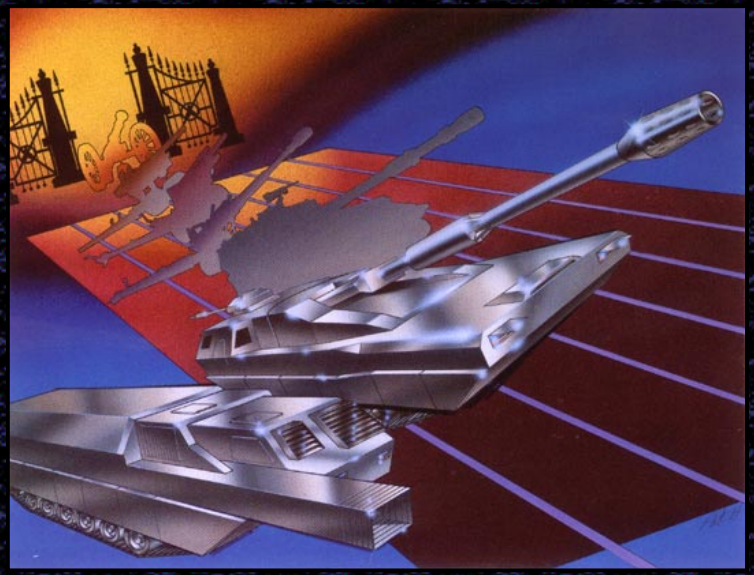
AMC

US ARMY
TANK-AUTOMOTIVE AND ARMAMENTS COMMAND
ARMAMENT RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
(TACOM-ARDEC)

TACOM



Future Challenges and Opportunities in Fuzing

Presented to

43rd Annual Fuze Conference

Presented by

BG John P. Geis
Commander, TACOM-ARDEC

7 April 1999

Outline

- TACOM-ARDEC Vision/Mission
- TACOM-ARDEC Future Thrusts
- Enabling Technologies
- Fuzing Challenges
- Future Fuze Technologies
- Summary

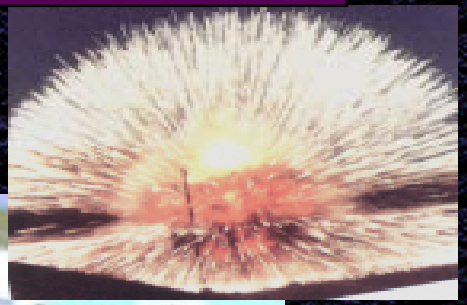
Tank-automotive & Armaments Command

TACOM is ...

