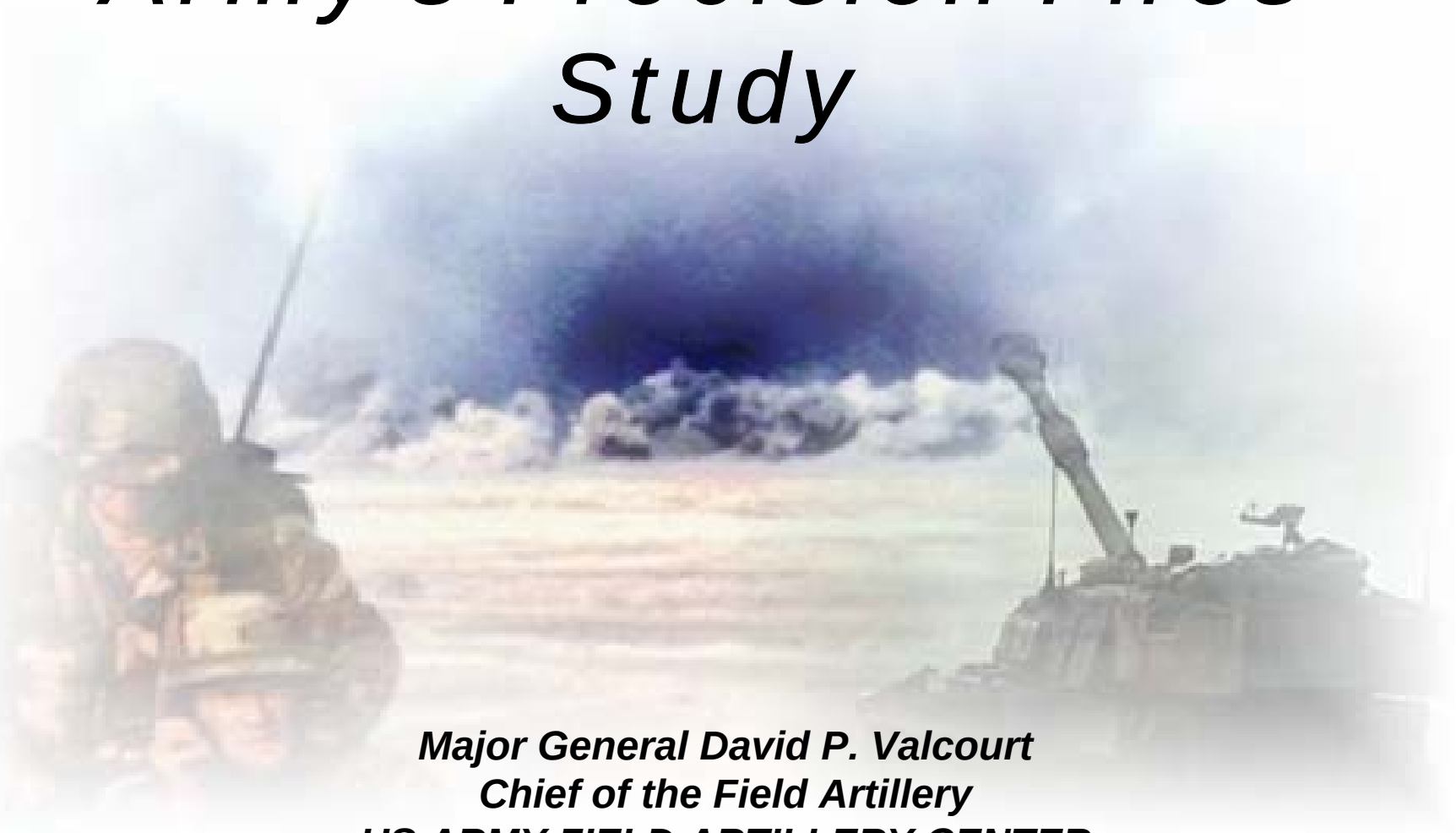
Army's Precision Fires Study



Major General David P. Valcourt
Chief of the Field Artillery
US ARMY FIELD ARTILLERY CENTER
FORT SILL, OK

Create the Thunder

Transforming Army Indirect Fires

- Robust mix of fire support systems is required to address the full spectrum of requirements and mitigate against surprise
- Volume, precision, responsiveness (24/7, all weather, all terrain), and range remain critical attributes of a fire support system
- Networked and precision fires offer opportunity to disrupt/destroy enemy capabilities at extended ranges and with greater precision

Networked through battle command
Fully interoperable with Joint systems
Mobile (strategic and tactical)
Fully integrated with maneuver
Lethal (through precision and volume)
Precise effects with area options
Reduced logistics
Ability to mass effects
24/7, all weather, all terrain

To achieve Destructive, Suppressive and Protective effects while minimizing collateral damage and taking advantage of emerging technology

Create the Thunder

Must Deliver Precision Effects . . .

Capability to rapidly and accurately locate and attack targets with the required operational responsiveness matched to desired effects (lethal and non-lethal) and the greatest efficiency.

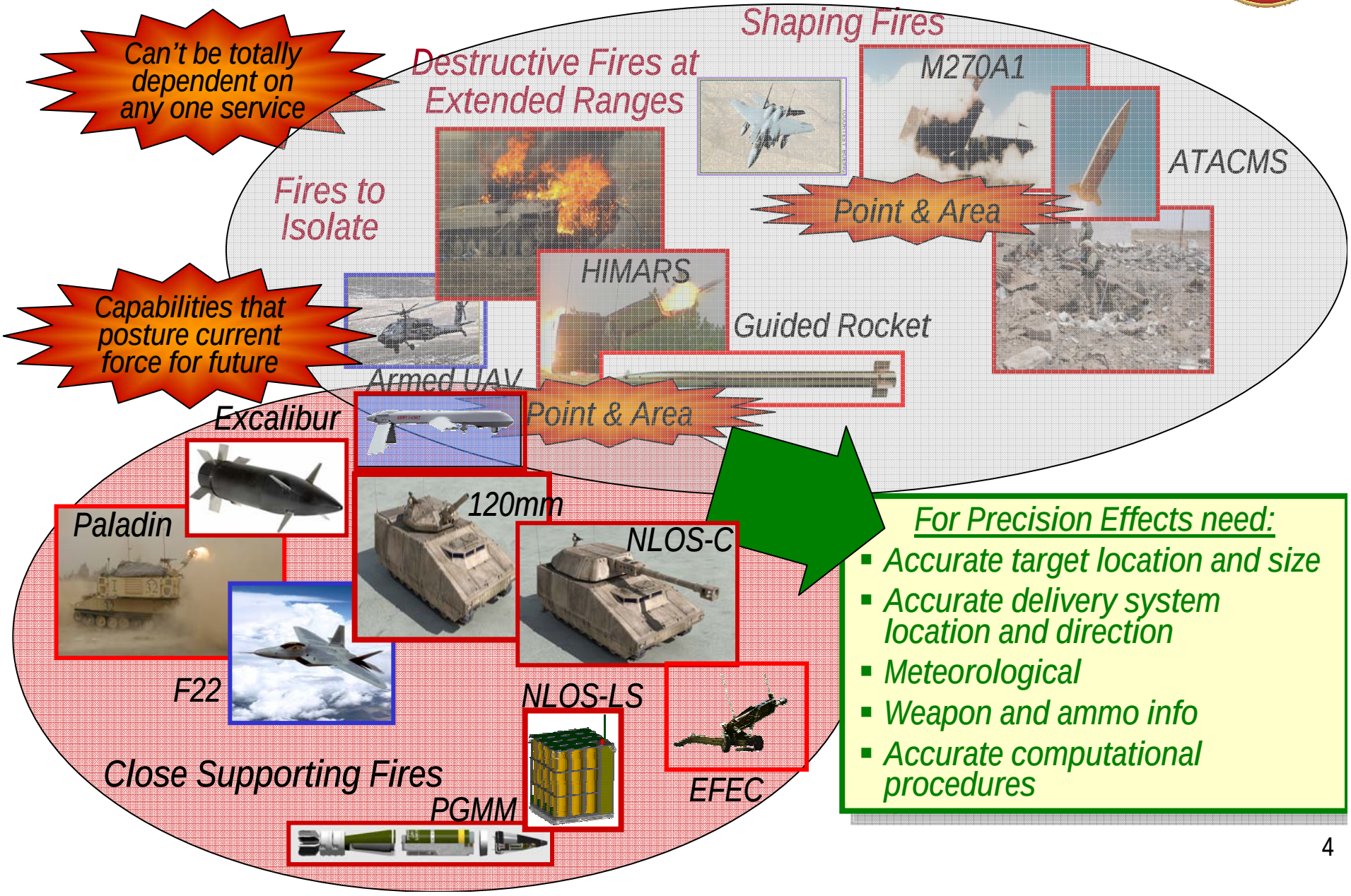
Must have these for Precision Effects:

- *Accurate target location and size*
- *Accurate delivery system location and direction*
- *Meteorological*
- *Weapon and ammo info*
- *Accurate computational procedures*

Create the Thunder

. . . to be Relevant and Ready

JFC Needs a Variety of Capabilities



For Precision Effects need:

- Accurate target location and size
- Accurate delivery system location and direction
- Meteorological
- Weapon and ammo info
- Accurate computational procedures

Missiles & Rockets

RESPONSIVE LONG RANGE FIRES FOR THE JFC COMMANDER

- ✓ **Organic fire support directly responsive to the JFC commander**

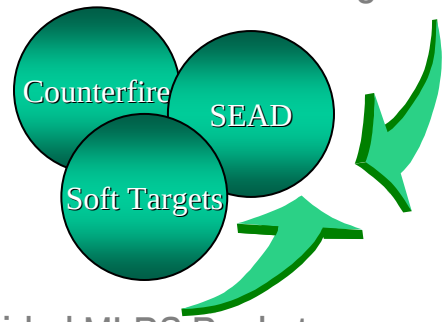
- ✓ **Optimal platforms for engagement ~ 300km**
- ✓ **All weather / all environments**

