Precision Guided Missiles and Rockets Program Review

Presented to

PRECISION STRIKE ANNUAL PROGRAMS REVIEW

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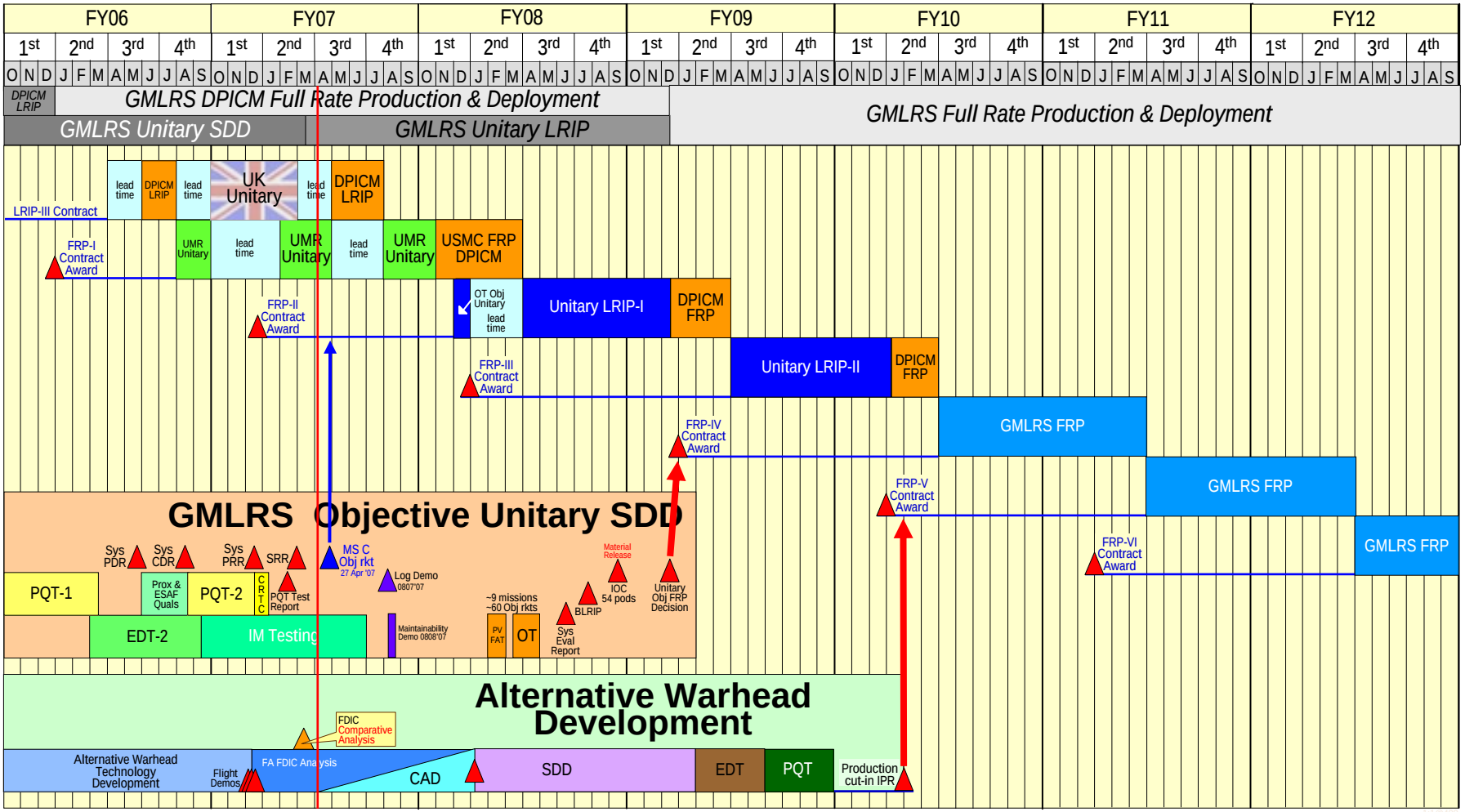
ANY SOLDIER, ANYWHERE, ALL THE TIME

GMLRS Agenda

- GMLRS Program Review
  - Program Schedule/Evolution
  - GMLRS DPICM
  - GMLRS Unitary
  - Alternative Warhead Program
  - Operational Update
- ATACMS Program Review
  - Program Schedule/Evolution
  - ATACMS Unitary
  - Operational Update

