynamics Land Systems

Z4-383-1

ORGANIZATION



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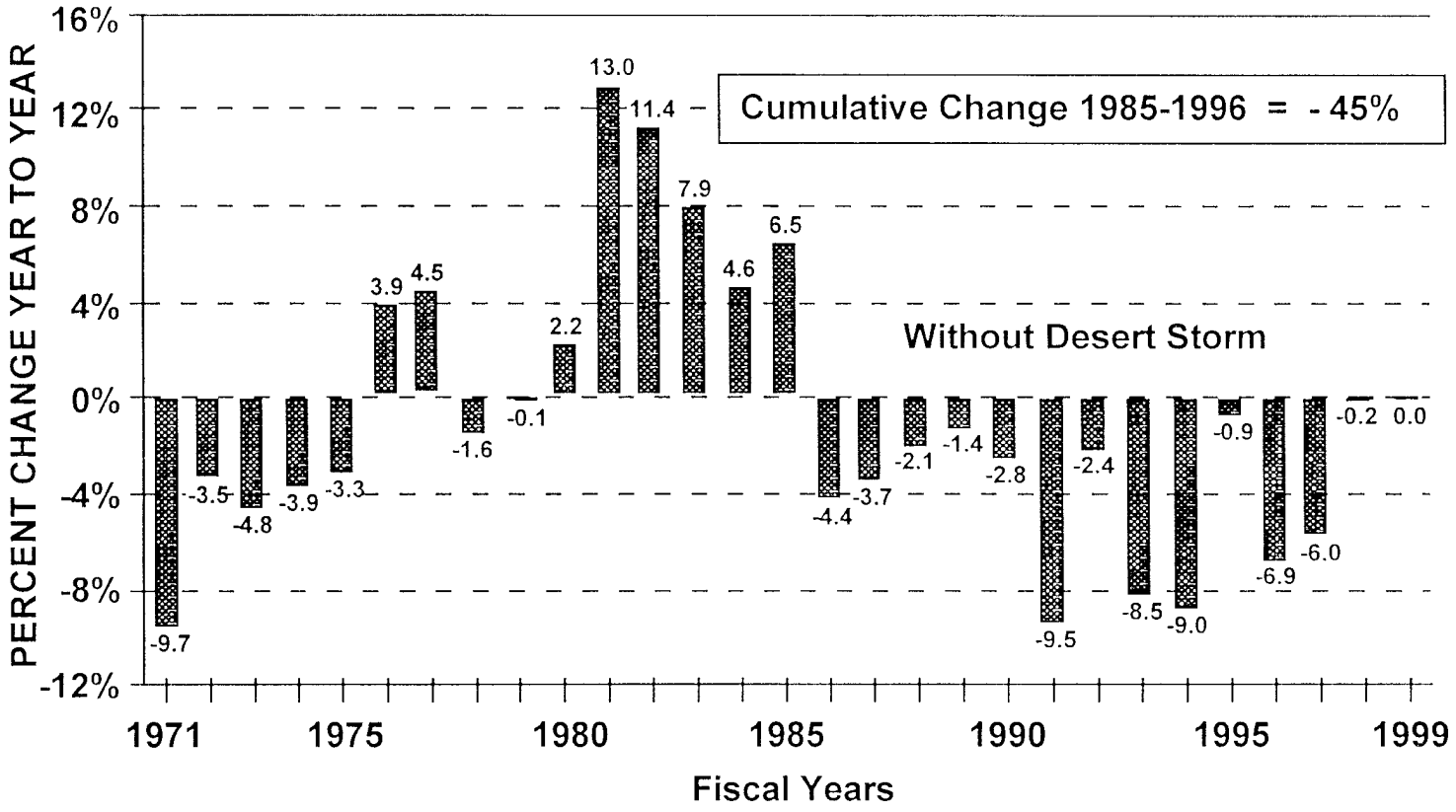
GENERAL DYNAMICS
Land Systems

PERCENT CHANGE IN REAL DEFENSE BUDGET AUTHORITY



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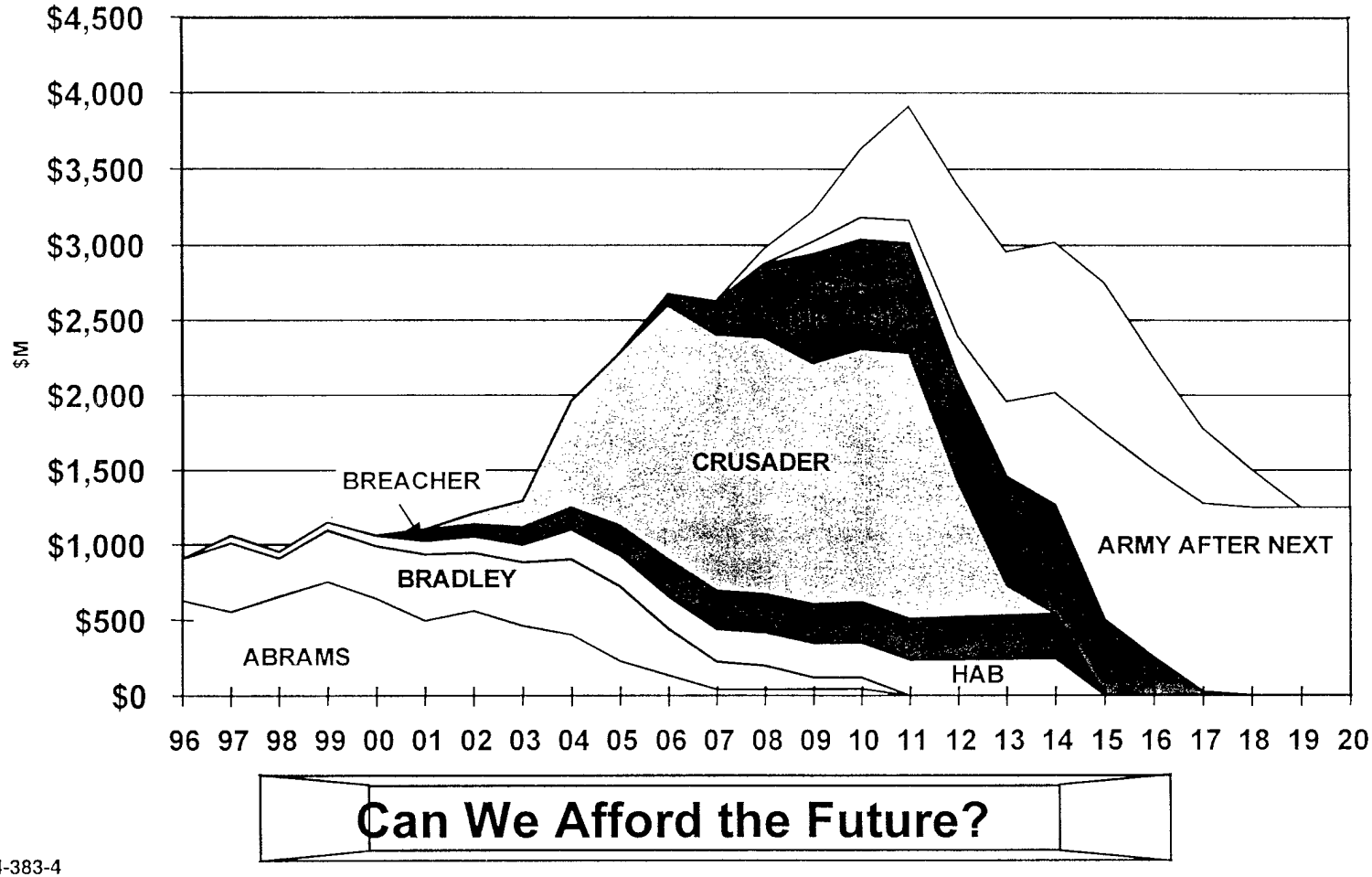
U.S. ARMY COMBAT VEHICLE PROCUREMENT PROJECTIONS



Can We Afford the Future?

Z4-383-4

THE RISK OF NO INDUSTRIAL BASE IS TOO GREAT!

WITHOUT INDUSTRIAL BASE

- OUR GREATEST ASSET - THE U.S. SOLDIER - MUST FIGHT WITH LESS THAN THE BEST EQUIPMENT
- PROGRAMMATIC FUNDING AND CONGRESSIONAL SUPPORT, LIKE THE INDUSTRIAL BASE, WILL HAVE TO BE RECONSTITUTED FOR AAN
- TECHNOLOGY WILL SHIFT AWAY FROM MILITARY APPLICATIONS IMPACTING ARMY'S ABILITY TO ACHIEVE AAN
- THE U.S. WOULD BE THE ONLY INDUSTRIAL NATION WITHOUT COMBAT VEHICLE PRODUCTION CAPABILITIES
- FLEET SUSTAINMENT OF OBSOLETE TECHNOLOGY WILL PLACE INCREASED BURDEN ON OPERATIONAL READINESS

NO INDUSTRIAL BASE . . . A RISKY PROPOSITION

INDUSTRY TRENDS TO ADDRESS SHRINKING SALES BASE

- MERGERS AND ACQUISITIONS
  - Lockheed Martin / Raytheon, Hughes, TI / Boeing McDonald Douglas
  - Significant Increase in Mergers Since the End of the Cold War
- TEAMING AGREEMENTS
  - Dow Corning, GDLS / MTU, Matra BAe Dynamics
- PRIVATE / PUBLIC INDUSTRY PARTNERSHIPS

INDUSTRY, LIKE THE ARMY, HAS A SIGNIFICANT CHALLENGE TO OVERCOME

GENERAL DYNAMICS
Land Systems

COMBAT VEHICLE WORLD MARKET
AVERAGE ANNUAL MARKET 1996 - 2005

	U.S.*	%	REST OF WORLD*	%	TOTAL*	%
PRODUCTION	$1.5	7	$8.5	37	$10.0	44
DEVELOPMENT	$0.9	4	$1.7	7	$2.6	11
OPERATIONS & MAINTENANCE	$3.6	15	$6.8	30	$10.4	45
TOTAL	$6.0	26%	$17.0	74	$23.0	10

* $'s in Billions

- U. S. MARKET 35% LOWER THAN 1986-1995 PERIOD
  - PRODUCTION - 48%
  - R&D - 25%
  - O&M - 30%

Z4-383-7

MUTUAL SOLUTIONS

- PROVIDE RAPID RESPONSE (150 DAYS) MAINTENANCE REPAIR PARTS FOR IN-PRODUCTION HARDWARE
- MULTI-YEAR PROCUREMENT
- SUPPORT FOR INTERNATIONAL SALES
- PARTNERSHIP WITH SERVICES
- PROVIDE CRADLE TO GRAVE OR ARMS AROUND SUPPORT
- REDUCE OWNERSHIP COSTS

FOCUS TO PROVIDE STABILITY FOR CORE CAPABILITIES

CRADLE TO GRAVE PARTNERSHIPS

"Unless the Army Figures Out How to Move a Legacy System Into a Cradle to Grave Partnership, Significant Savings Will Not Appear Until Long After the Army has Cut the Workforce, Responded to the Quadrennial Defense Review and Downsized. The Bottom Line is to Provide as Good or Better Service to the Warfighter Without Further Burdening the Soldier"

•

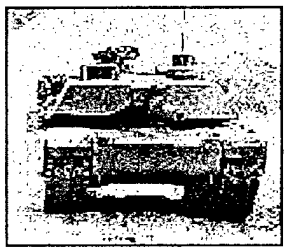
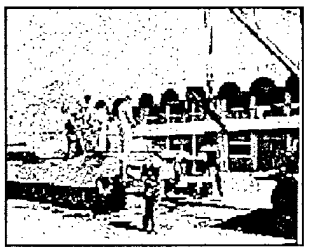
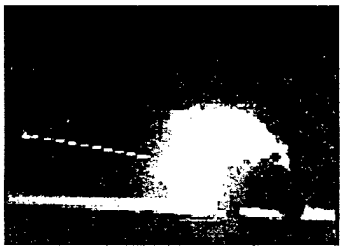
LTG PAUL KERN
A DRAFT WHITE PAPER ON CRADLE-TO-GRAVE PARTNERSHIPS - AUGUST 1998

GENERAL DYNAMICS
Land Systems

FUTURE BUSINESS
U.S. ARMY

- ABRAMS FLEET LOGISTICS REPORT SUPPORT
  - Life Cycle Support to be Provided by GDLS
    - Configuration Management
    - Total Package Fielding
    - Field Maintenance Above Direct Support
    - Spare and Repair Parts Inventory Management
    - Field Service, Training and Modifications
    - Repair and Upgrade

"CONTRACTOR LOGISTICS SUPPORT"

CURRENTLY PURSUING A 2 YEAR FFP CONTRACT FOR
THE M1A2 TANK AT FT. HOOD AND FT. CARSON

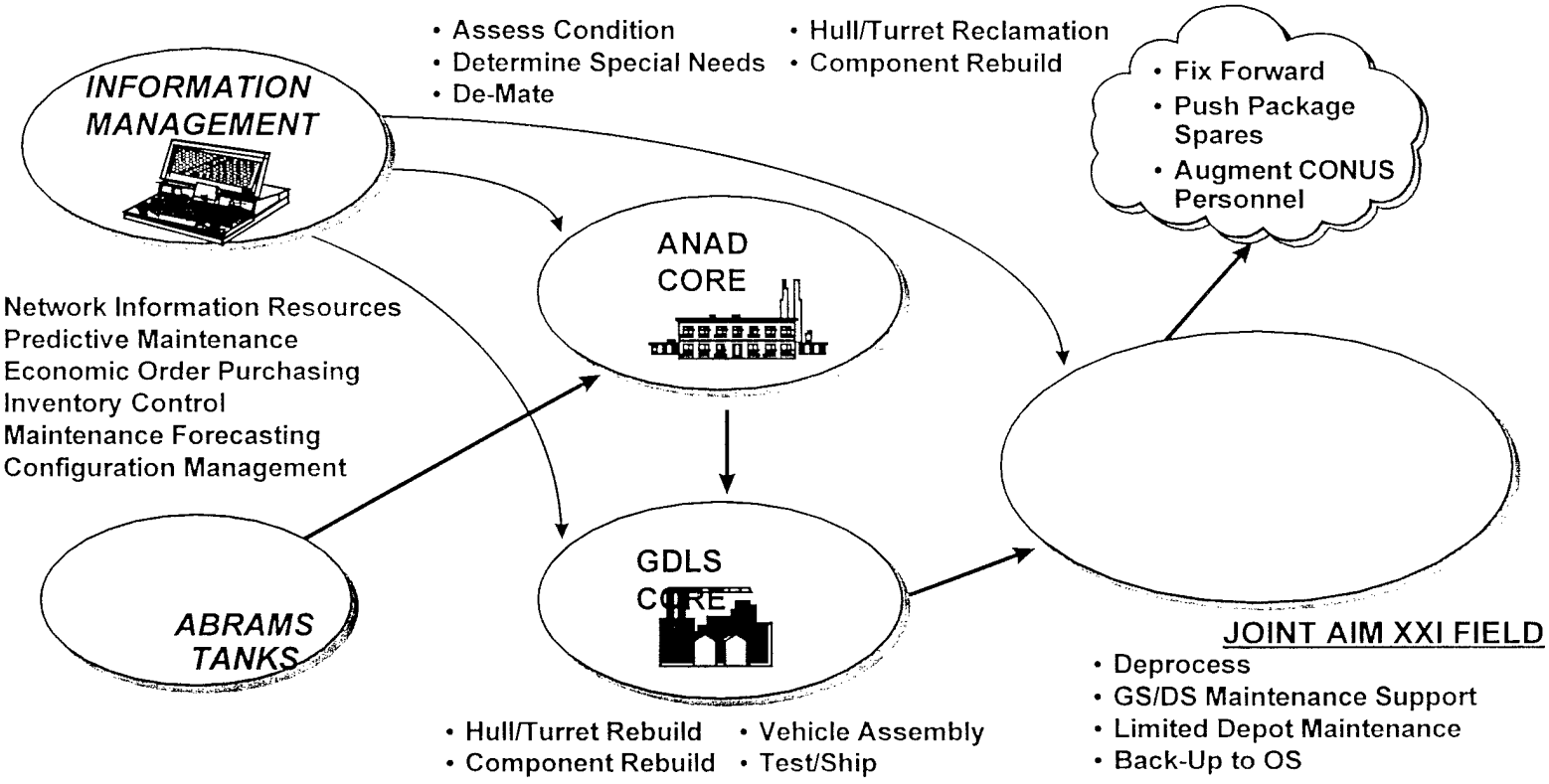
Z4-383-10

AIM XXI

INFORMATION MANAGEMENT

VEHICLE REBUILD

FIELD SUPPORT



Z4-383-11

SUMMARY

- CORPORATE AND MILITARY ROLES ARE CANDIDATES FOR CHANGE
- READINESS / TECHNICAL SUPERIORITY IS FIRST
- INDUSTRY INVOLVEMENT CAN SUPPORT MUTUAL OBJECTIVES AND STRENGTHEN THE INDUSTRIAL BASE

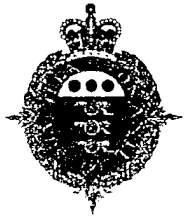
Future Scout & Cavalry System and Tactical Reconnaissance Armoured Combat Equipment Requirement, FSCS/TRACER Program

TACOM

Out of the Gate

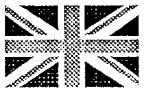
COL PETER WALL
PM, TRACER

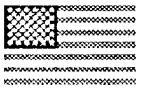
ROLAND A. ASOKLIS
PM, FSCS

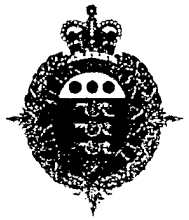


TACOM

- Context
- Collaboration
- Challenges of PD/ATD
- Conclusions

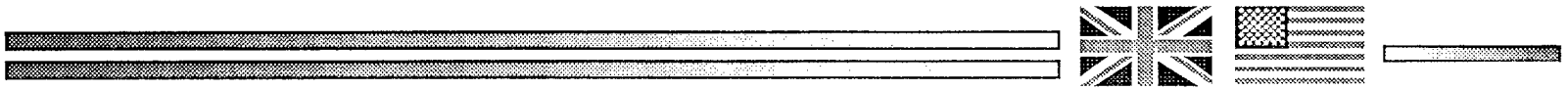


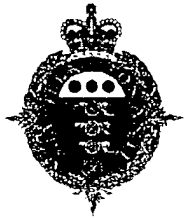




TACOM

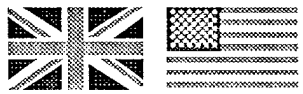
Context

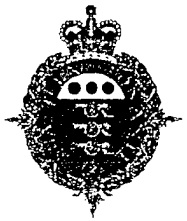


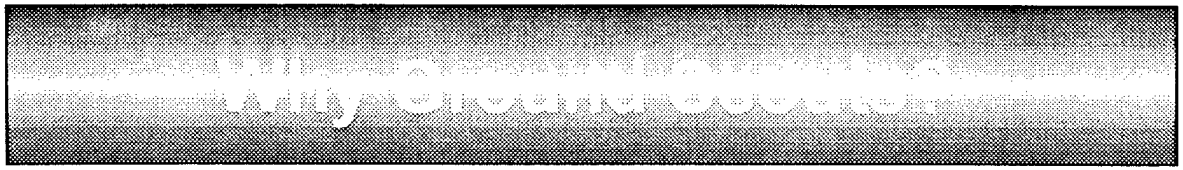


TACOM

- Part of a Balanced ISTAR Mix
- Bridging Force XXI and AAN
- Integrated into Digitized Battlespace
- Employed in Deep and Close Battle
- Interact with Direct and Indirect Fire Assets
- Enable Decisive Mounted Operations through Information Dominance
- Operate across Conflict and Environmental Spectrum

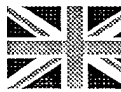


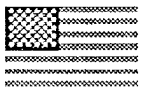


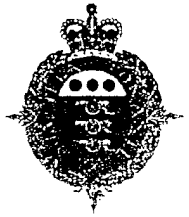


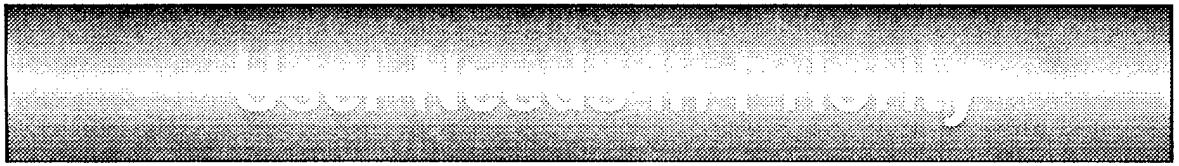
TACOM

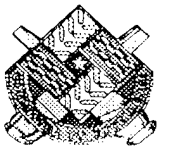
- Continuous Operations
- All Weather Capability
- On Site Human Judgment
- Probe Deception





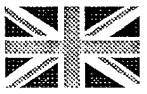


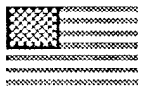


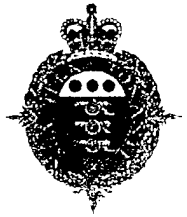


TACOM

- Information Gathering
- Survivability - Signature Management
  - Physical Protection
  - DAS
- C4I
- Mobility, Including C130 Transportability
- Lethality
- Growth
- Life Cycle Cost - Effectiveness
- Ease of Training - Reduced TADSS





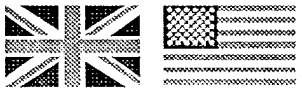


Information Warfare:

- Multi-Spectral Sensor Suite
- Automatic Target Detection/Recognition
- Advanced C4I
- Crew Stations with Advanced Interfaces

Survivability:

- Low Profile
- Stealth in All Spectra
- Advanced Structure with Modular Armor



Relevant Technologies - II

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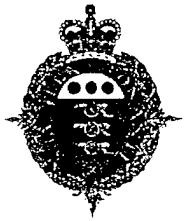
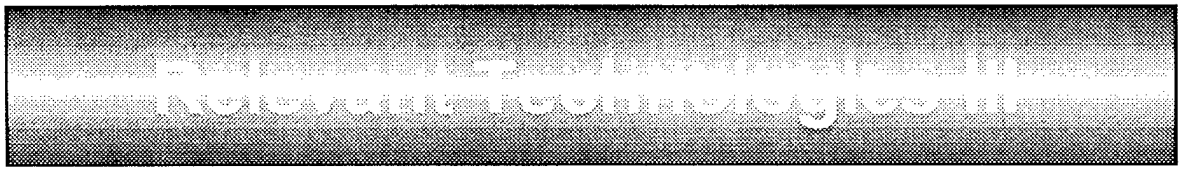
Mobility

- High Power Density Engines
- Semi-Active Suspension
- Hybrid Electric Drive

Lethality

- 35-40mm Cannon
- Case-Telescoped Ammunition
- ATGW Variant for UK





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Growth

- Modularity
- Upgradeable Components
- Open Systems Architecture

Reduced TADSS

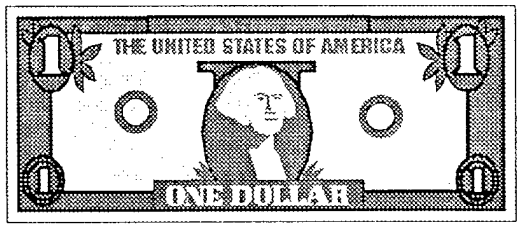
- Embedded Training

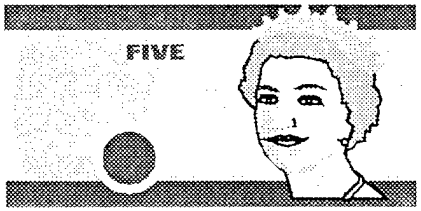
TACOM

BUT.....

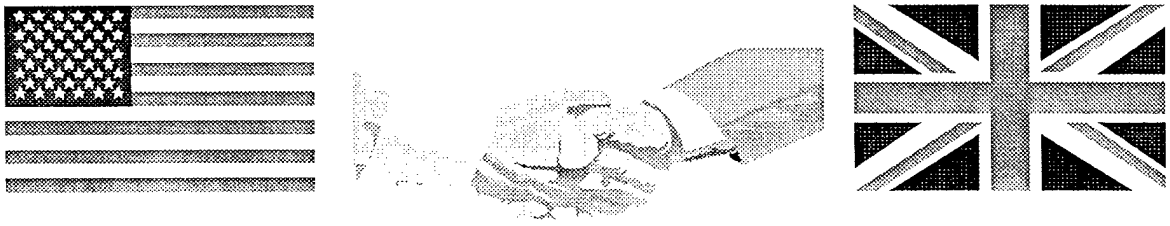
financial constraints imply the need for.....

COLLABORATION





TACOM



US/UK FSCS/TRACER
Statement of Intent

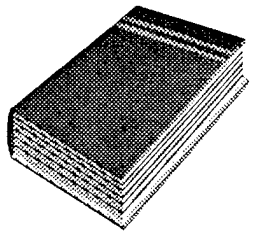
TACOM

- Purpose: Explore Common Areas for Cooperation on a Future Armored Reconnaissance Vehicle:
  - Harmonization of National Requirements
  - Procurement Strategy and Implementation of a Joint Advanced Technology Demonstrator/Project Definition Phase
  - Joint Management of ATD/PD Phase
  - Technology Sharing
  - Potential for Cooperation Beyond First Phase

Combined Operational Requirements Document (CORD) Harmonization

TACOM

- Drawing on Existing US/UK Studies
- Minor Variation on Concept of Use and Doctrine
- User Negotiations Harmonized All CORD Requirements
- Critical Negotiated Requirements:
  - OMS/MP, Lethality, Air Transportability



Common Requirements Essential Prerequisite for Collaborative Program

Procurement Strategy
Harmonization of PD/ATD Phase

TACOM

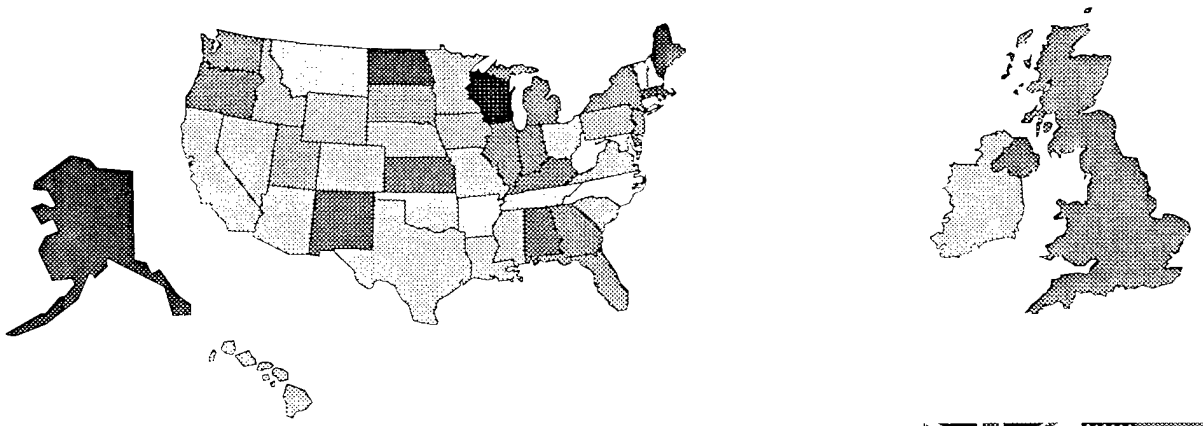
- Single Customer Approach
- Common Acquisition Strategy for UK Project Definition (PD) Phase and US Advanced Technology Demonstration (ATD) Phase
  - Length of Phase
  - Introduction of System Level Demonstration to Address System Risk Early
  - Robust Trade Study Plan and Affordability Decision Process
- Common Technical Requirements Specification (TRS) Based on CORD
- Common Invitation to Tender (ITT) Document (US Request for Proposal)

Procurement Strategy

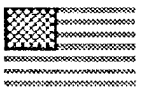
Industrial Roles

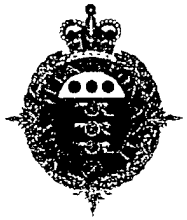
TACOM

- US/UK Partnering Requirement
- Work Share
- Production Capabilities in Both Nations



- Joint Steering Committee (General Officer Level)
- Joint Program Office (JPO):
  - Abbey Wood, UK and Warren, MI, US
- Exchange of Personnel, Co-located with PMO
- US/UK Subject Matter Expert (SME) Teams to Assist Consortia
- UK Contracting Agency for PD/ATD
  - All Contracting Documents Harmonized
- Best Practices from both Nations being Employed

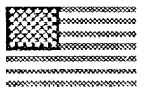




Technology Sharing

TACOM

- US & UK Industry Export Licensing Agreements in Place
- US & UK Government Technology Program Exchange Meetings with Industry Conducted
- Approvals to Include Third Party Country Technologies In Process
- Exchange of Developing Government Technology Information will Continue

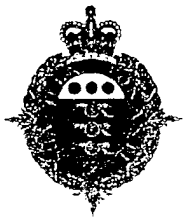


Potentials for Cooperation Beyond First Phase

TACOM

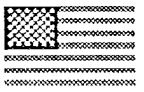
- US/UK Memorandum of Understanding (MOU) Addresses all Phases of Collaborative Program
  - 50/50 Cost Share for EMD/FD
  - Use & Disclosure of IPR Addresses Entire Program

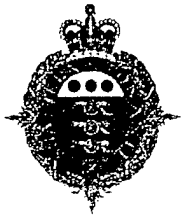
ational Approvals Required for try into Each Subsequent Phase



TACOM

- Strong High Level Support from the Outset
- Security Addressed from the Outset
- Early, Open and Frank Dialogue with Industry
- Early MOU Development / Staffing
- 50/50 Collaborative Approach
- Teamwork and Trust





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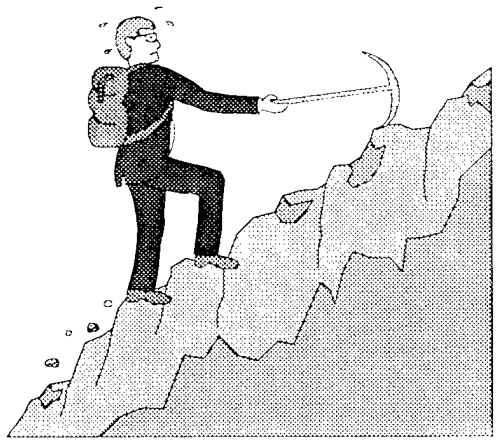
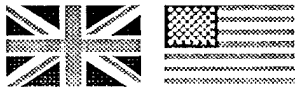
Challenges of PD/ATD