- ✓ **Precise & smart munitions**
- ✓ **ADA threat irrelevant**
  - ***Highly effective in SEAD role***
  - ***ATACMS – QRU: Command Posts***
- ✓ **High volume continuous fires**
- ✓ **Direct, digital linkage with sensors**
  - ✓ **Rapid fires against fleeting targets**
  - ✓ **Effectively engage nK arty system in 3-5 minute window of vulnerability**
- ✓ **Pilots not placed over targets … *rockets and missiles are unmanned systems***
- ✓ **Fires available to the joint force commander where and when they are needed**

Create the Thunder

MLRS Rocket Transition

Basic & Extended Range Rocket

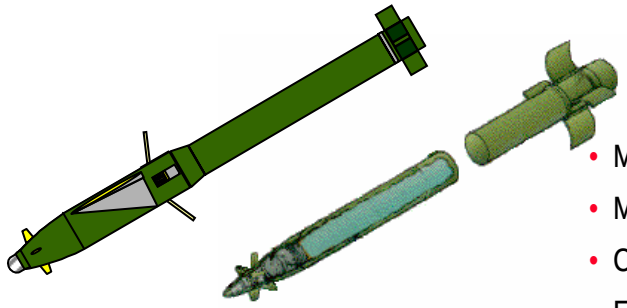


Guided MLRS Rocket

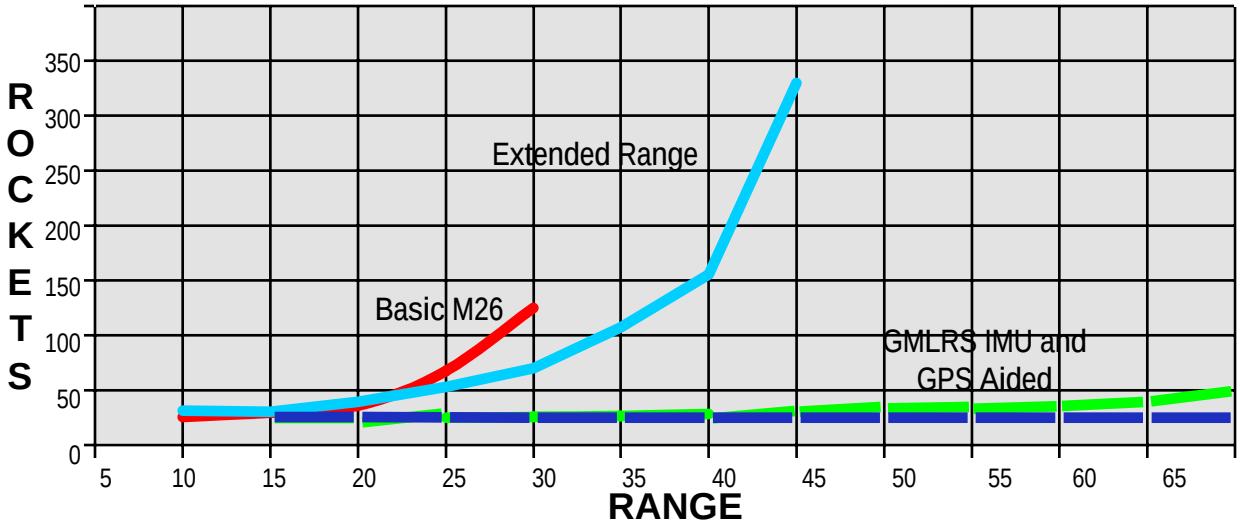
Guided Unitary Rocket

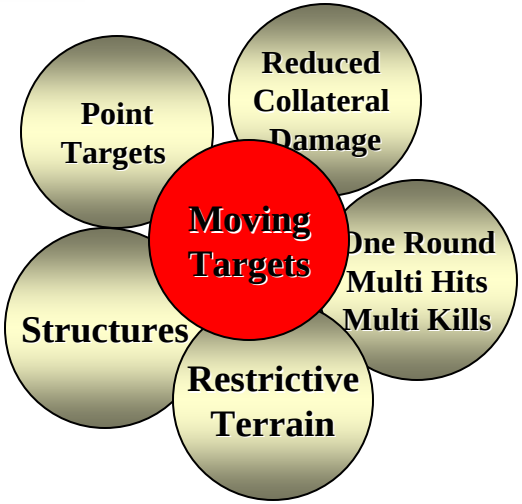
Guided Cargo Rocket

- Increased Target Sets
- Further Reduces Logistical Foot Per Target
- Precision Engagements
- Multi- Precision Engagements
- Overcomes Large Total System Error
- Shoot-and-Scoot Type Targets



- Maximum Range: 70-100 Km
- Minimum Range: 15 Km
- Cylindrical Warhead Shape
- Elliptical Warhead Shape





What We're Looking For

-- More Precision (Reduce CEP); Better Inertial Measuring Units / GPS

-- Predictable Effects and Controllable Effects

-- Scaleable Multiple Effects (Wrapped Penetrators)

-- Semi-autonomous / Autonomous Operations

-- Greater System Reliability

-- Increased Reach (Range)

-- Loiter Ability (Maneuverable)

-- Waypoint Flight

-- Automatic Target Recognition (Detect, Classify, Recognize, Identify)

-- In-Flight Communications (Update, Re-tasking, etc.)

-- Multiple Sensor Package (Uncooled IR, IR, Millimeter Wave, LADAR, TV, Semi-active Laser)

-- Greater Sensor Footprint

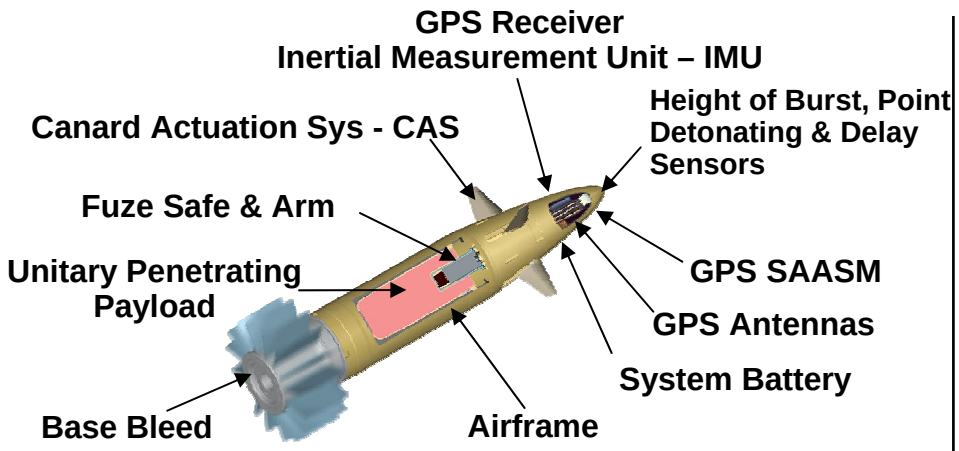
-- Reduced Size / Weight

-- Reduced Cost

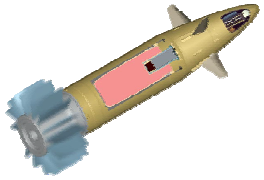
-- Warheads with Controllable Separating Motors

Excalibur Precision Bus

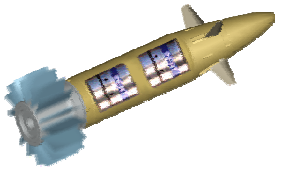
Unitary



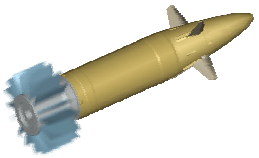
Excalibur Family Variants



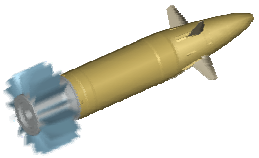
Block I (Unitary):
Unitary (HE) warhead
Fin stabilized airframe
Precision guidance



Block II (Smart):
Detect/acquire/engage submunition capability



Block III (Discriminating):
Discriminating capability
(e.g. Target Recognition)



Future Blocks:
Unlimited potential

Capabilities

- Precision bus capable of delivering a variety of warheads
- Expands fire support capability to support various missions
- Extended Range 35-40km
- 10m Circular Error Probable (CEP) at all ranges
- Decreased collateral damage
- Increased tactical efficiency

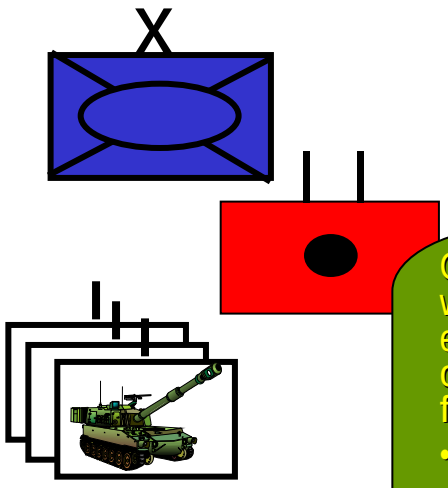
Future Potential

- Future potential is unlimited
- Serves as a bus to carry any payload that must be delivered at extended ranges with increased precision
- Future applications could include: home-on-jam, delivery of sensors, precision scatterable mines
- Other non-lethal applications