Mobility and Firepower for America's Army

Mobility

Firepower



Survivability

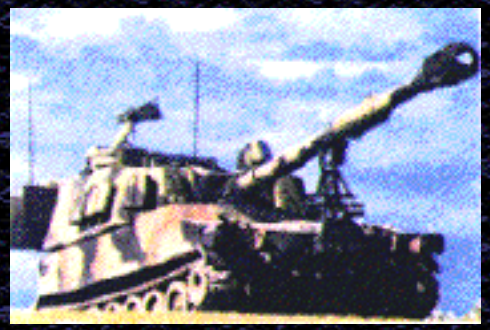
Lethality

VISION

Provide Overwhelming Firepower for Decisive Victory

MISSION

Fire Support



Aviation Armament

Mounted Operations

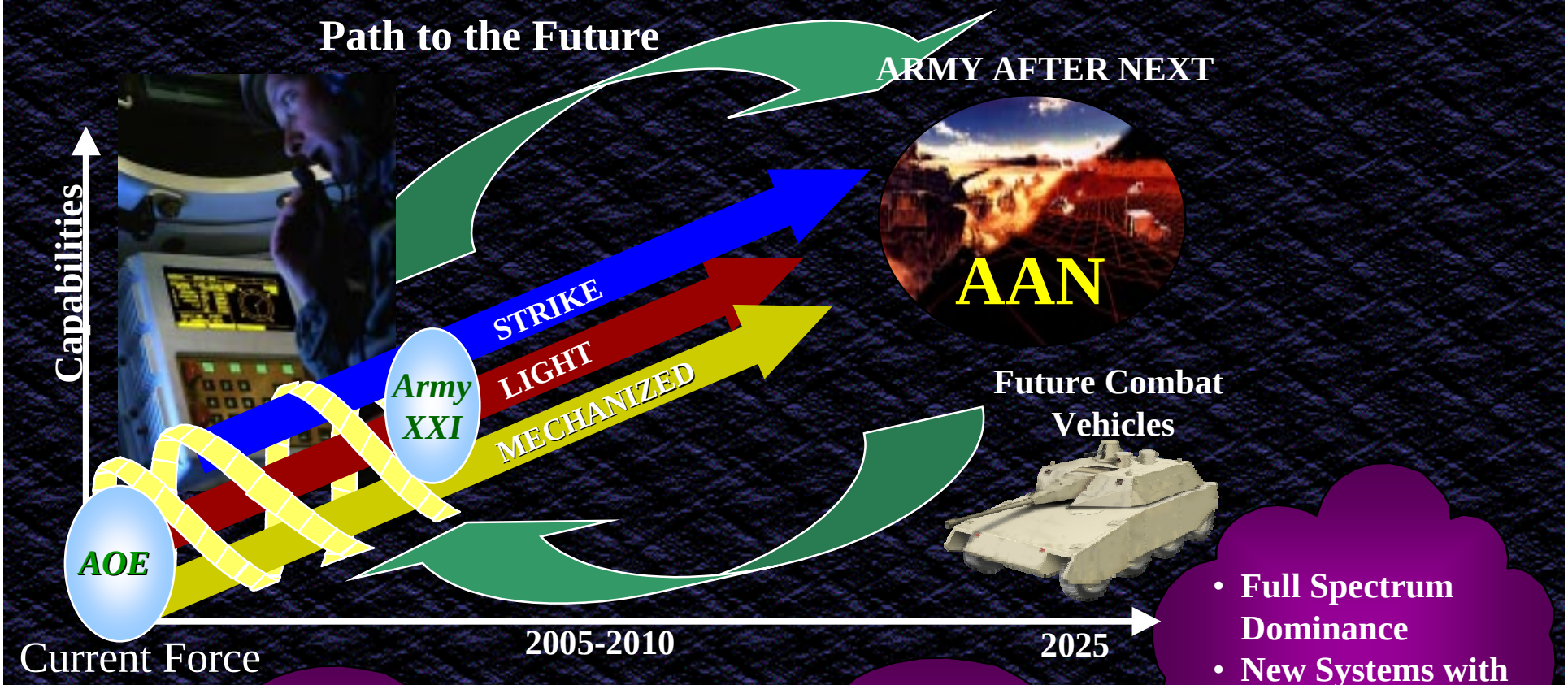
Special Operations

Dismounted Operations

Combat Service Support

Counter - Mobility

Evolving U.S. Land Warfare Doctrine



- Digitized Force
- Information Dominance
- System Upgrade to Maintain Overmatch

- World Class C4ISR
- Medium Weight Force
- Evolutionary Technologies
- Reduced Logistics Tail

- Full Spectrum Dominance
- New Systems with Physical Agility

S&T Implications for AAN:

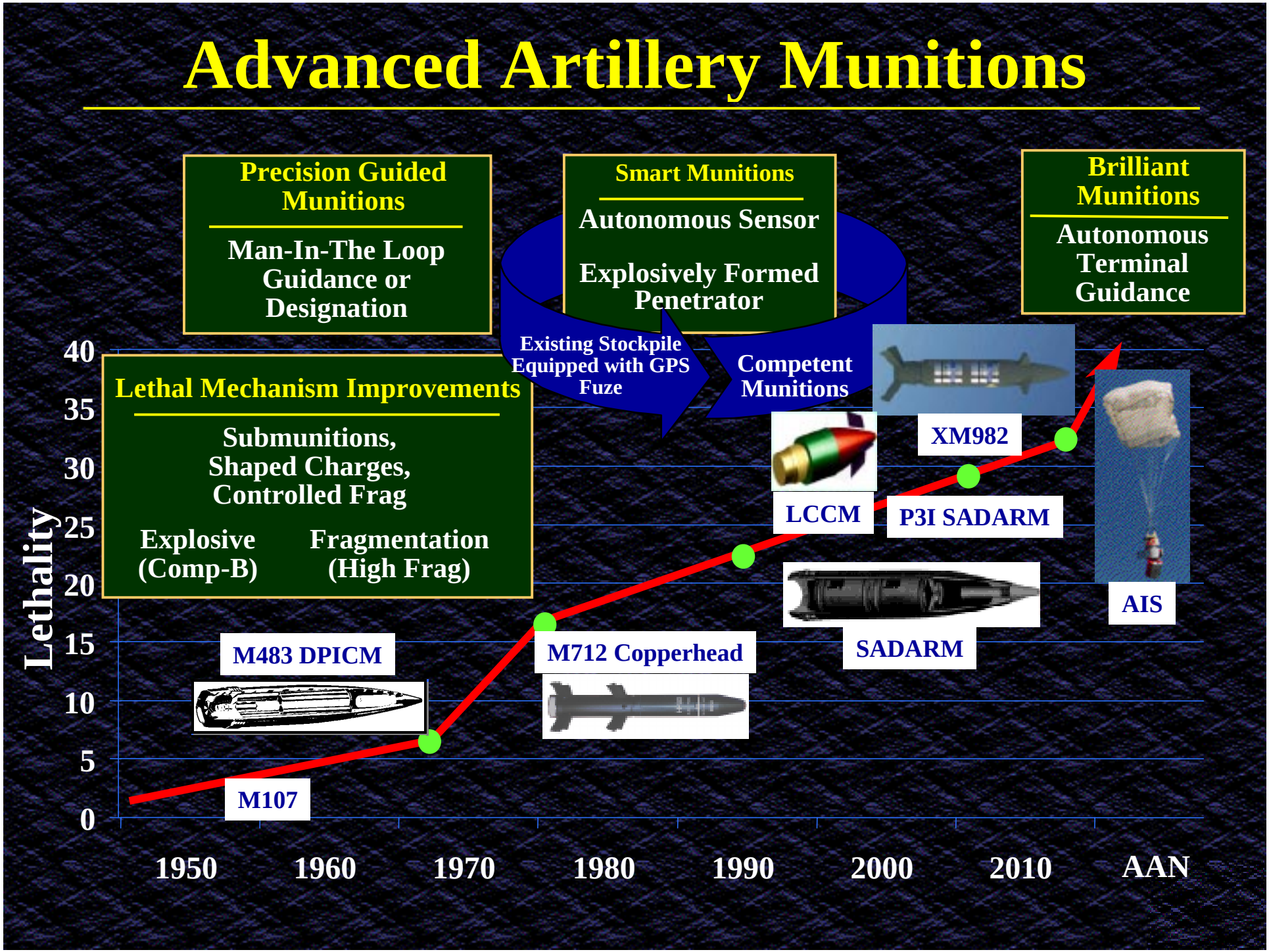
Future Combat Vehicles

- Protection
  - Lightweight Protection Materials
  - Low Observable Technologies
  - Ballistic Crew Protection
  - Active Protection
  - NBC Protection
  - Threat Awareness with 30 km

- Mobility
  - All Terrain Capable
  - Road Speed 120 km/hr
  - Sustained Cross-Country 75 km/hr
  - Operating Range 800-1500 km
  - No More Than 15-20 tons
  - C130 Like Deployable

- Firepower
  - NLOS & LOC Capable
  - Multi-Purpose Munitions
  - Redundant, Long Range Target Detection
  - System Lethality to 50 km
  - Advanced Munitions

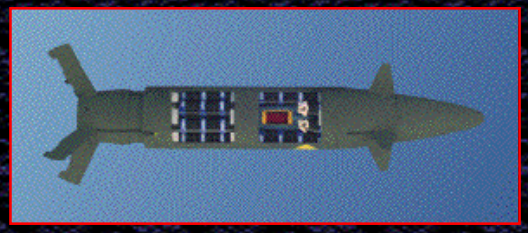
Advanced Artillery Munitions



XM982 Extended Range Artillery

- Fire & Forget
- GPS / IMU Guidance
- Modular Design
  - DPICM
    - Type Classified 4QFY01
  - SADARM
    - Type Classified 4QFY04
  - Unitary
    - Type Classified 4QFY05
- Increased Range
  - Paladin/M198/JLW155: 37 Km
  - Crusader: 50 Km

