Precision Engagement Capabilities for the Future

July 27-28, 2005

Precision Strike PEO Forum 2005 Agenda

Keynote Address: **Major General Robert W. Chedister**, USAF, Air Force Program Executive Officer for Weapons, and Commander Air Armament Center, Air Force Materiel Command, Eglin AFB, FL

PRECISION ENGAGEMENT - U.S. AIR FORCE PERSPECTIVE:

- Acquisition at the Air Armament Center, **Mr. Thomas Robillard**, Director Air-to-Missile Systems Wing, Eglin AFB, FL

PRECISION ENGAGEMENT - U.S. ARMY FORCE PERSPECTIVE:

- PEO Ammunition, **Mr. James Sutton**, Deputy Executive Officer, Ammunition
- Excalibur XM982 , **Mr. Chris Grassano**, Deputy Product Manager, XM982 Excalibur
- Viper Strike Overview, **LTC John Oxford, USA**, Product Manager, Viper Strike
- Precision Mortar Systems Overview, **Mr. Greg Bischer**, Test & Evaluation Lead, Precision Guided Mortar Munition (PGMM)

JOINT FIRES: PROGRAM MANAGER PERSPECTIVE:

- Joint Fires Integration and Interoperability Team (JFIIT) - Executive Overview, **Colonel David Brown, USAF**, Integration & Interoperability Team, HQ USJFCOM

PRECISION ENGAGEMENT - U.S. NAVY FORCE PERSPECTIVE:

- Precision Strike Capabilities for the Future Battlefields, **Rear Admiral Timothy Heely, USN**, PEO for Strike Weapons & Unmanned Aviation

PRECISION ENGAGEMENT - U.S. MARINE CORPS PERSPECTIVE:

- USMC Precision Strike **Brigadier General Martin Post, USMC**, Assistant Deputy Commandant for Aviation

PRECISION ENGAGEMENT:

- Precision Engagement, **Mr. Randy Bigum**, Deputy Executive Officer, Ammunition

PRECISE EFFECTS VICE PRECISE MUNITIONS:

- Precision Effects v. Precision Munitions, **Brigadier General Philip D. Coker, USA**, Director, Capabilities Developments, Futures Center, United States Army Training and Doctrine Command

WEAPONS DATALINK NETWORK (ACTD):

- Air Armament Capability for the Future, **Ms. Lynda Rutledge**, Program Manager, NCW-Network Weapons ACTD

JOINT BATTLESPACE MANAGEMENT COMMAND AND CONTROL (AFEI):

- The Challenge of Achieving Joint Command and Control in a Network Centric Environment, **Mr. Frank Caravella**, Program Manager, Raytheon Network Centric Systems
- Imagine….and act, **Mr. Greg Gardner**, Vice President, Oracle, Homeland Security

PRECISION STRIKE PEO FORUM
JULY 27-28, 2005
EMERALD COAST CONFERENCE CENTER
FT. WALTON BEACH, FL

KEYNOTE ADDRESS:
Major General Robert W. Chedister, USAF
Air Force Program Executive Officer for Weapons, and Commander Air Armament Center, Air Force Materiel Command, Eglin AFB, FL

PRECISION ENGAGEMENT—U.S. AIR FORCE PERSPECTIVE:
Thomas Robillard
Director, Air-to-Air Missile Systems Wing, Eglin AFB, FL

PRECISION ENGAGEMENT TO ENSURE DOMINANT MANEUVERS—U.S. ARMY PERSPECTIVE PANEL:

- **James Sutton**
  Deputy Program Executive Officer, Ammunition
- **Chris Grassano**
  Deputy Product Manager, XM982 Excalibur
- **LTC John Oxford, USA**
  Product Manager, Viper Strike
- **Greg Bischer**
  Test & Evaluation Lead, PGMM

JOINT FIRES: PROGRAM MANAGER PERSPECTIVE:
Colonel David Brown, USAF
Integration & Interoperability Team, HQ USJFCOM

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Rear Admiral Timothy Heely, USN
PEO for Strike Weapons & Unmanned Aviation

PRECISION ENGAGEMENT—U.S. MARINE CORPS PERSPECTIVE:
Brigadier General Martin Post, USMC
Assistant Deputy Commandant for Aviation

PRECISION ENGAGEMENT:
Randy Bigum
Vice President, Strike Weapons Lockheed Martin Missiles and Fire Control

PRECISE EFFECTS VICE PRECISE MUNITIONS: What the Army sees as its critical capability gaps for precision, and view on interdependence.
Brigadier General Philip D. Coker, USA
Director, Capabilities Developments, Futures Center, United States Army Training and Doctrine Command

WEAPONS DATALINK NETWORK (ACTD):
Lynda Rutledge—Program Manager, NCW-Network Weapons ACTD

JOINT BATTLESPACE MANAGEMENT COMMAND AND CONTROL (AFEI):
Senior military leaders discuss successful use of information sharing in the operational context, and provide a look at future operations requirements for net-centric capabilities that support the military end-user.