Create the Thunder

Changing Role of the Cannon

Current Force

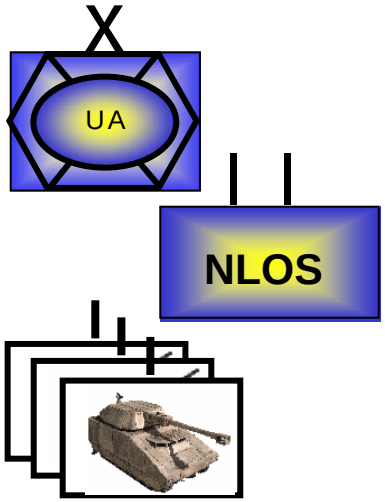


Close Support

Shaping

Counterfire

Future Force



Close Support

Shaping

Counterstrike

Close Support: Attack of enemy troops, weapons, or positions in close combat, enabling maneuver forces as part of decisive operations with the following categories of fires:

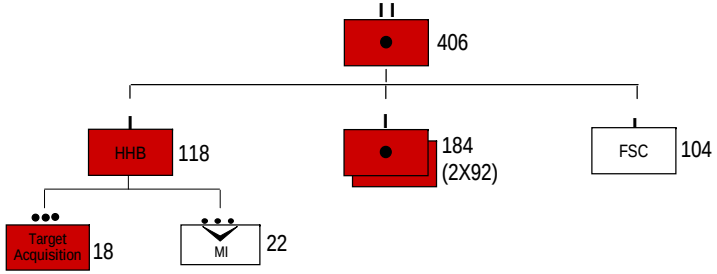
- Destructive
- Suppressive
- Protective
- Special Purpose

Today - Direct Support cannons must do it all – often resulting in less responsive and effective fires

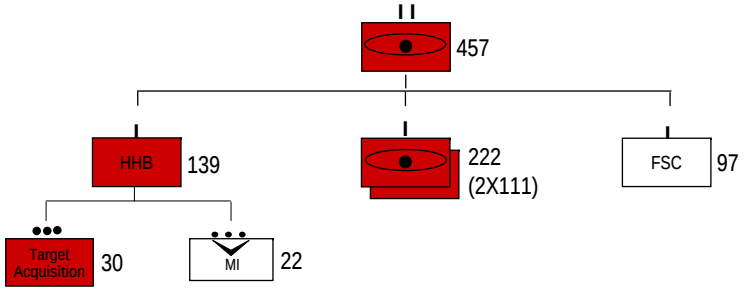
Tomorrow – NLOS-C emphasis on close support while other fires assets (PAM, MRM, GMLRS & Joint fires) help with shaping and counterstrike

Modular Designs

Fires Battalion – Infantry BCT



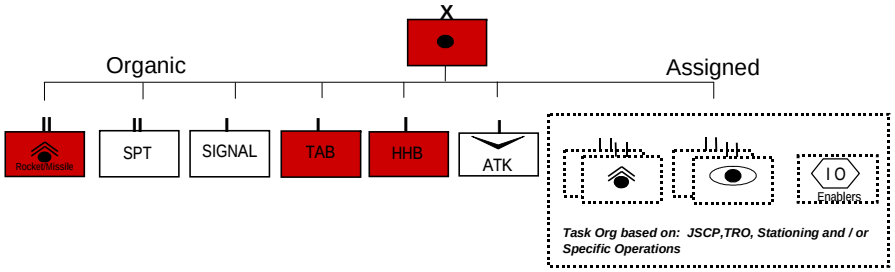
Fires Battalion – Heavy BCT



Capability for:

- *Locating and assessing targets with organic TUAVs and radars*
- *Providing MET for all BCT indirect fire assets*
- *Conducting internal BCT counterfire operations*
- *Conducting sustainment with organic assets*
- *Supporting airborne and air assault operations (Infantry only)*
- *Providing platoon fire units*

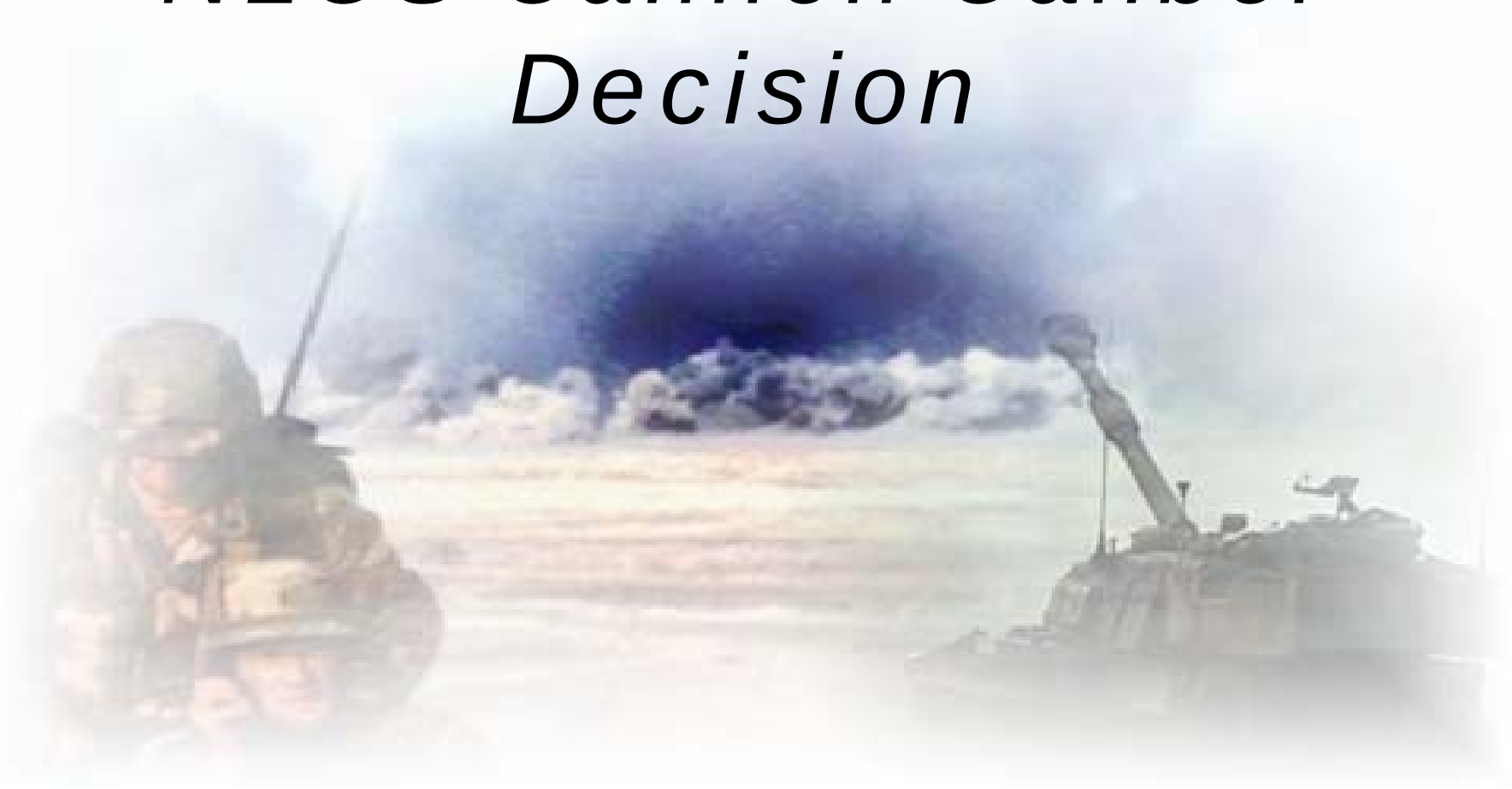
Fires Brigade



Capability for:

- *Providing close support and precision strike for JFC, UE and brigades with cannons, rockets, missiles and armed UAVs without augmentation*
- *Employing combinations of organic and assigned enablers*
- *Conducting sustainment and signal operations with organic assets*
- *Locating and assessing targets with organic TUAVs and radars*
- *Providing MET and survey for all Fires BDE indirect fire assets and radars*