Guided MLRS Rockets

GMLRS Program Schedule

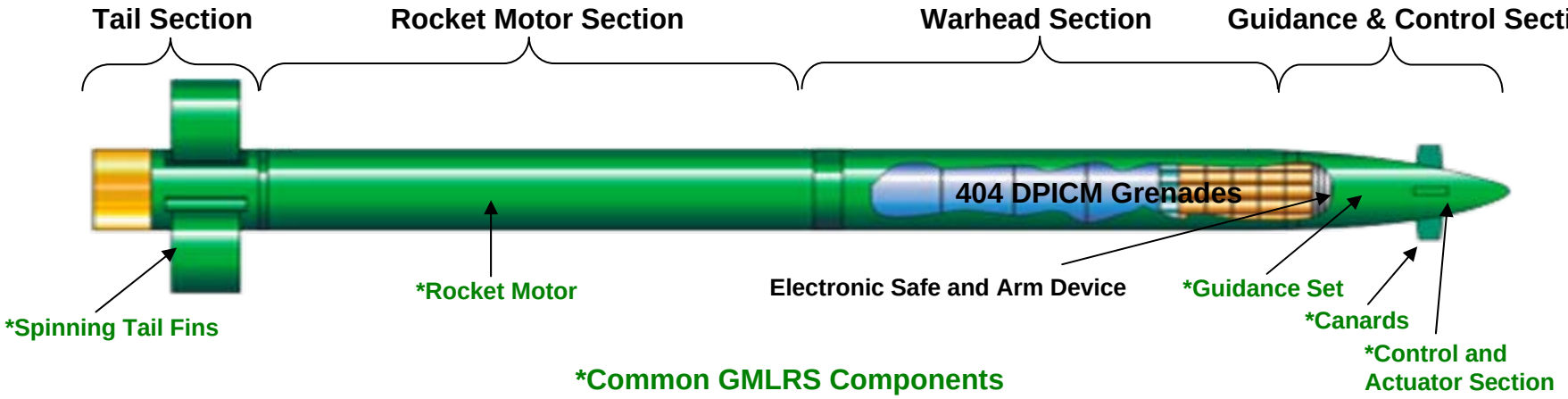


as of 050605Apr07

MLRS / GMLRS History and Evolution

User Requirements	Basic Rocket (M26)	Extended Range Rocket (M26A1 / A2)	Guided Rocket DPICM (M30)	Guided Unitary Rocket-UMR (XM31)	Guided Unitary Rocket (XM31E1)
• Range	32 km	45 km	70 km	70 km	70 km
• Precision / Accuracy	Free Flight Rocket	No Load Detent	Inertial Measurement Unit (IMU) / Global Positioning System (GPS) Aided	IMU / GPS Aided	IMU / GPS Aided
• Flexibility	—	Deeper Targets Farther Laterally "General Support (GS)" Mission	Deeper Targets Farther Laterally "GS-Reinforcing" Mission	Deeper Targets Farther Laterally "GS-Reinforcing" Mission	Deeper Targets Farther Laterally "GS-Reinforcing" Mission
• Payload	644 Dual Purpose Improved Conventional Munition (DPICM) M77 Grenades	518 DPICM M77 Grenades	404 DPICM M101 Grenades	Unitary with Dual Mode Fuze	Unitary with Multi-Option (Tri-Mode) Fuze
• Maneuver Safety	5% Dud Rate	4% Dud Rate / < 1% with M101	Threshold: < 2 / 4% Dud Rate Objective: 0% Dud Rate	NA	NA
• Targets	Soft	Soft	Soft	Hard Stationary Point Targets Collateral Damage Sensitive Soft Area Targets	Hard Stationary Point Targets Collateral Damage Sensitive Soft Area Targets
• Survivability	—	Set Back	Set Back Dwell Time	Set Back Dwell Time	Set Back Dwell Time
• Current Inventory	368,848	4,110	1,518	678	0

GMLRS DPICM Overview



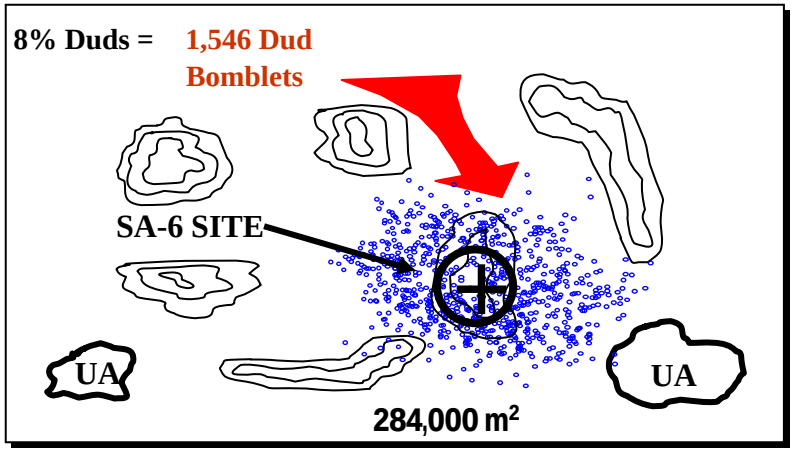
CHARACTERISTICS

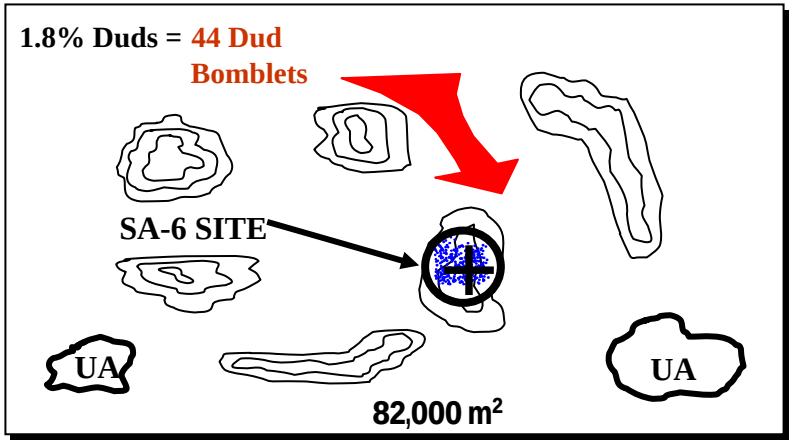
- *Range - 70 Km*
- *Effectiveness - 30% Expected Fractional Damage*
- *Rocket Reliability: Threshold: 92%; Objective 95%*
- *Guidance - Inertial GPS Aided*
- *All Weather; Day/Night*
- *Immediate Response*
- *<2% Hazardous Dud Rate*
- *Launched From M270A1 or HIMARS*

Weight at Launch	668 lbs
Weight at Burnout	401 lbs
CG (X) at Launch	7" 2"
CG (X) at Burnout	5" 11"
Length	12"11"
Diameter	9"