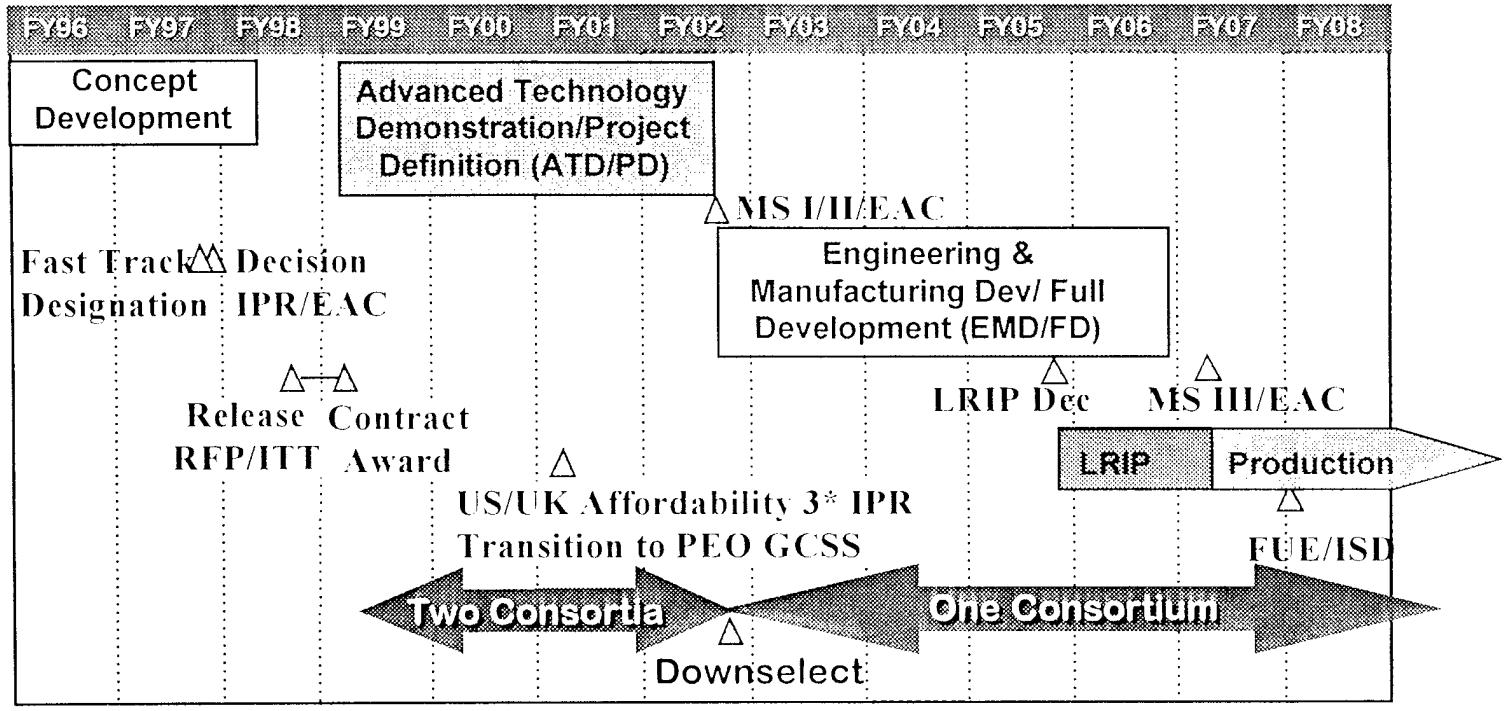


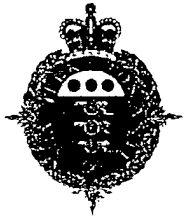


Acquisition Strategy

TACOM

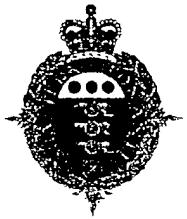
TRACER/FSCS PROGRAM SCHEDULE





TACOM

- Cost will be Examined on Equal Basis with Performance and Schedule in Trade Studies
- LCC Parameters Considered throughout Design Process - Best Value Engineering
- Mechanism for Parametric Cost Estimates to be Established by Contractor
- Supports Cost-Effectiveness Trade Studies



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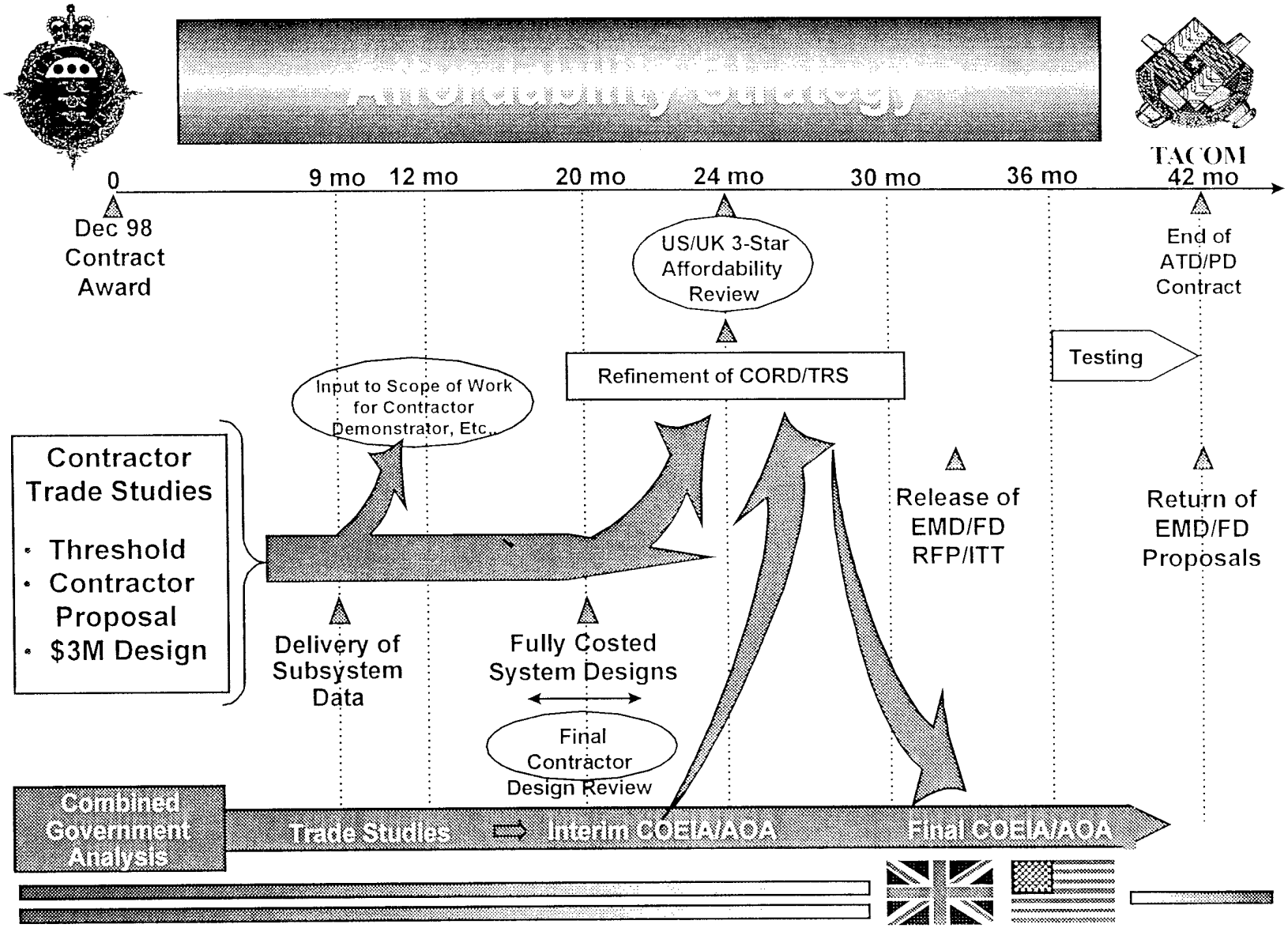
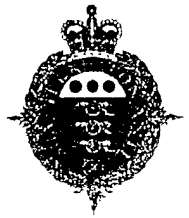
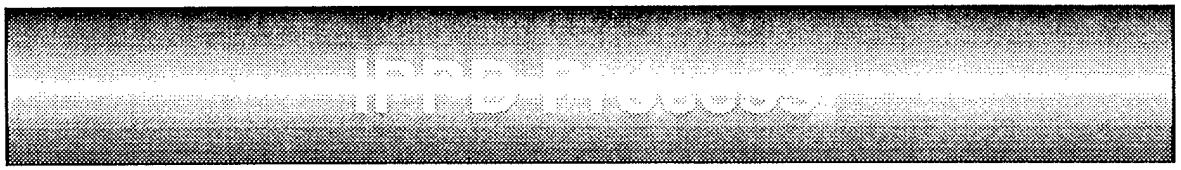
- Non-prescriptive Technical Specification
- Government Analysis of Trade Study Data
- 'Necking-Down' of System Design Options at Month 24 Driven by Cost Effectiveness
- Design to Cost Budgetary Estimates for UMC and Whole-Life Support Costs Delivered to Industry

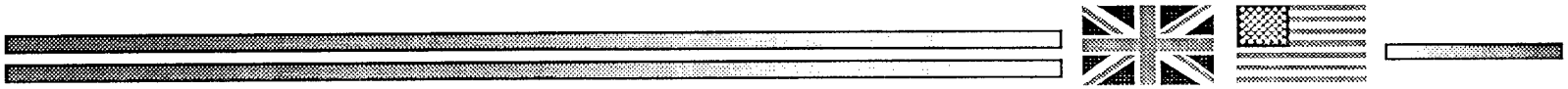

TACOM
0
9 mo
12 mo
20 mo
24 mo
30 mo
36 mo
42 mo
Dec 98
Contract
Award
US/UK 3-Star
Affordability
Review
End of
ATD/PD
Contract
Testing
Refinement of CORD/TRS
Input to Scope of Work
for Contractor
Demonstrator, Etc.
Contractor
Trade Studies
• Threshold
• Contractor
Proposal
• $3M Design
Release of
EMD/FD
RFP/ITT
Return of
EMD/FD
Proposals
Delivery of
Subsystem
Data
Fully Costed
System Designs
Final
Contractor
Design Review
Combined
Government
Analysis
Trade Studies
Interim COEIA/AOA
Final COEIA/AOA





TACOM

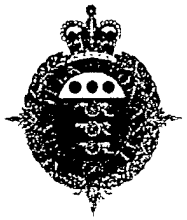
- Government Personnel Sit on Industry IPTs
- Close Visibility of PD/ATD Process to Monitor Progress, Agree Deliverables and Authorize Payment Milestones
- Competition must not be Compromised - Strict Control of Individuals to ensure Consistency of Advice

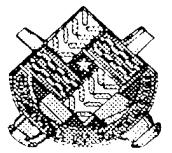


Potential Hazards

TACOM

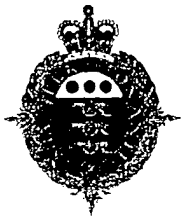
- National Interest - Especially in Sub-System Selections
- Nationally Balanced System Solutions Essential for Cost Share in FD/EMD without Compromising Performance
- National Views of Cost Effectiveness and Affordability Could Diverge
- Industrial Rationalization
- Cost Overhead or Collaboration could Decrease Risk Reduction During ATD/PD Phase

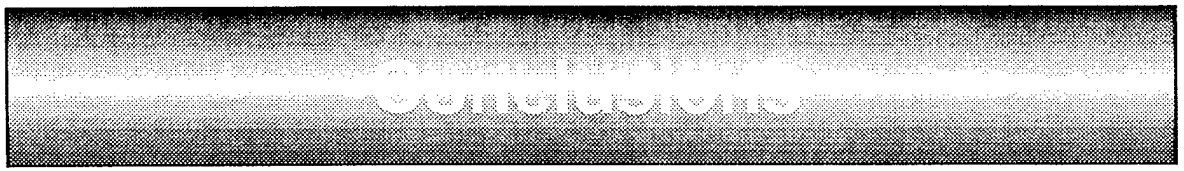




TACOM

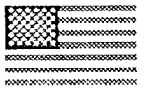
Conclusion





TACOM

- Realistically Addresses the Constrained Financial Environment
- Leverages Two National Technology Bases
- Capitalizes on Two Industrial Bases
- Saves Acquisition Dollars and Reduces Overall Cost of System Ownership
- Effectively Enables Modernization



TACOM

Mobility and Firepower
for America's Army

LAV PROGRAM UPDATE

COMBAT VEHICLE CONFERENCE
22 SEPTEMBER 1998

Thomas M. Lytle
Colonel, PM, LAV

Tank-automotive & Armaments COMmand
Committed to Excellence

TOPICS

- LAV MARINE CORPS PROGRAMS
- LAV INTERNATIONAL PROGRAMS

LAV
MARINE CORPS PROGRAMS

LAV SERVICE LIFE EXTENSION PROGRAM (SLEP)

Objectives	*Assumptions*
1. Extend LAV service life through 2015	→ Resources will allow LAV replacement by 2015
2. Reverse declining trend of operational readiness	→ LAV Auto-hull will remain viable platform through 2015
3. Reduce Fleet O&S costs	
4. Enhance performance where appropriate and affordable	

LAV SLEP

Acquisition Strategy

→Rationale

→Fleet reaches projected service life 2003-2008

→Funding not available for replacement vehicle before 2010

→Strategy - The priority of the effort will be to maintain the current capability of the LAV Fleet. Product Improvements and Tech Insertion will be accomplished as enhancement, IF AFFORDABLE, to meet operational deficiencies.

LAV SLEP
Schedule

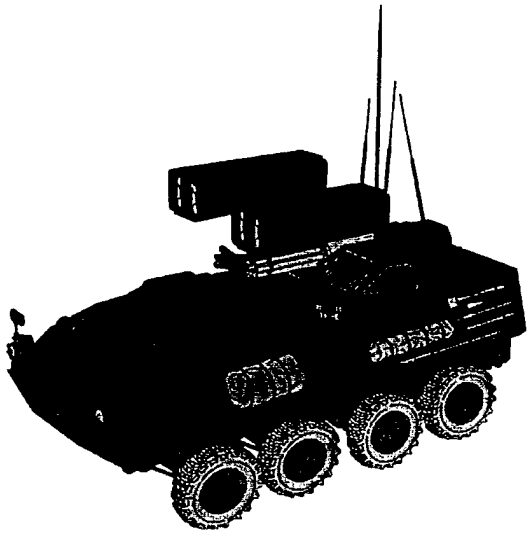
→MS 0	1 Qtr/FY98
→MS I/II (a)	2 QTR/FY99
→MS II (b)	1 QTR/FY00
→DT/OT	1-4 QTR/FY01
→MS III	4 QTR/FY01
→IOC	4 QTR/FY03
→FOC	1 QTR/FY07

POTENTIAL
SLEP Components

- → General
  - → Corrosion Prevention Program
    - → LAV-25 Battery Box Mod
  - → Hull/Structural Crack Reduction
  - → IETM
  - → Integrated Battlefield Info Sys
- →
- → Turret/Gun
  - → LAV-25 Contact Test Set
  - → Driver's Hatch Upgrade
  - → Gyro Test Kit
  - → Gyro Upgrade
  - → Traverse Drive Backlash Test Kit
  - → Gunner's Hatch Upgrade
  - → Sight Synchronization Kit
  - → Sight Purging Kit
  - → Hydraulic Test Kit (Turret)
  - → Long-Stroke Recoil Mechanism Upgrade
- → Auto-Hull
  - → Mechanical
    - → Steering Bearing Shaft Upgrade
    - → Alternator Bracket
    - → Driveline & Suspension Retrofit
    - → Engine
    - → Transmission
    - → 2-Speed Transfer Case
    - → Power Pack Maintainability Enhancements
  - →
  - → Hydraulic/Pneumatic
    - → Pneumatic System Air Dryer
    - → Hydraulic System Test Kit (Hull)
    - → Hydraulic Oil Cooler
  - →
  - → Electrical
    - → Alternator Test Kit
    - → Cable Test Kit

POTENTIAL
SLEP Enhancements

- → Turret/Gun
  - → Electric Turret Drive
  - → 30mm MG/AAAV Turret
  - → LAV-25T & TE TOW Retrofit
  - → Gun Control Unit Retrofit Kit
  - → Traverse Drive Upgrade Kit
  - → Gen II HIRE Sight
  - → Gen III Night Elbow Kit
  - → Manual Drive Slip Ring Upgrade Kit
  - → HIRE Installation Enhancement
- → Auto-Hull
  - → Mechanical
    - → Muffler Signature Enhancements
    - → Heavy Duty Torsion Bars
    - → LAVII Shocks
    - → Wheel and Tire Assembly
    - → Cooling System Retrofit
    - → Swim Aids
    - → Quick Engine Disconnects
    - → Marine Drive Mounting Bracket Upgrade
  - → Electrical
    - → Low Voltage Headlights & Taillights



LIGHT ARMORED VEHICLE - AIR DEFENSE

- Crew: 3 (Commander/Gunner/Driver)
- 25mm Gatling gun (Total of 990 rounds)
- Stinger missiles (Total of 16)
- FLIR/Day TV Sight
- Automatic Tracking
- Eye safe Laser Range Finder
- Common LAV chassis
- General Dynamics Ordnance Systems, Burlington, VT (22 Dec 95)
- Quantity: 16 (4th LAR Bn, CamPen)
  1 (NSWC Crane, IN)

MILESTONE SCHEDULE

• Engineering devel contract award	Dec 87
• DT-II test completed	Feb 91
• R&D contract award	Jun 92
• MDA directed more testing	May 94
• DT/OT -IIB completed	Jul 94
• RFP issued	Sep 95
• MS-III Decision approval	Dec 95
• Contract award	Dec 95
• IOC (1st 4 vehicles)	Jun 98
• FOC	Oct 98

CURRENT STATUS

- Undergoing Initial Production Testing (IPT)

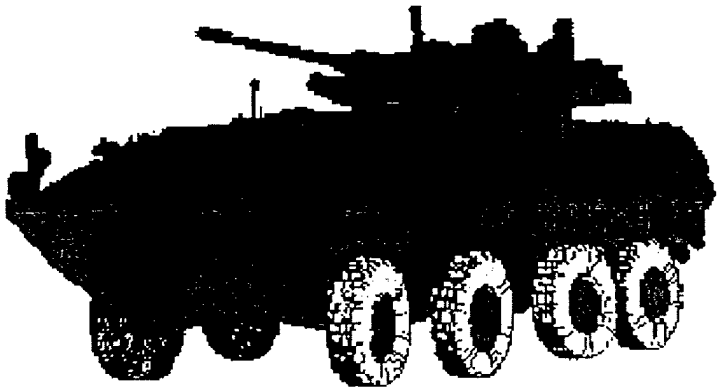
- FOT&E completed 8 Aug; results being analyzed by MCOTEA

- 15 Systems delivered to date (11 shipped-in-place at GDAS being retrofitted - Sight)

- Anticipate completion of IPT and release of vehicles to the 4th LAR in Nov 98

•

9/19



MOBILITY BLOCK IMPROVEMENT PROGRAM (MBI

- "Silver Series" Engine, with Engine High Idle Kit
- ECP-type Improvement: Brake System Upgrade
  - - Tire Chains
  - - Steering Roller Bearings
  - - Engine Grill Swim Covers
  - - Laser Shielded M17 & M27 Periscopes
  - - Portable Tire Mounter/Demounters
  - - Power Pack Ground Hop Stand
- RDT&E Contracts - Non-competitive, DDC & DDGI
- Prod. Contracts - Non-competitive & competitive

MILESTONE SCHEDULE

MS I/II Decision	Jul 95
RDT&E Contracts Awarded	Aug 95
DT/OT Completed	Dec 95
LAR	May 96
MS-III Decision	May 96
Production Contracts Awarded	Aug 96
IPT Completed	Apr 97
IOC	Oct 97
FOC	Aug 99

CURRENT STATUS

- o 749 (81%) complete (either installed in LAVs or on the shelf)
- o 791 delivered by DDC
- o Program on schedule for Aug 99 FOC

POC: Mr. Carl Zink; DSN: 786-8369
Comm: (810) 574-8369
E-Mail: zinkc@cc.tacom.army.mil
Date: Sep 98

OTHER USMC PROGRAM SUPPORT

Joint Light NBC Recon System (JLNBCRS)

- JLNCBRS suite to be integrated into HMMWV & LAV
- 31 basic LAV-L chassis to be provided to integrator as GFE
- PM-LAV handling procurement of basic LAV-L chassis

Mobile Electronic Warfare Support System (MEWSS)

- Joint USMC/USA Program with USA the lead service
- PM-LAV assisting PM-Intel/Comm with MEWSS PIP on auto/hull issues

Applique Armor

- Emerging conflict with weight and coverage requirements
- Potential problem w/storage of solvent and adhesive (HAZMAT)
- Program under review

Enhanced C2 Variant

- Mar 98 - change to LAV ORD
- Apr 98 - IPT met to discuss revised performance requirements
- Leveraging efforts on the AAAV program
- Prototype candidate system to be evaluated during the "Urban Warrior" exercise
- Draft performance specification for comment and release following Urban Warrior

11/19

LAV INTERNATIONAL PROGRAMS

ACTIVE PROGRAMS

- SAUDI ARABIAN NATIONAL GUARD (SANG)
-
  - OTHER POTENTIAL INTEREST
  -
    - IRELAND
    - ISRAEL
    - TAIWAN
    - SANG (Added battalion)
    - US Army

SANG
PRODUCTION DELIVERIES TO-DATE

VARIANT	QUANTITIES REQUIRED	QUANTITIES DELIVERED
LAV-25	384	384
LAV-Anti Tank	111	111
LAV-Pers Carrier	47	47
LAV-Recovery	67	67
LAV-Comm/Control	182	182
LAV-Engineer	34	34
LAV-Ambulance	71	71
LAV-Mortar	73	4
LAV-Ammo Carrier	18	0
LAV-Assault Gun	130	0
Total Required	1,117	
Total Delivered		900

SANG 120mm Turreted Mortar Characteristics

- Based on LAV Type 1 chassis (Marine Corps version)
- 120mm smooth bore, breech loaded Royal Ordnance Mortar weapon
- Mecar HE, WP and Illum ammo (SANG directed source)
- Delco modified Vista fire control computer with English and Arabic capability
- 500-9200m range indirect fire
- 240-1000m direct fire
- -5 to +80 degrees elevation/full 360 deg weapon traverse
- 40 round ammo stowage capability
- Digital link with FDC

Mortar Planned Program

• Weapon/ammo certification	Aug 97 - May 99
• System testing at YPG/NATC	Mar 98 - Sep 99
• Recoil mech/barrel fatigue tests	Mar - Jul 99
• System-level safety tests	Mar - Apr 99
• RAM firing	Mar - May 99
• Performance testing	Mar - May 99
• RAM miles at NATC	Nov 98 - Jan 99
• First production vehicle accepted	May 99
• Deliveries to KSA	Jul 99 - Dec 99
• Mortar/FDC/AC interop test at NATC	Aug-Sep 99

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• Deliveries to KSA	Jul 99 - Dec 99
• Mortar/FDC/AC interop test at NATC	Aug-Sep 99

MORTAR CURRENT STATUS

- Testing Program approximately seven months behind schedule
  - late weapon delivery
  - weapon/ammo safety and performance deficiencies
-
- All other program milestones met
  - Test ammo delivery
  - Production chassis delivery
  - Test vehicle delivery
  - Software development
  - Log development

SANG Assault Gun Characteristics

- 90mm Main Gun (CMI)
- Two-man Turret
- 28v Electric weapon/turret drive
- Gunner's Thermal/Day Sight with Cmdr Remote
- Commander's Panoramic Day Sight
- Digital Fire Control
- MECAR Unique 90mm Ammo
- Commander Loads Weapons
- LAV Gen II Chassis

LAV-AG(S)
Milestones to Contract Award

• OPM-SANG Review and USASAC/DSAA Signature of JBP Amendment Offer	Oct 98
• SANG Signs Amendment	Oct 98
• Case Implemented	Nov 98
• Issue Final RFP	Nov 98
• Receipt of Contractor's Proposal	Feb 99
• SANG Review of Proposal Complete	Mar 99
• Contract Award	Mar 99

VEHICLE
Program Overview

NDIA 1998 Combat Vehicles Conference

"The AAAV Represents the Signature Mission of the United States Marine Corps. A Truly Amphibious Vehicle That Will Replace the Marine Corps' Aging Current System and Provide the Capability to Maneuver, Combat Loaded, With a Marine Rifle Squad at 20-25 Knots in the Water, and Maneuver Cross Country With Agility and Mobility Equal or Greater Than That of the M1 Tank.

The AAAV Will Virtually Revolutionize Every Facet of Marine Corps Combat Operations. It Is One of the Most Capable All-around Weapon Systems in the World. The Technology to Meet These Requirements Has Been Demonstrated and the Plan to Produce This System Represents the Most Operationally Effective Solution for Meeting Marine Corps Requirements."

General C. C. Krulak , USMC
Commandant of the Marine Corps

Provide High Speed Transport of Embarked Marine Infantry From Ships Located Beyond the Horizon to Inland Objectives

Provide Armor Protected Land Mobility and Direct Fire Support During Combat Operations

Parameter	Objective	Threshold
High Water Speed Sea State 3	25 knots	20 knots
Forward Speed (Hard Surface Road)	72 kph	69 kph
Armor Protection (MM/M)	30/1000	14.5/300
Firepower (Range M)	2000	1500
Reliability (MTBCMF)	95 hours	70 hours
Carrying Capacity	18 Marines	17 Marines

GDLS EMPLOYEES	150
SUBCONTRACTORS EMPLOYEES	25
GOVERNMENT PROGRAM OFFICE (DRPM AAA, DCMC, PCO, ACO, Legal)	74
TOTAL	249

PDRR Contract Award to GDLS on 13 Jun 96

Facility Ribbon Cutting 9 Sep 96

SECNAV, CMC, Senator Warner, Senator Robb

Government Personnel Arrive 23 Sep 96

System Requirements Review (SRR) Completed Dec 96

Integrated Baseline Review (IBR) Completed Dec 96

System Design Review (SDR) Completed May 97

Preliminary Design Review (Prototype) Completed Dec 97

Critical Design Review (Prototype) Completed Jun 98

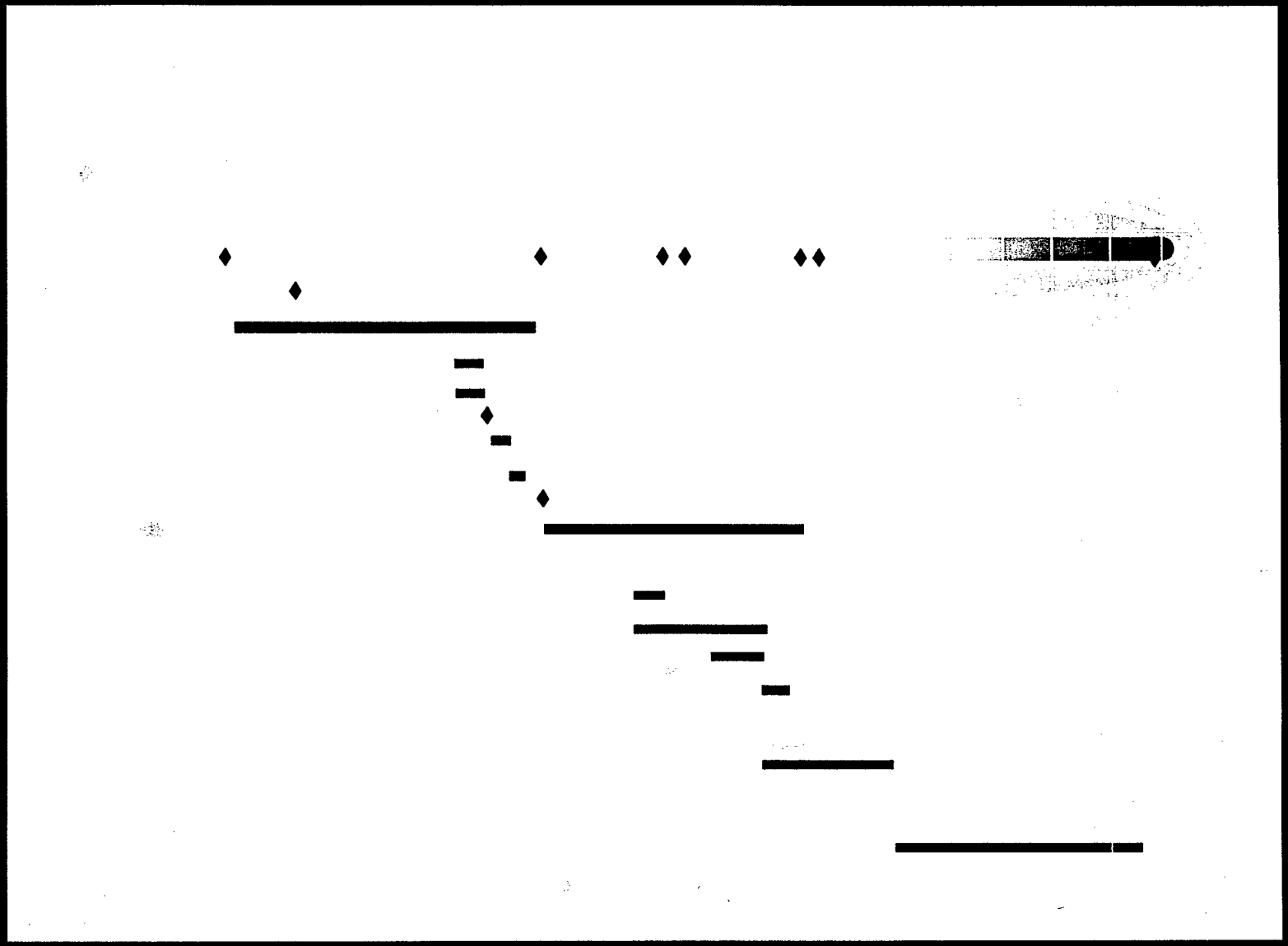
AAAV(P) #1

Vehicle Assembly:	Nov 98 - May 99
Hull Check-Out:	Jun 99
Turret Check-Out:	Jun 99
Marry Hull/Turret:	Jul 99
Roll Out	Aug 99
Shake-Down Testing:	Aug 99 - Sep 99
Acceptance Testing:	Oct 99 - Nov 99

AAAV(P) #2 Two Months After #1

AAAV(P) #3 Two Months After #2

Developmental/Live Fire Testing:	Jan 00
EOA:	Jul 00
Milestone II DAB Review:	Dec 00



Two Man Turret

MK 44 Mod 1 30/40 mm Gun

- Ready 60 AP/ 150 HE
- Stowed 60 AP/ 150 HE

7.62 Coax

- Ready 800
- Stowed 1600

Full Solution (M1A2) F/C

Fully Stabilized

2nd Gen FLIR (240x4)

Eye Safe Laser Range Finder

Embedded Training and Diagnostics

Open System Architecture

70% Commonality with M242

Dual Feed

Rate of Fire

- Single Shot
- 5 Round Burst at 200 SPM
- 200 SPM

Weight - 325 pounds

Dispersion- <0.5 mil

30 X 173mm NATO/GAU-8 Standard

40 mm Growth Capable

- Growth built into receiver and feeder
- Requires change of barrel and minor feeder changes
- Reduced Recoil