- **Frank Caravella, PM**—Raytheon Network Centric Systems
- ***Greg Gardner, Vice President—Oracle, Homeland Security***

Precision Engagement

LOCKHEED MARTIN

We never forget who we're working for™

Randy Bigum
Vice President, Strike Weapons

27 July 2005

Evolution Of "Precision Engagement"

- XYZ coordinates are much better
  - Four meters or better CEP demonstrated with GPS only
  - One meter CEP demonstrated with seekers
- Collateral damage is less
- Fixed or relocateable targets

Seeker Guidance

High Value Targets

HDBT

GPS Guidance

Better Accuracy Is Today's Precision Engagement

What Is The Next Challenge In Precision Engagement

XYZ Accuracy Plus . . . .

“Precise Timing”

Characteristics Of “Time”

- XYZ plus time
  - Time = Tracking error for movement (xyz / time)
  - Time = Enemy driven opportunities (short reaction windows)
  - Time = Enemy driven complexity of engagement (evasive or concealed)

Complexities Of Engaging Ground Targets

Evasive Targets	Concealed Targets
Decoys (EO / IR / RF / Laser)	Urban Area
Erratic Vector (Movers)	Law of Armed Conflict Exploitation
Jamming (EO / IR / RF / Laser / GPS)	Collateral Damage
Cooperative Tactics	Camouflage
Deception (SUV, Bus in Convoy)	Clutter (IR / Radar / RF / Laser)
Counter-fire	Buried
At Range	Hardened
Even Small Targets	Weather
Short Reaction Windows	Day / Night

Two Ways To Approach Evasive Targets and Concealment

Speed	Persistence	
RATTLRS	TAC TOM	LCMCM
HiFLY	SLAM-ER	Dominator
FALCON	JASSM / ER	High Altitude Airship




Effects of Speed And Persistence

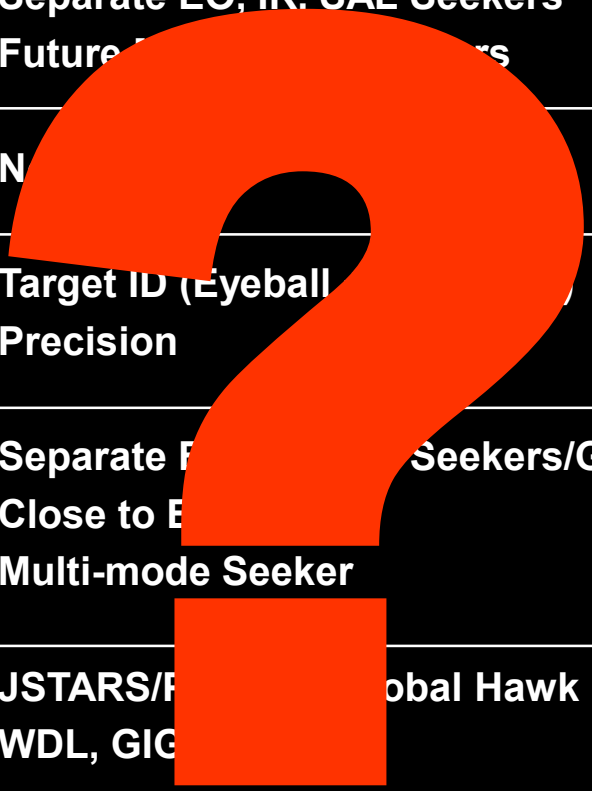
✓ Persistence
✓ Speed

Evasive Targets	Concealed Targets
✓ Decoys (EO / IR / RF / Laser)	✓ Urban Area
✓✓ Erratic Vector	✓ Law of Armed Conflict (Exploitation)
✓ Jamming (EO / IR / RF / Laser)	✓ Collateral Damage
✓ Cooperative Maneuvers	✓ Camouflage
✓ Deception (SUV, Bus in Convoy)	✓ Clutter (IR / Radar / RF / Laser)
✓ Counter-fire	✓ Buried
At Range	✓ Hardened
Even Small Targets	✓ Weather
Affordably	✓ Day / Night
✓✓ Short Reaction Windows	