GMLRS DPICM
Increased Effectiveness

- Increase Effectiveness Against Counterstrike and Other Target Sets Through Greater Range and Precision
- Decrease Logistics Throughput Per Target (Reduced Expenditure)
- Mitigate Shelf Life Issue of M26 Stockpiles
- Reduce Unexploded Ordnance





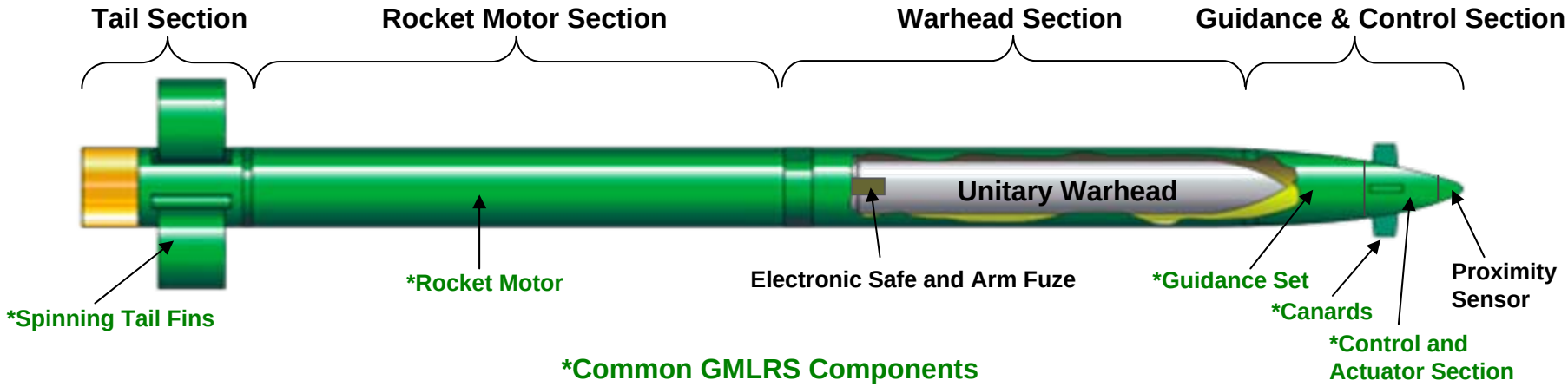
M26	(32km)	75 rockets	6 launchers – 19min, 1 M270A1 Reload = 1 Battery
M30	(60+km)	15 rockets	2 launchers – 2min, No M270A1 Reloads = 1 Platoon (-)

(Data taken from DOTE BLRIP Report 19 May 2005)