Other Enhancements

- Sealed Feeder
- Stainless Steel Hardware
- Phosphate breach, bolt, etc
- Mil G 23827B Grease

HEI-T: PBXN-5/ M758 SD Fuze

SAPHEI-T

TP-T

APFSDS-T: FCT currently approved for FY-99

- Mauser-Oerlikon Candidate
- Raufoss Candidate

Performance

Armor Piercing

- 30mm AP Significantly Overmatches Target of Interest
- 25mm at 500m = 30mm at 1500m = 35mm at 2500m

High Explosive

- Twice Lethal Area of 25mm
- Significantly Better Against Material Targets (BTR/Watercraft)
- Substantial Growth For Airburst

Super 40mm Growth

Weight

- Larger Medium Caliber Guns Exceeded Weight And Volume Budgets

20 Year Life Cycle Costs

- 25mm - $596.95M
- 30mm - $662.92M
- 35mm - $1.206B

Balanced Solution

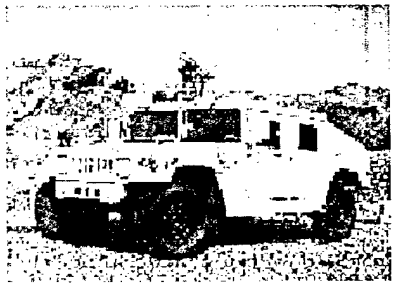
Http://www.aaav.hqi.usmc.mil

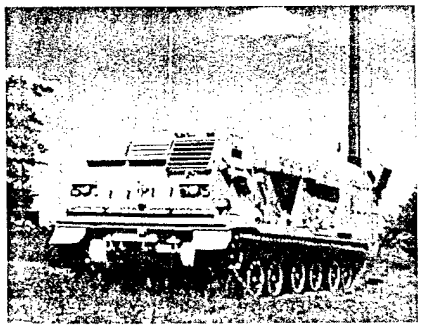
PEO

GCSS

Bradley Fighting Vehicle Systems

Bradley Fighting Vehicle Program Challenges



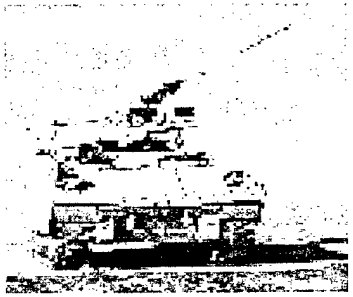


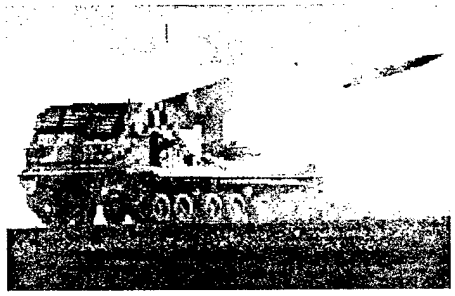
COL Paul S. Izzo

Project Manager, Bradley Fighting Vehicle Systems

NDIA Combat Vehicle Conference

Sept 1998

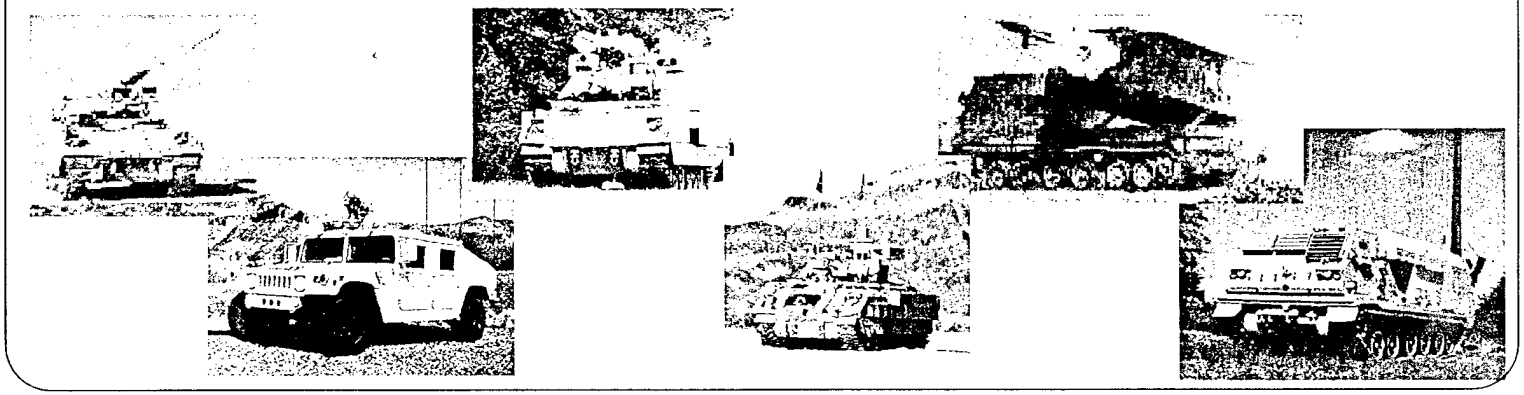




GCSS

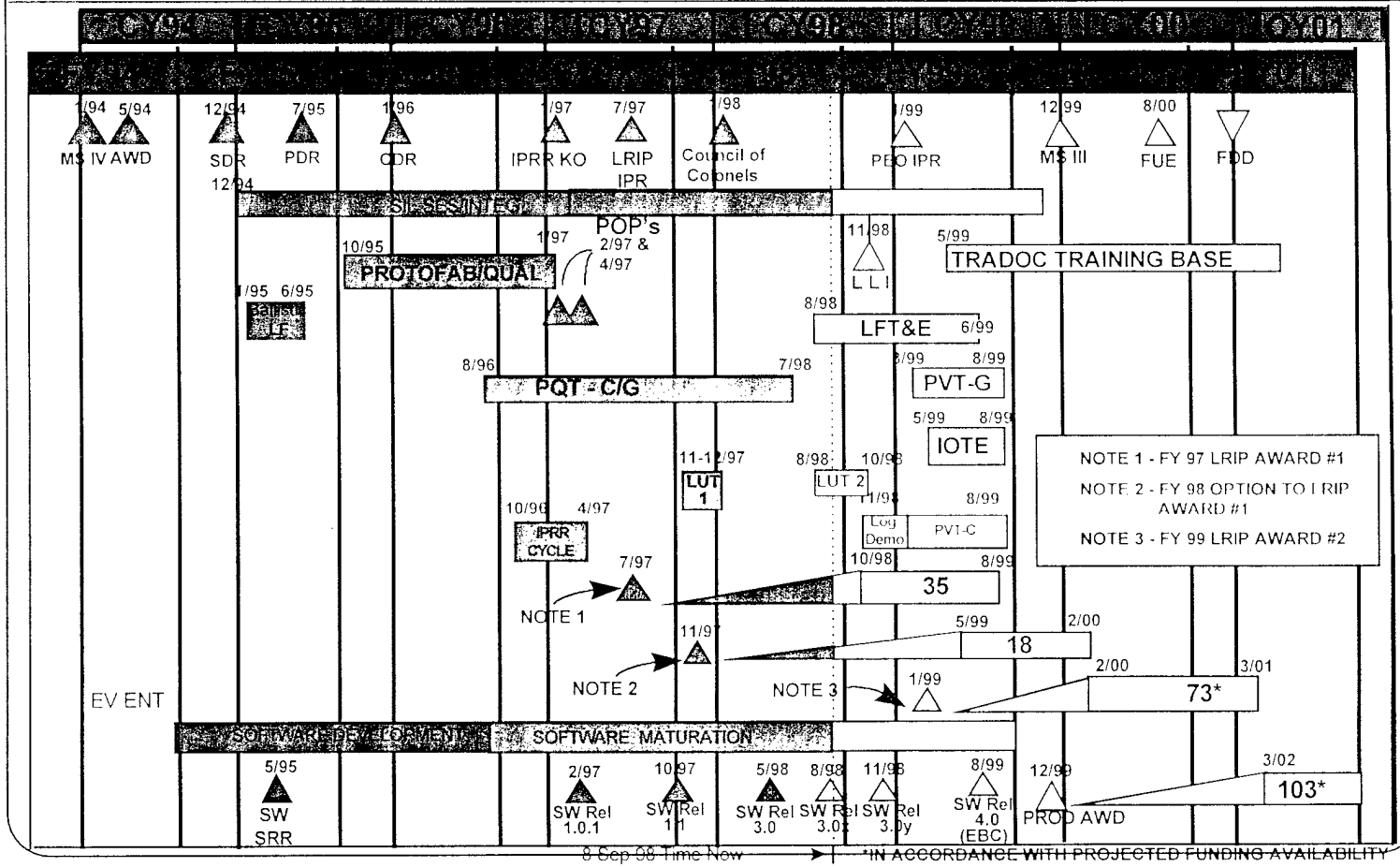
Bradley Fighting Vehicle Program Challenges

- *Bradley A3 Program Schedule and EMI*
- *Multi-Year/Multi-Product Contract*
- *Reducing Operations & Sustainment Costs*
- *Test, Measurement and Diagnostic Equipment*
-



GCSS

Bradley A3 EMD Schedule



A3EMD

GCSS

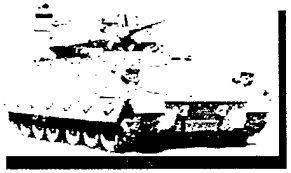
Challenge: Managing Electro-Magnetic Interference within Bradley Vehicles

- As vehicles add digital components, complex electronics and radios emit more signal interference in the turret
  - Increased interference in FLIR sights and static in intercom systems
- Status: Root Causes identified with Near Term Fixes
  - Improved Combat Vehicle Crew Helmet reduces interference
  - Improved Antenna base Grounding reduces EMI within turret
  - Studying FLIR impacts to identify EMI entries and shielding options

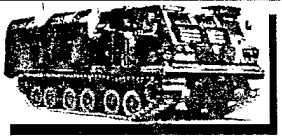
Army issue: as systems add even more complex new electronics, need a higher level of system integration to minimize EMI interference

GCSS

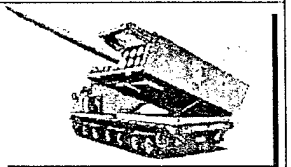
Challenge: Award Affordable BFV Multi-Year/Multi-Product Contract



A3



C2V



MLRS

The Challenge:

- Award Affordable Multi-Year Contract Within FY00-03 POM Dollars
- Award an Omnibus Contract for all UDLP Systems to Facilitate Single Process Initiatives Across all Product Lines

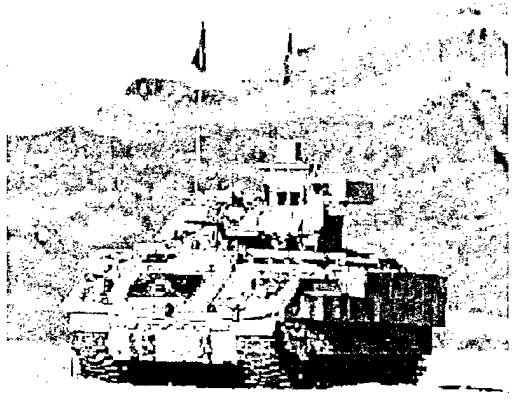
- MY/MP Contract Award Targeted for Dec 99
  - -Alpha Contracting
  - -Acquisition Streamlining
  - -Performance Based Contracting
  - -Partnering With Industry Including Subcontracting

Identified Savings Already Removed From Core Programs

Top 10 BFVS O&S Cost Drivers

Rank	NSN	Part Number	Item Name	Approximate Unit Price	Cost / Mile
1	1240-01-216-6331	12293339-1	Integrated Sight Unit (ISU) T2SS	$136,949.00	$4.61
2	2520-01-338-2703	57K0709	TEC Transmission	$174,250.00	$3.69
3	2530-01-288-2719	12359466-1	Big Foot Track Shoe	$ 135.00	$3.36
4	6110-01-176-8802	12328964	Turret Distribution Box (TDB)	$ 19,819.00	$1.30
5	1240-01-339-6326	13294692	TOW Visual Module Assembly (TVM)	$ 22,671.00	$1.25
6	1005-01-105-5191	12524100	25mm Gun Feeders	$ 25,155.00	$1.10
7	6110-01-201-7880	12328513	Vehicle Distribution Box (VDB)	$ 7,568.00	$1.03
8	2815-01-290-1290	57K0394	Engine	$ 48,803.00	$0.92
9	2540-01-312-4730	12369308	Shock Absorber	$ 448.00	$0.47
10	1005-01-273-5946	9379400	Digital Electronic Control Assembly (DECA)	$ 33,042.00	$0.45

Note. Based on 2200 Vehicles in use, at 650 Average Miles per Year. Current AMDF Prices



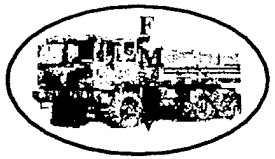
LEADING THE TACTICAL FLEET

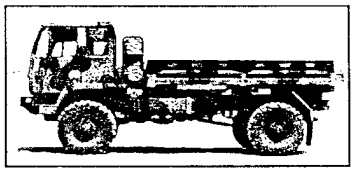
COL KENNETH R. DOBECK
PM, Medium Tactical Vehicles

PEO GCSS

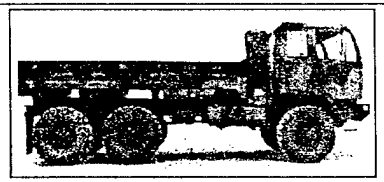
PM – MEDIUM TACTICAL VEHICLES

Family of Medium Tactical Vehicles Model Variants

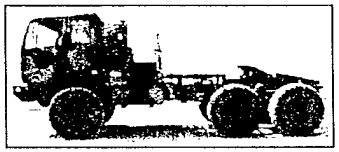




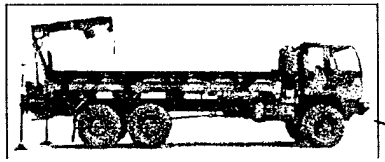
LMTV CARGO (2)



MTV CARGO (3)



MTV TRACTOR

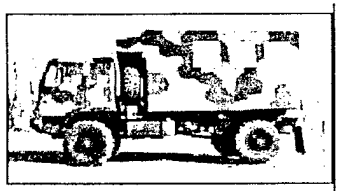


MTV LWB CARGO W/MHE

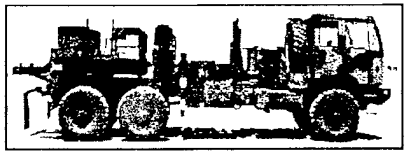
BASE CHASSIS

MTV DUMP (2)

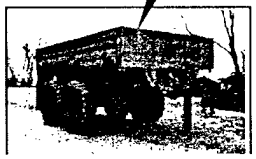
MTV EXPANSIBLE VAN



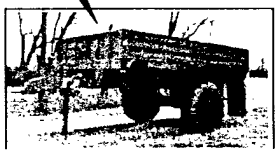
LMTV VAN



MTV WRECKER



MTV TRAILER

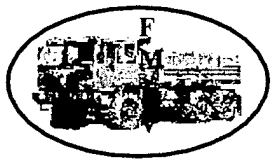


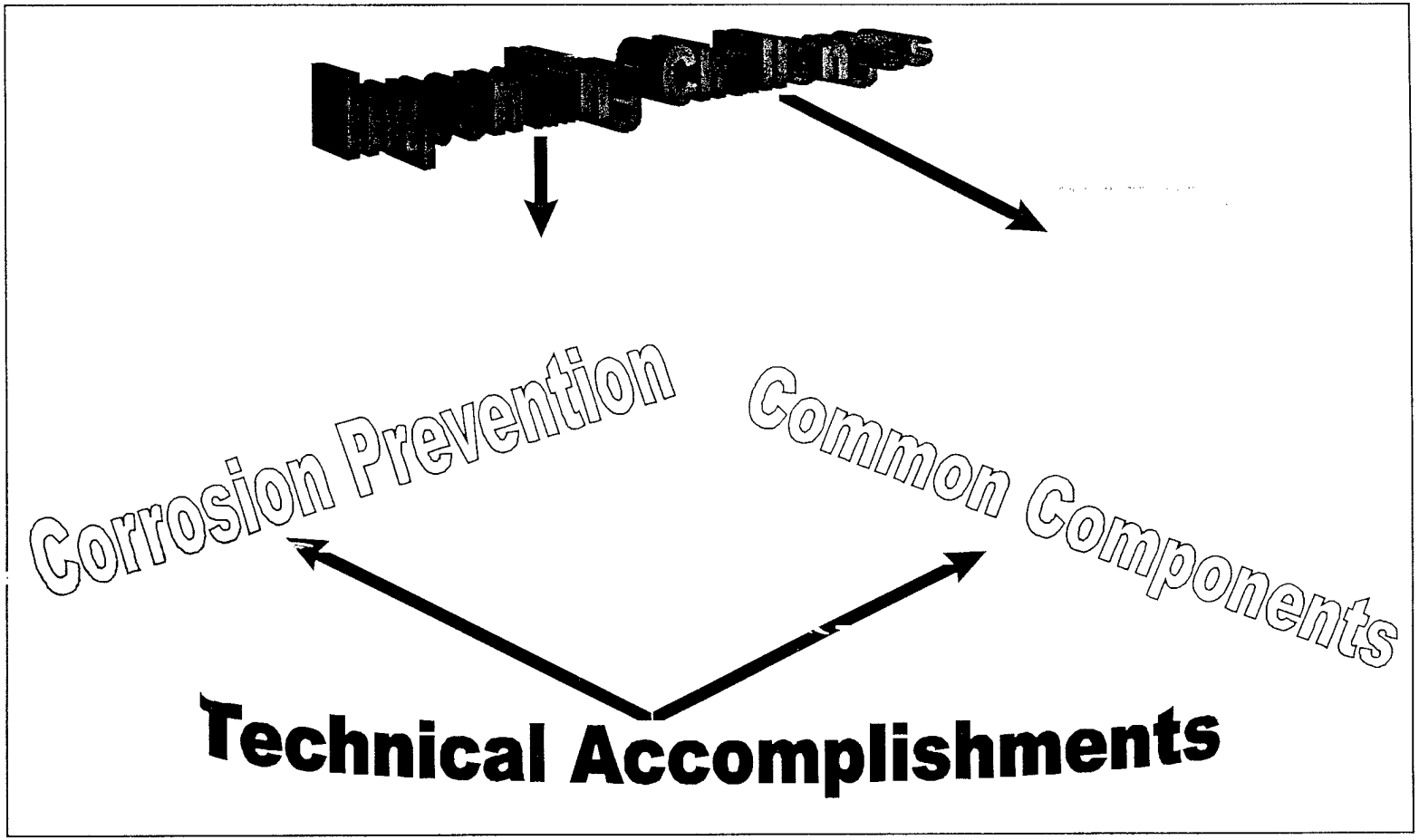
LMTV TRAILER

MTV TANKER

PM LMTV

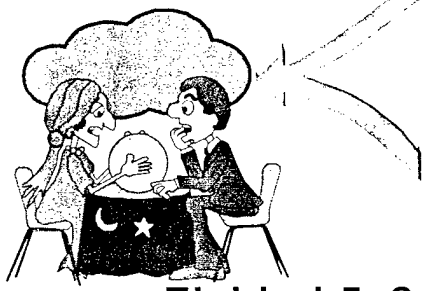
SEP 98




Corrosion Prevention
Common Components
Technical Accomplishments

PM – MEDIUM TACTICAL VEHICLES

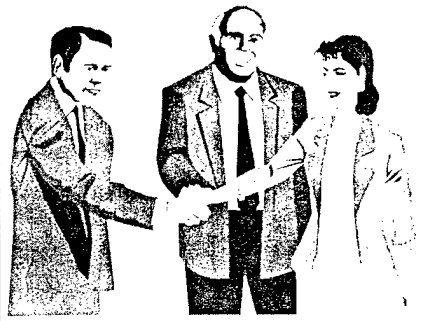
Common Components



World-wide AAO of 85,000 2-1/2 Ton & 5 Tons
Shortly will add 2 more 5 Ton variants
& trailers at both sizes

Fielded 5 2-1/2 Ton & 15 5 Ton variants.
Cross country mobility & RAM superior to commercial 2-1/2 Ton or higher capacity vehicles.
About 85% parts commonality across the entire fleet.

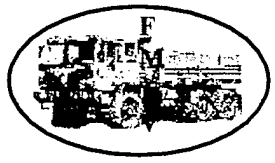
Major components from recognized world-class suppliers ...



CTIS	⟷	Eaton
Tires	⟷	Michelin & Goodyear
Engine	⟷	Caterpillar
Transmission	⟷	Allison
Axles/driveshafts	⟷	Meritor (Rockwell)

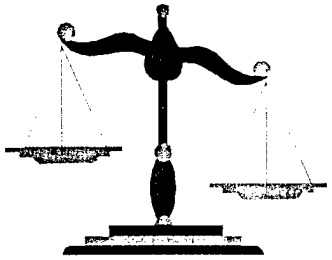
PM – MEDIUM TACTICAL VEHICLES

Corrosion Prevention Initiatives



- ☑ Over 30 component prevention design upgrades
  - Full galvanized cab
  - Cab bottom protection
  - Stainless steel exhaust system
  - Coated oil pan
  - Coated transmission oil cooler
  - Brass radiator tanks w/ coated core fins & bottom protection
  - Stainless steel charge air cooler tubes
  - Aluminum surge tank
- ☑ Upgrades enhance life by an additional 10-15 years
- ☑ Further upgrades planned as technology makes them cost effective to field
- ☑ Carwell Rust Preventative:

With Carwell: $400 / vehicle to protect against rust

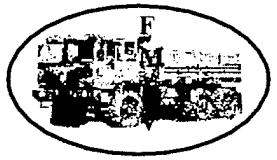


Without Carwell: $19k / vehicle to repair rusty eqmt

(Use for highly corrosive environments)

PM – MEDIUM TACTICAL VEHICLES

Accelerated Corrosion Test



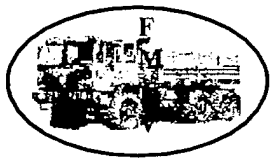
- ☑ Test facility built at Aberdeen Test Center, MD

1st of it's kind in Department of Defense!

- ☑ Test design assisted by General Motors & Ocean City Research Corporation
- ☑ Non-Destructive Test evaluations: at both "10 year" & "15 year" points
- ☑ Destructive evaluation at end of test, representing "22 years" of corrosion
- ☑ Future enhancements based on end of test evaluation

PM – MEDIUM TACTICAL VEHICLES

Interactive Electronic Technical Manuals



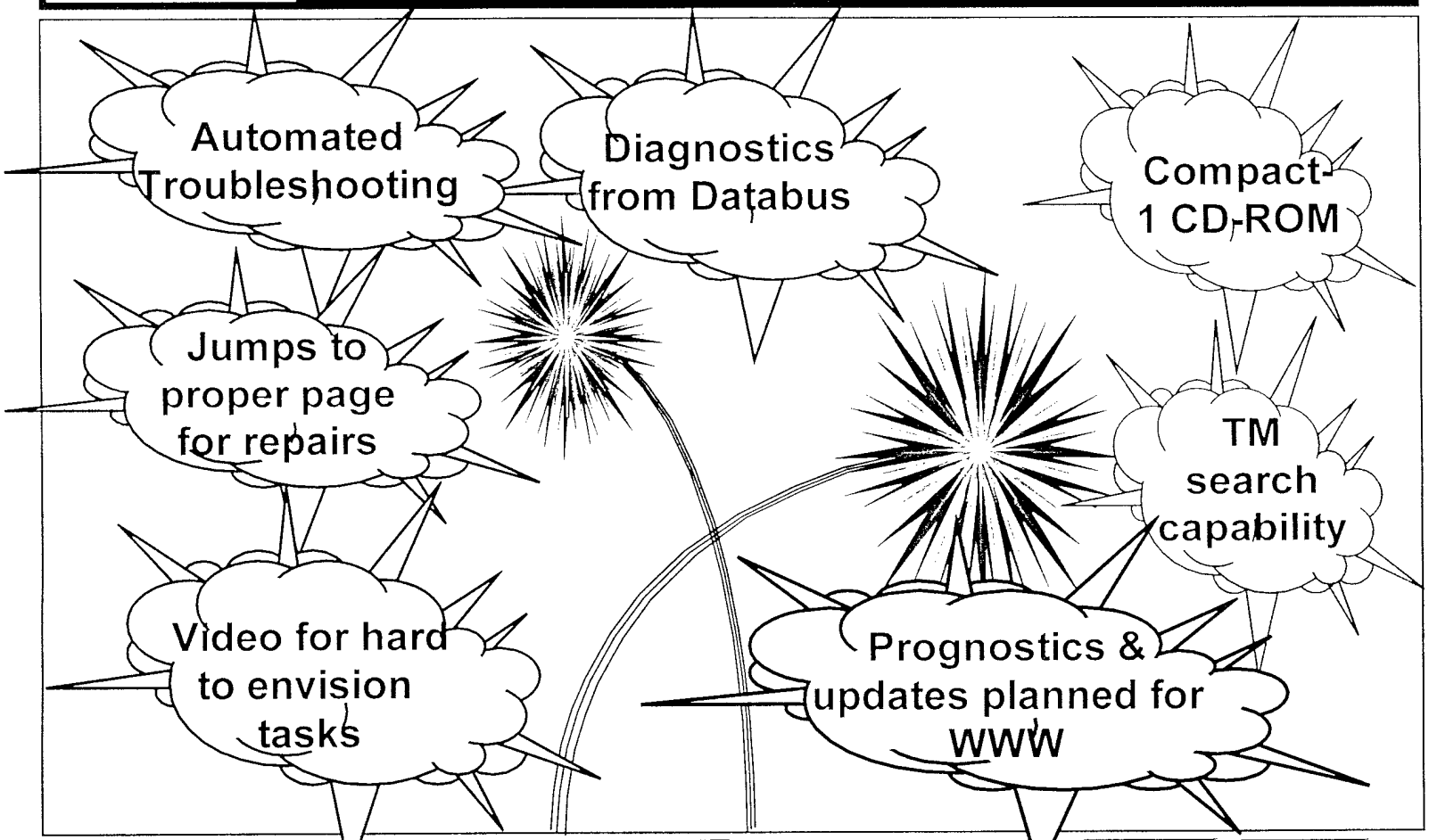
IETMS

- Sport
- EMS2
- Litton
- Beta Test Site

PEO GCSS

PM – MEDIUM TACTICAL VEHICLES

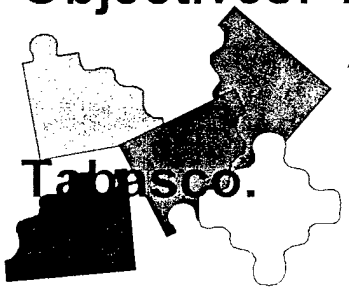
IETM Benefits



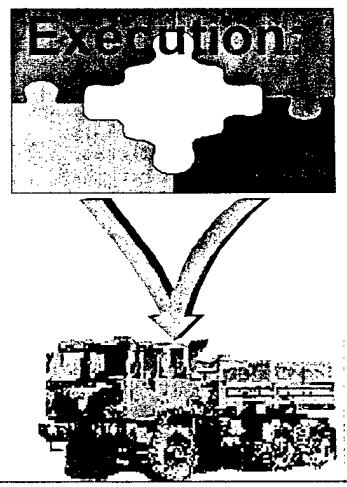
PM – MEDIUM TACTICAL VEHICLES

Fleet Management Challenges

- Objectives: Achieve a high degree of readiness.
  Assist field units in expediting parts.
  Stir creative juices, but hold the Tabasco.



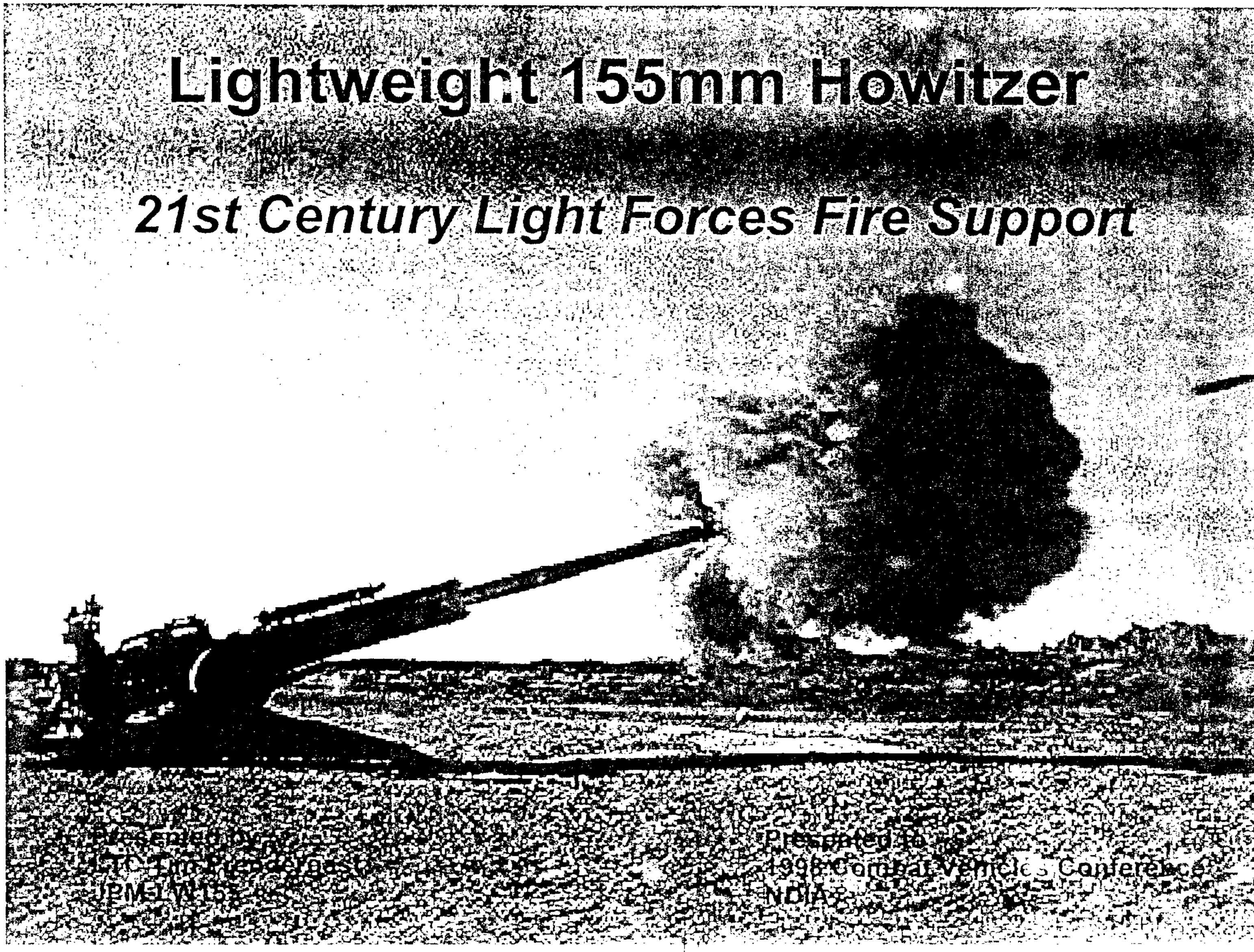
- Make Life Cycle Project Management a reality, not a buzzword.
  Currently making periodic visits to field sites, discuss & resolve problems.
  Tracking & expediting repair of NMCs.
  Permanent FMTs at major fielding sites.
  Corporate contract initiated to cut parts costs & time for delivery.
  For Rebuy contract, will be providing a PM warranty including parts



PM – MEDIUM TACTICAL VEHICLES

Summary

- ☑ PM-MTV is committed to continuous product improvement and acquisition reform as witnessed by accomplishments and taking on challenges.
- ☑ FMTV is a tactical "force multiplier" for Force XXI and the Army After Next and will provide same, well into the 21st Century.
- ☑ Effective project management of Life Cycle Cost and field logistics impacts are critical to the FMTV program in this continuing age of Cost As an Independent Variable.