A Digression

The Air-To-Air Analogy

Problem	Air-to-Air	Ground Moving Target Solution
Jamming/Clutter	Separate RF & IR Seekers Future: Multi-mode seekers	Separate EO, IR, SAL Seekers Future
Weather/Night	RF Seeker	N
Collateral Damage	Target ID (RF-SOME EO + Off Board) Precision	Target ID (Eyeball Precision
Evasive Targets	Separate RF & IR Seekers/Gun Close to Engage Future: Multi-mode Seeker	Separate Close to Multi-mode Seeker
Battlespace Awareness	AWACS with Data Link Future: GIG	JSTARS/ WDL, GIG



Spirals In Ground Attack Could Parallel Spirals In Air-to-Air

Army Ground Moving Target Solution

Joint Common Missile – 2008

Longbow – 1998

Hellfire II – 1993

= RF

“Persistence” In Precision Engagement

Surveilling assets with weapons

- Predator
- C-130
- P-3
- JUCAS (X-45, X-47)

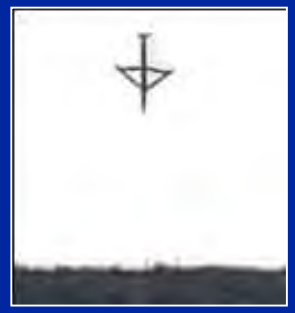
Weapons with surveilling capability

- SLAM-ER
- JASSM
- SDB II
- ACTD/ATD programs










Shouldn’t Weapons Surveille If They Have Seekers, Persistence, And Connectivity?