72 % Reduction in Hazardous Area

99% Reduction in Duds Per Target

GMLRS Unitary System Overview

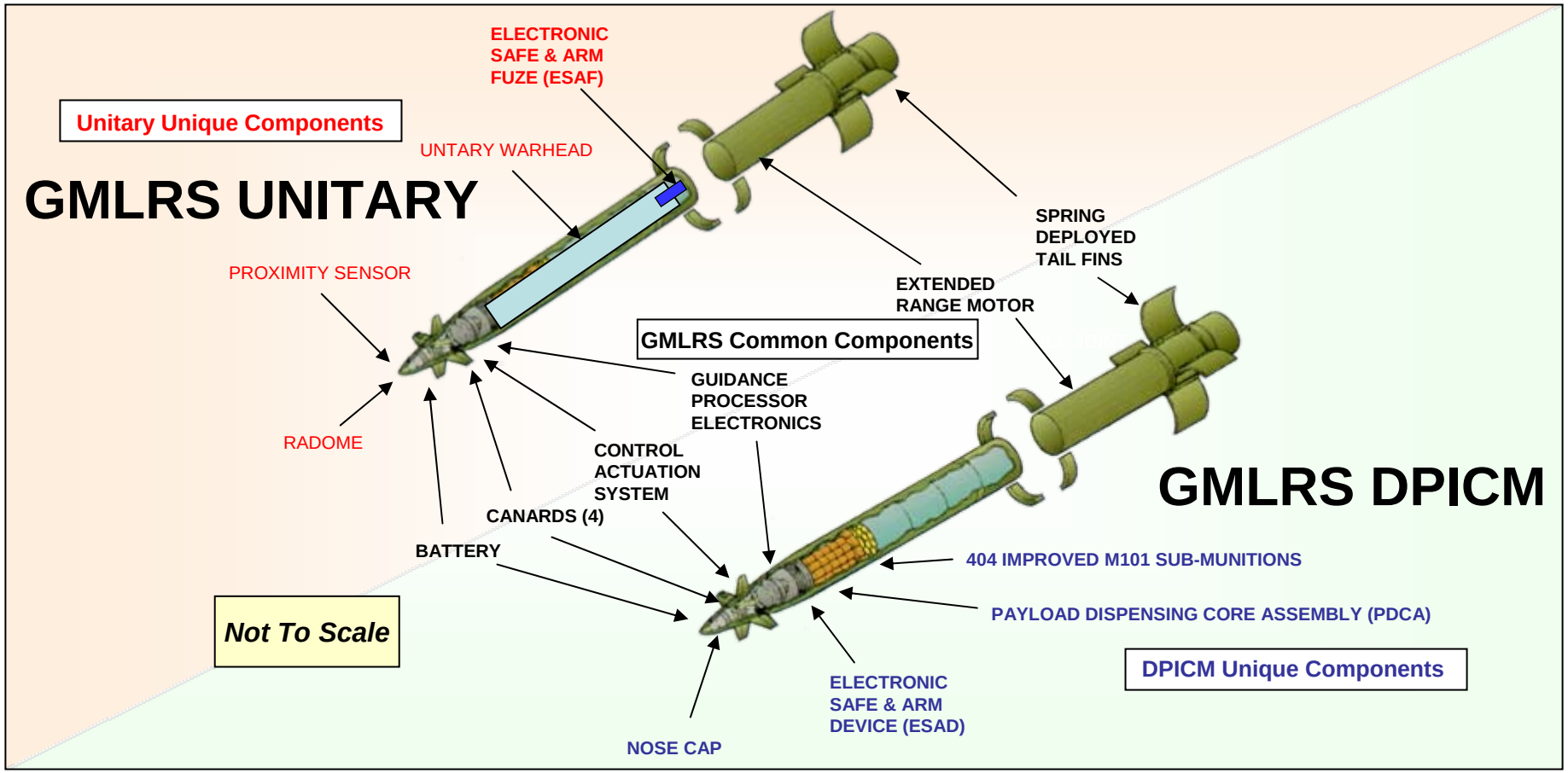


CHARACTERISTICS

- 80% Commonality of Components With GMLRS DPICM
- Additional Commonality With GMLRS Unitary UMR Rocket Currently In Production and Employment
- Launchers - HIMARS or M270A1
- Range - 70 Km
- All Weather; Day/Night
- Accuracy - Less than 5 meters Circular Error Probability (CEP)
- Guidance System (GS) - Contains Inertial Measurement Unit with GPS Updates
- Control Actuation System (CAS) - Commands Canard Steering
- Payload – 200 lb Class Unitary Warhead
- Tri-Mode Fuze: Point Detonate, Delay, Proximity
- Rocket Motor – Arcadene 361 HTPB (260.5 lbs) Propellant With Steel Case
- Spinning Tail Fins / Roll Joint Assembly - Decouples Rocket Roll from the GS
- Electronic Safe and Arm Fuze (ESAF) - Initiates Warhead

Weight at Launch	668 lbs
Weight at Burnout	401 lbs
CG (X) at Launch	7" 2"
CG (X) at Burnout	5" 11"
Length	12"11"
Diameter	9"

GMLRS Commonality



Alternative Warhead
The GMLRS DPICM Problem

The Dual Purpose Improved Conventional Munitions (DPICM) Problem

- *Unexploded Ordnance (UXO)*
- *Insensitive Munitions (IM) Performance*
- *Collateral Damage*

Background

- *GMLRS DPICM meets the ORD lethality requirements*
- *DOD UXO goal is a 99% or higher functioning rate (<1% residual grenades)*
  - *GMLRS DPICM demonstrated 2% UXO at most ranges; 4% UXO at extreme long and short ranges*
  - *With a 1% dud rate, for every DPICM fired (404 grenades), 4 unexploded grenades remaining on the battlefield pose a hazard to friendly troops and non-combatants and are also available for possible enemy conversion into IEDs.*
- *GMLRS DPICM has a Type I IM reaction (Type V is the goal)*
  - *IM compliance is a statutory requirement "where practicable"*
  - *IM waivers from the JROC are required on an annual basis*
- *CENTCOM Rules of Engagement governing the prevention of collateral damage do not allow employment of DPICM rockets in Iraq or Afghanistan*

GMLRS Alternative Warhead Background

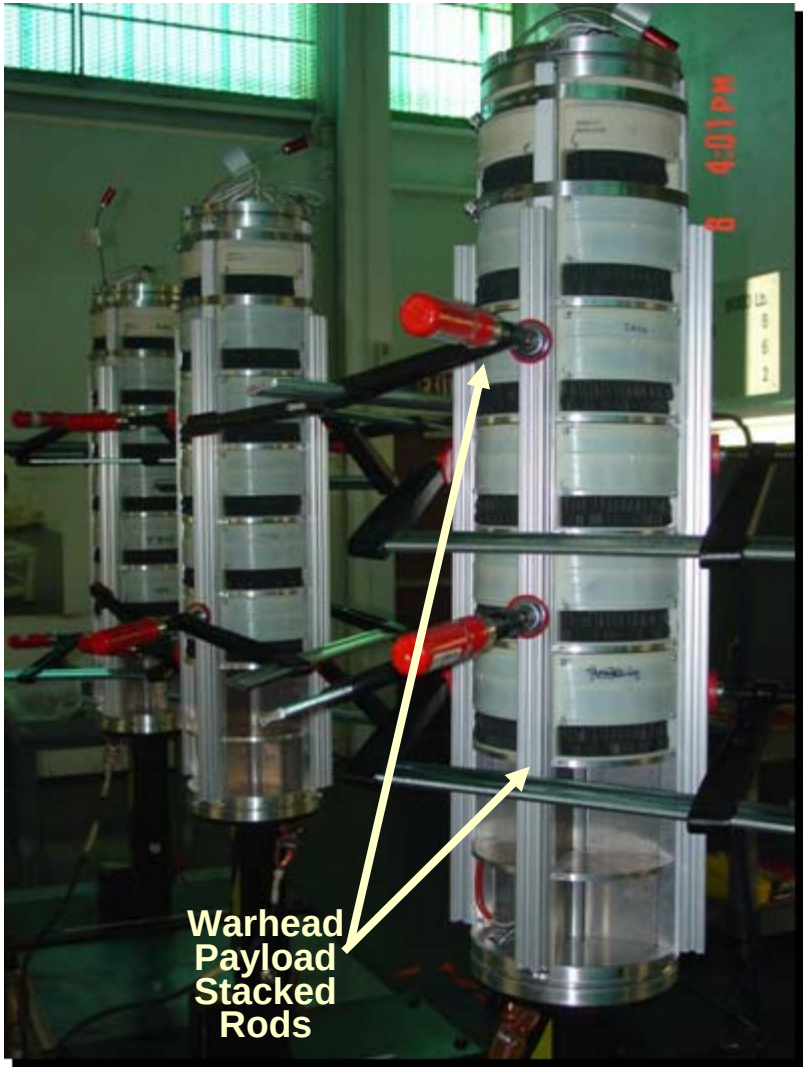
1) The current GMLRS DPICM is not UXO or IM compliant.
   - GMLRS DPICM does meet the UXO Threshold Requirement
   - GMLRS DPICM currently has an IM waiver.
2) AMRDEC completed the KE Rod technology development (the first Alternative warhead candidate) and successfully demonstrated it at WSMR Dec ’06.
3) The USG’s preliminary Business Case Analysis shows the KE Rod as a cost effective material change to the currently fielded DPICM grenade.
4) Ft. Sill is conducting an Alternative Warhead comparative analysis—between the KE Rod and the currently fielded DPICM
   - Alternative Warhead candidates must meet same operational requirements as DPICM