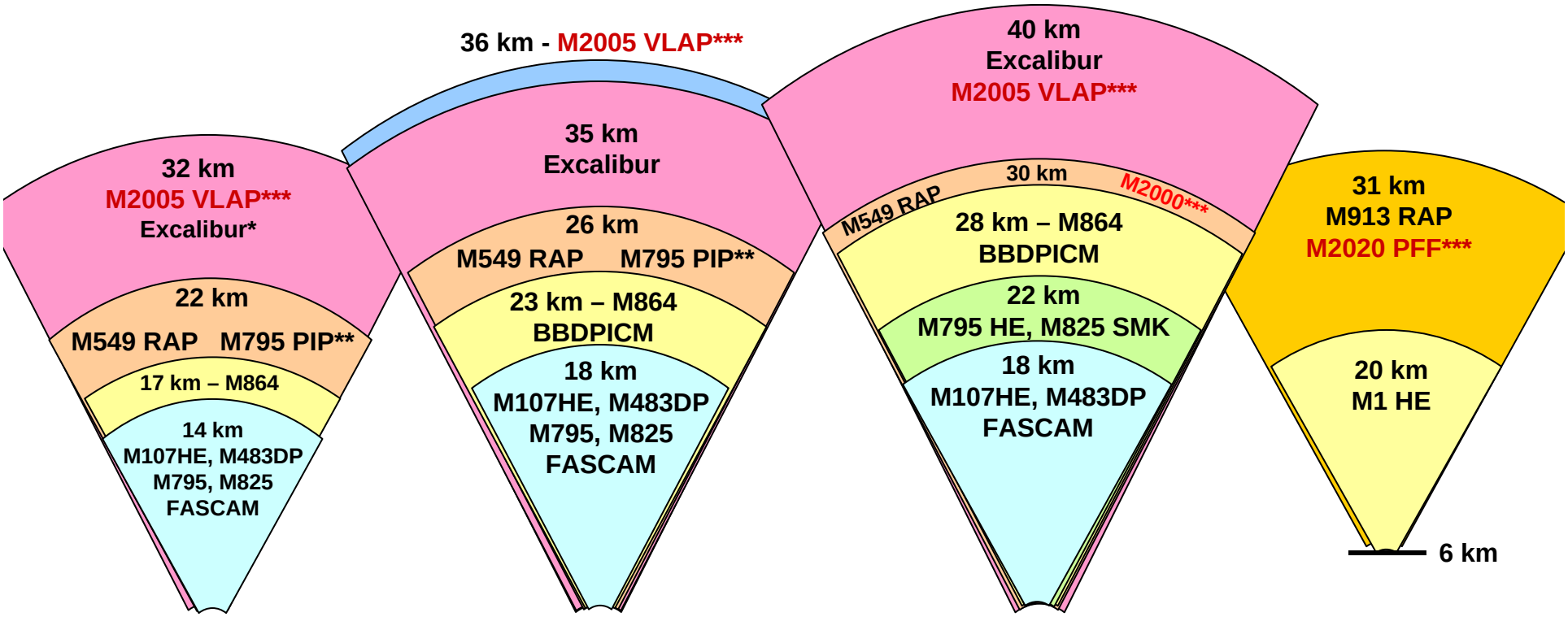
NLOS-Cannon Caliber Decision



Cannon Mission Module Priorities

- ✓ Range of at least 30KM for HE
- ✓ Accuracy must not exceed 0.55% of range at low angle, for ranges of 30 km or less (165m CEP)
- ✓ Rate of fire of at least 6 RPM
- ✓ Respond to a fire order in 30 seconds when moving
- ✓ Automatic loading (no personnel)
- ✓ Rearm the system in under 12 minutes
- ✓ On-board ammunition of at least 24 rounds
- ✓ Survivability through crew served weapon and active protection

Range vs Weight Savings



155mm, 37 Caliber, Zone 3
1949 lb savings

155mm, 38 Caliber, Zone 4
1367 lb savings

155mm, 39 Caliber, Zone 5
FCS AoA Base Case

105mm – 62 Caliber
1596 lb savings

BBDPICM: Base Bleed Dual Purpose Improved Conventional Munition
FASCAM: Field Artillery Scatterable Mine Field
PIP: Product Improvement Program
PFF: Pre-formed Fragment
RAP: Rocket Assisted Projectile
VLAP: Velocity Enhanced Long Range Artillery Projectile

* Excalibur range estimated
** Technology base development
*** Foreign Tech Base / Not currently US certified

38 Caliber 155mm ECC Concept

SURVIVABILITY

14.5mm 360º horizontal crew protection (306 lbs)
- 14.5mm top crew protection

30 mm frontal area crew protection
- 60º arc side crew protection

HE/HEAT 360º protection (APS)
- 60º to 90º vertical dead space in coverage

7.62 Ball Protection for 15% Coverage of Mission Module

NBC filtration/sensing system
- No NBC overpressure

AP mine protection / No AT mine protection

No Smart top attack protection

152 mm frag crew protection 360º for Crew

No Aerial bomblet protection

MOBILITY

40 kph cross country sustained

70 kph hard-surface sustained

1m obstacle

1.5 m gap crossing

LETHALITY

155mm, 38 Caliber, Zone 4 cannon

6 rounds on board at ECC (723 lbs)

18 rounds added for 24 rounds at FCC

CCSW (XM 307) - 300 of 300 rounds

Projectile Tracking System (231 lbs)

OPERATIONAL MANEUVER

Allocated C4ISR

4.8 hours from ECC to FCC

SUSTAINABILITY

Automated Rearm (107 lbs Greater BII)

A_o baseline of 85%
(Requirement is 95%)

Water generation/purification/storage

100 km range / Fuel for 400 km at FCC

3 days rations/water added for FCC

Black Text = included at ECC

Red Text = not included at ECC/FCC

Blue Text = not included in ECC, added at FCC for the capability

Hi-Lite = changes from 39 Caliber

( ) = weight savings investment

Create the Thunder

Phase I - Precision Effects Study

Precision Fires Study

Fire Support Sensor System

FY05

Purpose

- ✓Evaluate current or near-term precision engagement capability
- ✓Select those that will provide the best pay-off for improving the precision capability
- ✓Provide an improvement in engagement efficiency, meet rules of engagement (ROE) restrictions on effects, and provide potential logistical efficiency at a reasonable cost
- ✓Outline how the Army can expedite acquisition and fielding of these capabilities

ACAAP Ammo

FY06

Methodology

- ✓ Identified capability gaps
- ✓ Working with industry and S&T communities developed proposals for a SAG decision

Evaluation

- ✓Effectiveness: Enhance accuracy, responsiveness & reduce collateral damage
- ✓Cost: RDT& E, Integration (system and software), fielding to one BCT
- ✓Risk: Assessed by Technology Readiness Level - at least TRL 6
- ✓Schedule: Capability can be fielded to a BCT in 24-36 months

Lightweight Counter Mortar Radar

FY06

Precision Effects Mission Manager

FY06

Precision Guided Mortar Munition

FY07

Create the Thunder

Selecting the Best

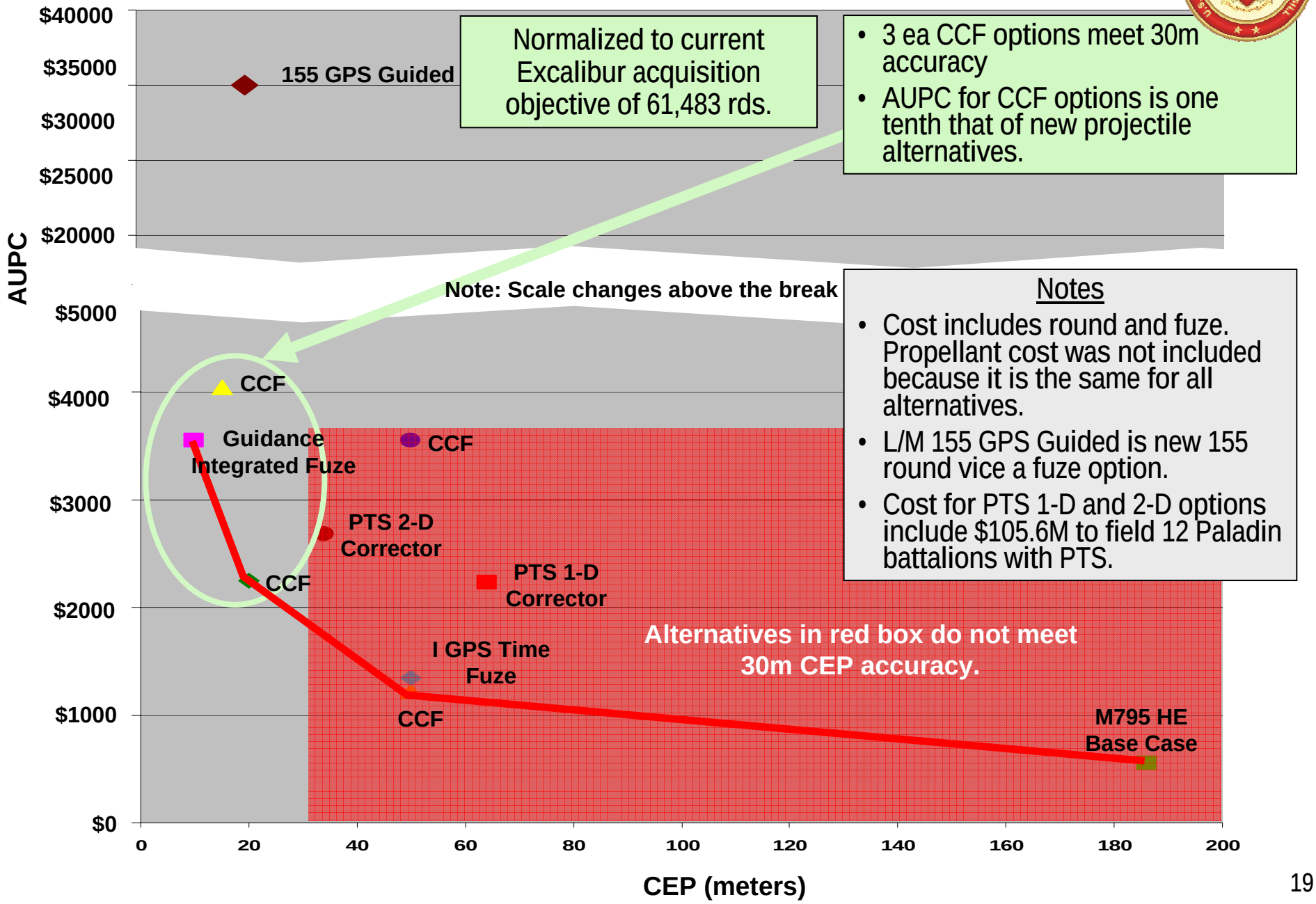
	Request for Proposals - 56	Working Group - 24	SAG - 5
Precision Delivery Systems and Munitions	GPS Time Fuze Advanced Cannon Artillery Ammunition Program Low Cost Course Correction (LCCC) Technology - 120mm Mortar Approach for the 155mm M232 High Zone MACS 105mm Stryker Artillery Weapon System Projectile Tracking System for Paladin Optimized Control Kit for Missile Rounds M898 SADARM Plus An Improved Smart Submunition for M982 Excalibur (Smart) Improved Smart Submunition for the Guided MLRS Precision Guided Mortar Munition 120mm XM395 Course Correction Fuze SMArt 155 Course Corrected Fuze for Large Caliber Artillery Artillery Registration Shell Concept (ARSC) Precision Targeting Workstation 155mm BONUS Sensor Fuzed Munition System Non-Lethal Indirect Fire Course Corrector Fuze Projectile Kinetic Energy Reduction System Viper Strike BLU-108 Submunition Configured GMLRS Guided Projectiles Rocket Assisted GPS Guided 155mm Projectile Modernized Copperhead Kinetic Energy Artillery GMLRS Unitary Cargo HIMARS C2 Accelerated NLOS-LS Self-Propelled 120mm Mortar GMLRS Unitary ATACMS Unitary	**Accelerated Precision Guided Mortar Munition Fielding** **Projectile Tracking System (PTS) for Paladin** **SMArt 155** **GMLRS/BLU-108** **Advanced Cannon Artillery Ammunition Program (ACA2P)** **Viper Strike Precision Munition (UAV)** **Precision Effects Mission Management Improvements** **Guided Unitary Rocket Accelerated Fielding** **Excalibur Upgrade for Paladin** **155mm BONUS Sensor Fuzed Munition System** **Improved, Multi-Mode Unitary Warhead on ATACMS** **M898 SADARM Plus & An Improved Smart Submunition for M982 Excalibur (Smart) (PLUS)** **Precision Targeting Workstation** **M898 SADARM Plus & An Improved Smart Submunition for M982 Excalibur (Smart) (Excalibur)** **Viper Strike Precision Munition (GMLRS)** **Improved Smart Submunition for the guided MLRS** **SMArt 155 (GMLRS)**	• Accelerate Precision Guided Mortar Munition Fielding • Procure Advanced Cannon Artillery Ammunition Program • Develop Precision Effects Mission Management for AFATDS
Mounted Optics	Short Wave InfraRed (SWIR) Technology EO/IR Sensors Proposal for CE #2 Tripod-Mounted Target Acquisition System	**Fire Support Sensor System (FS3)** **Precision Tageting Acquisition Mobile (PTAM)**	• Additional Fire Support Sensor Systems (FS3)
Dismounted Optics	Dynamic Range Enhancement Precision Targeting Acquisition Mobile (PTAM) Common Remote Stabilized Sensor System TALON	**TALON**	
Counterfire	Shoulder Launched Unmanned Reconnaissance System (SLURS) Passive Hostile Artillery Locating HALO(+) Lightweight Counter Mortar Radar Unmanned Air Vehicle Weapon Locating Radar Enhanced Shelter JLENS Spiral I Q-36 Upgrade	**Lightweight Counter Mortar Radar** **Passive Hostile Artillery Locating (HALO+)**	• Accelerate Light Weight Counter Mortar Radar
Direction & Location	UWA DGPS Network Position Location and Direction Determination Joint Tactical Positioning System Simplified Survey System	**Joint Tactical Positioning System**	
Met	TeraScan Profiler Block II Ballistic Met Data via Guided Projectiles	**TeraScan**	