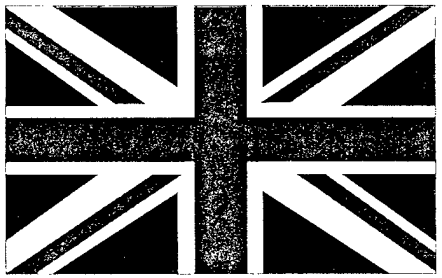

Lightweight 155mm Howitzer
21st Century Light Forces Fire Support
Presented by:
Presented to:
1998 Combat Vehicles Conference
NDIA

Jointness

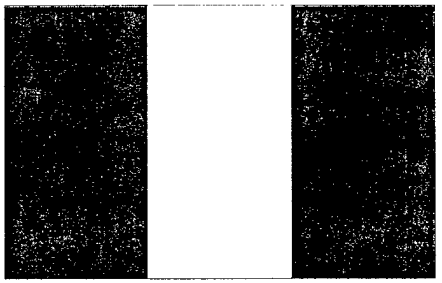
The Marines and Army Have a Fully-Coordinated Effort in Place for Joint Development of LW155

- Assistant Secretary of the Navy (Research, Development and Acquisition) is the Milestone Decision Authority (MDA)
- Commander, Marine Corps Sys Command Directs Program
- PEO-GCSS (Army Executive Agent) Executes Program
- Program Office is JOINT
  - Marine PM Manages All LW155 Programs
  - Howitzer Development - USMC Funds & Directs
  - P3I DFCS Development - USA Funds & Directs
- JOINT Documents:
  - MNS, JORD, COEA, ILSP, APBA, and TEMP

International Involvement



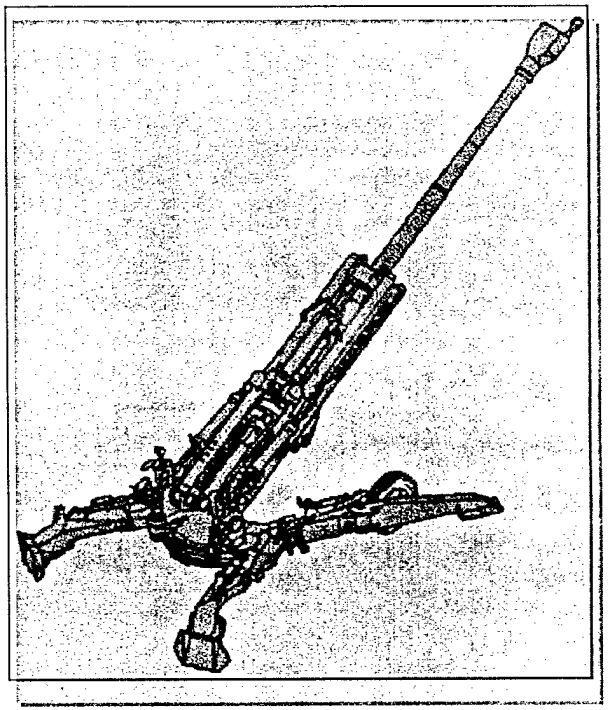
- Bilateral EMD MOU - Sept 98
- Funding to US - Oct 98
- Supplementary Testing Planned
- Integrate UK into the Team - Engineer Already in Place
- UK LIMAWS Study - LW155 the System of Choice



- Trilateral EMD MOU Negotiations Underway
- Funding to US Planned
- Major Support in Auto-Rammer Development
- Integrate Italy into the Team

LW155 Joint Operational Requirements Document

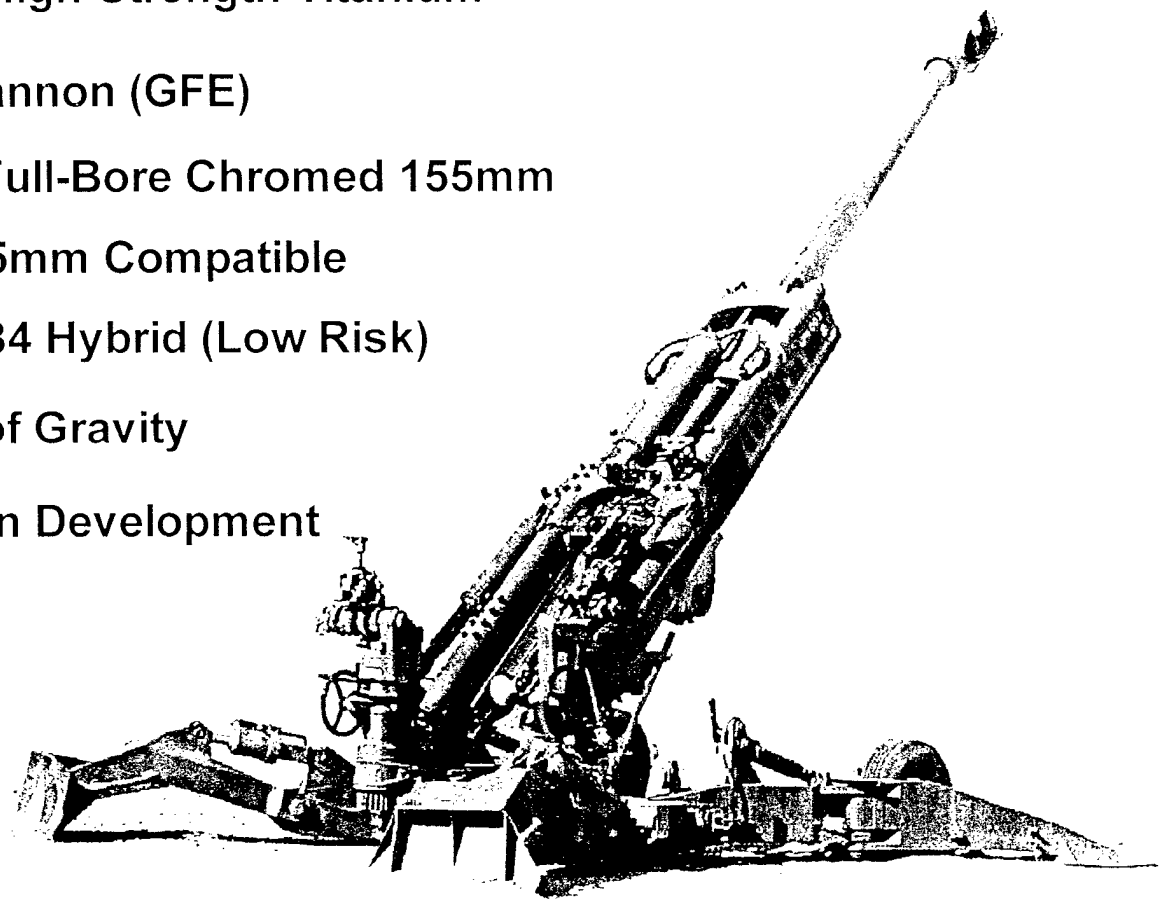
- 9000 Lbs or Less - Deployable and Mobile
- Emplace in 2-3 Min, Displace in 1-2 Min
- External Lift by MV-22, CH53D/E, CH47
- All USAF (2 per C130, LW155 & Truck in C141)
- Rate of Fire 5-8 RPM, Sustained 2 RPM
- Max Range 30-40km with Rocket Assist
- Bold Shift in 2-3 Min
- Semi-Auto Breech & Primer Feed Mechanism
- 800 to 900 Rds Between Systems Abort
- P3I: Digital Fire Control System (DFCS)
  - » Digital Indirect Fire Control
  - » Inertial Navigation with GPS Backup
  - » 1st Round Hit Direct Fire Sight
  - » Powered Rammer
  - » Powered Elevation & Deflection Drives
  - » P3I DFCS Weight: 500 Lbs Max



(Signed 29 SEP 95)

LW155 Design

- Lightweight High-Strength Titanium
- Watervliet Cannon (GFE)
  - » First US Full-Bore Chromed 155mm
  - » NATO 155mm Compatible
  - » M199/M284 Hybrid (Low Risk)
- Low Center of Gravity
- Eight Years in Development



Fully Coordinated

JOINT PROGRAM MANAGER LIGHTWEIGHT 155MM

FY 94 95 96 97 98 99 00 01 02 03 . . .

The Howitzer Program

JORD Shoot-Off EMD Production Fielding

MS I MS II/III LL IPR MS II IOC

3rd Generation

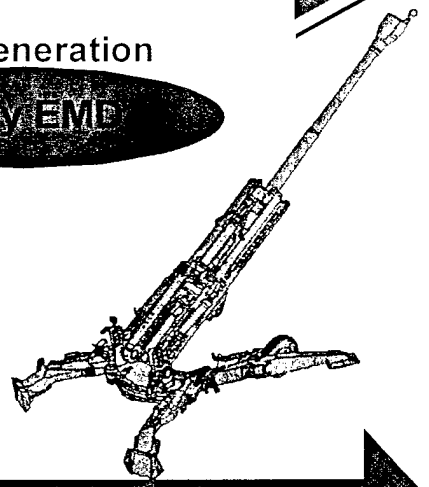
Army EMD

2nd Generation

RFPI AH

1st Generation

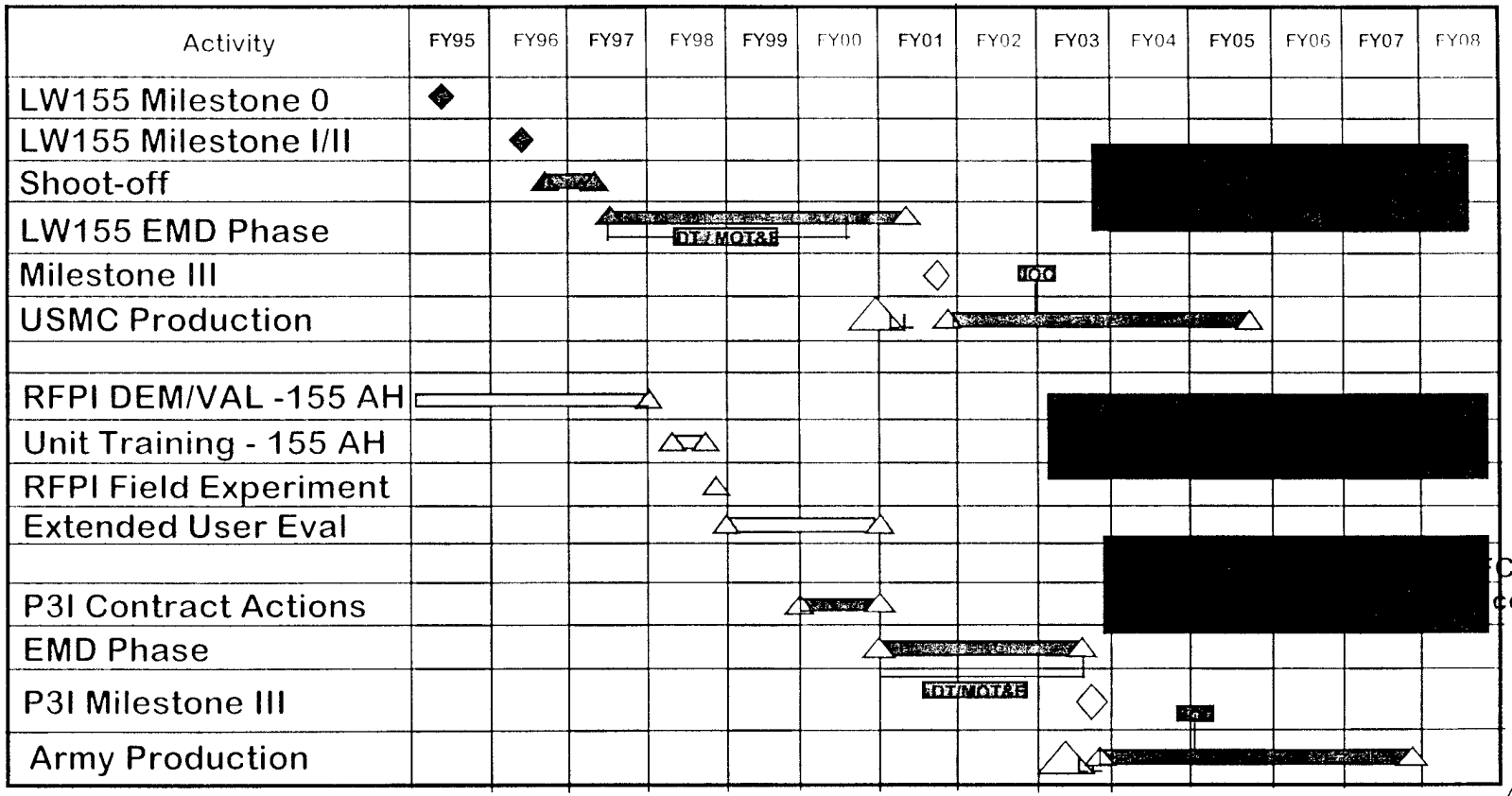
Warrior Focus Warrior



The P3I DFCS Program

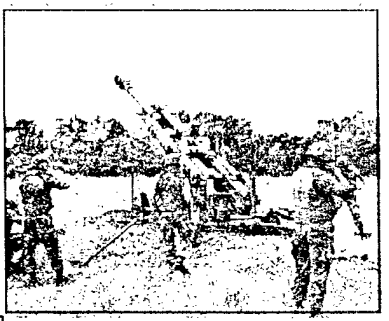
Build/Experiment/Learn Build/Test/Field

Fully Coordinated Marine Army Development

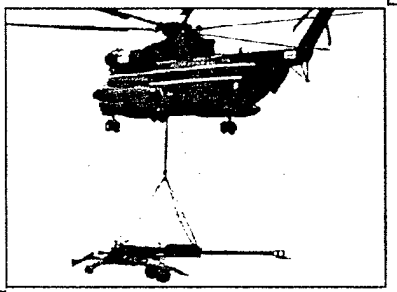


Engineering and Manufacturing Development

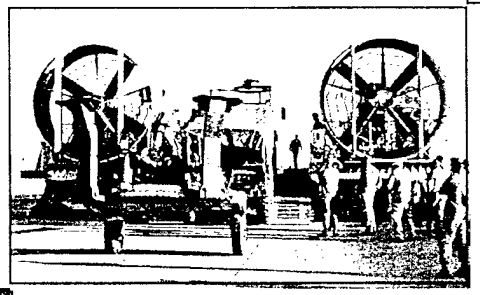
- Applied Shoot-Off Lessons Learned

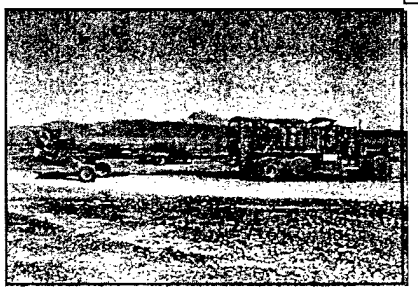


- Comprehensive Evaluation of 8 EMD Prototypes



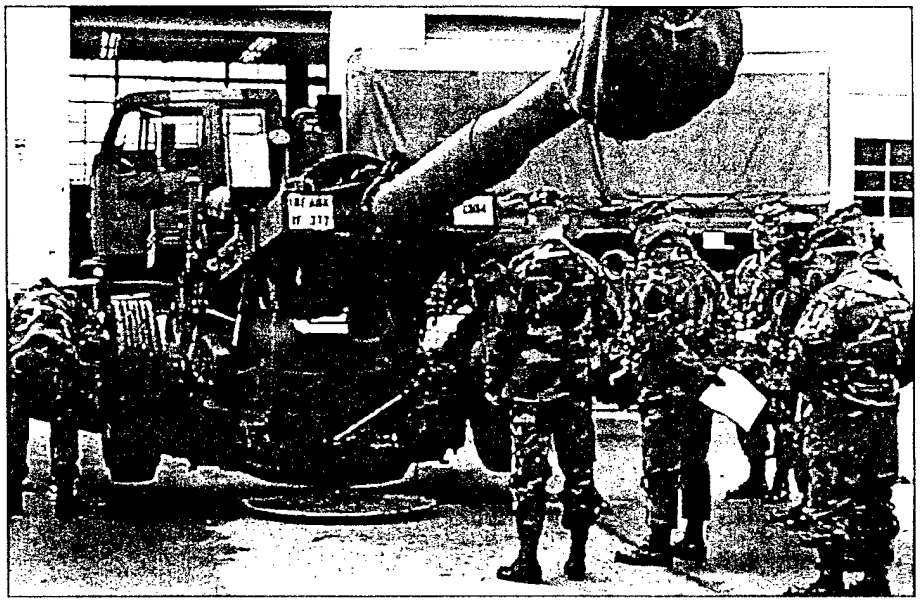
- Arctic, Jungle and Desert





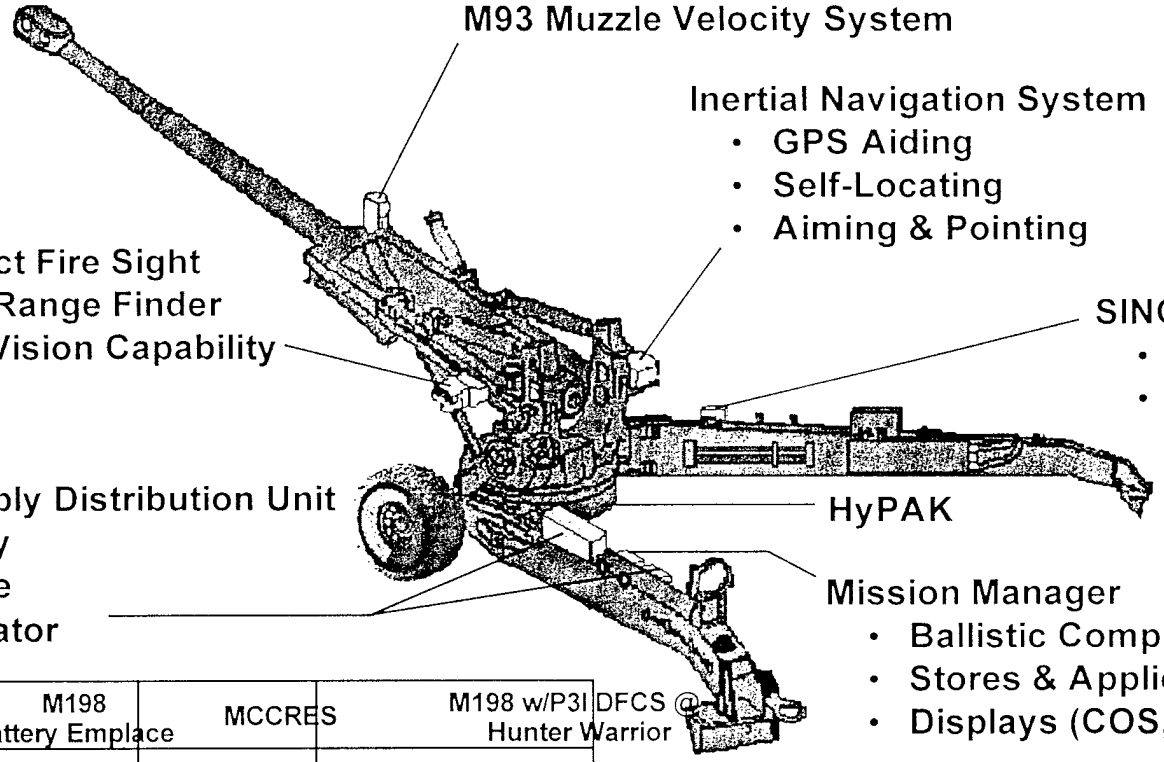
- Joint Marine & Army Live Fire Tests
- Detailed Logistics & Fielding Plans
- Production Preparation & Decision

Rapid Forces Projection Initiative



March 98 - Soldiers of the XVIII Airborne Corps Artillery
Training on RFPI Automated Howitzer

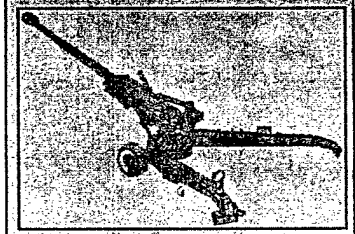
Digital Fire Control Technology Demonstrator



M198 Battery Emplace	MCCRES	M198 w/P3I DFCS @ Hunter Warrior
Day	12 Min	3.5 Min
Night	20 Min	3.5 Min

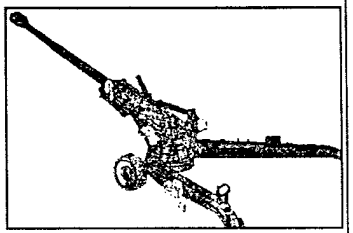
155mm Towed Artillery Digitization

GENERATION 1



Army & USMC AWEs

GENERATION 2



Army RFPI (155 AH)

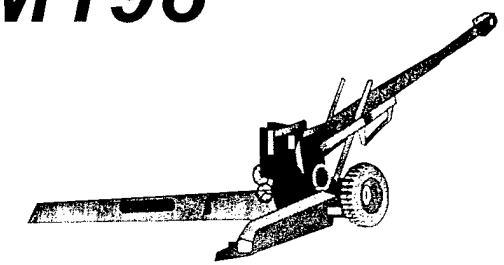
Technical/Operational

Lessons Learned

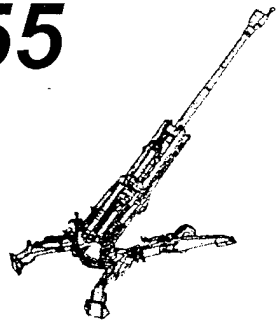
EMD / Production

GENERATION 3

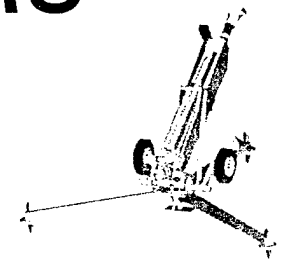
M198



LW155



ATLAS



Summary

- Fast Moving Joint Program
- Valid Joint Requirements
- Strong Support
- International Involvement
- On Track for 2002 USMC IOC

OPM SADARM Briefing

23 September 1998

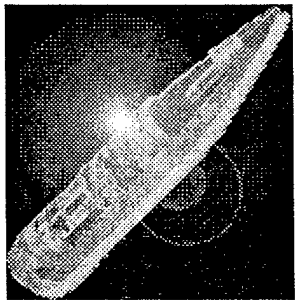
Presented To:

1998 COMBAT VEHICLES CONFERENCE
MOUNTED FORCE MODERIZATION PANEL

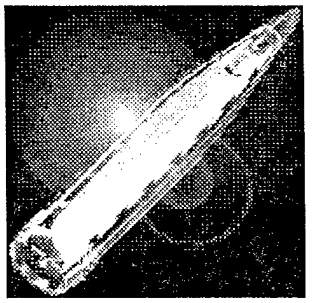
Presented By:

MR. JOSEPH GORMLEY
Business Manager, PM SADARM
(973) 724-5891

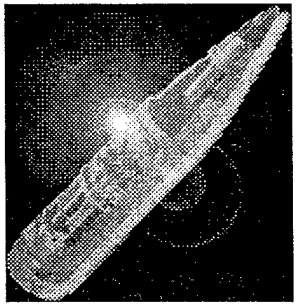
Deliver Leap - Ahead Munitions Combat Power to War Fighters



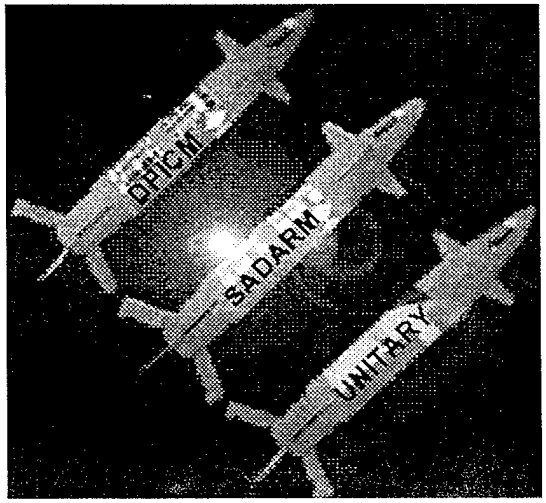
M898
SADARM



M795
High Explosive

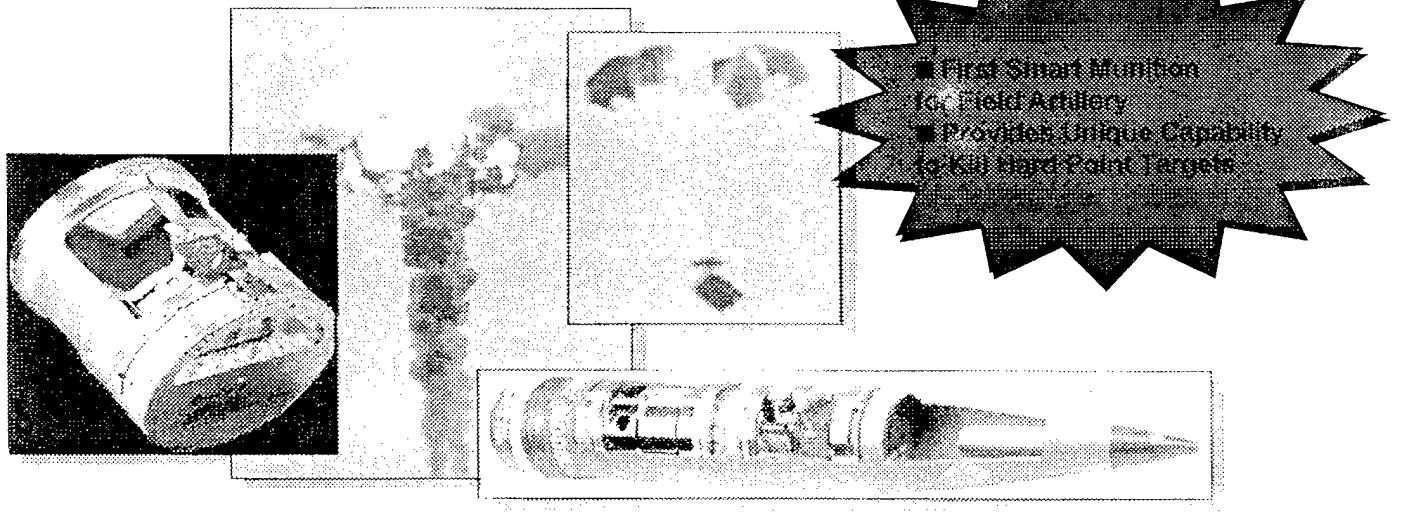


M898E1
PI SADARM



XM982
Extended Range
Artillery Projectile

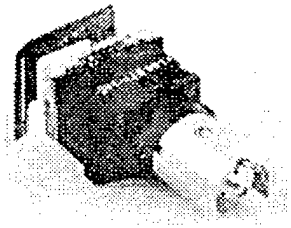
What Is SADARM?