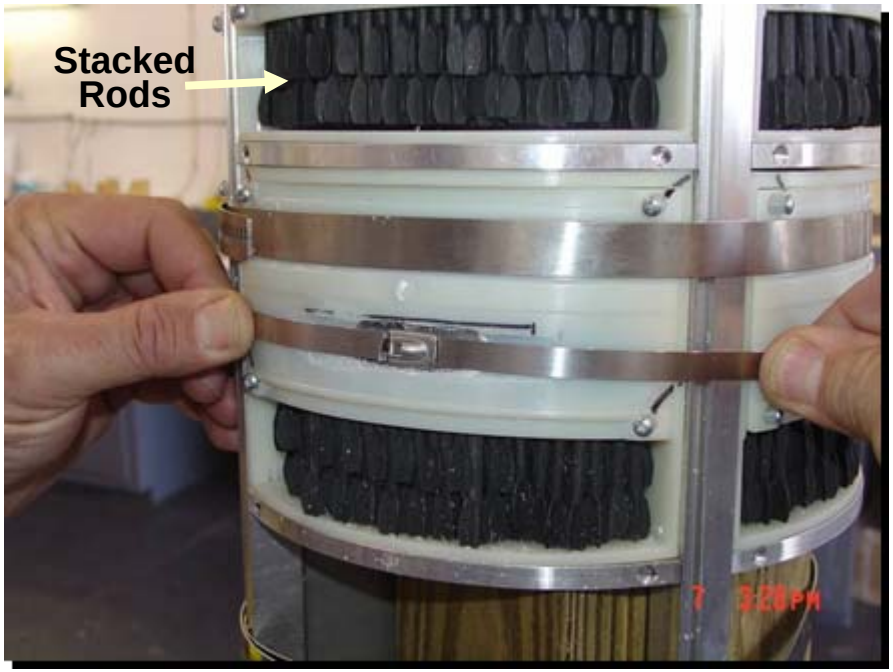
Alternative Warhead
Program Description

Provide a cost effective solution to these three requirements:

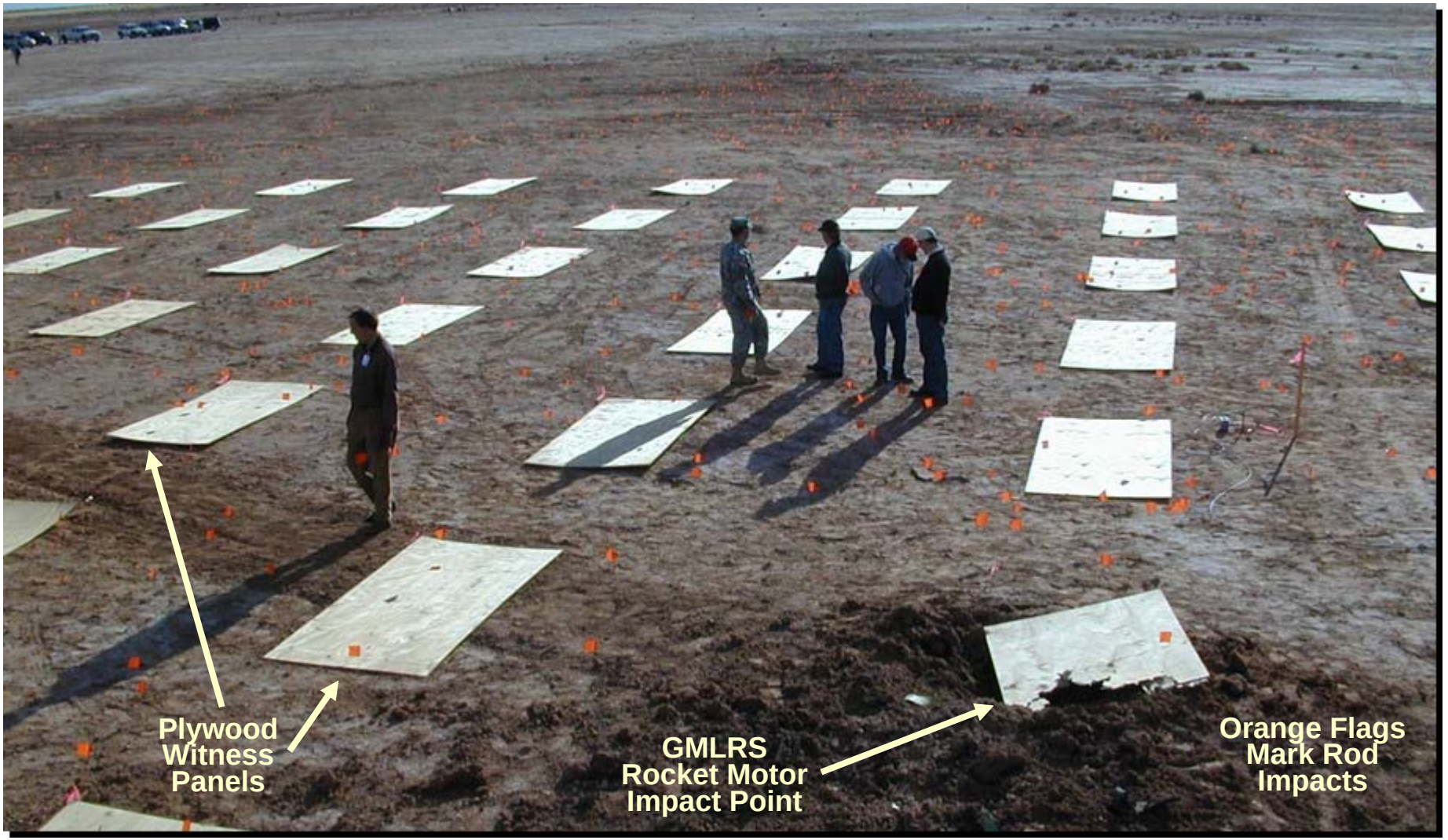
- ***Unexploded Ordnance (UXO):***
  - ***Currently fielded DPICM meets ORD threshold requirement; average dud rate <2% between 20-60km (<4% between 15-20km and 60-70km)***
  - ***Objective ORD requirement for zero duds remaining on the battlefield***
  - ***Some AOs (Korea) accept the threshold capability; others (Middle-East) will not field munitions with less than the objective capability***
- ***Insensitive Munitions (IM):***
  - ***Currently fielded DPICM is classified as a Type I munition; the goal is either Type IV or Type V***
  - ***Implementing the IM fill in the DPICM improves its IM rating to Type III***
  - ***The KE Rod is completely insensitive with a Type V IM rating***
  - ***A Type V Warhead IM rating will not improve the GMLRS system IM rating beyond a Type III rating—the rocket motor is most critical IM component in the GMLRS rocket***
- ***Collateral Damage:***
  - ***Dispense techniques to reduce chances of collateral damage beyond the specified impact zone***