DPICM

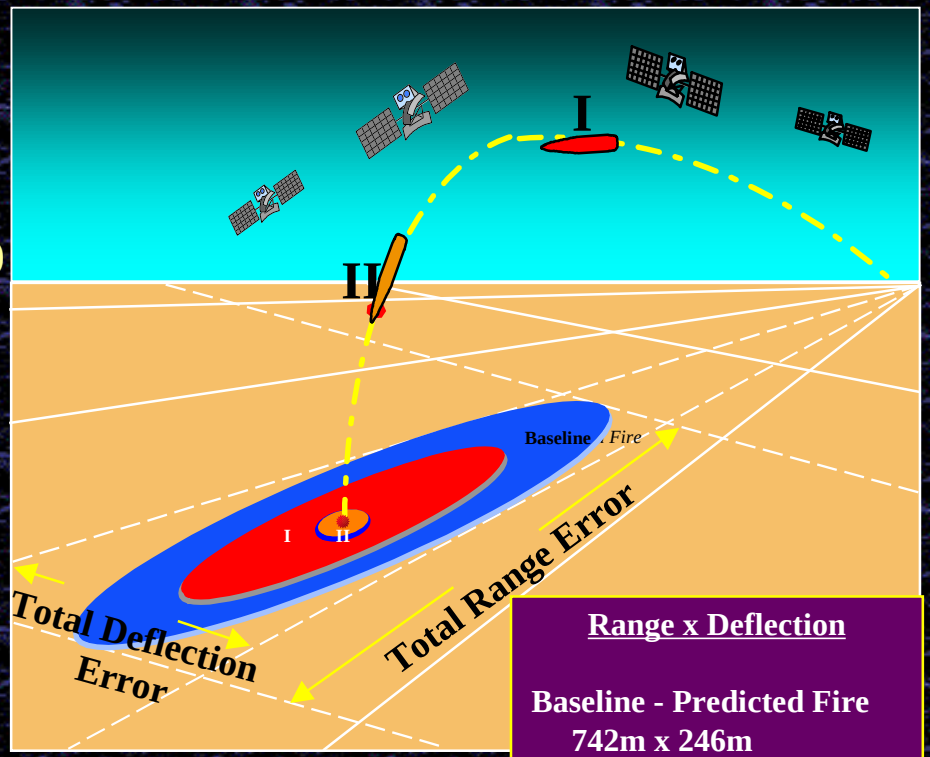


Transitioned to EMD
Contractor Selected:
Raytheon/TI Systems

Will Outrange All World Artillery Systems

Low Cost Competent Munitions

- Low Cost GPS/INS MEMS Technology
- 3 Variants
  - Auto-Registration (Army Lead)
  - Range Correction (UK Lead)
  - Range & Deflection Correction (Navy Lead)
- Increased Firepower
- Dramatic Reduction in Logistics