Analysis of Precision Fires Study

- ✓ Phase I study recommendations to reduce target location error are critical enablers for precision effects and Joint capabilities
- ✓ Combining greater precision through course correcting fuzes (CCF), combined with enhanced lethality of individual munitions provides a significant precision effects capability not present today
- ✓ When employing 2-D CCF in conjunction with small target location errors, there is a significant reduction in the number of conventional rounds required to achieve desired effects and the corresponding logistics burden
- ✓ CCF combined with ACAAP ammunition improves lethality and further reduces rounds required for desired target effects

Both CCF and ACAAP ammunition have a jump start through other ongoing actions

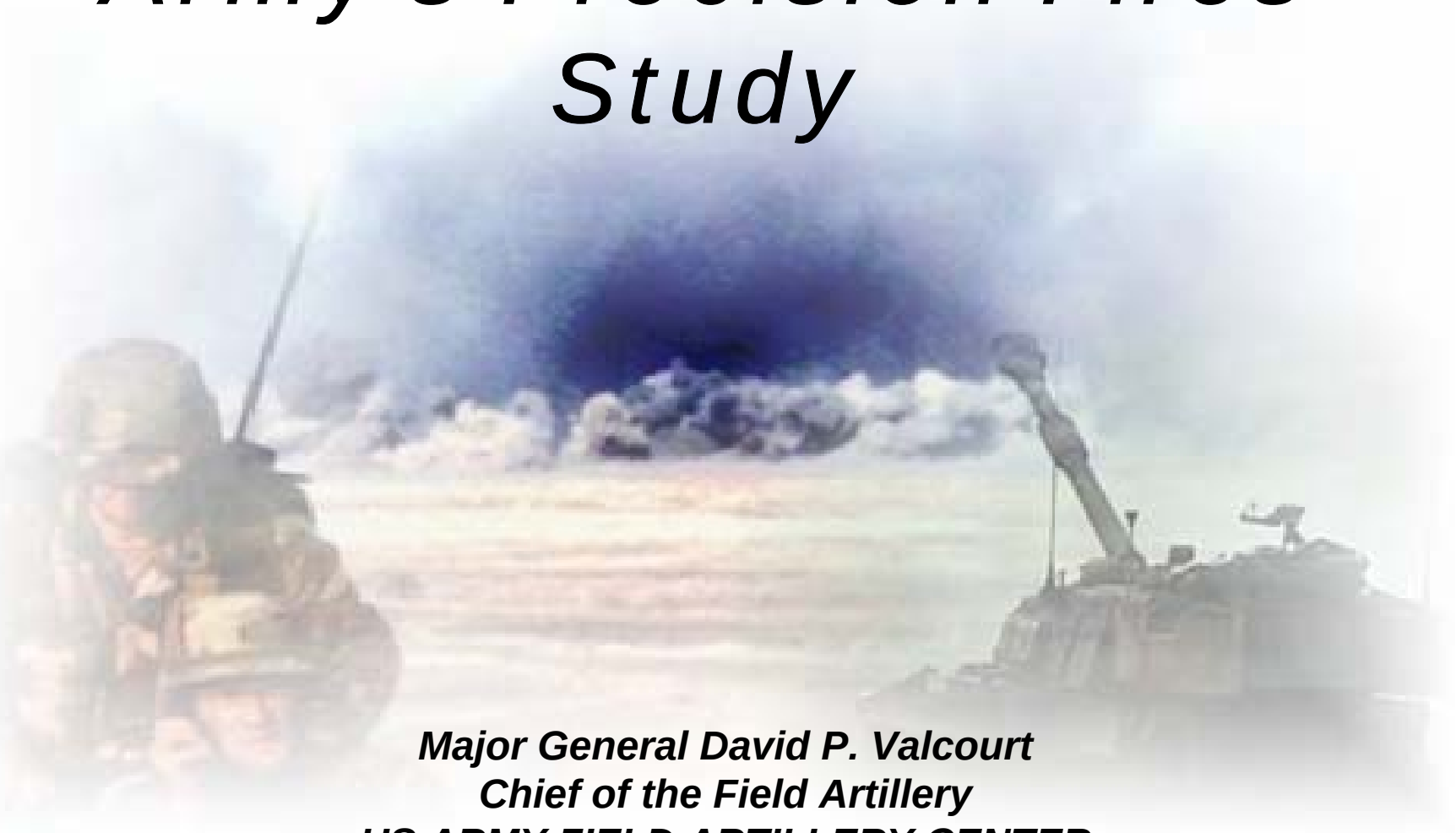
CEP vs. AUPC (61K buy)



Conclusions

- ✓ Phase I recommendations are still valid. Some are already being worked in other venues such as Modularity. TRADOC Commander endorsement will help
- ✓ Phase II recommendations offer significant capability enhancements. ACAAP ammunition was one of the Phase I recommendations
- ✓ Development of GIF/CCF capability should be supported even if ACAAP ammunition is not procured. Significantly improves precision effects capability of current munitions stockpile
- ✓ Both of the Phase II recommendations have ongoing efforts that we can leverage to accelerate fielding
- ✓ All of the recommendations allow for spiral development

Army's Precision Fires Study



Major General David P. Valcourt
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FORT SILL, OK

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BACK UP SLIDES

Priority 1 - Fire Support Sensor System

Accelerate fielding of FS3

"To optimize the stand off capabilities of fire support, optical, lasing and thermal imagery devices for the BFISTs and COLTs need improvement."

"There is an immediate need in the field artillery community for optic and designator systems that are smaller and provide observation that exceeds maneuver optical systems."

- 3ID OIF After Action Report

OEF	OIF	ONS	UR	TF Mod
X	X		X	X

EFFECTIVENESS	*COST*	*RISK*	*SCHEDULE*
• > 2.5x day & night ID range of G/VLLD & AN/TAS-4 • Meets all Heavy/Light Mounted Requirement Key Performance Parameters • Achieved 20m TLE at 10 Km during testing • Common with maneuver targeting system (LRAS3)	~ $3M Non-recurring expense ~ $3M to field heavy brigade (7 systems) ~ $1.7M to field light brigade (4 systems) Stryker brigades currently funded	TRL 8	2QFY05

Priority 2 - Precision Guided Mortar Munition (PGMM)

Accelerate development and Low Rate Initial Production of the PGMM (XM395 projectile).

"Rules of engagement and clearance of fires in urban areas create unique challenges due to the use of areas that they knew we would not strike with munitions based on our desire to not commit collateral damage (targets located in or beside schools, mosques, hospitals and housing."
- 3ID OIF After Action Report

OEF	OIF	ONS	UR	TF Mod
X	X			X

EFFECTIVENESS	*COST*	*RISK*	*SCHEDULE*
Advantages • High angle trajectory enables employment in urban terrain. • Early Entry Scenario – Reduced indirect fire ammo consumption 56% (214 to 95 STONS) • Accuracy (1m CEP) exceeds ROE restrictions Disadvantages • Requires laser designation	FY05 - $21M FY06 - $10M	TRL 5	LRIP (100 rounds) 2QFY07

Priority 3 - Advanced Cannon Artillery Ammunition

Field selected non-developmental conventional 105mm and 155mm artillery ammunition.