Kinetic Energy Rods
WSMR, Dec '06 Demo





KE Rod Dispersion
WSMR, Dec '06 Demo



GMLRS Operational Update

163 TOTAL ROCKETS FIRED AS OF 4 MARCH 2007

Who uses GMLRS Unitary:

Army	**25**	**15.3%**
Marines	**121**	**74.2%**
Special Operations Forces	**17**	**10.4%**

How GMLRS Unitary is employed:

Troops In Contact	**126**	**77.4%**
Pre-Planned	**37**	**22.6%**

Environments GMLRS-Unitary is employed:

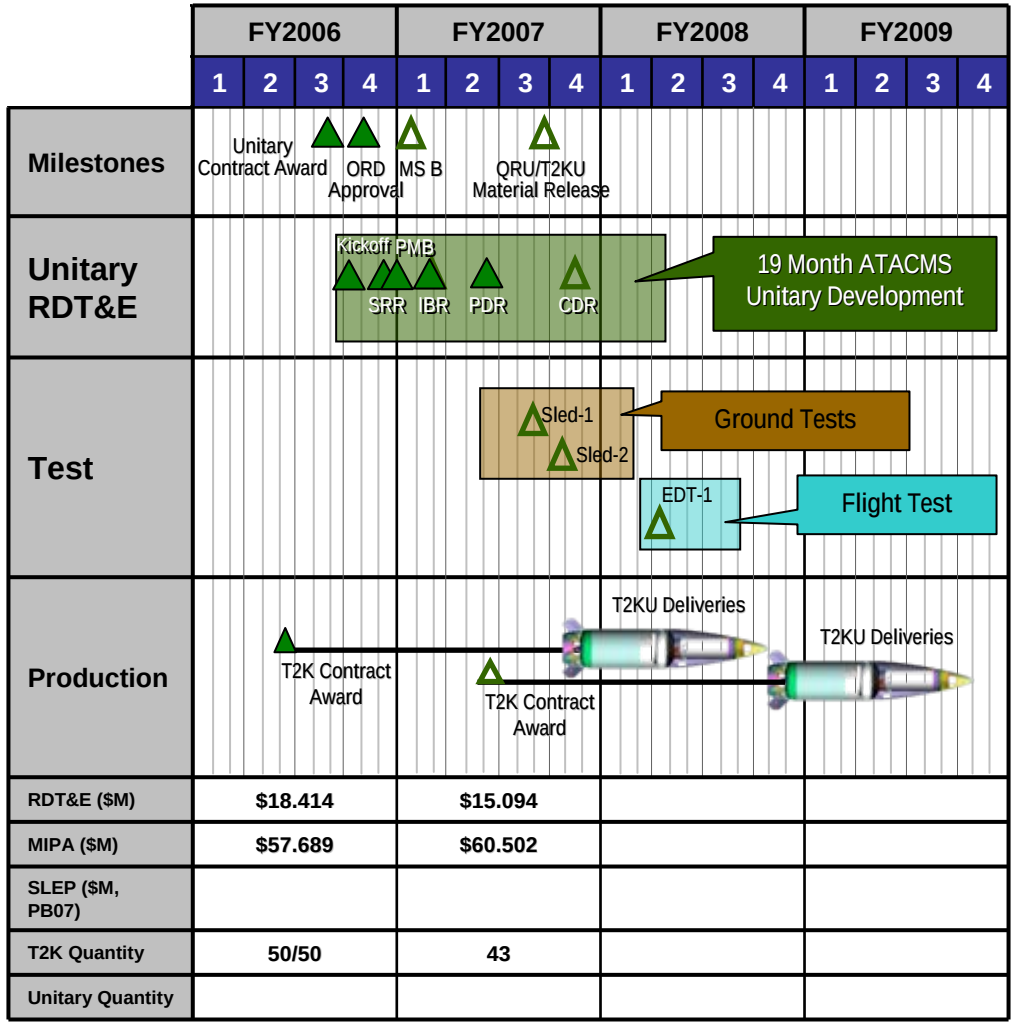
Urban/ Counter Insurgency	**136**	**83.4%**
Other (Training/Test)	**27**	**16.6%**