- First Smart Munition for Field Artillery
- Provides Unique Capability to Kill Hard Point Targets

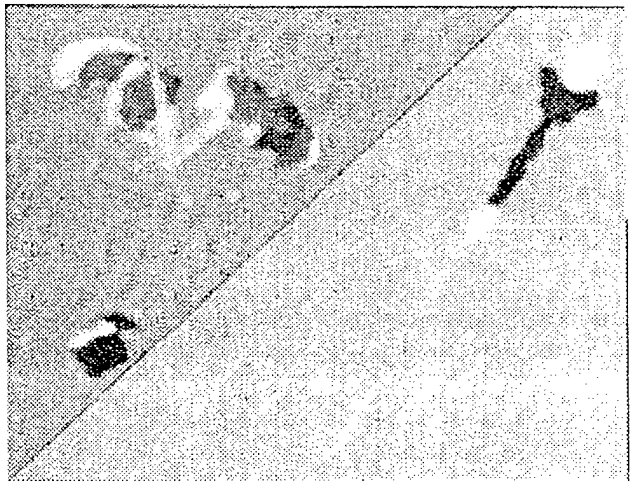
- Multi-Sensor, Fire & Forget, Top Attack
  - Counterbattery Weapon, Secondary Anti-Armor
  - Countermeasure Resistant
  - Explosively Formed Penetrator Defeats All Known Armored Targets From Top

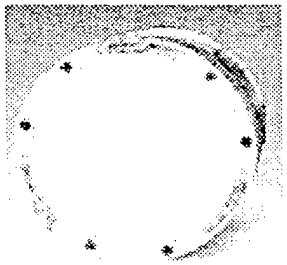
Multi-Mode Sensor Suite: Countermeasure Robustness



Passive IR

- Heat Sources
- Full Image of Target
- Preferred Aiming Sensor
- Flare/Fire Discrimination

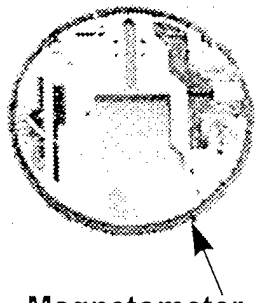




MMW

Passive
- Metallic Object Sensing
- Scene Sensing
- Tactical Target Sizing
- Aimpoint Puller Discrimination
- Combined Countermeasure Discrimination

Active
- Man-Made Object Sensing
- Tactical Target Sizing
- Alternate Aiming Sensor
- Corner Reflector Discrimination



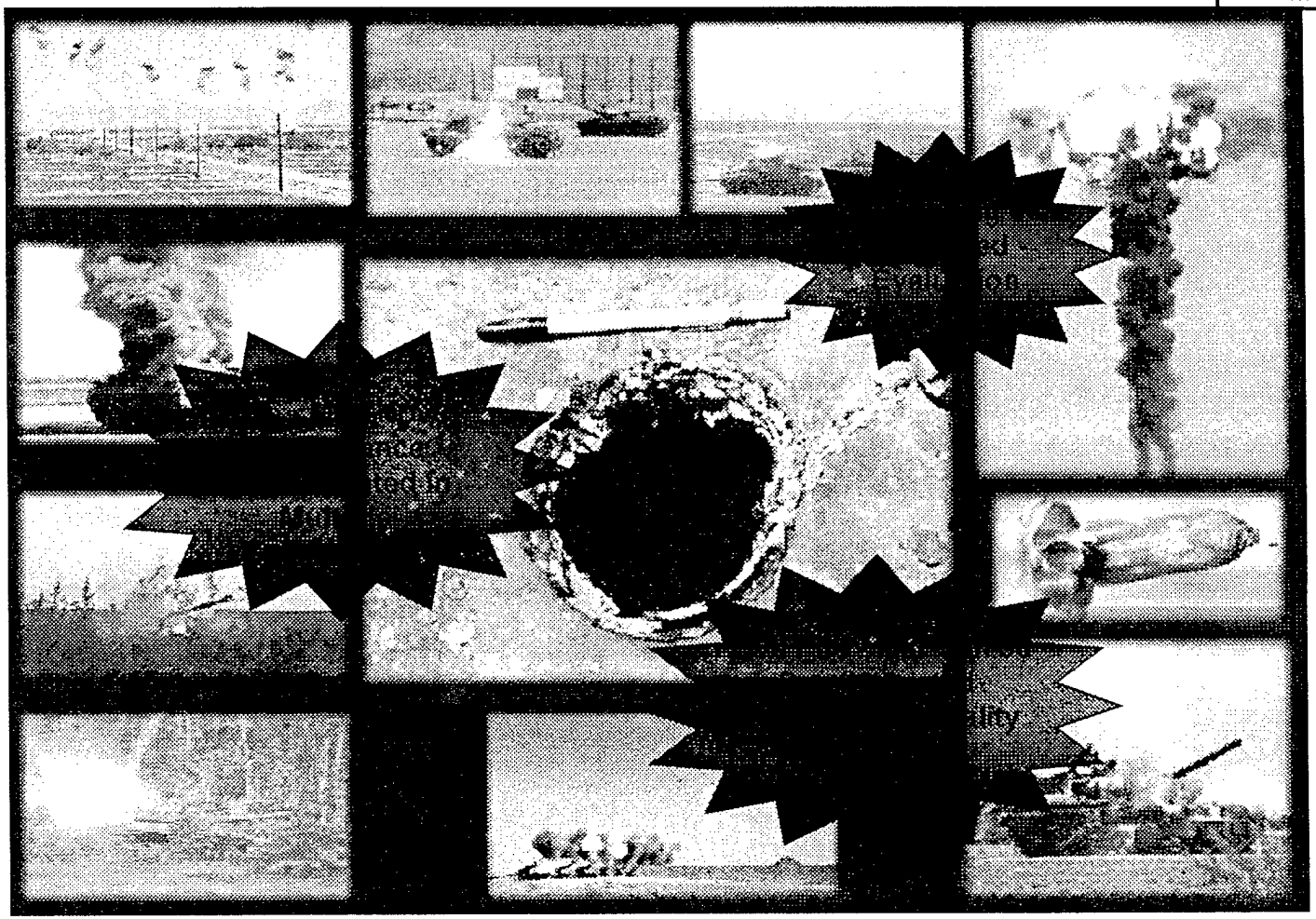
Magnetometer

- Orientation
- Spin Rate Count

Real-Time Sensor Fusion

M898

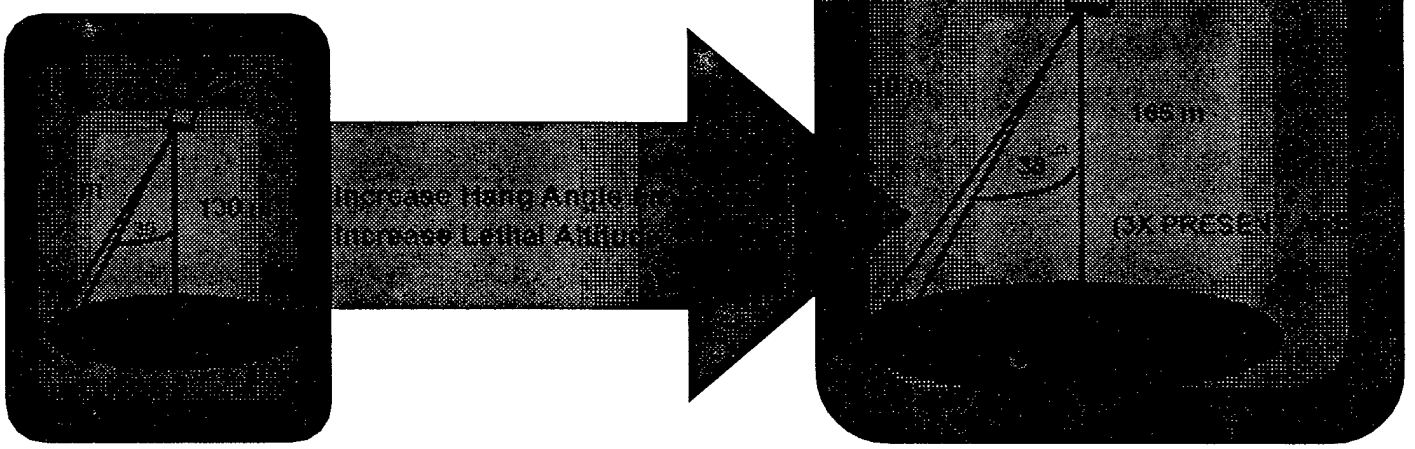
SADARM TESTING

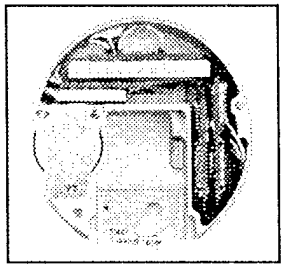


- 3X Footprint Area
- Increase Number of Submunitions that Have a Target in the Footprint From 55% to 80%
- 30 % Fewer Projectiles Required

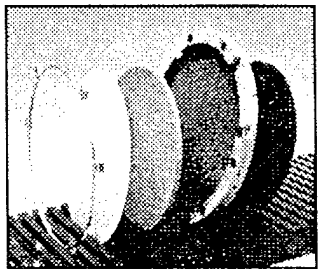
PRODUCT IMPROVEMENT

BASELINE





Electronics Module



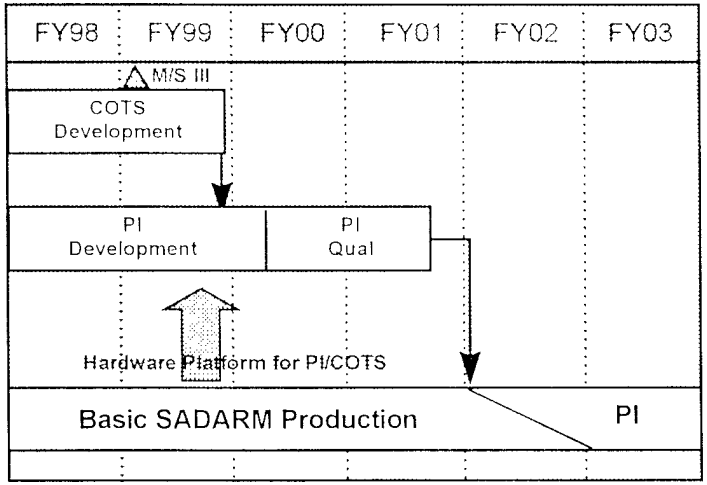
Millimeter Wave (MMW) Assembly

Objectives

- Reduce Submunition Unit Cost By 22%
- Eliminate Custom Components
- Insert Into Basic Production In FY02
- Increase Effectiveness

Key Features/Benefits

- Fewer Parts
- Commercial Packaging
- Less Complexity
- Structural Improvements
- Avoids Parts Obsolescence
- Higher Yield MMW



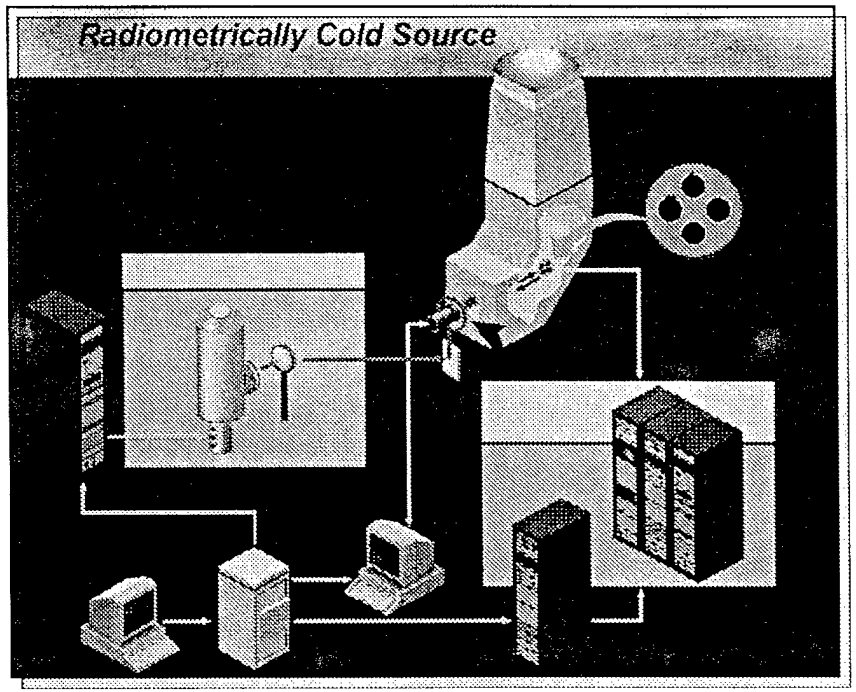
Linkage to Basic

- Parts for Qualification
- Support Personnel Working Both Programs
- Production Line Learning

SADARM Modeling and Simulation for Improvement/Evaluation

- SADARM Development Relied on Expensive & Time Consuming Captive Flight Testing for Sensor Performance Data
  - Data Collected for Multiple Sites and Seasons, Various Targets and Countermeasures
- During Development, a Hardware In The Loop (HWIL) Facility was Established at Redstone Arsenal to Aid Development and Evaluate Production Changes
- Currently Validating With Tactical Gun Firings From Initial Production Tests
  - Environment and Countermeasure Scenerios Form Standardized Test Sets
  - Test Sets Used to Evaluate Future Hardware Changes
-
-

HWIL Will be Ready to Replace Captive Flight Testing



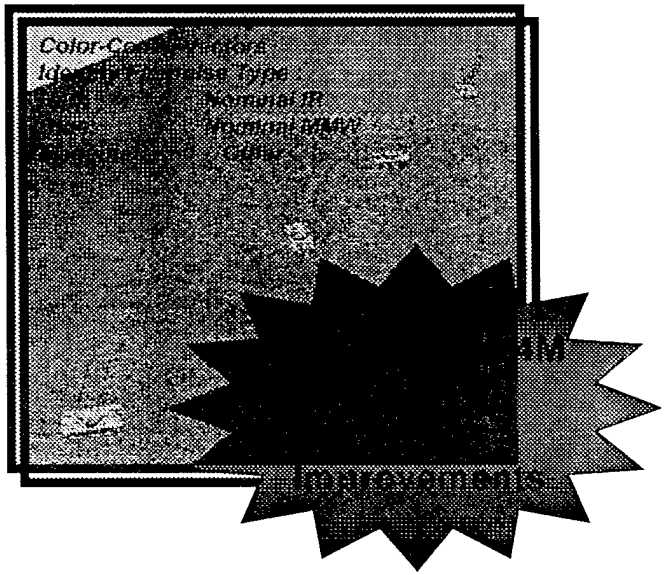
■ Interactive Aimpoint Viewer Program - Zoom in on individual targets, or view the scene as a whole, including False Fires.

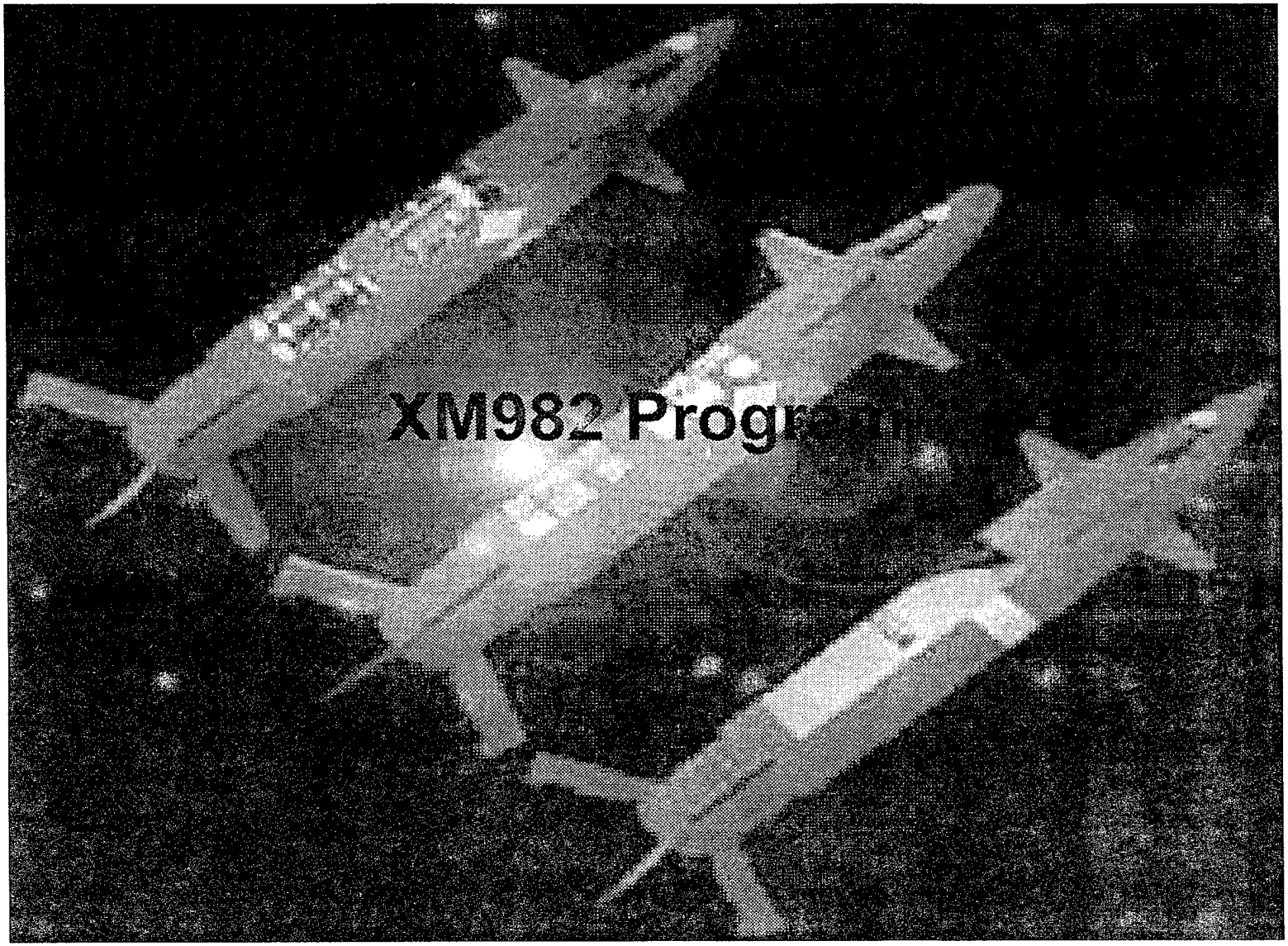
Hardware-in-the-Loop Simulation

■ A Precalculated and Preconvolved Multiband Signature is transmitted to the unit under test (UUT).

■ Submunition responds according to its internal signal processing and algorithms.

■ Performance data collected.



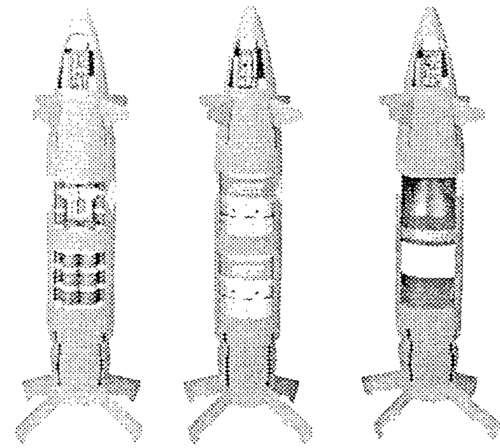

XM982 Progr

XM982 Description

- Provides the [illegible] force with improved fire support through an Extended Range, fratricide reducing, accuracy enhancing, more lethal family of 155mm projectiles in support of Force XXI operations
  - DPICM with 64 Submunitions
  - SADARM with 2 PI-SADARM Submunitions
  - Unitary with Bunker Penetrating HE Warhead

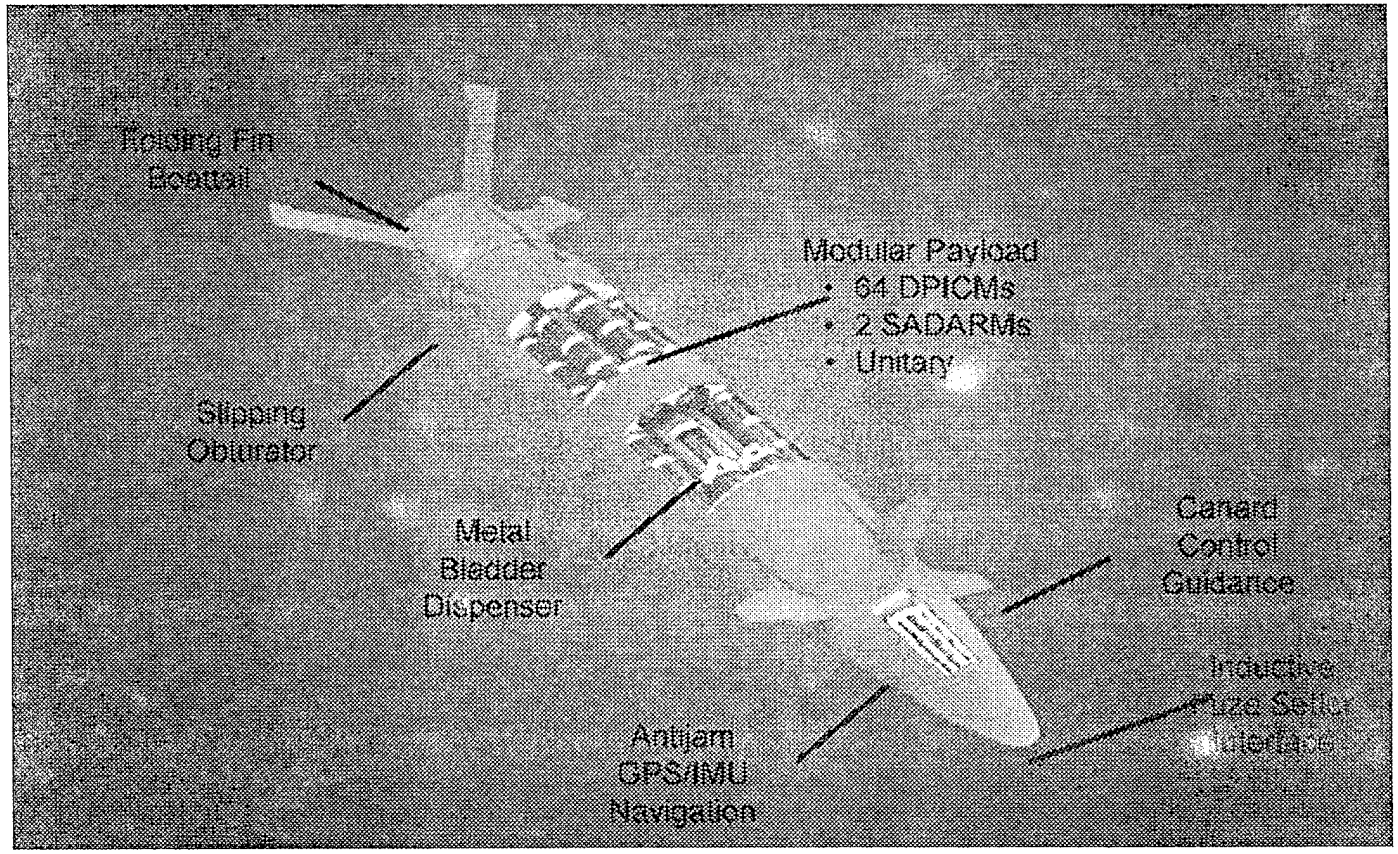
- Increased Range:
  - Paladin / M198 / JLW155: 28 to 37 Km
  - Crusader: 40 to 47 Km
- Increases Survivability Through Greater Stand-off Ranges

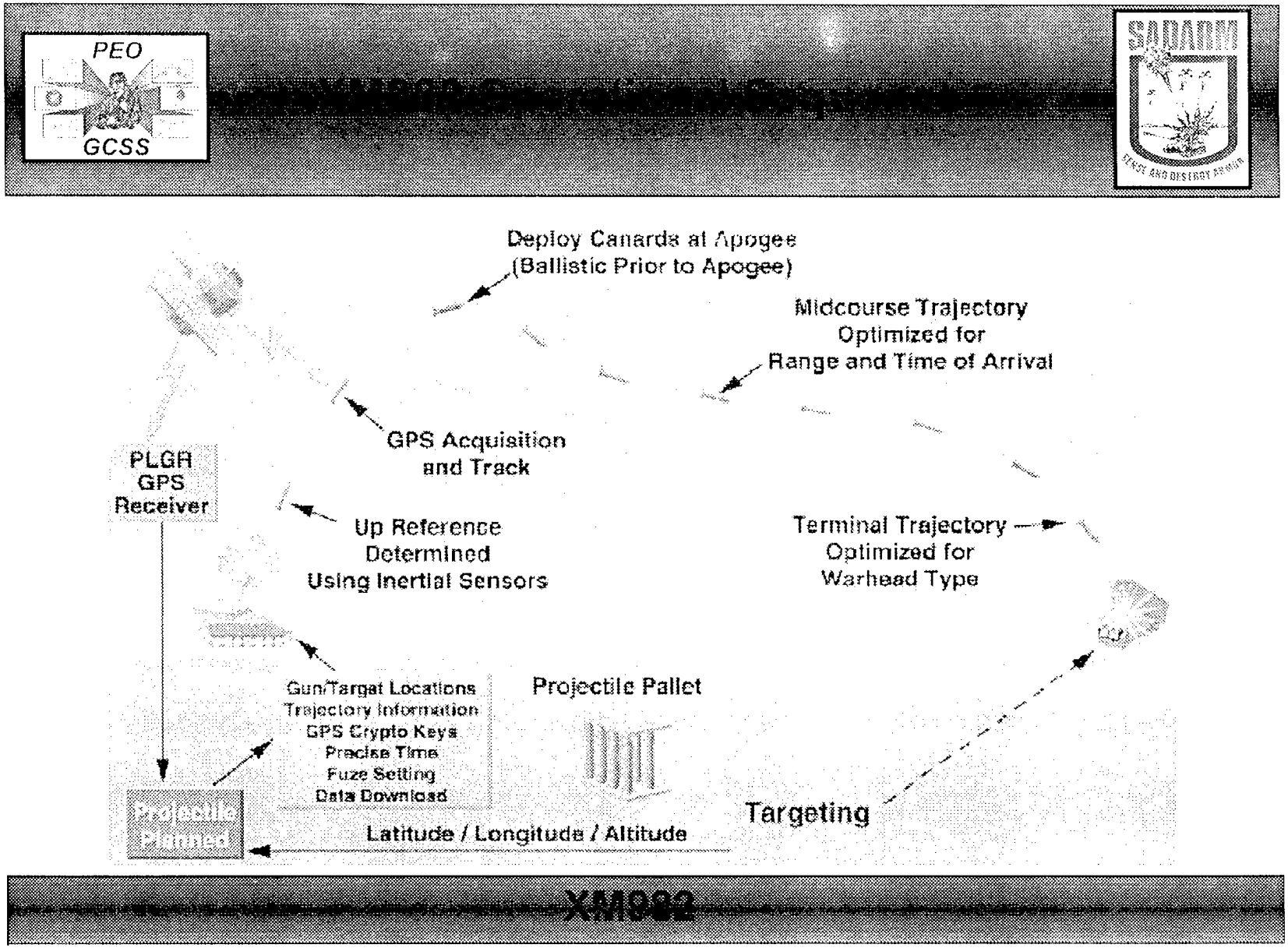
- DPICM 1Q FY04
- SADARM 1Q FY07
- Unitary 1Q FY08



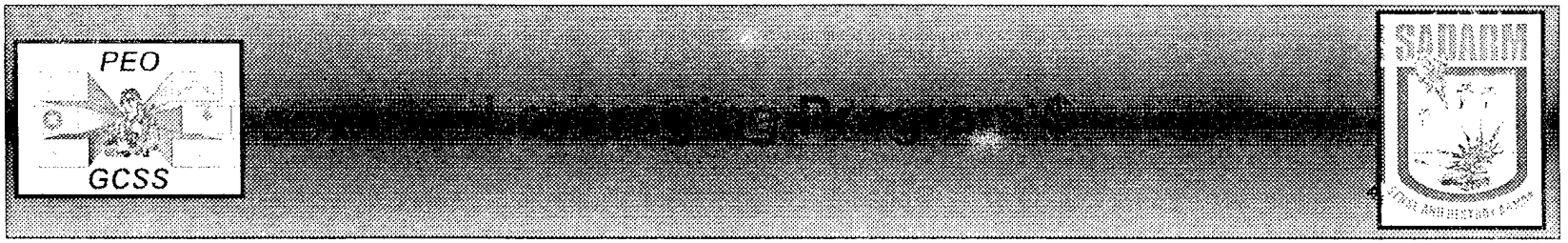
- One Meter Length [illegible]
- DPICM Submunitions with Self Destruct Feature
- On-Board Self Locating System (SLS)
  - GPS / INS Guidance
- Inductive Set Integral Fuze - PIAFS
- Fin Stabilized Glide Air Frame
- Anti-Jam Features
- Modular Projectile Configuration

XM982


Folding Fin
Boattail
Modular Payload
• 64 DPICMs
• 2 SADARMs
• Unitary
Slipping
Obturator
Metal
Bladder
Dispenser
Canard
Control
Guidance
Inductive
Fuze Setter
Interface
Antijam
GPS/IMU
Navigation


PEO
GCSS
SADARM
Deploy Canards at Apogee
(Ballistic Prior to Apogee)
Midcourse Trajectory
Optimized for
Range and Time of Arrival
GPS Acquisition
and Track
PLGR
GPS
Receiver
Up Reference
Determined
Using Inertial Sensors
Terminal Trajectory
Optimized for
Warhead Type
Gun/Target Locations
Trajectory Information
GPS Crypto Keys
Precise Time
Fuze Setting
Data Download
Projectile Pallet
Projectile
Launch
Latitude / Longitude / Altitude
Targeting
XM982

15.



U.S. Navy

ERGM	Best Buy	NGNGS
127 mm	127 mm	155 mm
Under Contract	Under Contract	Awarded

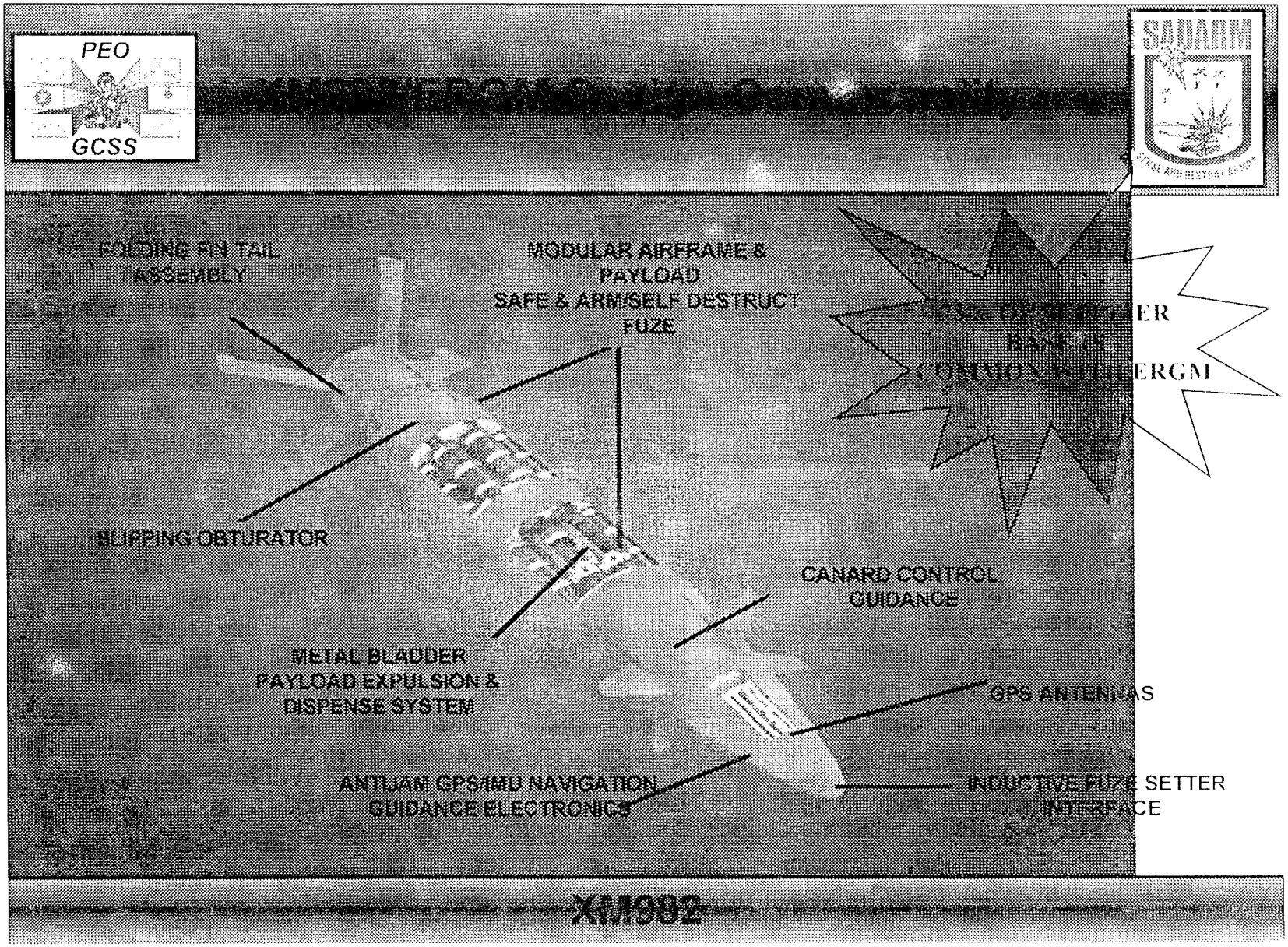
U.S. Army

XM982	XM982	XM982
DPICM	SADARM	Unitary
Under Contract	Contract Option	Contract Option

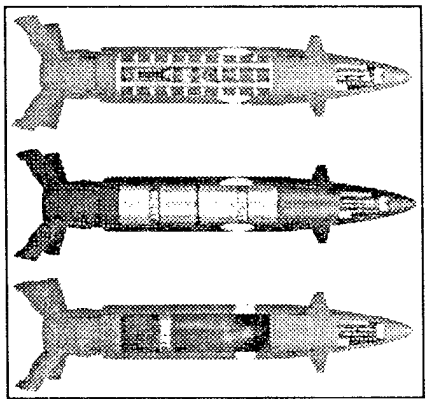
International

ERGM Derivative
127mm
Under Contract

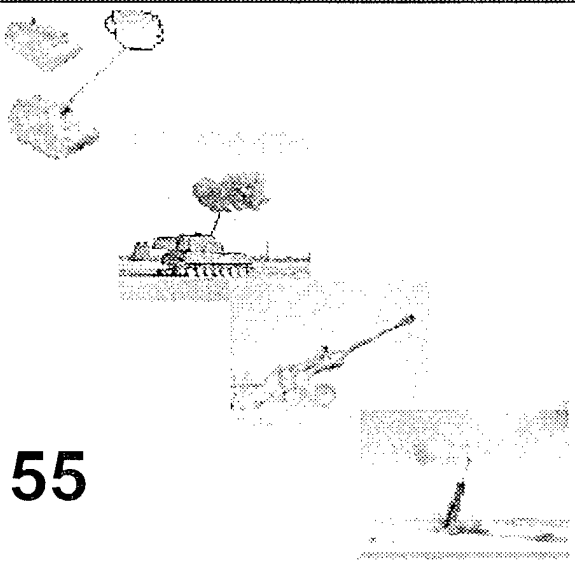
4 To 1 Return on Investment Thru Cost Sharing and Commonality!