105mm HE PFF

155mm HE

"Simultaneous with advances in deep battle capabilities, there has been a decline in the capabilities and demands for direct support/close support fires. In addition to the efforts currently underway to improve cannon and rocket/missile munitions, we need to provide precision munitions for lighter systems."

Letter from Cdr, 18th Abn Corps Artillery to CG, USAFAC

OEF	OIF	ONS	UR	TF Mod
			X	X

EFFECTIVENESS	*COST*	*RISK*	*SCHEDULE*
Improved effectiveness; 33% increase in range for 155mm 39 caliber tube • > 50% reduction in minimum safe distance reduces collateral damage and risk to friendly forces • Eliminates UXO hazard • HE fill meets insensitive munition requirements	Qualification ~ $25.7M Procurement cost same as current 105mm and 155mm munitions	TRL 8	2QFY06 (LRIP)

Priority 4 - Extended Range Lightweight Counter Mortar Radar

Modify existing LCMR to increase system acquisition range from 6km to 10km for 120mm mortars with better target location.

"The LCMR will clearly improve force protection, complement the existing radars supporting OEF, and provide an added capability to accurately locate enemy forces."

- 82d Abn Div Operational Needs Statement

OEF	OIF	ONS	UR	TF Mod
X	X	X		X

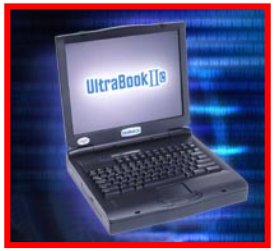
EFFECTIVENESS	*COST*	*RISK*	*SCHEDULE*
•Fills Q-36 gap with 360 degree coverage • 50m CEP for 120mm mortars at 8.5 km range – Accurate enough for mortar and artillery engagement • Immune to small arms fire false alarms	~ $750K for development ~ $2.4M to field one brigade (4 systems)	TRL 7	3QFY06

Priority 5 - Precision Effects Mission Manager

Develop and field AFATDS enhancements that provide the ability to more effectively employ precision munitions.

"Rules of engagement and clearance of fires in urban areas create unique challenges due to the use of areas that they knew we would not strike with munitions based on our desire to not commit collateral damage (targets located in or beside schools, mosques, hospitals and housing."
- 3ID OIF After Action Report

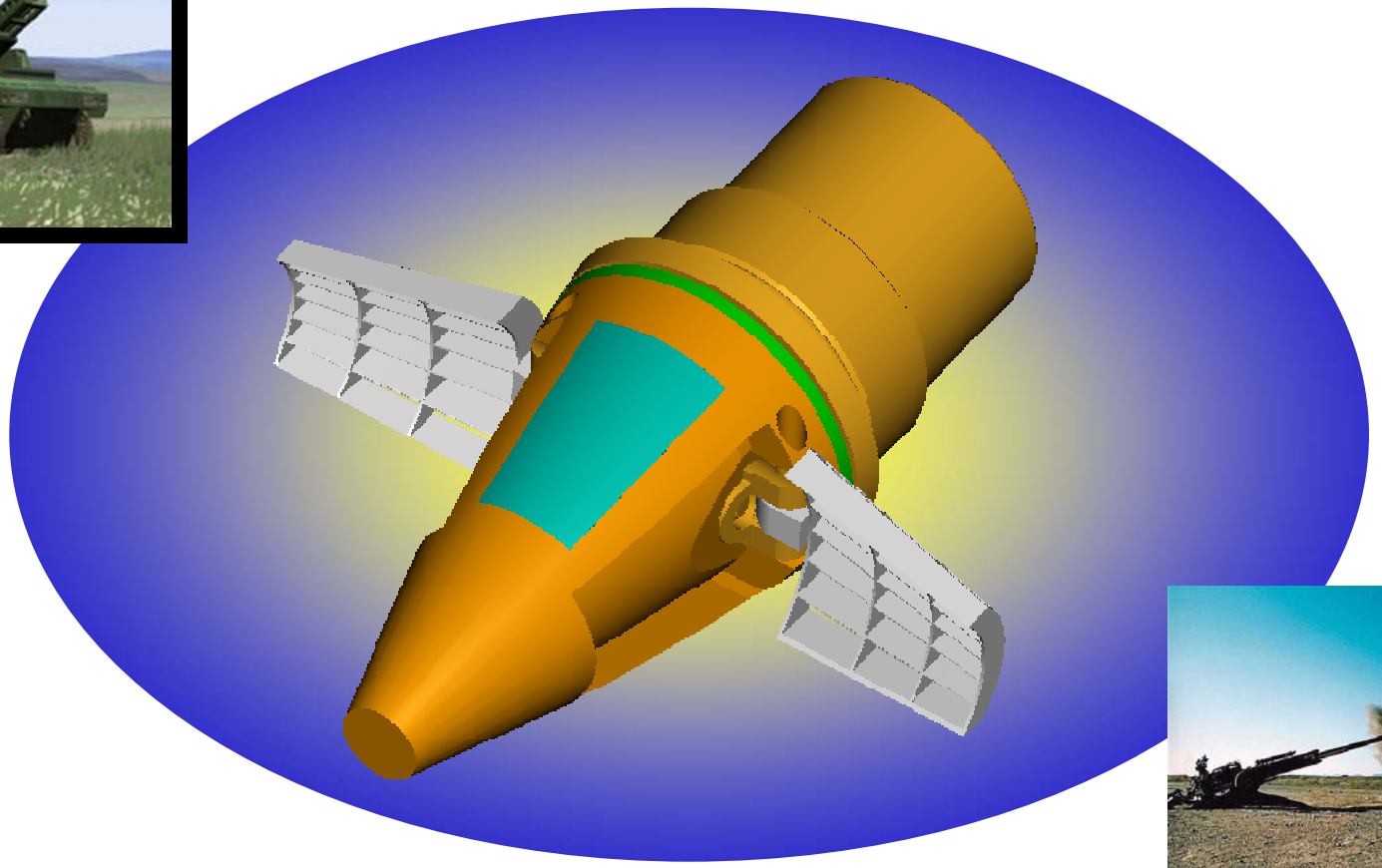
Target Segmentation (Sheafing) Tool



OEF	OIF	ONS	UR	TF Mod
	X		X	

EFFECTIVENESS	*COST*	*RISK*	*SCHEDULE*
Allows accurate assessment and mitigation of collateral damage and fratricide • Allows optimization of precision munitions reduced delivery error • Architecture allows targeting and engagement options to be distributed throughout the TOC	~ $4.76M for recommended improvements Fields entire FA force (Active, NG, USMC)	Low for recommended improvements	1QFY07

Course Correcting Fuze (CCF)