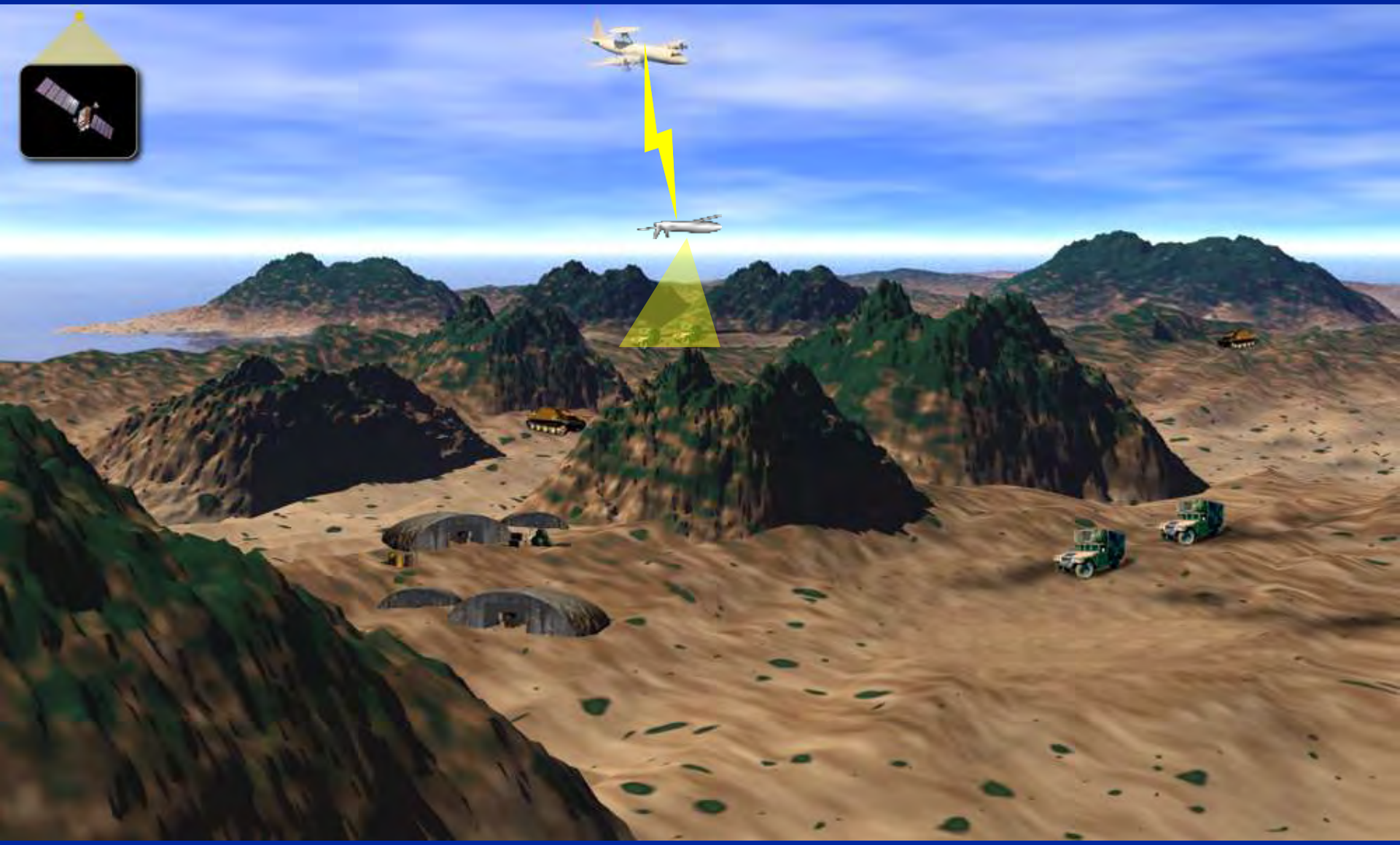
Surveilling Weapons

- Must provide various degrees of persistence based on mission
- Should be low cost, high density assets. Expendable by definition.
- Pre-position weapons based on best available data
  - Where "should" the target be? (PBA)
- Receipt of surveillance information in a timely manner results in precise engagement

Weaponized Surveillance	Surveilling Weapons
• Few assets • Expensive • Threat Dependent • Recoverable	• Many assets • Low Cost (shoot down is OK) • Cooperatively linked • Expendable

Key Is Affordability: ***Data Links = Small $***
Seekers = Small / Medium $
Persistence = Small $ (Motor)