160 / 163 = 98.15 Reliability

GMLRS Operational Video

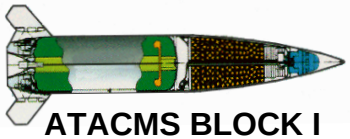
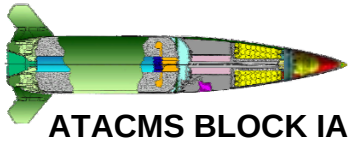
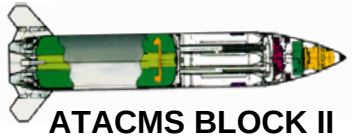
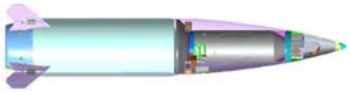
Army Tactical Missile System

ATACMS Program Schedule

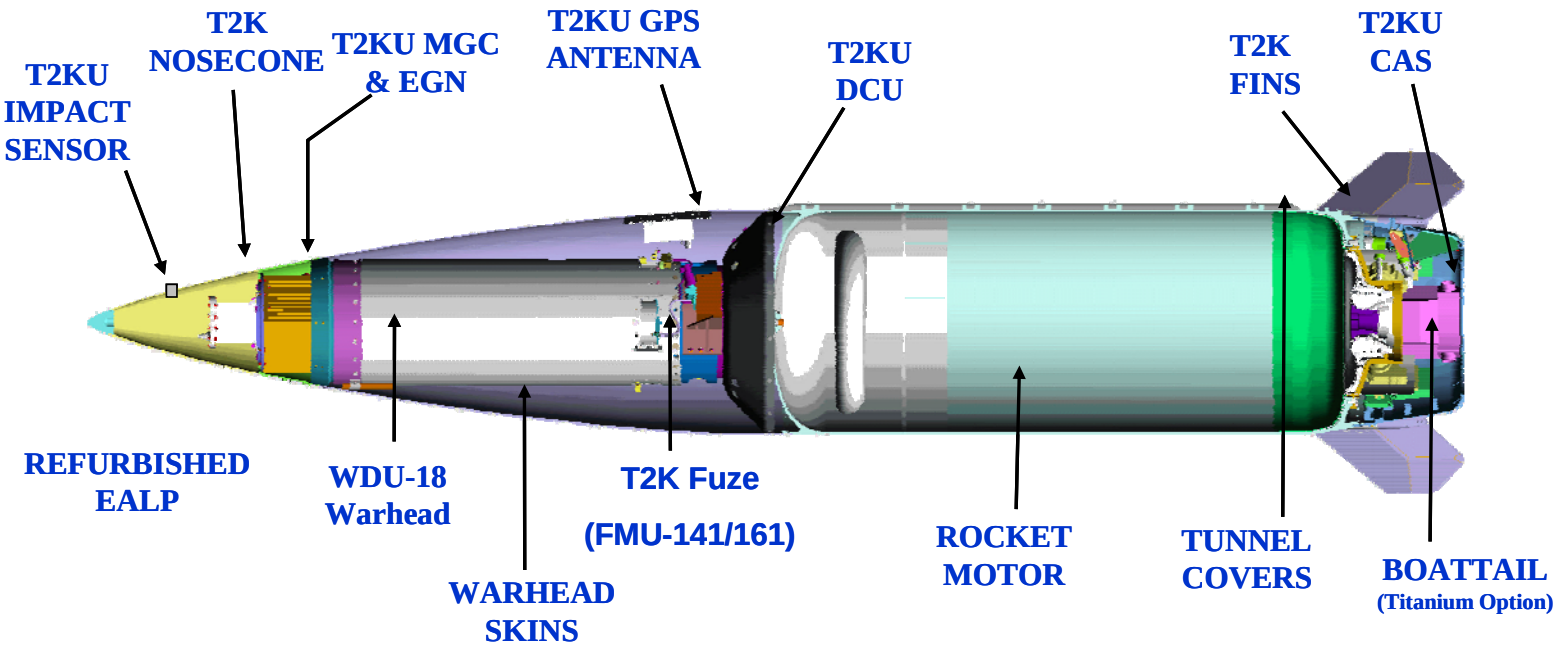


RDT&E ($M)	$18.414	$15.094		
MIPA ($M)	$57.689	$60.502		
SLEP ($M, PB07)				
T2K Quantity	50/50	43		
Unitary Quantity				

ATACMS Family Of Munitions

Variant	Nom.	Navigation	Mission	Munition	Range	Production
 ATACMS BLOCK I	M39	Inertial Guidance (MGS)	Area Weapon System (APAM)	950 M74 Submunitions	Min – 25 km Max – 165 km	FY90-FY96 1076 Units in Inventory
 ATACMS BLOCK IA	M39A1	GPS Aided Inertial Guidance	Area Weapon System (APAM)	300 M74 Submunitions	Min – 70 km Max – 300 km	FY97 – FY03 488 Units in Inventory
 ATACMS BLOCK II	M39A3	GPS Aided Inertial Guidance (MGS II)	Area Weapon System (Weapon Systems)	13 BAT Smart Submunitions	Min – 35 km Max – 145 km	FY02-FY04 75 Units in Inventory
 ATACMS QRU	M48	GPS Aided Inertial Guidance (MGS II)	Precision Point	WDU - 18 Unitary Warhead, FMU-141/B PD Fuse	Min – 70 km Max – 270 km	FY01-FY03 153 Units in Inventory
 ATACMS T2K	M57	GPS Aided Inertial Guidance (T2K)	Precision Point (near vertical engagement)	WDU - 18 Unitary Warhead, FMU-161/B PD Fuse	Min – 70 km Max – 270 km	FY03-FY10 169 Produced 141 at Depot
 ATACMS Unitary		GPS Aided Inertial Guidance (T2K)	Precision Point Air Burst Delay	WDU - 18 Unitary Warhead, FMU-161/B Tri-mode Fuse	Min – 70 km Max – 300 km	