Range x Deflection

Baseline - Predicted Fire
742m x 246m

I - Auto Registration
518m x 152m

II - Range & Deflection Correction -70m x 56m

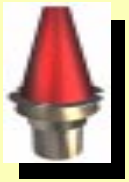
LCCM Concepts

Auto-Registration

GPS Translator Fuze

Provides Accuracy Improvement For All Missions

Self-Correctors



Range Only

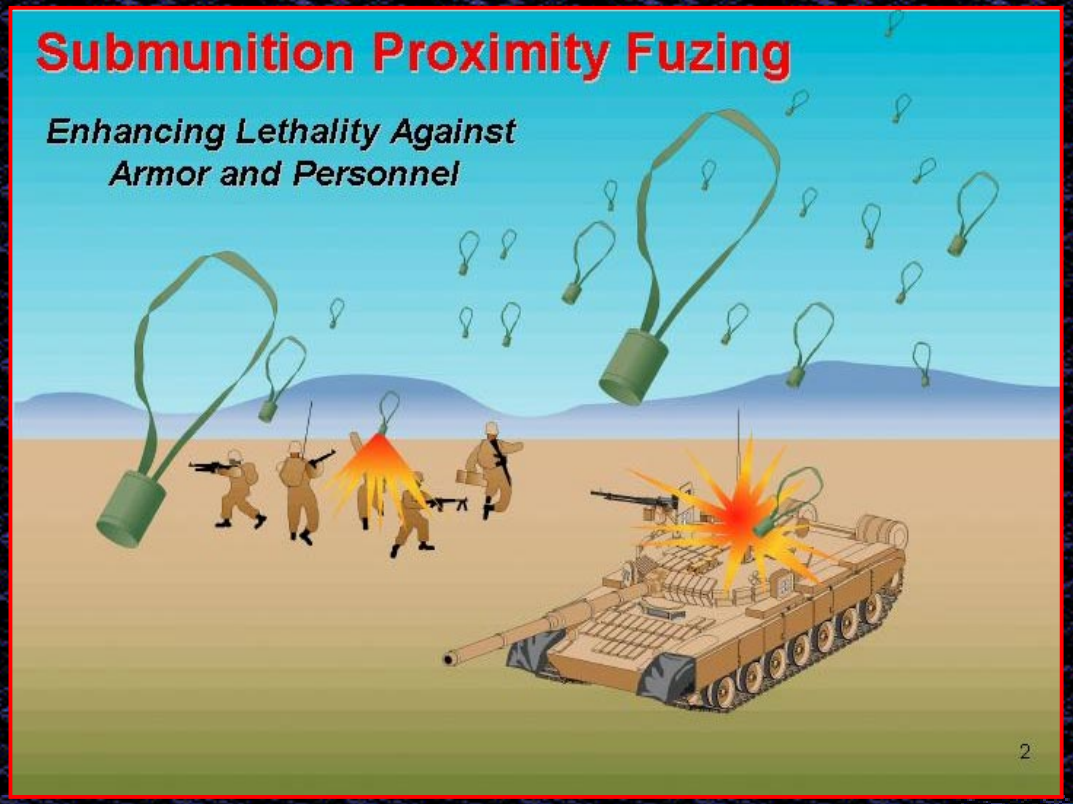
Range & Deflection

Provides Capability For First Round Effects On Target For Missions Requiring Precision Fire

Breakthrough Increase in Accuracy of Current & Future Projectiles

M80 Family of Submunitions

- The M80 Submunition was Developed by TACOM-ARDEC with the M234 SD Fuze for Reduction of Duds
- Army Applications
  - XM982 (155mm)
  - Extended Range MLRS
- Navy Applications
  - ERGM (5 inch)
  - Advanced Gun System



XM782 Multi Option Fuze for Artillery

- Four Function Setting: Prox, Time, PD & Delay
- Simplifies Logistic Burden by Reducing Load Mix Combination
- Supports Crusader Rapid Rate of Fire
- All Functions Auto Settable
- Compatible with Current 105mm and 155mm Projectiles