Speed In Precision Engagement

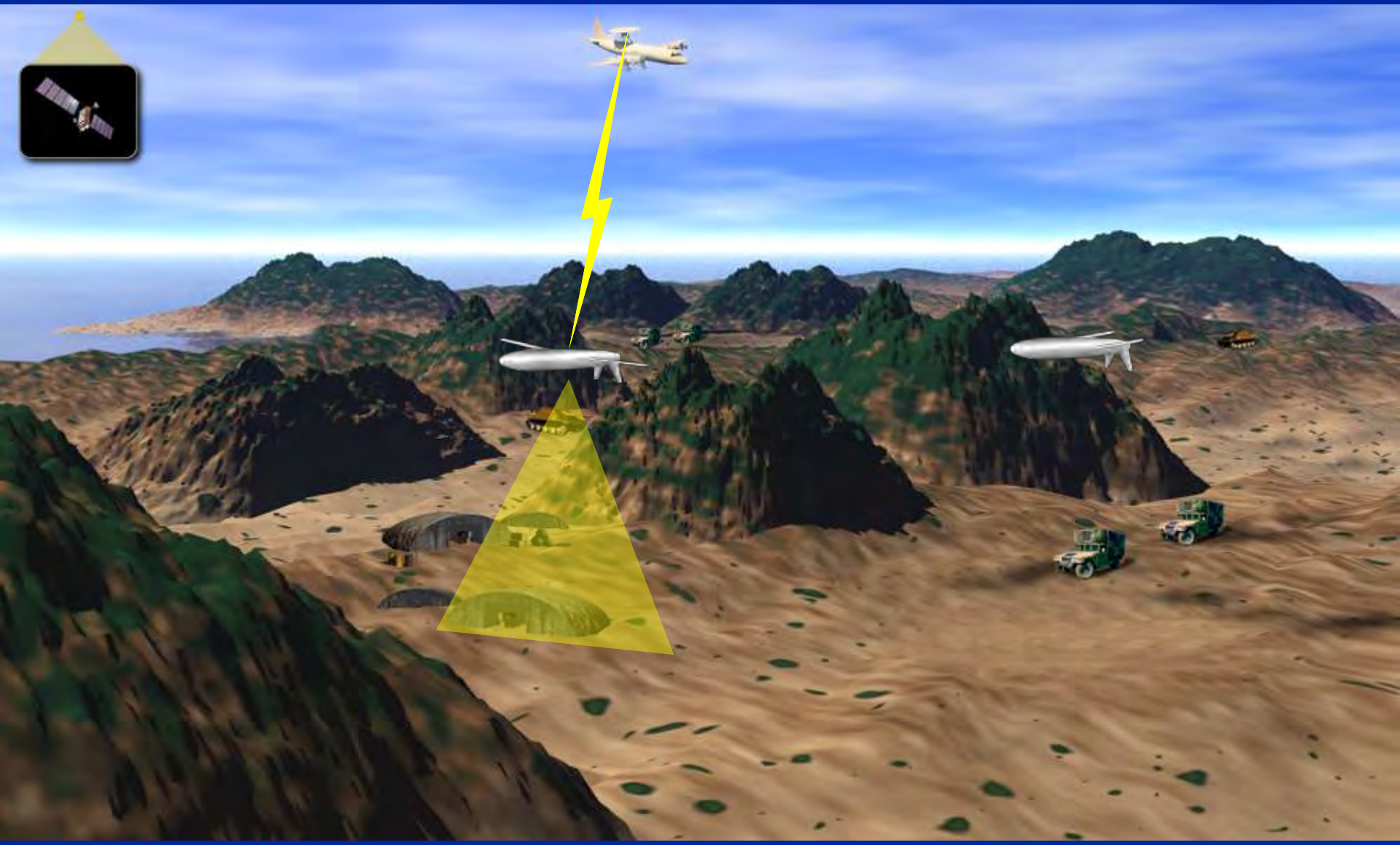


Speed In Precision Engagement

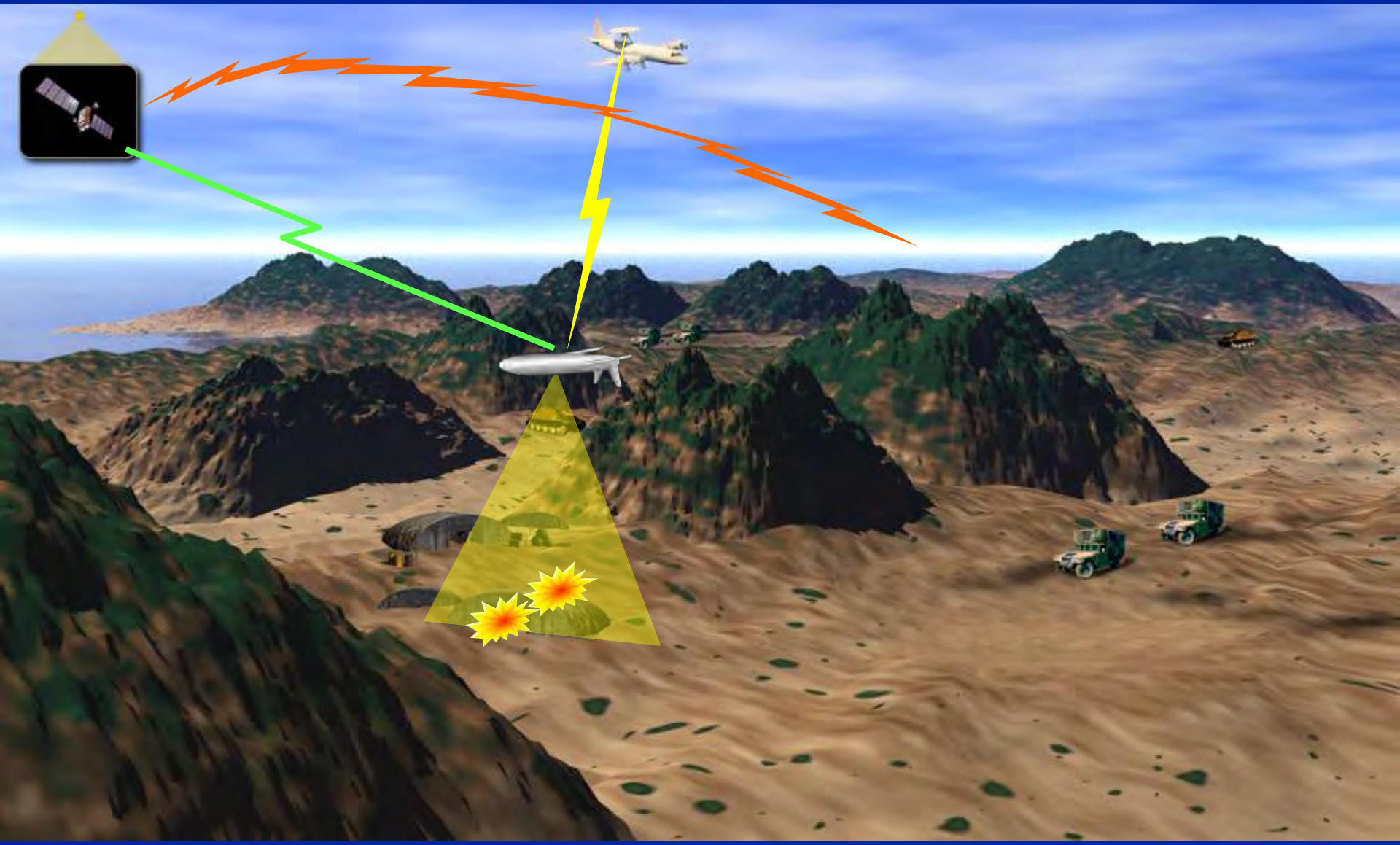
Speed In Precision Engagement

Speed In Precision Engagement

Speed In Precision Engagement



Speed In Precision Engagement



Summary

"Time" is the new challenge

- Today's seekers bring all weather, fixed & moving target capability
- Seeker should augment systemic ID
- Persistence can solve many problems
- Speed is a future and complimentary solution
- Ideal "Precision engagement" weapon:

"Surveilling weapon with persistence AND speed"

Industry Working To Provide Full Spectrum Of Options To The Warfighter

Precision Mortar Systems Overview

Precision Strike Summer PEO Forum

27-28 July 2005

LTC Andre C. Kirnes