Army TACMS T2K Unitary M-57



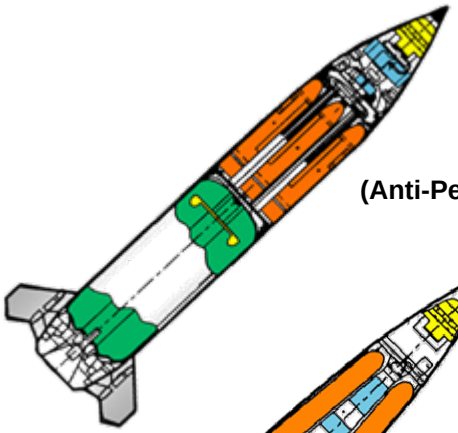
CHARACTERISTICS

- Launchers - HIMARS or M270A1
- Range - 70 Km Minimum / 270 Km Maximum
- All Weather; Day/Night
- Accuracy - Less than 9 meters Circular Error Probability (CEP)
- Guidance System (GS) - Contains Inertial Measurement Unit with GPS Updates
- Control Actuation System (CAS) - Commands Canard Steering
- Payload – 500 lb Class Unitary Warhead
- Tri-Mode Fuze: Point Detonate, Delay, Proximity

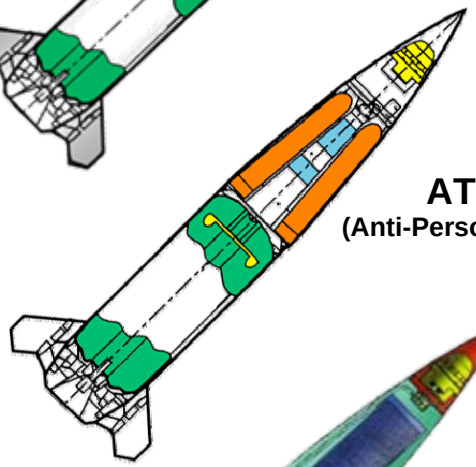
Army Tactical Missile System (ATACMS) in Operation Iraqi Freedom (OIF)

- Fired over 450 ATACMS in support of Operation Iraqi Freedom
- Over 290 ATACMS were fired during the first two days of OIF
- Majority of the missions were Joint Suppression of Enemy Air Defense (SEAD) and Destruction of Enemy Air Defense (DEAD)
- Joint Force with targeting & surveillance Assets
- 3ID fired ATACMS laterally in support of the 1st Marine Expeditionary force (MEF)
- High Mobility Artillery Rocket System (HIMARS) launchers fired 40 ATACMS in close support of small maneuver units in Western Iraq
- ATACMS missiles with Unitary warheads continue to support provide precise, long-range, low collateral damage attack of high payoff targets in support of the Global War on Terror

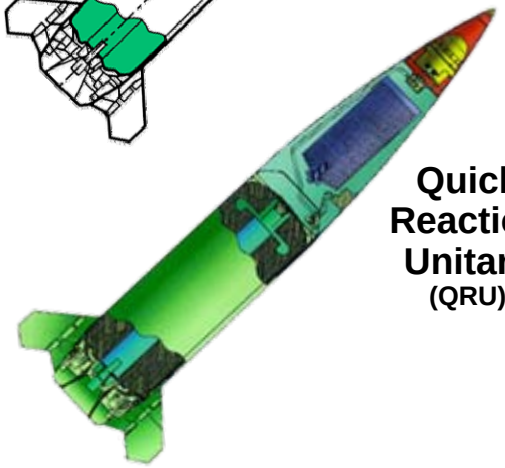
Operation Iraq Freedom ATACMS Expenditures



ATACMS I
(Anti-Personnel/Anti-Materiel)



ATACMS IA
(Anti-Personnel/Anti-Materiel)



Quick Reaction Unitary (QRU)

Quantity Fired

ATACMS I	**371**
ATACMS IA	**69**
QRU	**13**

ATACMS Video

Summary

- GMLRS And ATACMS Provide the Warfighter An Unprecedented Capability That is Proven in Combat
- GMLRS Unitary Continues To be Used In Current Operations
- GMLRS DPICM And Unitary Production Deliveries Ongoing
- GMLRS Unitary To Enter Full Rate Production In 2009

Contact Information

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Acronyms

AMRDEC – Aviation and Missile Research and Development Center
ATACMS – Army Tactical Missile System
CENTCOM – U.S. Central Command
DOD – Department of Defense
DPICM – Dual Purpose Improved Conventional Munitions
GMLRS – Guided Multiple Launch Rocket System
HIMARS – High Mobility Artillery Rocket System
IED – Improvised Explosive Device
IM – Insensitive Munitions
JROC – Joint Requirements Oversight Council
KE Rod – Kinetic Energy Rod
MIPA – Missile Production Allocation
RDT&E – Research, Development, Test and Evaluation
SLEP – System Life Extension Program
UXO – Unexploded Ordnance