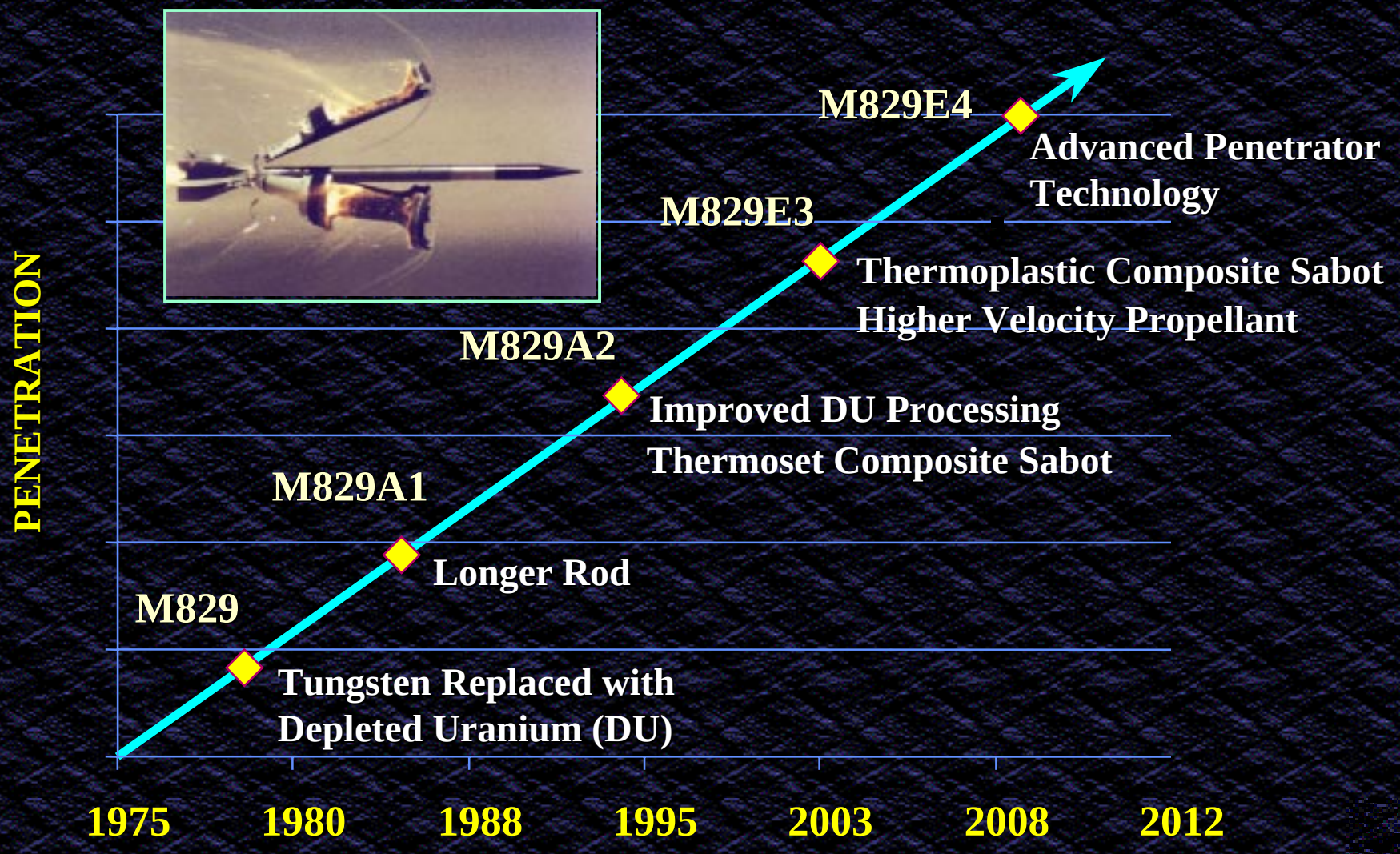
XM782 MOFA

Precision Guided Mortar Munition

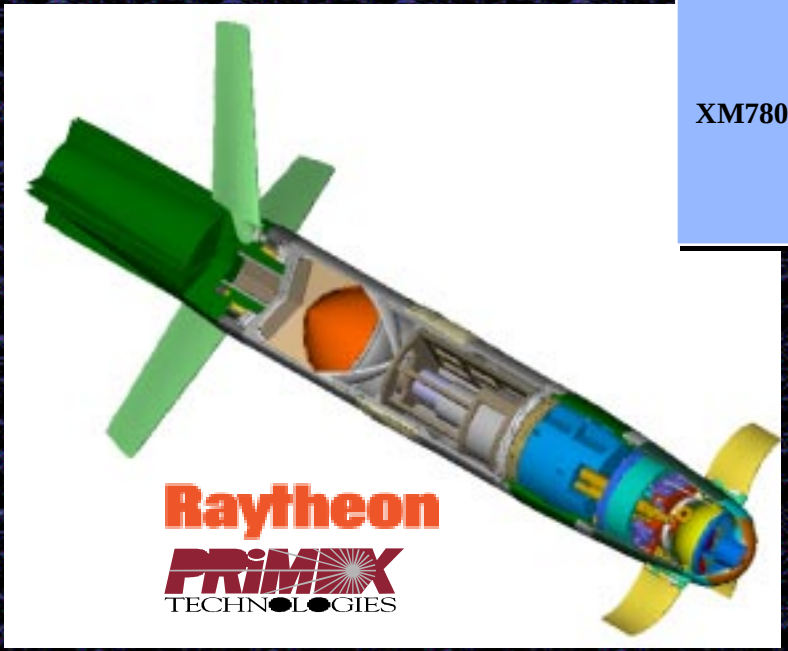
- GPS/INS & Laser Guided Mortar Munition
  - Pinpoint Accuracy
  - 12+ Km Range
- Provides Responsive Standoff Defeat of High Value Targets
- Reduced Collateral Damage
- Improved Survivability and Accelerated Enemy Defeat
- Improved Deployability and Logistics

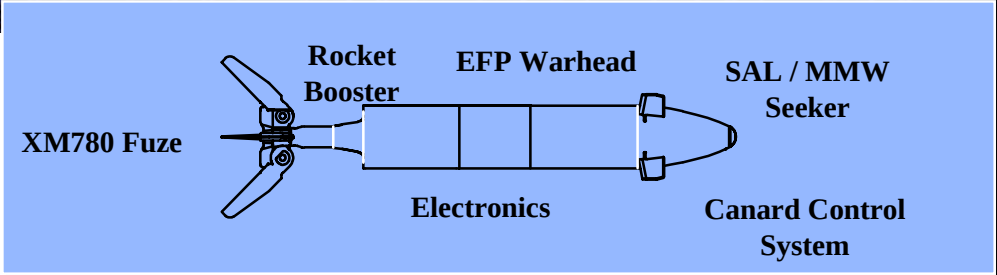
Precision Fire for the 21st Century Infantry