Product Manager
Mortar Systems

Task and Purpose

Task

Provide An Overview on Current and Future Mortar Systems

Purpose

Show How These Systems Provide Precision Strike Capabilities to the Current and Future Forces.

Overall Agenda

- Mission and Vision
- Precision Guided Mortar Munition
- Mortar Fire Control System
- Summary

PM Mortars

Mission

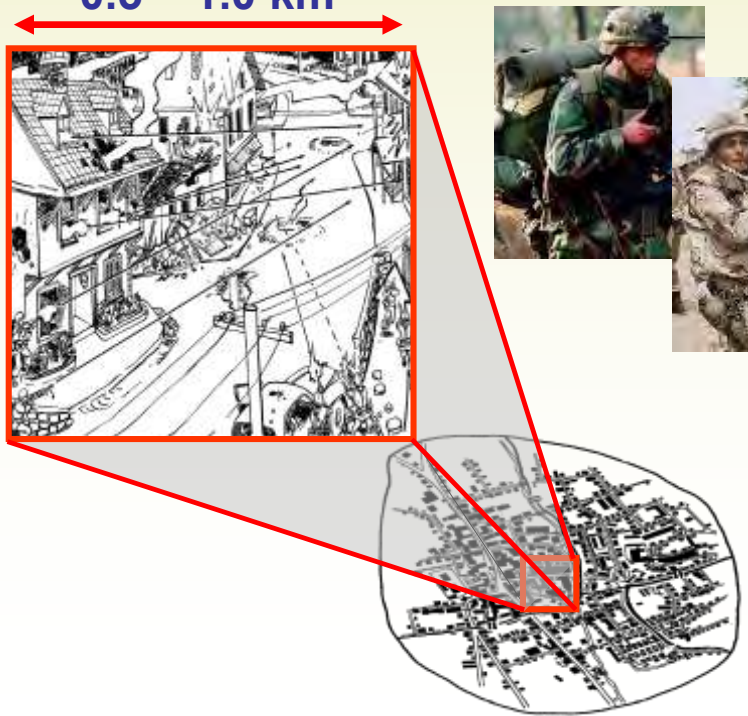
Life Cycle Manager for the full range of **mortar systems** to include **weapons**, **fire control**, and **advanced ammunition** integrated across **Current and Objective Forces.**

Vision

To Be the **Mortar Systems Expert** who provides the **Close Combat Warfighter** with the **World's Best Integrated Mortar Systems**

XM395
Precision Guided Mortar Munition (PGMM)