PEO
GCSS
SADARM
FOLDING FIN TAIL ASSEMBLY
MODULAR AIRFRAME & PAYLOAD
SAFE & ARM/SELF DESTRUCT FUZE
SLIPPING OBTURATOR
METAL BLADDER PAYLOAD EXPULSION & DISPENSE SYSTEM
CANARD CONTROL GUIDANCE
GPS ANTENNAS
ANTIJAM GPS/IMU NAVIGATION GUIDANCE ELECTRONICS
INDUCTIVE FUZE SETTER INTERFACE
XM982

XM982 Horizontal Technology Integration to 155mm Field Artillery

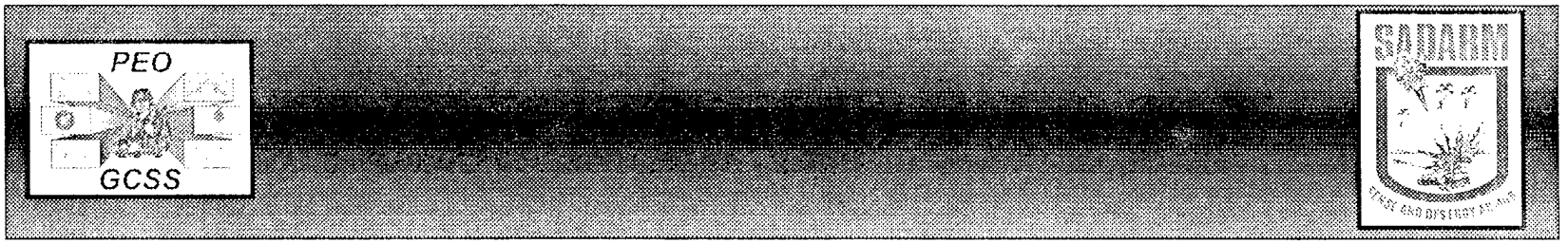


- Crusader
- Paladin
- M198
- LW155



XM982 - Platform Integration Efforts:

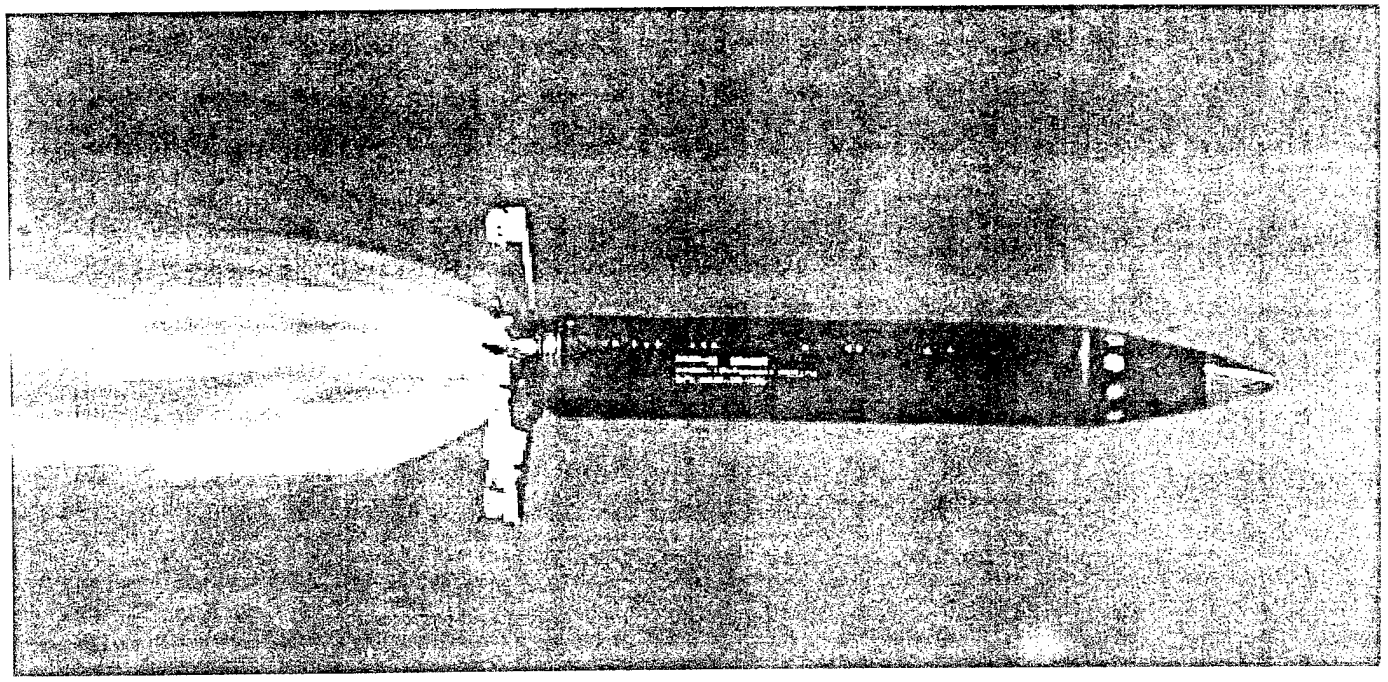
- Fire Control Software Upgrades
- Platform Electronics Integration Kits
- Portable Inductive Artillery Fuze Setter (PIAFS) Upgrades
- Pallet Packaging



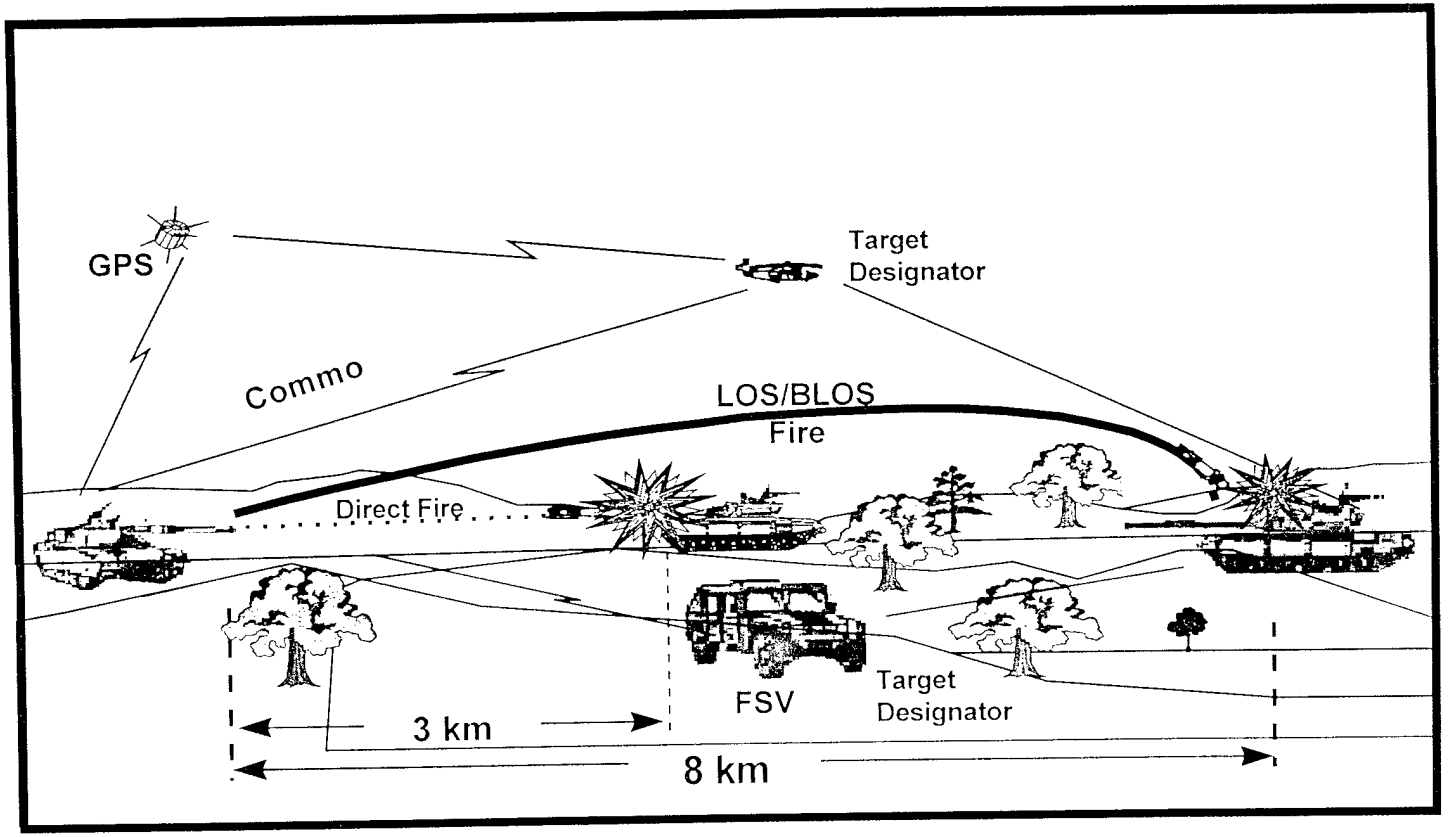
- SADARM
  - IPT, LFT&E and IOTE Completed
  - Milestone III and First Unit Equipped on Horizon
  - PI SADARM Scheduled for FY02 Production Cut-In
  - Using M&S to Reduce Costs and Accelerate Program
- XM982
  - Increases Range and Effectiveness of Cannon Artillery
  - Highly Leveraged Via Cost Sharing and Commonality with US Navy Programs

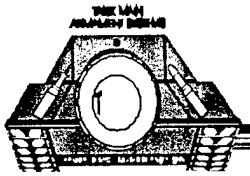
Simulation Based Acquisition (SBA) in XM1007 TERM-KE

PEO GCSS



TERM-KE Operational Concept



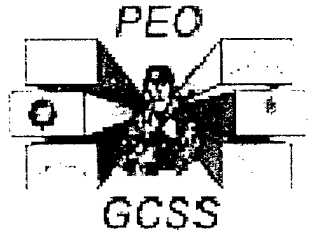


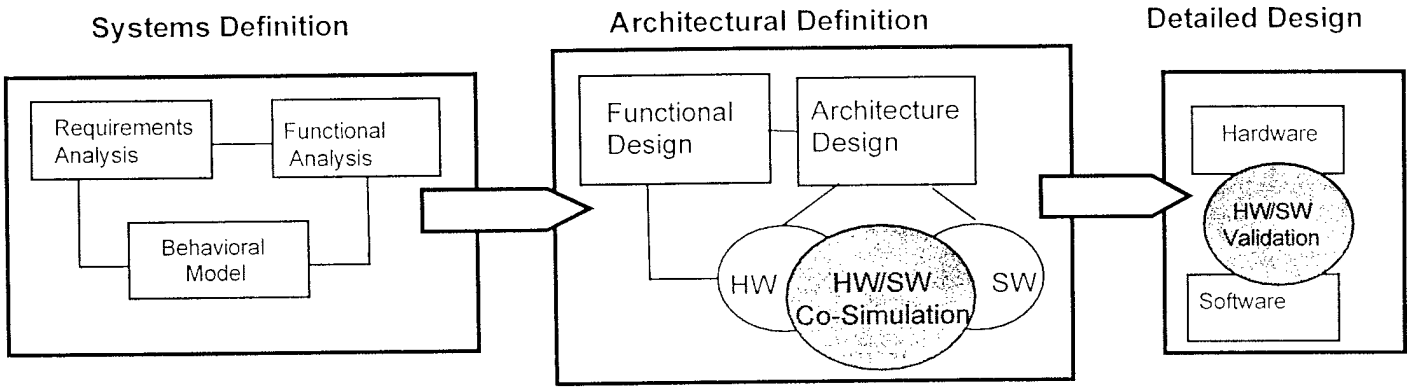
XM1007 TERM-KE's SBA Methodology

- Based on comprehensive design process developed under the DARPA Rapid Prototyping of Application Specific Signal Processor (RASSP) program.

- Methodology anticipates a 4X improvement in design cycle times, cost of design & the quality of design using linked Engineering Design Automation (EDA) tools coupled with concurrent engineering design practices.

RASSP

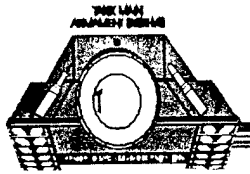




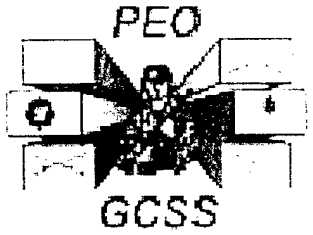
Executable Specification Using RDD-100

HW/SW Virtual Prototypes using linked EDA Tools

Validated Model Year Architecture



RDD-100

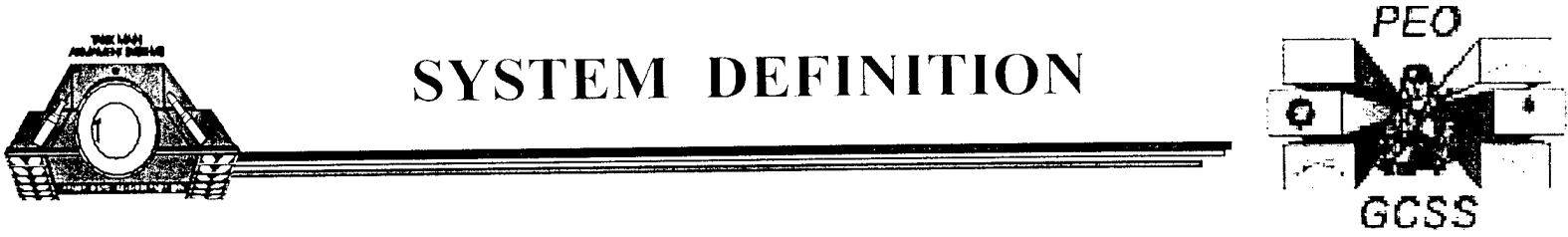


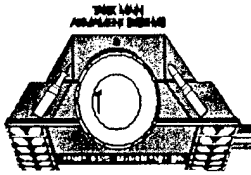
- Is used in the initial phase of the RASSP process, to flow-down requirements, **directly from the customers originating source documents.**

- Flow-down continues through to the final product specifications, needed for detailed design of the hardware & software.

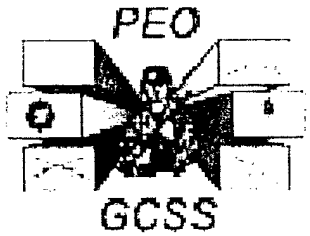
- This permits the developer to decompose & track requirements, define functionality, & model the physical system architecture, deriving the optimum system at the lowest life cycle cost.

SYSTEM DEFINITION





RASSP Modeling



- Following the break down of requirements within RDD-100, the data is automatically processed into executable, architectural simulations of the product systems, and subsystems.
- These simulations automatically mature in parallel with the system requirements, throughout the product life cycle.
- This process, called ***behavioral analysis,*** is the key capability behind the RASSP concept.
- Model Year Architecture provides the most up to date COTS components, that will perform the functions of the final Detailed Design requirements .

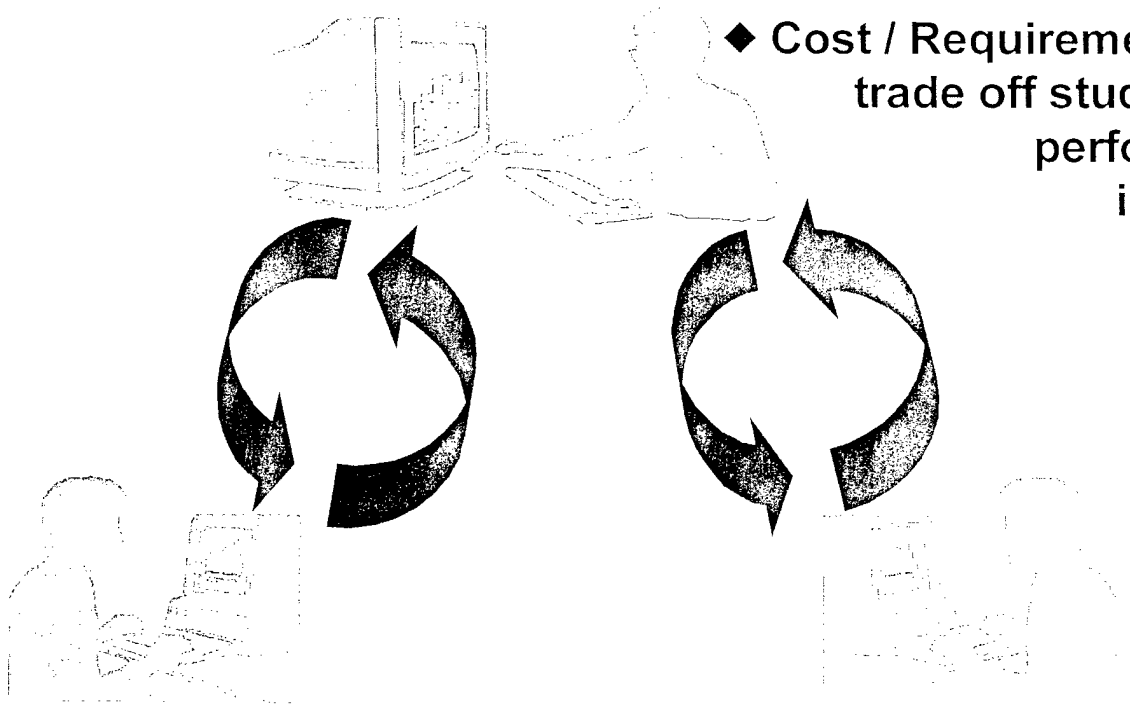
Integrated System Engineering (ISE-RASSP)

- In addition to the architectural simulations, the RDD-100 data, ports directly into a variety of other Simulation & Modeling Tools.
-
  - ➢Parametric Cost Estimating Models (PRICE), which produces a Design to Unit Cost Analysis model, & a Life Cycle Cost Analysis model.
  - ➢RAM-ILS which creates Reliability & Maintainability Analysis Models.

RASSP TOOL INTEGRATION

PEO GCSS

SYSTEMS ENGINEERING
(RDD-100)

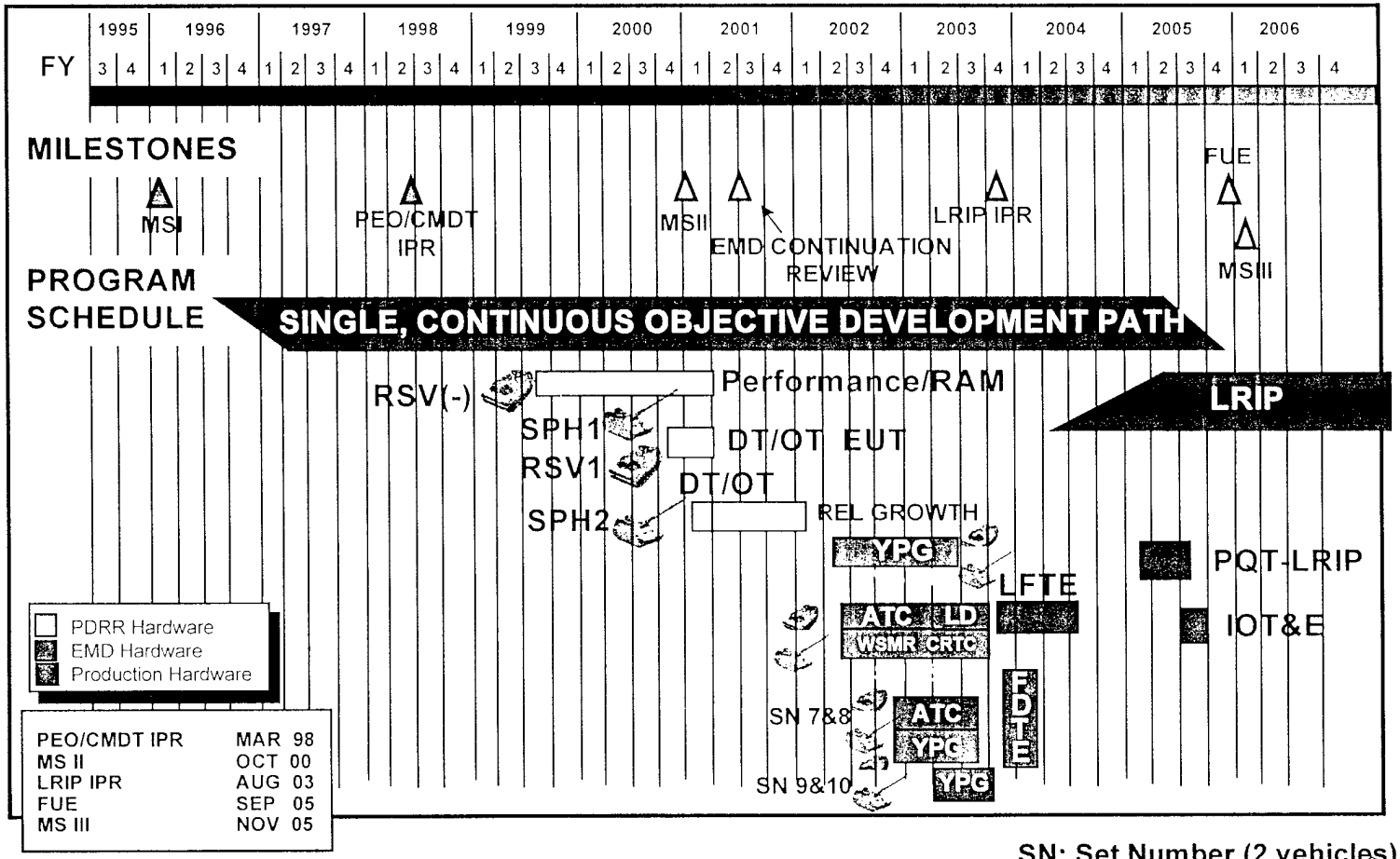


- Cost / Requirement / Reliability trade off studies can all be performed through interoperability of the RASSP models

COST ANALYST
(PRICE)

RELIABILITY ENGINEER
(RAM-ILS)


The Army XXI
Firepower Revolution
Combat Vehicle Conference
Presented by:
Kevin M. Fahey
DPM Crusader
September 22-23, 1998



SN: Set Number (2 vehicles)

DAES - Sept98

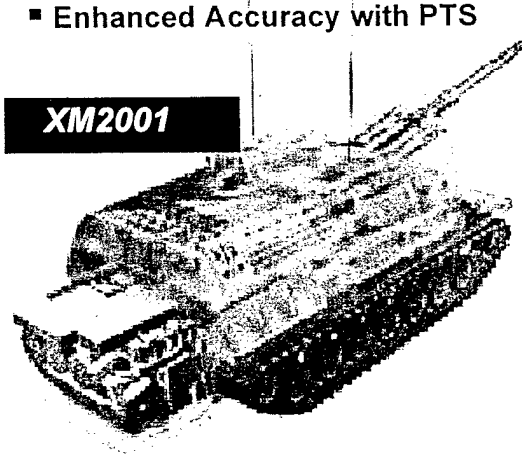
Lethal Firepower

- Cooled Cannon for Continuous Fires
- 10-12 Rnds/minute out to 40-50 km
- Enhanced Accuracy with PTS

Crew Cockpit Enables Information Dominated Warfare

- Mission Planning
- Situational Awareness
- Decision Aids

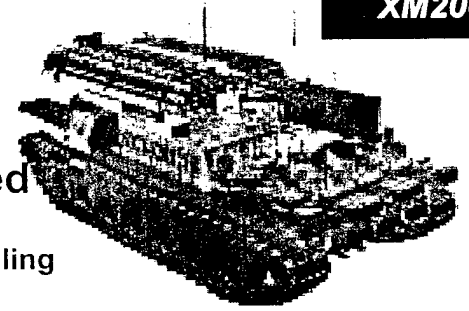
XM2001



Fully Automated

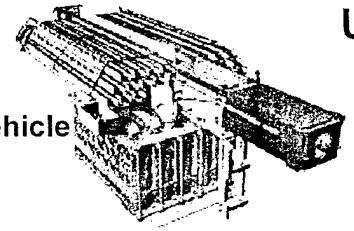
- Resupply
- Ammunition Handling
- Aiming
- Loading & Firing

XM2002



Highly Mobile

- 1500 HP to Meet & Exceed M1/M2
- First Drive-by-Wire Ground Combat Vehicle
- Ride Quality Better than M1/M2

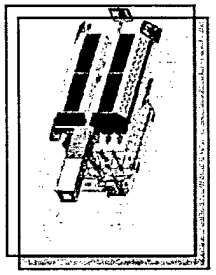


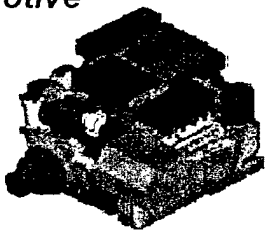
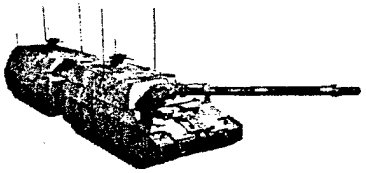
Unmatched Survivability

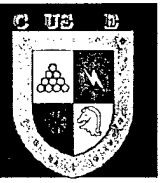
- Separate Crew & Weapon Stations
- Composite Armor
- Ballistic & Non-ballistic Protection

Crusader Is Not Just Another Howitzer

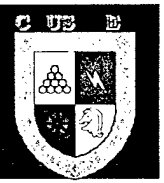
DAES - Sept98

Major Sub - System	Key Features	Status
Automated Cannon 	• Automatic Loading • Active Thermal Cooling • Laser Charge Ignition • Inductive Fuzing	***Achieved Multiple 15 Rd Auto Burst (Demonstrated 8.6 RPM)*** ***Demo'd Functionality of the Thermal System*** ***Mount & Cannon in Fabrication*** ***Demo'd 1 Battlefield Day Firing with Laser Ignition System***
 ***Automated Resupply/ Ammunition Handling***	• Inventory Management • Storage • Selection • Transfer	***Detailed Design Completed*** ***Procuring Objective Hardware*** ***Assembling SPH & RSV Hardware Set #1 in SIF*** ***Selected Ammo Identification/ Verification Approach***
Automated C^3 	• Fire control • Weapon Control • Positioning • Embedded Training • Situational Awareness	***Hardware in Detailed Design*** ***Software in Preliminary Design*** ***Lo-Fidelity Modeling***

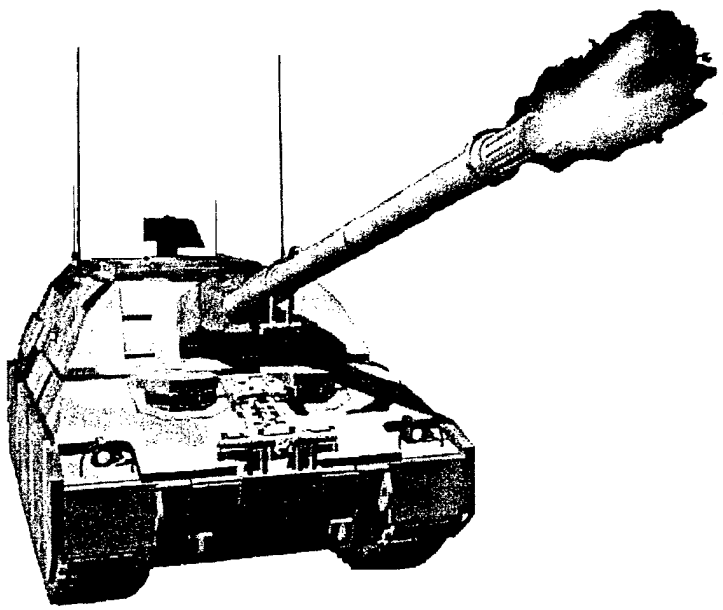
Major Sub - System	Key Features	Status
Automotive 	• 1500 Horse Power • Variable Geometry Turbochargers • Self Cleaning Air Filter • Roll-Out/In Power Pack • External Hydropneumatic Suspension • Drive-by-Wire • Composite Armored Hull	***Engines & Transmissions # 1 - 3 Delivered*** ***Engine Full Power Demo'd*** ***Max Transmission Tractive Effort Demo'd*** ***Power Pack Test Ongoing in Propulsion Test Lab*** ***Lower Hull Weld-Up In Process***
MACS and MOFA 	• Complete Zoning Solution • Supports 10-12 rd/min Rate of Fire • Significantly Reduces Logistics Tail • Four Fuze Setting Mode • Withstands Out-of-Pack Environmental Exposure	***MACS & MOFA Qualification Testing Ongoing*** ***Type Classification Complete within 24 months***
Survivability 	• Protect Crew, System and Mission • Composite Armor Ballistic Protect. • Ammo & Fuel Compartmentation • Susceptibility Reduction Features • NBC Collective Protection with Shirt Sleeve Environment • Automated Fire Suppression	***Hull, armor, top attack armor, & ballistic shock testing ongoing*** ***Propellant compartmentation testing in process*** ***Fire suppression dispersion testing completed*** ***NBC system checkout - Oct 98***



- Design to Build / Design Phase
- Software Development/Integration
- Funding Stability
- Timely Decisions (Continuous Development Schedule)
- SASC Report
- Maintain Technical Imperative
- Unknown Unknowns



- Software Detailed Design
- RSV (-) IAT&C
- RSV (-) Testing
- SPH/RSV Builds
- Crew Trainer
- CEP
- EMD Planning/Proposals/Contract
- Armaments Safety Certifications
-