Anti-Armor Lethality



Tank Extended Range Munition (TERM) Concepts

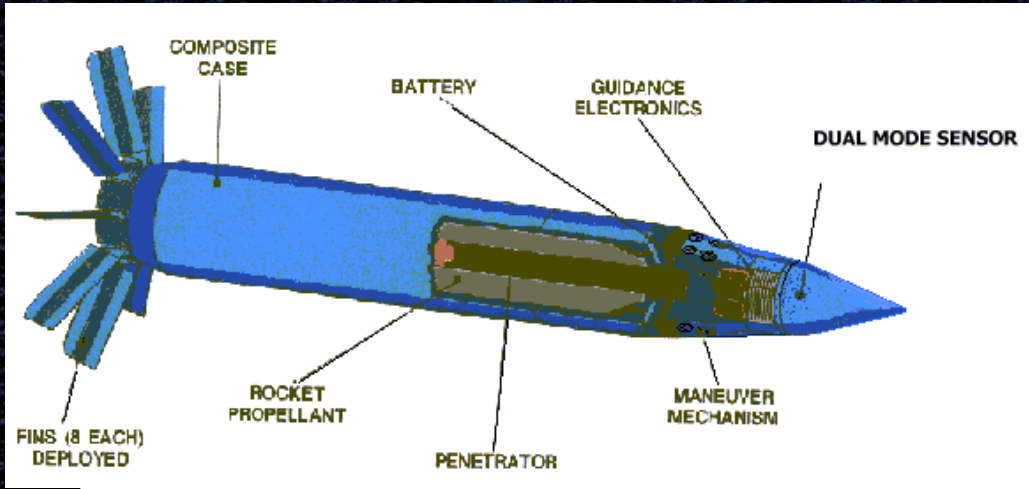




TERM-TA Concept

BOEING

ALLIANTTECHSYSTEMS



ALLIANTTECHSYSTEMS

TERM-KE PROJECTILE DEPLOYED

Objective Crew Served Weapon

- 25mm Airbursting & Armor Piercing Munitions
- Defeats Targets that the 7.62mm M240 and M2 Cannot (Defilade Targets)
- Miniaturized High "G" (105,000 G's) Electronic Time Set Fuzing
- Greater than 60% Reduction in System Weight
- 50% Reduction in Time-of-Flight to Maximum Effective Range vs. 40mm
- Greater than 500% Probability of Incapacitation Increase

Objective Individual Combat Weapon

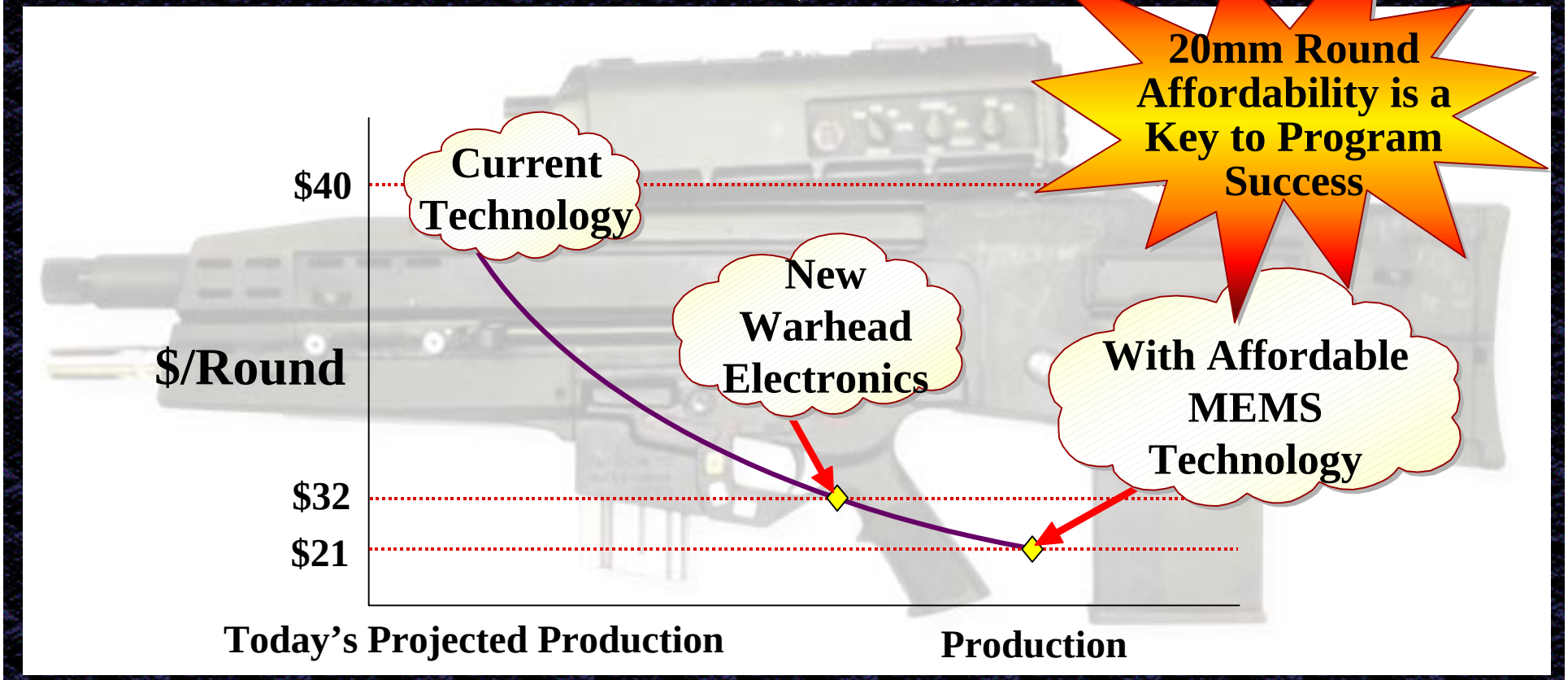
- Dual Capability - 20mm Air Bursting & 5.56 Munitions
- Defeats Targets that the M16 Cannot (Defilade Targets)
- Doubles Stand-Off Range to 1000+ Meters
- > 300% Probability of Incapacitation Increase