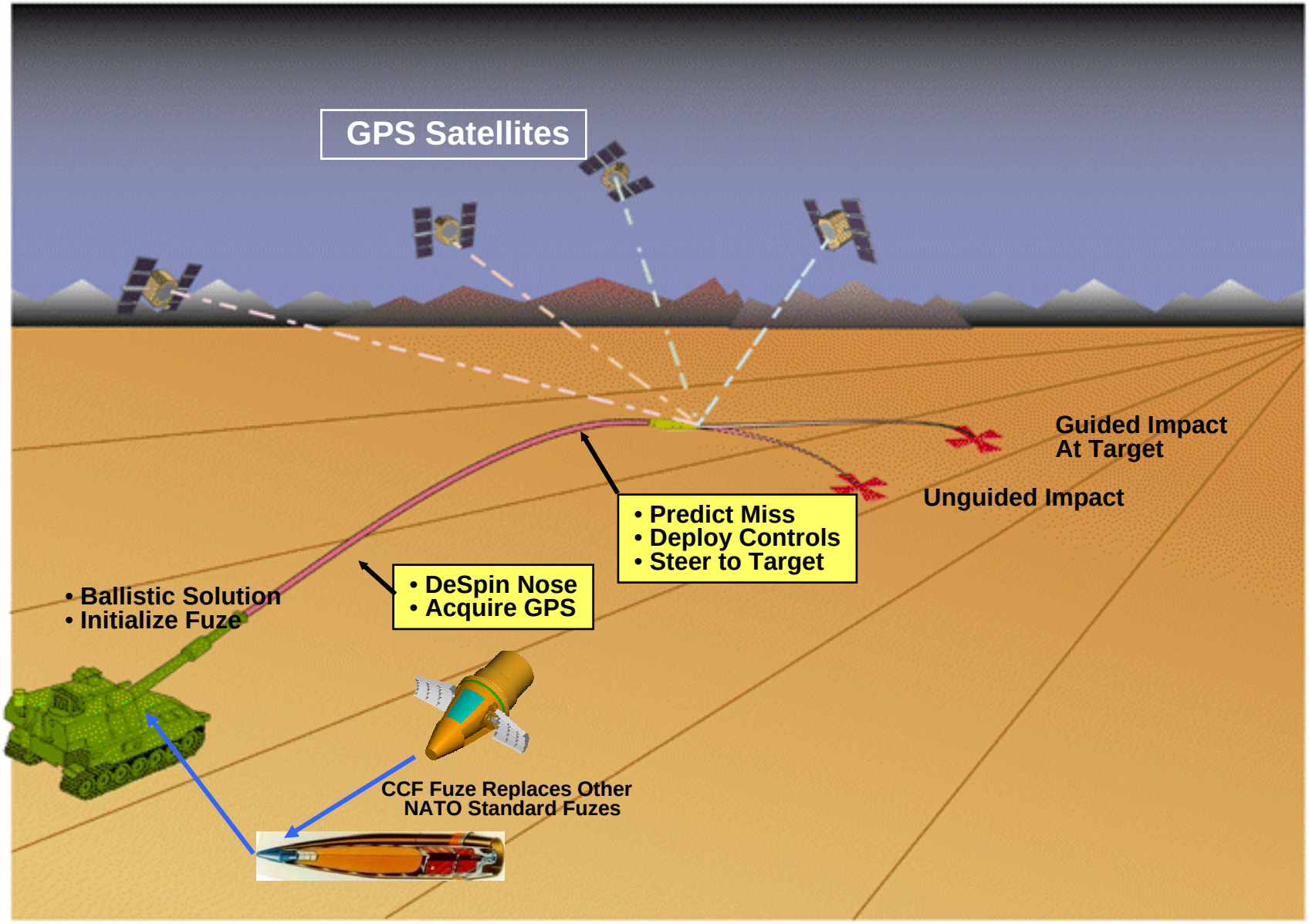


Create the Thunder

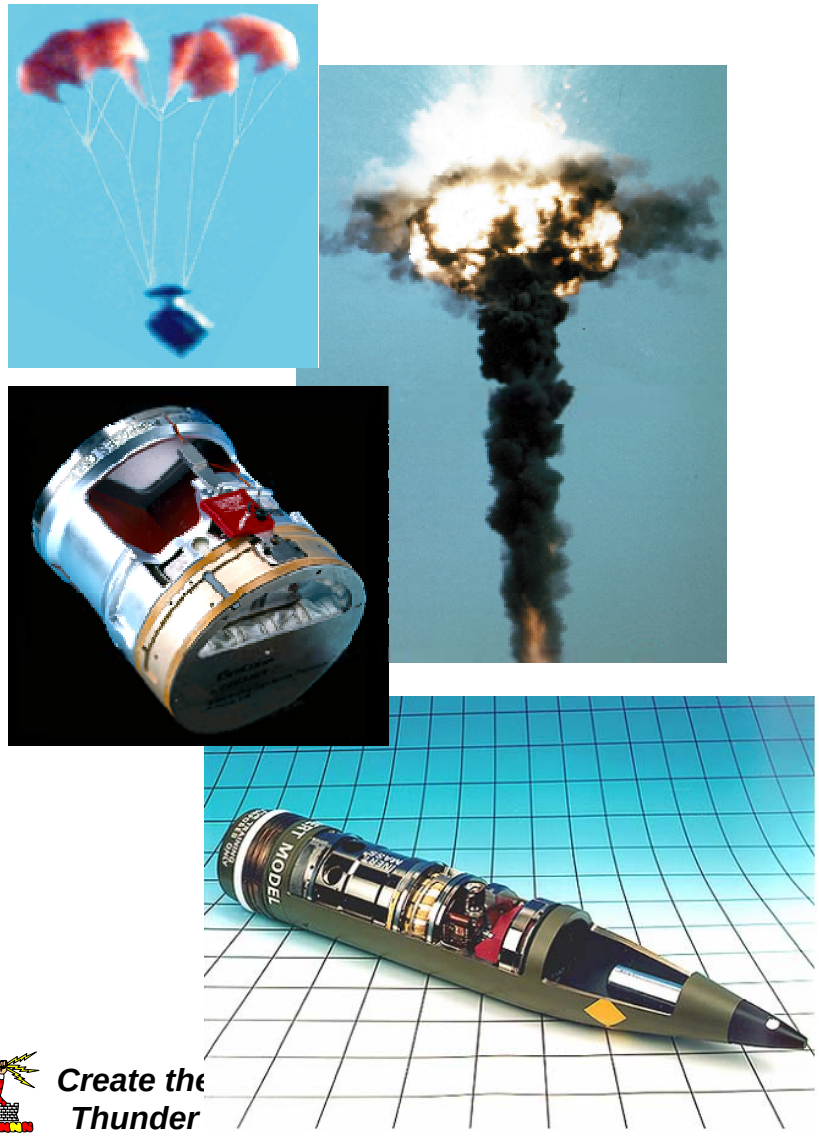
Course Correcting Fuze

- ✓ **What is CCF ?** **Fuze-sized module that is intended to replace a "NATO standard" fuze on existing stockpiled Army and Navy Ammunition.**
- ✓ **What Does it Do ?** **Corrects the ballistic trajectory of the projectile, resulting in a small terminal miss distance.**
- ✓ **What Difference Will It Make ?**
  - **Greatly reduce the number of rounds required to defeat a given enemy threat.**
  - **Applicable to existing cannon projectiles and mortar and systems.**
  - **Enhance "Maneuver Warfare" by reducing the time required to neutralize threats while minimizing logistic and re-supply burdens.**

How Does CCF Work?



Sense and Destroy Armor (SADARM)

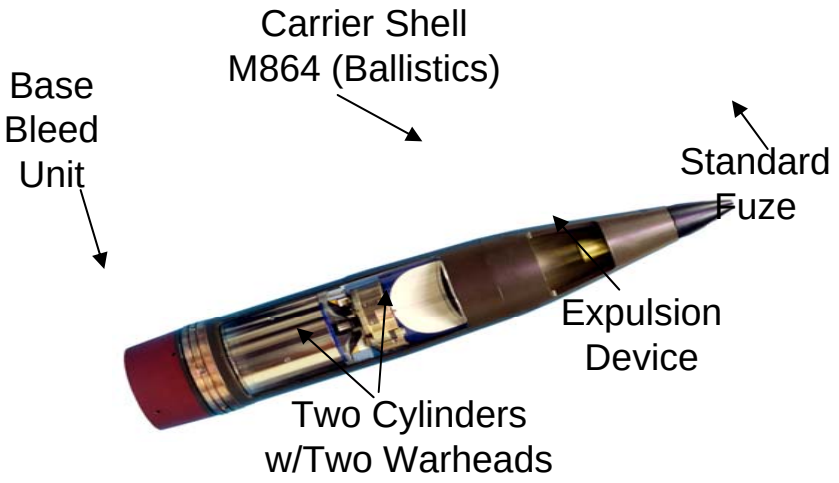


- A Smart Submunition For 155mm Counter-Battery/Anti-Armor Missions
- Adaptable to Rockets & Missiles
- Top Attack, Robust Submunition
- Warhead Defeats Up to Top Armor of MBT
- Limited quantity of M898 Projectiles In the U.S. Army Inventory
- Production stopped 2001
- Contractor startup cost - $30M with rounds delivered in 2-3 years

SMArt 155

- Developed by GIWS (Rheinmetall/Diehl JV)
- 155mm Sensor Fuzed Munition (SFM) in production today for the German Army - 9000 Projectiles
- Provides precision kill capability against enemy armor and artillery with demonstrated reliability and effectiveness
- Demonstrated success against an array of countermeasures and various environmental conditions.
- Demonstrated 90% reliability – Near zero dud rate in Lot Acceptance Test

155 BONUS



Acquisition Phase:

Currently in Production for Sweden and France

- Production Contract Awarded Fall 2000
- First Production Round Delivered Summer 2002
- Series Qualification Ongoing during 2003
- Production Decision for Improved Sensor Fall 2003
- Series Delivery with Improved Sensors Fall 2004

Canister, Pusher Plate and Submunition

Description:

- 155mm Sensor Fuzed Anti-Armor Munition
  - Dual Mode Seeker
  - wo Explosively Formed Penetrator Warheads
- Key Features
  - JBMOU Compliant
  - Fire and Forget Projectile
  - All Weather – All Climate System
  - Base Bleed for Extended Range
  - Winged Submunitions for Stability
  - First Pass Attack for Moving Targets

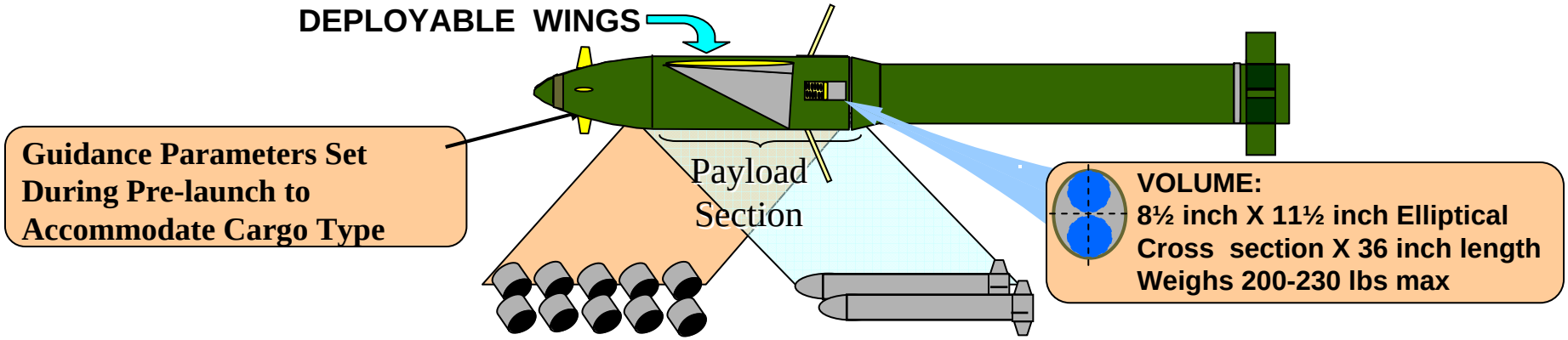
Contractor Team:

- BONUS is a Joint Program of France and Sweden.
- BONUS is assembled in both Sweden and France.
- BONUS will be licensed to an American Company

- Slides CG REMOVED

GMLRS Cargo Rocket
(Increment 2)

Cargo Only Limited by Volume & Weight



Cargo Must Be Provided With Adapters for the Standard Payload Dispensing System

System Key Performance Parameters *(Increment Two)*:

- **Will Accept any CARGO That Meets Volume and Weight Constraints**
- **Variable (Up Loaded) Guidance Parameters will Accommodate Different Dispense Altitudes, Attitudes & Velocities**
- **Payload Dispense**
  - **Interfaces Will Include Mechanical Adapters and Software Requirements to Control Sequence**
    - **Timing of Dispense Operation**
    - **Information Exchange Between Warhead and Submunition**
    - **Power Inputs to CARGO Munitions**
- **CARGO Provider will be Responsible for dispensing Adapters and Software Adapters That Meet Interface Requirements**

Current Cargo Capability

- **Smart Surgical Strike Cargo**
  - **BONUS (10 ea)**
  - **P3I Skeet (10 ea)**
  - **SMart**
  - **BLU-108 (SFW) (2 ea) (8 Skeet)**
- **Smart Precision Strike Cargo**
  - **Mini-Penetrator Rods**
    - **(2 ea Large)**
    - **(10 ea Small)**
- **Non-Lethal**
  - **Jammer/Sensor**
  - **Propaganda**

GMLRS Cargo Rocket

Objective System Description:

- *Single Shot, Multiple Kills* [1]
- *High component and subsystem Commonality with MLRS Family of Weapons* [1]
- *Built on Proven Technology* [1]
- *End Game Trajectory Shaping for Optimum Submunition Assignment* [1] *(Partial)*
- *Stationary-To-Moving, Hard-to-Soft, All Weather Target Engagement*
- *Can Carry Large Variety of Cargo Types* [1]
- *Services Targets with Large Target Location Errors*
- *Large Search Area Capability*
- *No Data Link Required (Updates Not Necessary; but can be done)* [1]
- *Maximized System Effectiveness and Efficiency*
- *No New Training Required* [1]

Note: [1] *– Increment Two*

Create the Thunder

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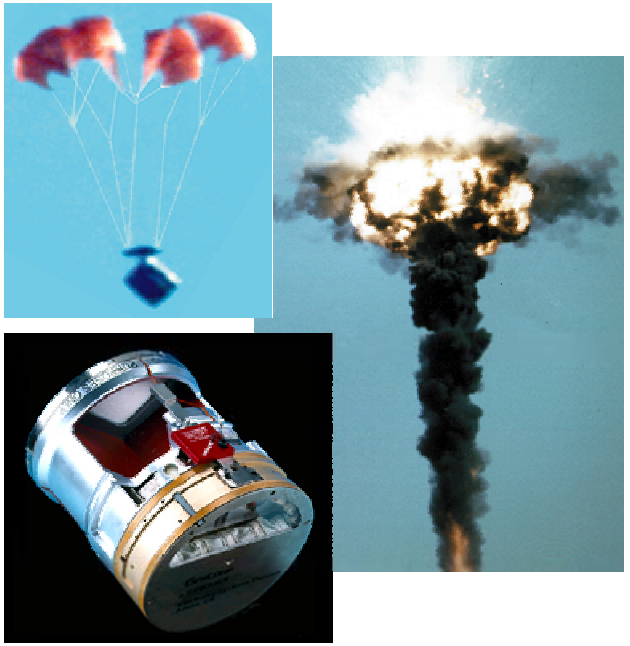
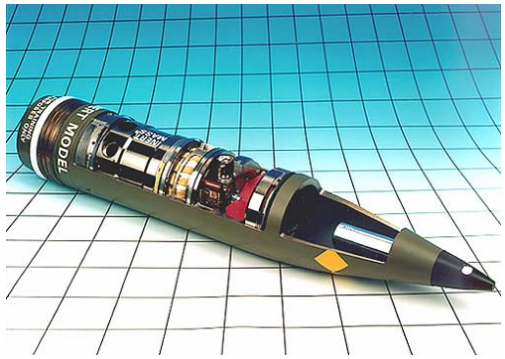
Need for Sensor Fuzed Munitions





- Historical and recent analysis (Center for Army Analysis DPICM Alternative Study, Jan 2001) has consistently shown SFMs are an effective killer of combat vehicles and artillery pieces
  - SFMs contribute greatly in both Current and Stryker scenarios
  - SFMs significantly increase lethality and blue artillery survivability
- SADARM ORD approved 1994 (invalid due to age)
- SADARM performance in OIF highlighted in 3rd ID After Action Report (AAR)

JBMOU Sensor Fuzed Munition (SFM) Compliance Testing

SMArt 155 – GIWS/ATK

Bonus – Bofors/UDLP

SYSTEM CHARACTERISTICS:

SMArt 155

- Range – 22 Km
- Ballistic similarity with M483 (DPICM)
- Sensor Systems – MMW Active/Passive and IR (DPICM)
- Submunition Search area – 35,000 sq M

Bonus

- Range – 27 Km (Base Bleed)
- Ballistic similarity with M864
- Sensor System – Multi band Passive IR
- Submunition Search area – 32,000 sq M

SYSTEM DESCRIPTION:

SMArt 155 and Bonus - Autonomous fire and forget all weather 155mm projectile containing 2 top attack submunitions. Submunitions are ejected over armored targets, perform a decreasing spiral scan, detect the target, initiate warhead and penetrate the target.

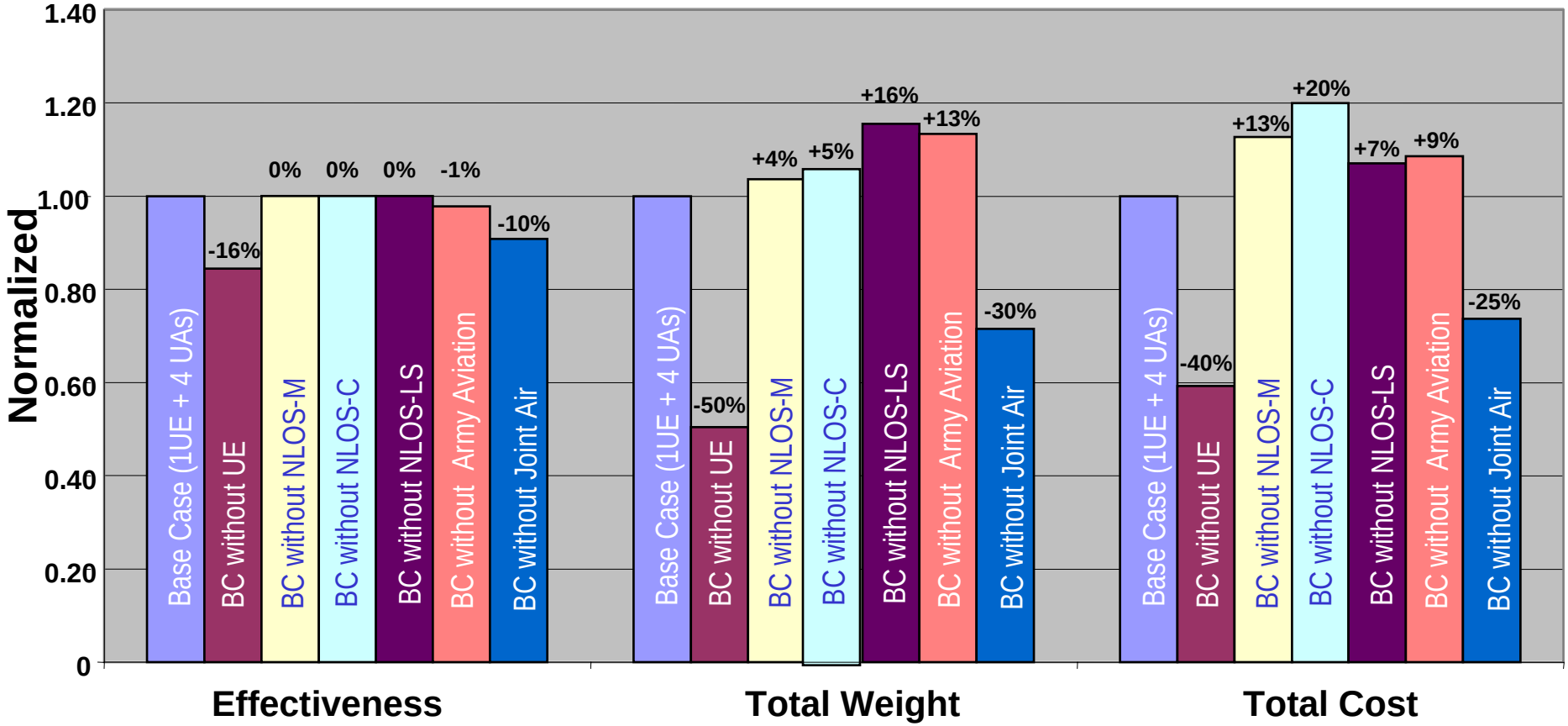
Phase II - Precision Effects Study

Phase II Guidance

- ✓On 2 Feb 04, briefed CG, TRADOC on Phase I study results and USAFAC recommendations
- ✓CG, TRADOC directed USAFAC to produce a matrix of all candidate munitions for providing “general purpose” precision capability

Operational Insights - Precision Fires Study

Comparative Effectiveness, Weight, and Cost of Indirect Fire Assets within the UA/UE



- **Force structure for the scenario is 4 UAs and 1 UE_x.**
- **The Base Case consists of NLOS-M, NLOS-C, NLOS-LS, HIMARS, Army Aviation and Joint Air assets.**

Create the Thunder

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Insights from UA/UE Mix Analysis

- ✓ Units of Action are 16% less effective without the UE_X assets and 10% less without Joint air assets
- ✓ With respect to NLOS-M, NLOS-C, NLOS-LS and Army Aviation, there is no loss in effectiveness with the removal of any one system; however, in all cases, an increase in weight of munitions fired and cost of the munitions becomes evident