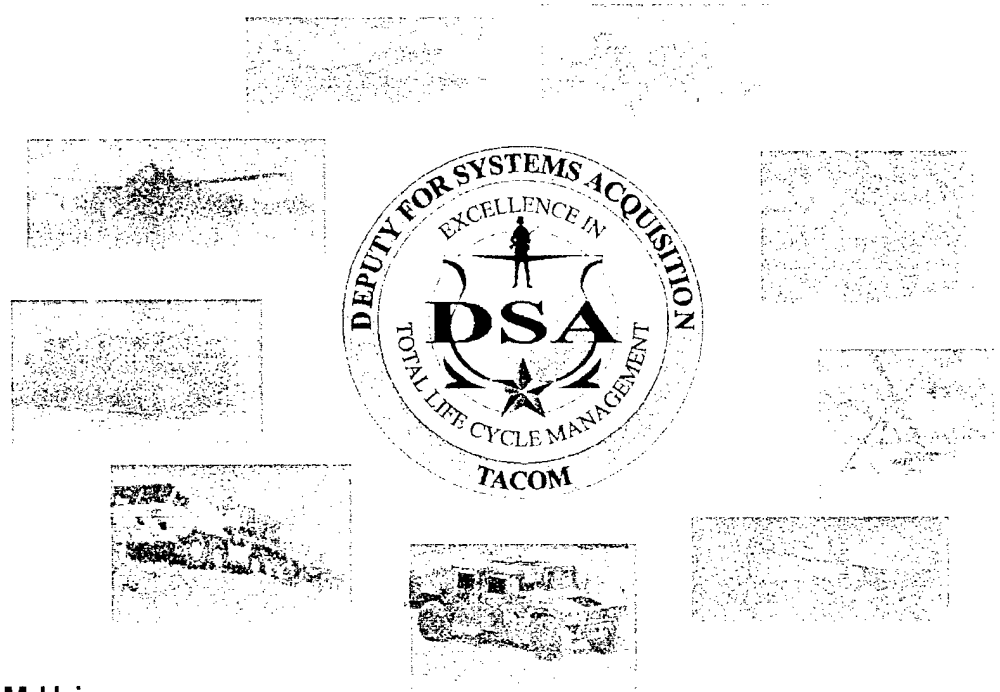


- Requirements Valid
- Design On-Track & Meets Requirements
- Program is Affordable
- Risk Under Control
- Deliver 1st Prototype Next April

DSA TACOM Acquisition Modernization Perspective

AMC

TACOM



COL (P) John M Urias
DSA TACOM

23 Sep 1998

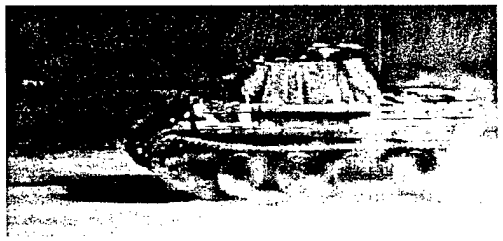
TACOM

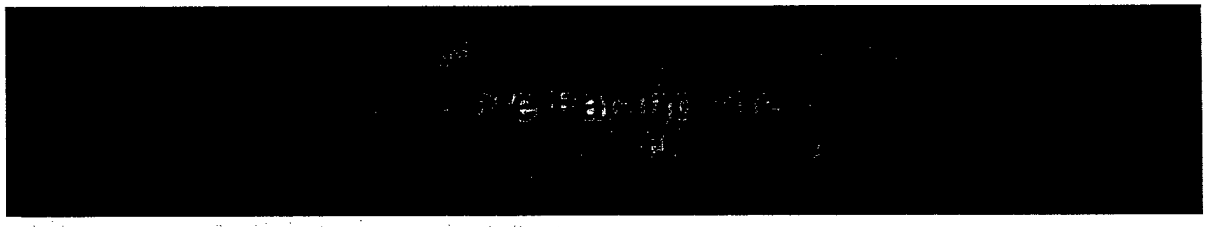
Outline

- Problem Statement
- The DSA Today
- DSA of Tomorrow
- What can Industry do for us?
- On Going Programs
- DSA PM Introduction

TACOM

Problem Statement

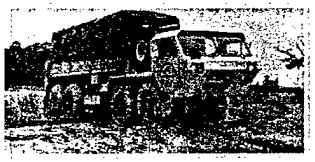


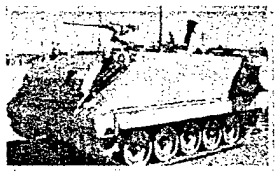


DSA TACOM Programs

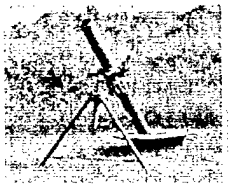
TACOM

36,000+ Tractors
13,000+ HEMTTs
2,900+ PLS
2,100+ Bridges
1,600+ HETs





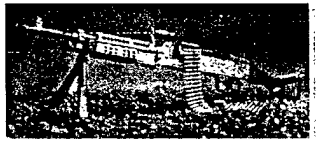
70,000+ M113 FOV



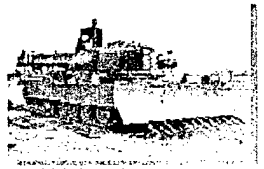
1000+ 120MM
900+ 81MM
700+ 60MM

100,000+ HMMWV
700+ HMT

Extremely Diverse Span of Control



9800+ MK19s
600,000+ M16s
1900+ M240
44,000+ M249
40,000+ M4

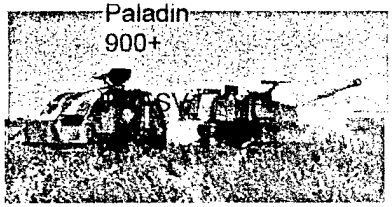


Wolverine

313+ Marine Systems
1,500+ Rail Cars
800+ Miles of Pipeline
1,200+ Containers

900+

Paladin
900+



2800+ LAV (With FMS)

460+ Grizzly

360+ HERCULES

100+

23 Sep 98

Committed to Excellence

TACOM

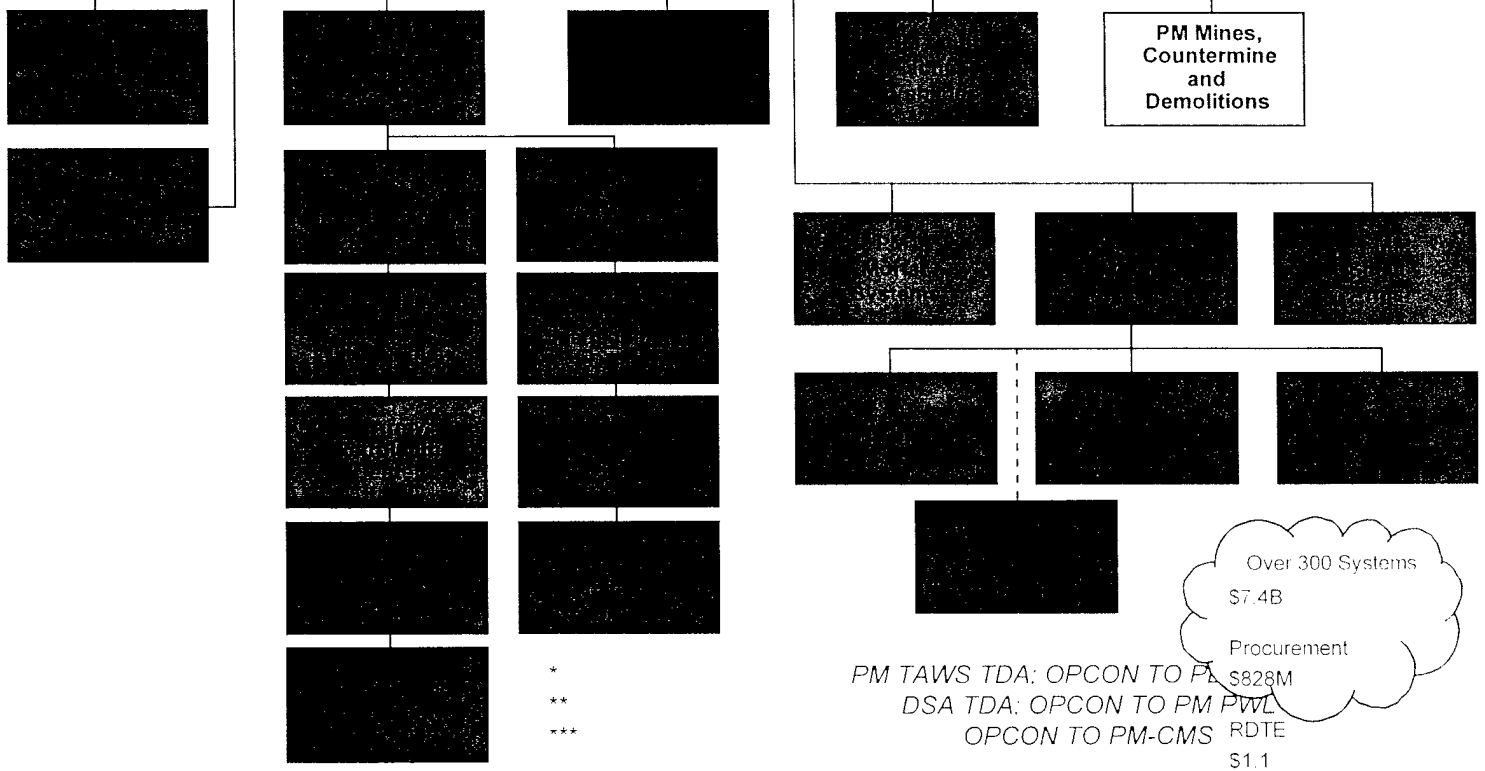
TACOM

- TACOM
- TACOM/Picatinny
- Picatinny
- NCAD

Ft. Belvoir/Picatinny

OFFICE OF DEPUTY FOR SYSTEMS ACQUISITION

- ASSIST DSA
- EXEC OFFICER
- BUSINESS MGR
- PROCUREMENT SPEC
- EXEC SECY
- SECY



PM TAWS TDA: OPCON TO PEO
DSA TDA: OPCON TO PM PWL
OPCON TO PM-CMS

Over 300 Systems
$7.4B
Procurement
$828M
RDTE
$1.1
B
FMS

23 Sep 98

Committed to Excellence

DSA\DSA unisas Perspective.ppt 9 17/98

The Future of the TACOM DSA

TACOM

- The TACOM DSA is an Evolving Organization
- There will be More Force Structure Cuts to TACOM and the DSA in the Future
- We are Working our Organizational Structure now to Meet our Customers Needs and Absorbs These Cuts

Key Issue: Life Cycle Mgt

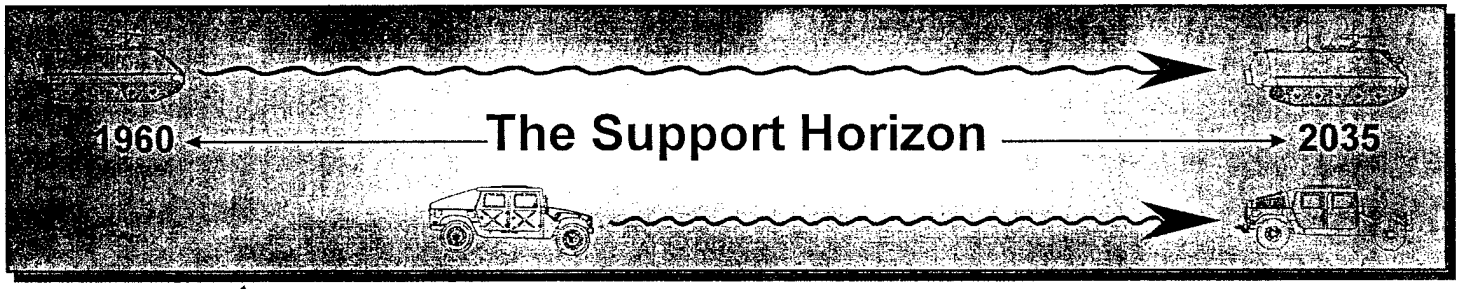
- There are Very few new Systems
  - TACOM DSA is Mostly Legacy Systems That will Remain in Inventory a Long Time
  - These Systems Need Support & Modernization to Meet the Needs of a Changing Army

We Need Industry's Help

TACOM

Extend the Life of Legacy Systems

Reduce Logistics Requirements of our Systems



Meet Requirements of Information Age Army

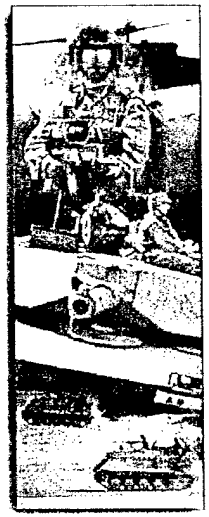
23 Sep 98

Committed to Excellence

TACOM

On Going Programs

- MTS
- Wireless TOC
- Combatt
- ABS Braking Systems
- Engine Improvements
- Paperless PM
- Tire Pressure Monitoring System



WRAP:
- GATOR

SBIR:
- TACOM Personnel Heater
- Filterless Heat Exchanger (M109)

ACT II:
- Hands Free Wireless Communications
- Ladar Targeting System

We Need More Programs Like These

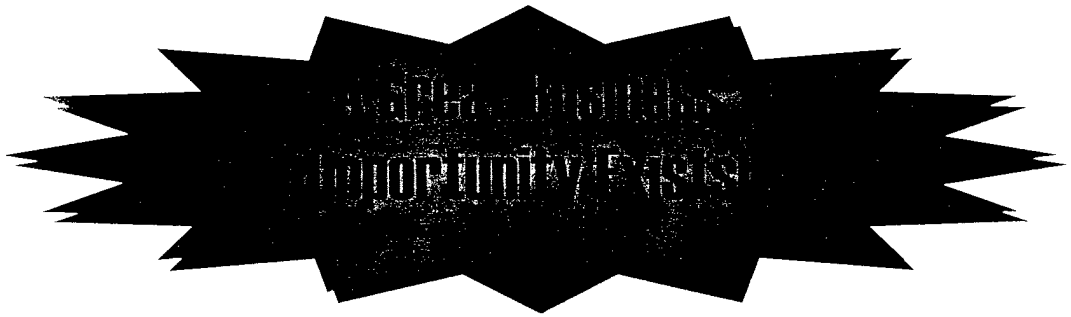
TACOM

Summary

- DSA Provides Oversight for Over 300 Very Diverse Systems
- Major Shift in TACOM Operations to Incorporate Best Business Practices
- Lengthy Support Horizon is a Reality for Most of our Systems
- A Strong Government-Industry Team is Critical to our Success

TACOM

Conclusion

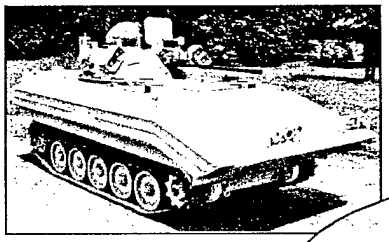


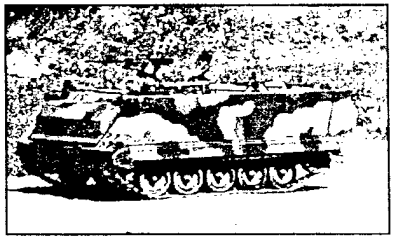
- AAN Tenets Mandate Ultra-Reliable Systems
- We are Entering the AAN Age With Legacy Systems that will Require Upgrading, Product Improvements and Life Extention Programs

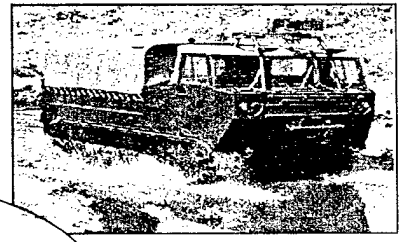
We can not Allow an AAN That is Supplied by Horses!

TACOM

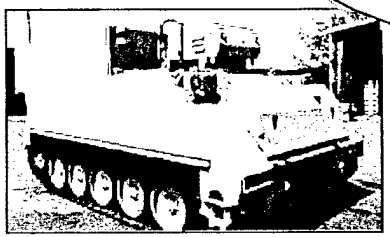
Mobility and Firepower for America's Army

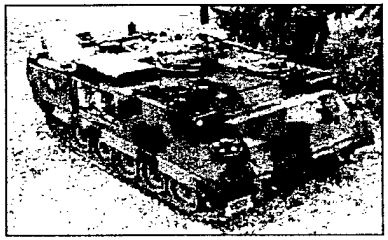


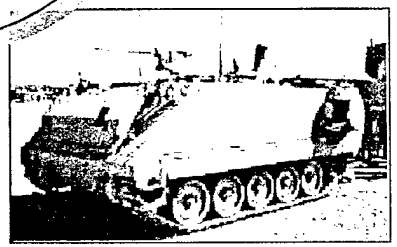




M113 FOV Overview
Combat Vehicle Conference
Sep 98







LTC David Ogg
PM M113/M60 FOV

AGENDA

- Mission
- Organization
- M113 Family of Vehicles Overview
- Industry Overview
- Summary

MISSION

To Develop, Produce, Modernize And Sustain The M113/M60 Family Of Vehicles, Through Innovative, Yet Sound Program Management, Always Mindful Of The Requirements Of The Ultimate Customer.

COMMAND ORGANIZATION

AMC
GEN J. Wilson

TACOM
MG R. Beauchamp

TACOM DSA
COL (P) J. Urias

PM TAWS
COL M. Cannon

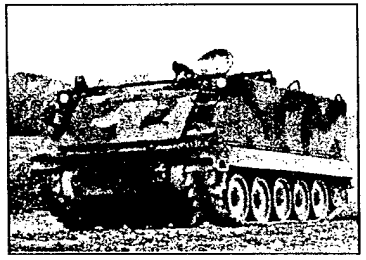
PM M113
LTC D. Ogg

M113 FOV REQUIREMENTS

- ODS After Action Report:
  - ✓ "Upgrade M113 FOV To Keep Pace With Abrams/Bradley"
- Tracked Vehicle Platform Conversion/Upgrade:
  - ✓ DCSOPS Priority: Customer; FPI-II
  - ✓ Highly Mobile, Survivable, And Reliable
  - ✓ Specialized Mission Modules Integration
  - ✓ Current/Future Adaptive
    - – Force XXI/AAN

No Replacement For The M113 FOV Has Been Programmed

M113 SUPPORT HORIZON

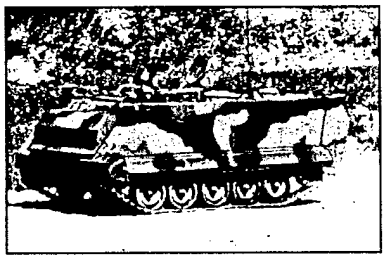


1960 M113 (Gasoline)
M577 (CMD Track), M106 (Mortar)

1964 M113A1 (Diesel)
M125 (Mortar), M548 (CGO Track),
M667 (Lance), M730 (Chap), M741 (Vulcan)

1979 M113A2 (Cooling And Suspension)
M901 (ITV), M981 (FISTV), M1015 (IEW)

1987 M113A3 (RISE Upgrade)
M1059 (Smoke), M1064 (Mortar),
M1068 (SICPS), OSV (BMP-2), M58 (Smoke)

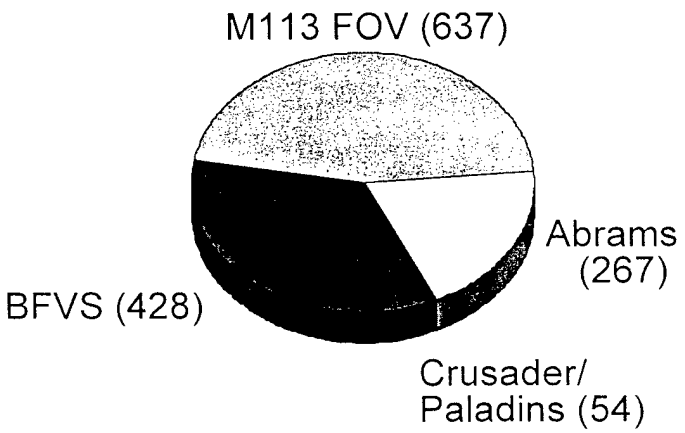


2025 . . . Force XXI and AAN

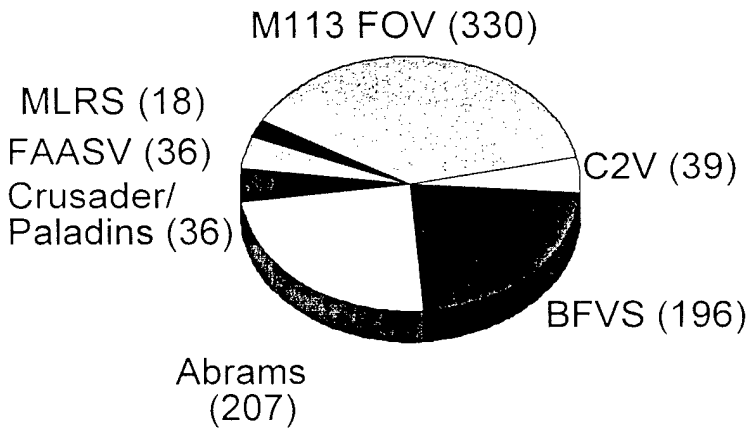
No Planned Replacement

COMBAT VEHICLE DENSITY

Current Division Density (1,386)



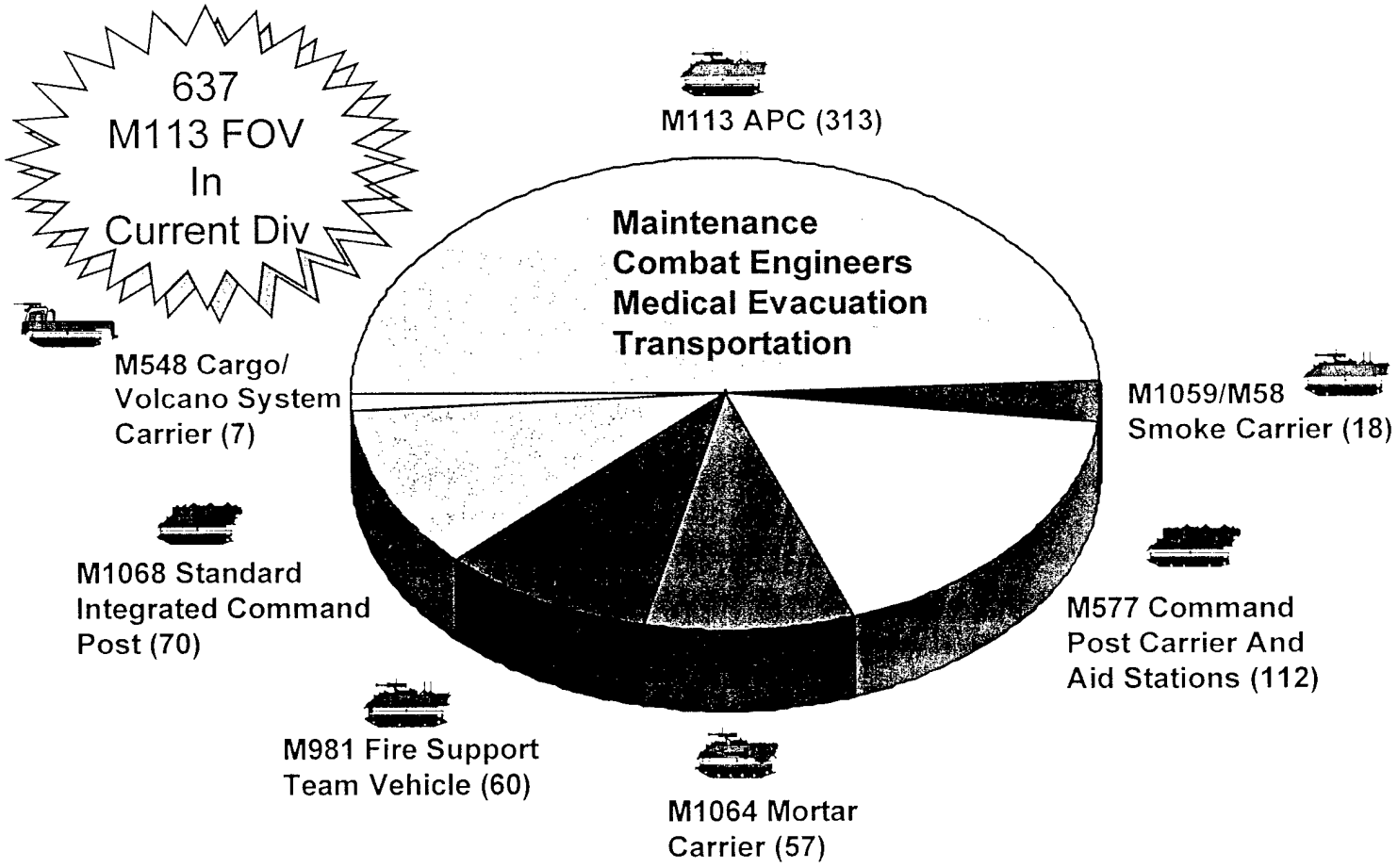
New Division Density (862)



As of 9/17/98

M113 FOV Represents 46% of Old Division Density and 40% of New Division Density

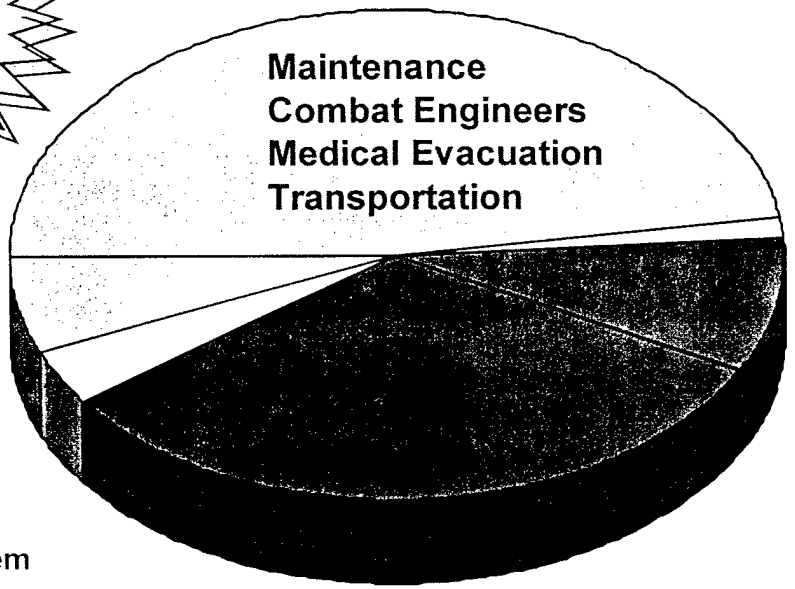
CURRENT M113 FOV MISSION BREAKOUT



NEW M113 FOV MISSION BREAKOUT

330
M113 FOV
In
New Div

M113 APC (157)



M577 Command
Post Carrier (4)

M981 Fire Support
Team Vehicle (21)

M1064 Mortar
Carrier (30)

M548 Cargo/
Volcano System
Carrier (12)

M1068 Standard
Integrated Command
Post And Aid Station (106)

As Of: 9/17/98

CURRENT M113 FOV FP I & II REQUIREMENTS

VEHICLE TYPE	TOTAL REQ'D	FIELDED TO DATE	REMAINING
M1064A3 (120mm Mortar)	349*	299	50
Op Forces Surro Veh (OSV)	133*	12	121
M58 (Smoke Generator)	140*	42	98
M1068A3 (SICPS)	623	0	623
M113A3 (APC)	1,779	1,252	527
M577A3 (Command Post)	703	42	661
M548A3 (Volcano/Cargo)	103	103	0
M113 FOV TOTAL	3,830	1,750	2,080

* **Includes FP III Requirements**

Complete: FP I = FY04; FP II = FY07

Does Not Support Force XXI Timeline

M113A2, M113A3, BFVS PERFORMANCE DATA

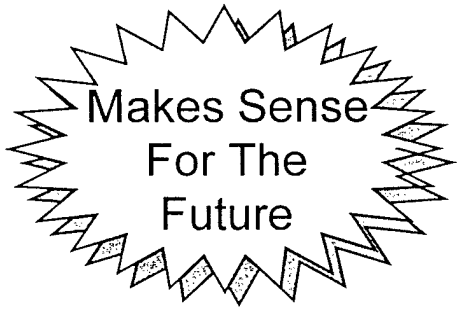
Vehicle Features	M113A2	M113A3	Bradley M2A2
Combat Weight	25,000 lbs	27,200 lbs	60,300 lbs
Engine	212 hp	275 hp	600 hp
HP/Ton	16.9	20.4	20
Speed (Level)	37.7 mph	41 mph	40 mph
Acceleration (0-30 mph)	40.3 sec	21.7 sec	18 sec
Cost To Operate/Mile ($)	13.83	12.89	49.40
MMBF Req't/Actual	750/1,902 hrs	850/2,202 hrs	240/750 hrs
Cruising Range	300 miles	300 miles	265 miles
Trench Crossing	66 in	66 in	100 in
Payload Capacity	3,000 lbs	3,000 lbs	5,700 lbs
Armor Protection (Defeats)	7.62 mm/Frag	7.62mm/Frag	30 mm
Deployability	C130,C141, C17 & C5	C130,C141, C17 & C5	C17 & C5

Problem: Resources Don't Equal Requirements

M113 STRATEGY XXI

Issue: M113's Current Program Doesn't Support Force XXI Or AAN:

- Obtain DCSOPS Guidance to Reprioritize Upgrade Program to Support Force XXI - Division/Corp
- Obtain Approval to Realign Vehicle Propronency with "School House"
- Manifest a TACOM/Industrial Upgrade Partnership
- Continue to Tell and Sell the M113 Program
  - ✓ Ensure Stable Funding and Requirements



M113 FIELDING STRATEGY

$625M To Complete By FY07

Current Guidance: Customer; FP I & II; Others

FP I	1,150/1,919
FP II	603/1,437
Div XXI	12/306
Corp XXI	691/1,587

FY	99	00	01	02	03	04	05	06	07	08	09	10

New Strategy: Force XXI Div/Corp; Customer; FP I & II; Others

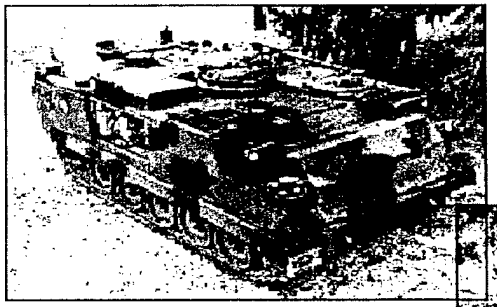
No Additional Funding Required

Div XXI*	12/306 * Redistribute M1064A3 Mortar Carriers
Corp XXI	691/1,587
FP I	1,150/1,409
FP II	603/1324

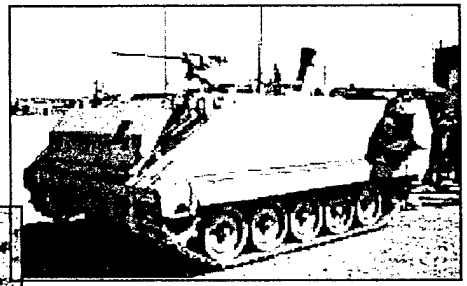
FORCE XXI: 4th ID = 1% A3s; Corps = 43% A3s