Unprecedented Lethality for the Infantry

OICW Video

MEMS
(Micro-Electromechanical Systems)

OICW (20mm)



Dramatic Reduction in Unit Cost with MEMS S&A, Fuze and Integrated Electronics

Fuze Technologies for AAN

- Advanced Sensors and Algorithms
- Guidance Integrated Fuzing
- MEMS Technology for Fuzing Applications
- Miniature Detonators and Initiators
- "Super Hard" Fuzes, to Withstand High Shock Environments
- Compatibility with Electrothermal Chemical and Electromagnetic Launched Munitions
- Miniature Power Sources

Key Fuzing Needs Identified by PMs

	Tech Base	Development
• Inductive Auto-Setting		✔
• Fuzes for Tank Ammo		✔
• Miniaturization (MEMS)	✔	
• Miniaturized Detonators	✔	
• Time Based Fuzes for Med Cal		✔
• Defeat of Air Targets in Clutter		
• Improved Power Sources		
• Prox Fuzes for Med Cal		
• Reduced Voltage ESAs		
• Second Safety Sensors		
• Submunition Prox Fuzing		

✔ Indicates Funded Army Effort

Tech Base
Return on Investments

1970s
IC amplifiers
Inductive Autosetting
Printed Ckt RF
Oscillators

M429
M728
M732
M734
M445

1980s
1-Chip FM-CW Signal Processor
Surface Mount Components
Microprocessor Timer/Controller

M732A2
M762
M74
XM450
M817A1
M818E1

1990s
1-Chip Microwave IC
Miniature Wide Band Antennas
Digital Signal Processing
Custom ASICs

XM773(MOFA)
XM782(MOFA)
M734A1

2000s
MMW, Optical, ESS Sensors
Low Energy Electronic S&A
MEMS Components

Tank Ammo
Future Arty Fuzes
WAM P3I
Adv Mortar Ctgs
Rocket Fuzes

An Investment in Fuze Technology Allows Transition of Critical Technology Into Advanced Munitions Systems

Summary

- ARDEC's Strategic Plan Will Support Force XXI and Army After Next
- Future Armaments Must Provide Increased Lethality and Performance While Maintaining Affordability
- Fuzes Key to Realization of this Goal
- Future Fuzes Will Require Pursuit of Critical Enabling Technologies

ZACOM

Mobility and Firepower for America's Army

Picatinny Arsenal -- USA

Weapon Systems for Today's & Tomorrow's Battlefield

ARMY XXI

ARMY AFTER NEXT

Leveraging the Information Age to Win the Battle

Postured for the Future

- Lethality to the Troops
- Technology Transitions
- Partnering w/ Industry/Academia
- Focused, Well Trained Workforce
- Unique Facilities
- Aggressive Leveraging
- Customer Focused

Overwhelming Firepower for Decisive Victory