M113 FOV SYSTEM

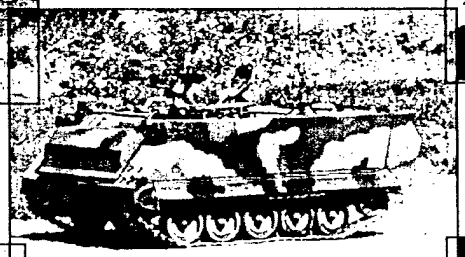
M58

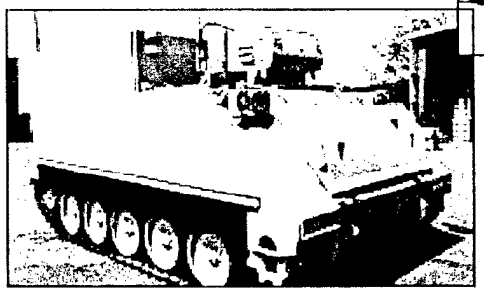


M1064

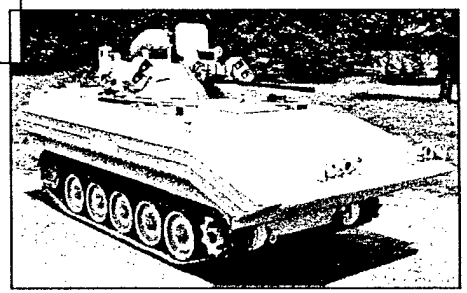


M113





M1068



OSV

M113 PROPONENT & USERS

VEHICLES	PROPONENT	USERS
M113	Infantry School	
CO/1SG		INF, AR
Ambulance		INF, AR, FA
Maintenance		AR, AV, FA
M577	Infantry School	
Command Post		AR
M1068	Infantry School	
Command Post		INF, AR
Medical		AR, EN
FDC		AR, FA
M1064	Infantry School	
Mortar		FA
M548	Infantry School	
Volcano		FA
M58	Infantry School	
Smoke Carrier		CHEM
OSV	Infantry School	NTC

M113 Family of Vehicles (FOV)

FY98 Fiscal and Congressional Information

1. Indiana

SEN Lugar (R) — SEN Coats (R, SASC)
REP McIntosh (R-2) — REP Burton (R-6)
REP Pease (R-7) — REP Carson (D-10)

Contractor	City (Dist)	Major Comp	FY98 Jobs	FY98 $
Allison Trans.	Indianapolis (2,6,7,10)	Transmission	20+	13.7M
State Totals			20+	13.7M

2. Alabama

SEN Shelby (R, SAC) — SEN Sessions (R)
REP Riley (R-3, HNSC)

Contractor	City (Dist)	Major Comp	FY98 Jobs	FY98 $
United Def.	Anniston (3)	Application*	180 +	18.8M
ANAD	Anniston (3)	Application	310+	14.1M
State Totals			490+	32.9M

* ANAD/UDLP Partnering

3. Kansas

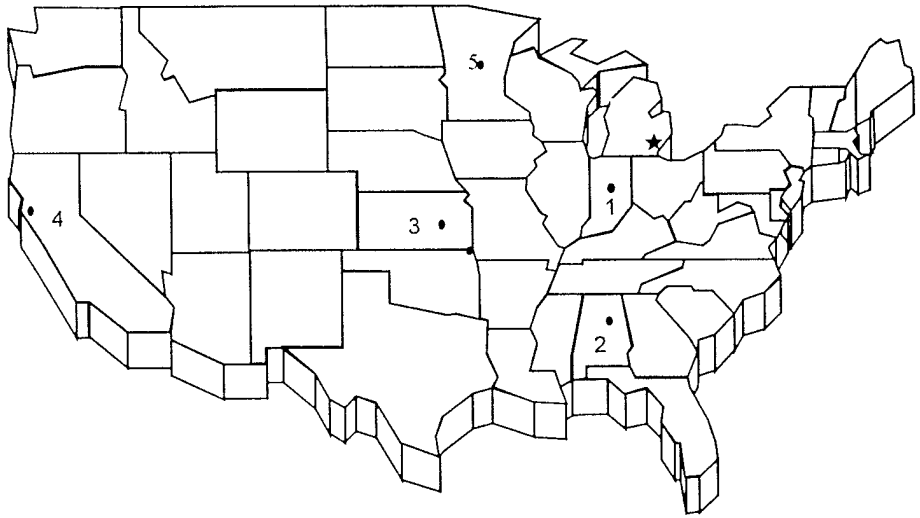
SEN Roberts (R, SASC) — SEN Brownback (R)
REP Moran (R-1)

Contractor	City (Dist)	Major Comp	FY98 Jobs	FY98 $
Detroit Diesel	Emporia (1)	Engine	20+	3.3M
State Totals			20+	3.3M

4. California

SEN Feinstein (D) — SEN Boxer (D, SAC)
REP Miller (D-7) — REP Pelosi (D-8, HAC)
REP Vacant (9) — REP Tauscher (D-10)
REP Pombo (R-11) — REP Lantos (D-12) — REP Stark (D-13)
REP Eshoo (D-14) — REP Campbell (R-15) — REP Lofgren (D-16)

Contractor	City (Dist)	Major Comp	FY98 Jobs	FY98 $
United Def.	San Jose (7-16)	Eng Services	20+	3.5M
State Totals			20+	3.5M



5. Minnesota

SEN Wellstone (D) — SEN Grams (R)
REP Ramstad (R-3)

Contractor	City (Dist)	Major Comp	FY98 Jobs	FY98 $
NAPCO	Minnetonka(3)	Conv. Kits	110+	15.9M
State Totals			110+	15.9M

Total Program Summary

	Top 5	Other	Total
# States:	5	0	5
# Contractor Jobs	350+	0	350+
# Government Jobs	310 +	0	310+
FY98 $ Budgeted:	$69.3M	0	$69.3M

Legend

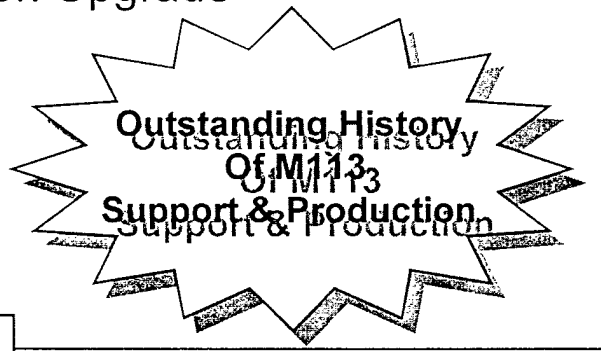
- **Jobs** rounded to nearest 10 for FY98
- **FY98 Program Budget $** rounded to nearest $100,000
- **(D-1):** indicates Party and Congressional District.
- **(6):** indicates Congressional District
- **Map dots** indicate Location of Top 3 Contractors in State
- **Star** indicates PEO/PM location

☐ **Top 5 (or less) States** with Program Contractors

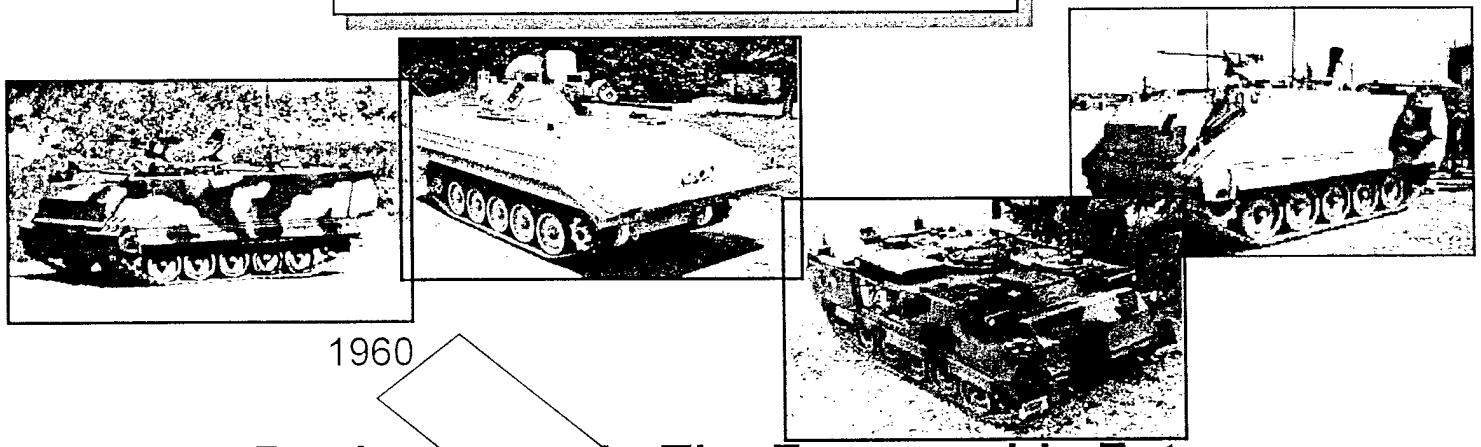
☐ **Other States** with Program Contractors

PM M113 AND INDUSTRY INITIATIVES

- Partnership of Overhaul/Conversion Vehicles: TACOM/ANAD/UDLP
  - ✓ FY97: 332 Vehicles; 16% Cost Savings
  - ✓ FY98: 242 Vehicles; 20% Cost Savings
- Alpha Contracting Initiative: M1068 SICP Kits - UDLP
- A3 RISE Conversion Kits: NAPCO International
- Detroit Diesel: Electronic Controlled Engine Upgrade
- Allison Transmission: X400A Transmission Upgrade
- TRW: Applique' Supporting Force XXI
-

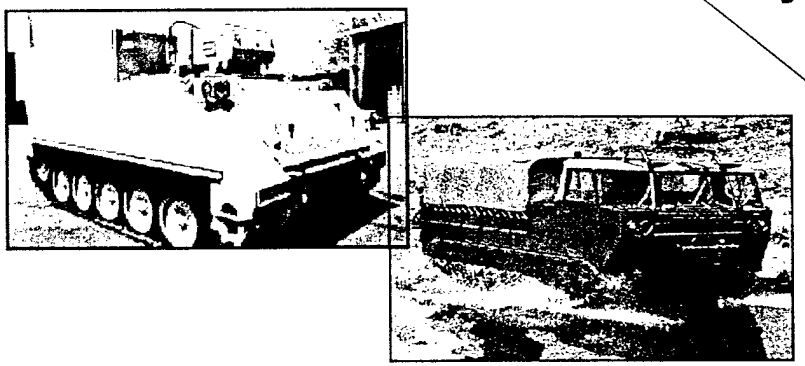


M113 FOV FUTURE



1960

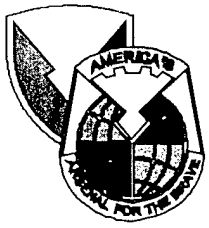
With No Replacement In The Foreseeable Future...
The M113 FOV Will Continue To Support The
21st Century Soldier



2025 . . .

SUMMARY

M113: Legacy To Legend … The Legend Lives On

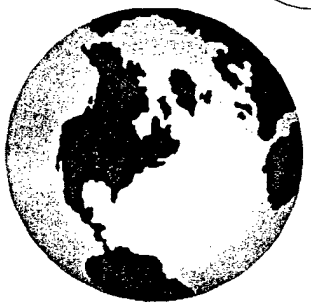


HMMWV Life Cycle Mgt Strategy Presentation for Combat Vehicle Conference

Nancy A. Moulton
Project Manager,
Light Tactical Vehicles

HMMWVs SUPPORT OUR COMBAT MISSION

Important in the Combined Arms Operations



95,616 HMMWVs worldwide

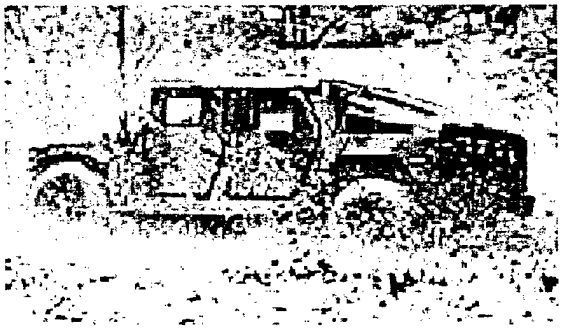
1714 HMMWVs Required in Heavy Division

A critical platform in support of the 7 Battlefield Operating Systems in all potential theaters of operations

UPARMORED HMMWVS
XM1114

Survivability features proven in two combat incidents

Materiel Release: 1Q/FY99
Supports Scout and MP missions



USAREUR maintain 92% OR on 409 vehicles

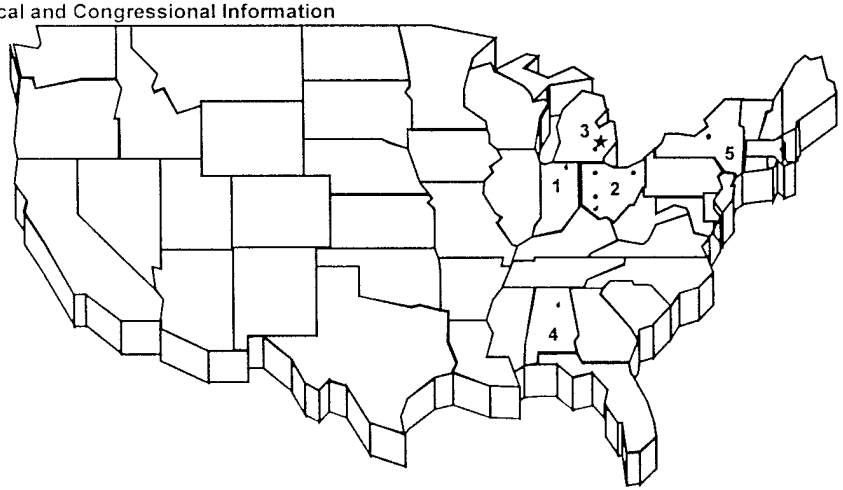
Distribution:
Bosnia: 409
Special Operations Command: 72
Forces Command: 776
Korea: 175
National Guard: 29
Armor School:10
MP School: 5

Over 2 million miles logged on Bosnian assets

Actual MMBHMBF is almost twice the projected rate

HMMWV

FY99 Fiscal and Congressional Information



1. Indiana

SEN Coats (R) (SASC) — SEN Lugar (R)
REP Roemer (D-3) — REP Souder (R-4)

Contractor	City (Dist)	Major Comp	FY99 Jobs	FY98$
AM General	Mishawaka (3)	Prime	1352	96.1M
AM General	South Bend (3)	Stamping	30	5.5M
Dana	Ft Wayne (4)	Axles	30	2.8M
State Totals			1,412	104.4M

2. Ohio

SEN DeWine (R) — SEN Glenn (D) (SASC)
REP Boehner (R-8) — REP Gillmor (R-5)
REP Hall (D-3) — REP Sawyer (D-14)

Contractor	City (Dist)	Major Comp	FY99 Jobs	FY98$
GM Diesel	Moraine (3)	Engine	20	10.1M
O'Gara-Hess	Fairfield (8)	Armor	20	24.5M
Hayes	Akron (14)	Wheels	10	1.2M
Defiance	Defiance(5)	Stampings	15	1.2M
State Totals			65	37.0M

3. Michigan

SEN Abraham (R) — SEN Levin (D) (SASC)
REP Rivers (D-13)

Contractor	City (Dist)	Major Comp	FY99 Jobs	FY98$
GM	Ypsilanti (13)	Transmissions	40	4.7M
State Totals			40	4.7M

4. Alabama

SEN Sessions — SEN Shelby (R) (SAC)
REP Aderholt (R-4) (HAC)

Contractor	City (Dist)	Major Comp	FY99 Jobs	FY98$
Goodyear	Gadsden	Tires	6	2.1M
Totals			6	2.1M

5. New York

SEN D'Amato (R) — SEN Moynihan (D)
REP Walsh (R-25)

Contractor	City (Dist)	Major Comp	FY99 Jobs	FY98$
New Venture	E. Syracuse (25)	Xfer Case	6	1.8M
State Totals			6	1.8M

Total Program Summary

	Top 5	Other	Total
# States:	5		5
# Contractor Jobs:	1,529		1,529
# Government Jobs:	46		46
FY99 $ Budgeted:	$12.1M		$12.1M

Legend

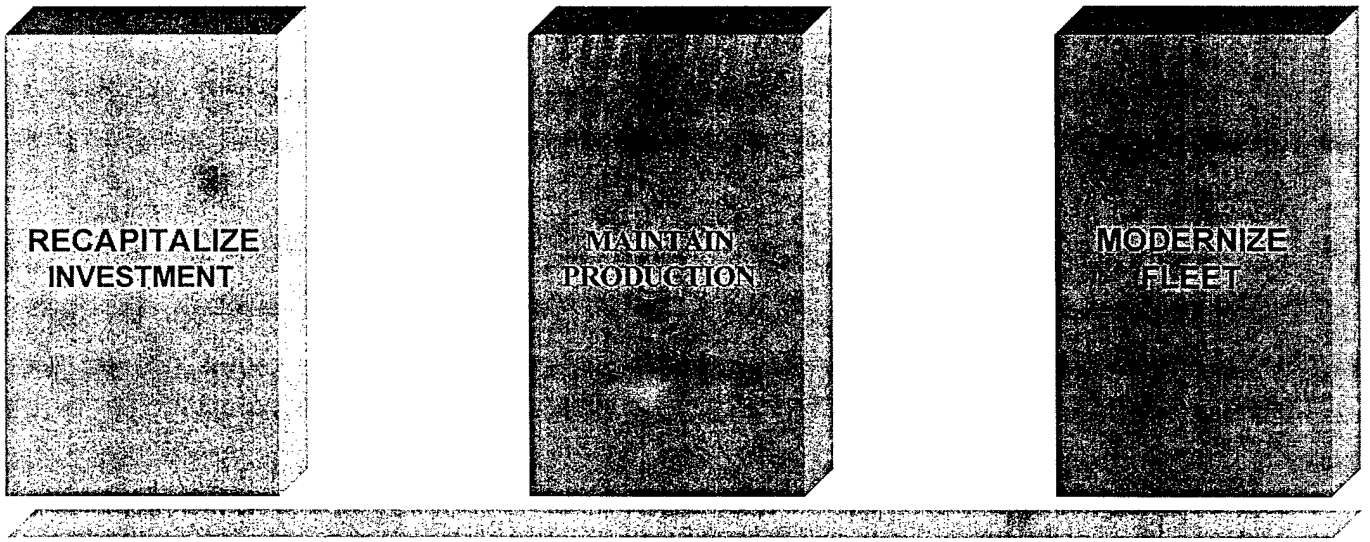
- **Jobs** rounded to nearest 10 for FY98
- **FY99 Program Budget $** rounded to nearest $100,000
- **(D-1):** indicates Party and Congressional District.
- **(6):** indicates Congressional District
- **Map dots** indicate Location of Top 3 Contractors in State
- **Star** indicates PM

☐ **Top 5 (or less) States** with Program Contractors

☐ **Other States** with Program Contractors

As Of: 5 Jun 98

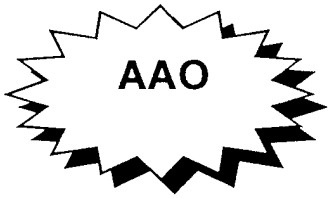
LTV LCM Strategy Pillars



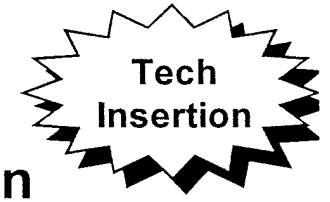
Foundation:
Stable funding stream & strong Army & joint requirements

Recommended LTV LCM Strategy Features

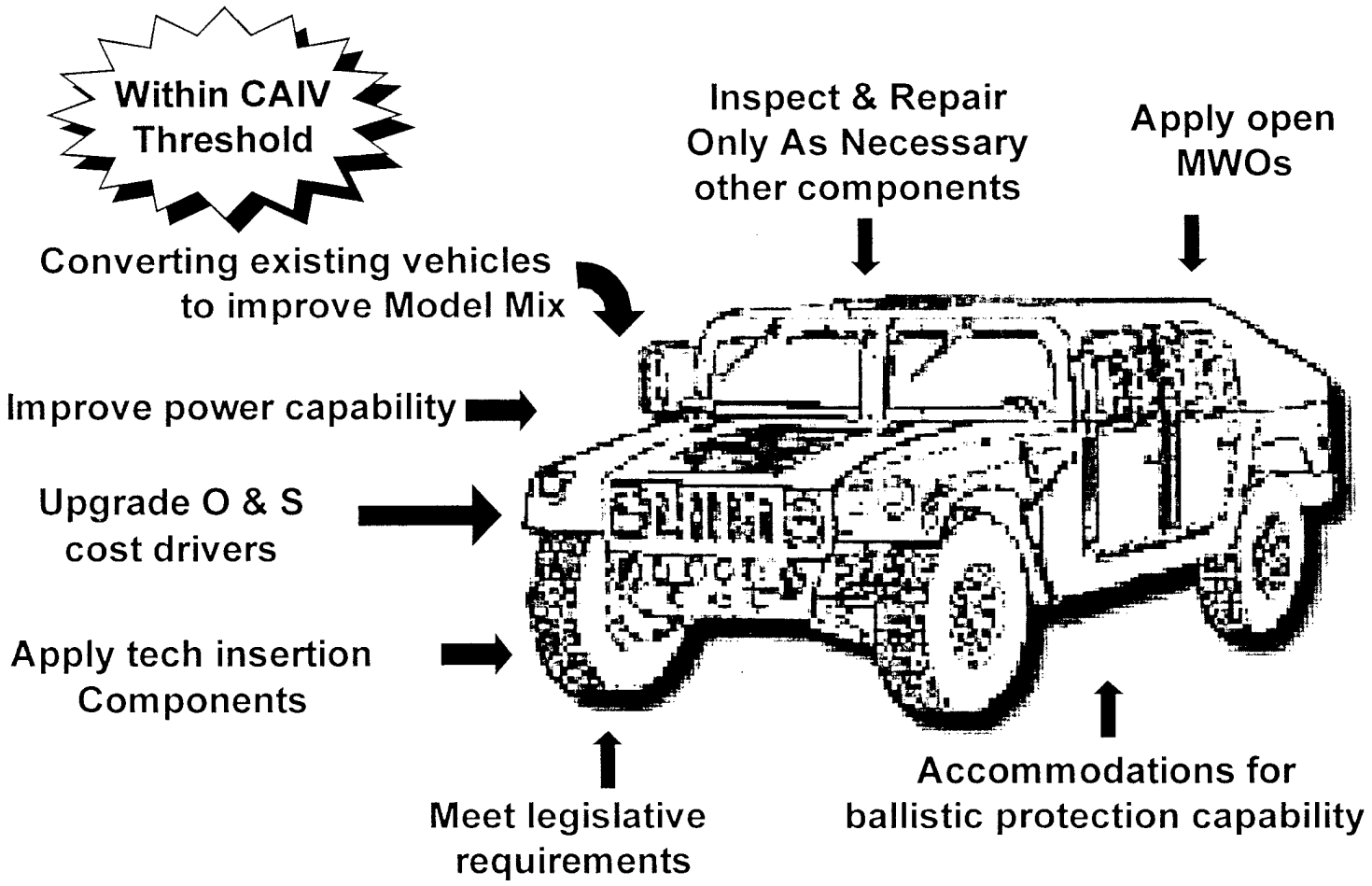
- Recapitalize Investment:
  - Supports a hybrid remanufacture effort to improve the condition of the fleet within economic threshold
  - ❑
- Maintain Production:
  - Maintains HMMWV production for AAO requirements:
    - ➡



- Modernize Fleet:
  - Leverages Commercially Based Tactical Truck (COMBATT) technology demonstration program
    - ➡
    - ➡

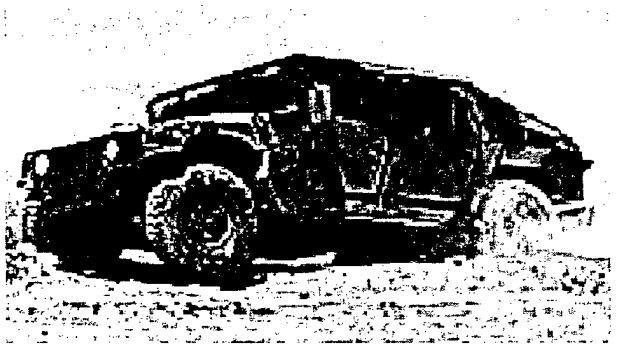


Hybrid Remanufacturing Definition



Maintain Production Pillar

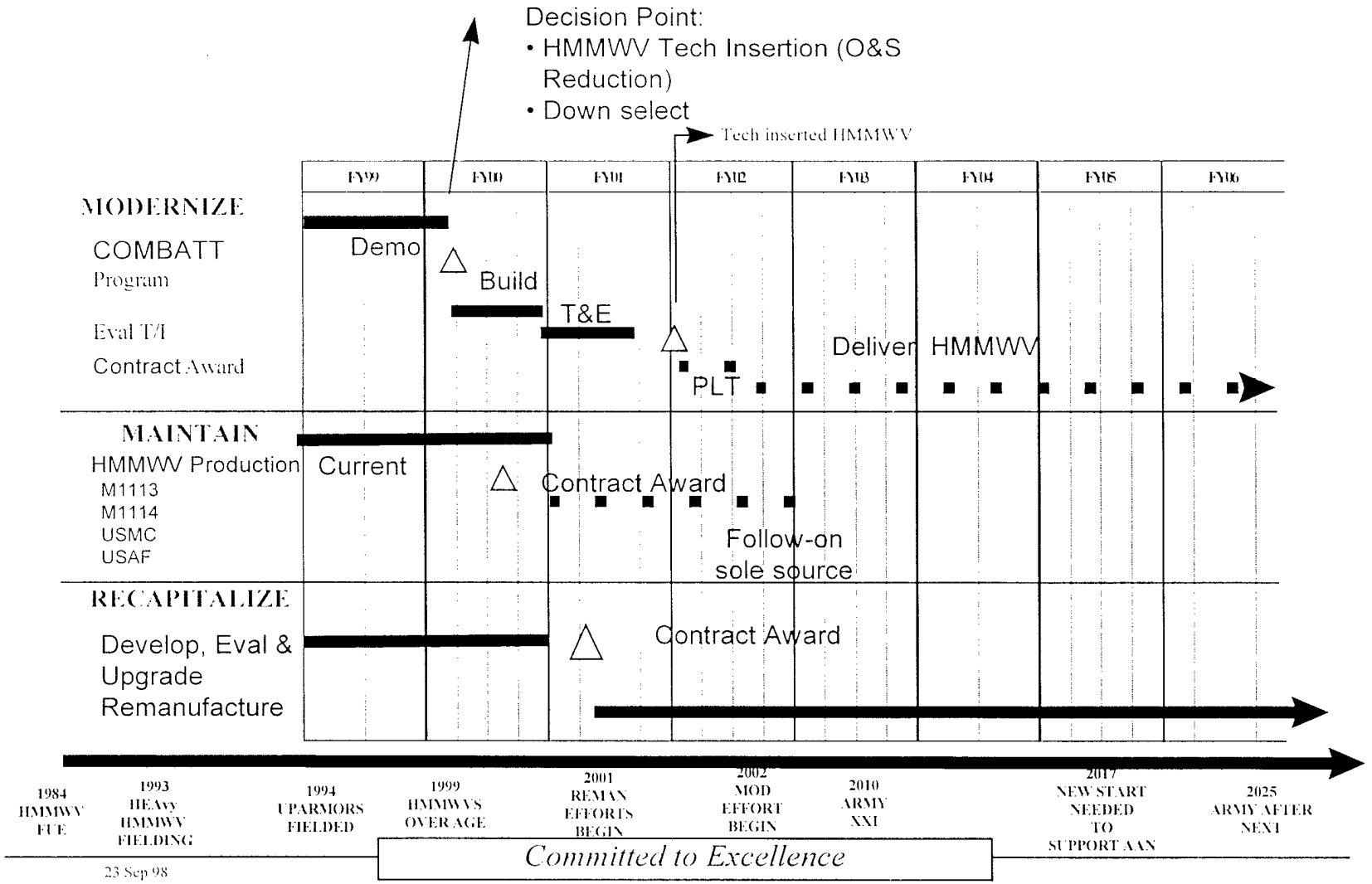
- Objectives
  - Continue HMMWV production to fill critical shortages (XM1113, XM1114, & M1097A2s)
  - Fill critical joint requirements
  - Provide higher reliability to maneuver forces
  - Provide an opportunity for fleet modernization
  - Leverage commercial technologies
  - Integrate Modernization Through Spares initiatives
  - Lower fleet O&S costs
  - Maintain a warm production base



Modernize Fleet Pillar

- Objective
  - Produce modernized HMMWVs that meet Army XXI goals
    - Lower cost of ownership
    - Affordable
    - Information dominance capability
    - Leverage and integrate technology
    - Provide high optempo, agility w/o any increase in O&S costs

LTV LCM Strategy Schedule

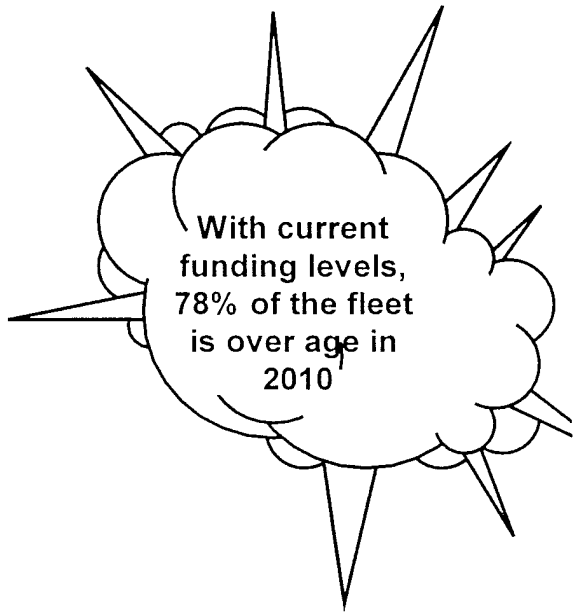


Committed to Excellence

23 Sep 98

Light Tactical Vehicle Life Cycle Management Strategy

- Supports the HMMWV fleet to maximum extent given funding constraints
- Modernizes a portion of the HMMWV fleet through technology insertion in new production and remanufacturing
- Recognizes the value of current HMMWV investment
- Introduces competition in new production and hybrid remanufacturing`



Summary

- HMMWVs are needed to support our combat mission objectives
-
- Current funding levels do NOT meet current Force Package 1 and 2 requirements
-
- By 2010, 100% of the vehicles in FP 1 & 2 units will be over 15 years old, costing units $5800 per vehicle and 20 average down days annually based on 4000 miles per year
-
- Partnering with materiel developer, combat developer, and contractors is a must to meet our goals and objectives