Close Fight – Present



TASKS: **Destroy / Defeat threats; Influence Situation**

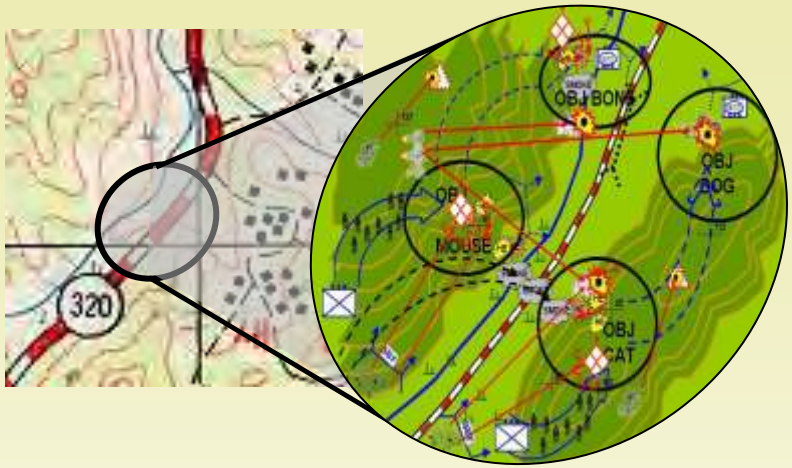
***AREA OF OPERATIONS*: Complex terrain & vegetation that limit mounted movement, 5 – 7 KM of battlespace; Urban clutter, rubbled terrain, 0.5 – 1.0 KM of battlespace**

TARGETS: **Primarily Infantry-based, supported by mechanized/armored platforms, mortars & artillery. Hasty to deliberate fortified fighting positions. Deliberate fight when in direct fire contact**

***EXISTING CAPABILITIES*:**

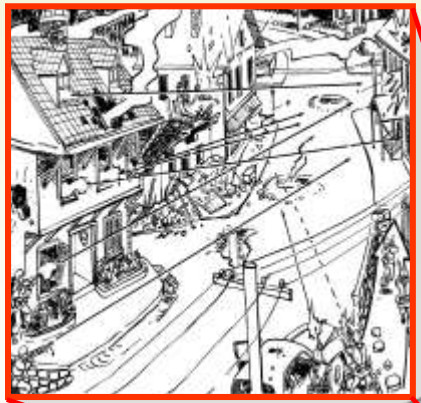
- **Limited range, primarily analog C^2 (FM voice)**
- **Limited indirect precision munitions**
- **Heavy, constrictive ballistic protection**
- **Limited, non-integrated, combat ID**
- **Manned LRS**
- **Wire-guided "heavy" AT systems**
- **Limited "fire-&-forget" AT systems**
- **Burdensome Soldier's load**
- **Limited mobility/survivability capabilities (especially in MOUT)**
- **Limited non-lethal assets**

Close/Decisive Fight – Future Requirements



10 – 12 km

1.0 – 1.5 km



TASKS: **Destroy / Defeat threats; Influence Situation**

AREA OF OPERATIONS: **Complex terrain & vegetation that limit mounted movement, 10 – 12 KM of battlespace; Urban clutter, rubbled terrain, 1 – 1.5 KM of battlespace**

TARGETS: **Primarily Infantry-based, supported by fleeting mechanized/armored platforms, mortars & artillery. Limited deliberate fortified fighting positions. Deliberate fight when in direct fire contact**

REQUIRED CAPABILITIES:

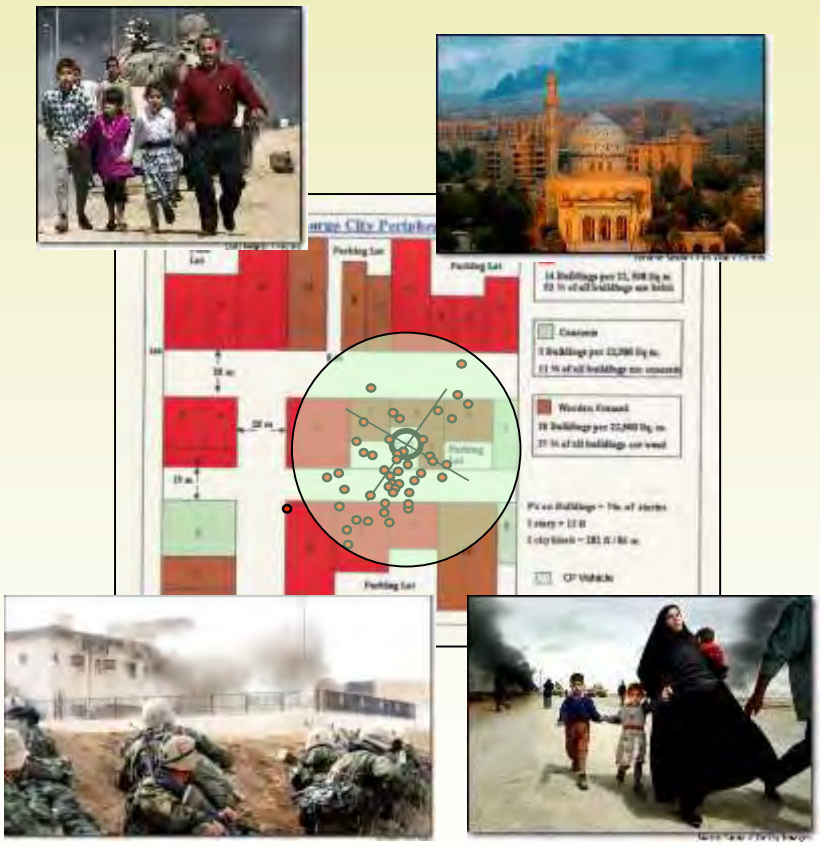
- **Extended range, urban capable, digital data & voice C^2 systems**
- **Precision direct/indirect engagement capability**
- **Light, tailorable, complete ballistic protection**
- **Integrated, soldier/platform combat ID**
- **Manned and unmanned recon capabilities**
- **All AT systems "fire-&-forget"**
- **Tailorable, light-weight Soldier's load**
- **Enhanced mobility/survivability capabilities (especially in MOUT)**
- **Integrated non-lethal capabilities**
- **Bunker defeat; wall penetration**

Indirect fire options begin to fall off when the Close Fight closes on the Objective…

Minimize "unintentional or incidental injury or damage to persons or objects that would not be lawful military targets in the circumstances ruling at the time."

- JP 1-02 "DoD Dictionary of Military and Associated Terms"

"Danger Close" Distance (meters)	Munition
750 m	Naval Gun Fire (5 inch or smaller)
600 m	155mm Conventional Artillery
225 m	GBU-31 Joint Direct Attack Munition (JDAM)
175 m	2.75 inch Rockets
170 m	M934 120mm Mortar (HE)
100 m	M720 60mm Mortar (HE)
< 100 m	**XM395 120mm PGMM**



Precision Required to Effectively Engage the Enemy in the Close Fight

PGMM Enables the Maneuver Commander

What does it do?:

- Adds a special purpose "hit a target" precise round of ammunition to the family of munitions for the battalion 120mm mortar system
- Enables the maneuver commander to incapacitate/kill individuals (snipers), small groups of threat soldiers (crew-served weapons teams), or mounted squads who have taken cover within close proximity to civilians and valued infrastructure
- Reducing the number of rounds fired and time required to fire those round allows the maneuver commander to maintain his operational tempo
- Reduces the risks of collateral damage to civilians and valued infrastructure in close proximity to these individuals, teams, and squads

What does it not do?:

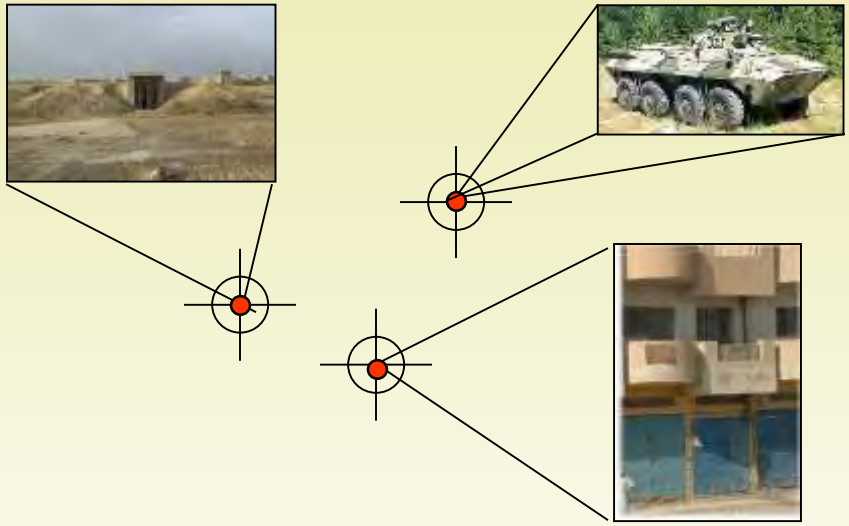
- Alter the traditional role of the mortar
- Replace High Explosive (HE) mortar or HE artillery fires
- Provide a more precise "area" munition

XM395
Precision Guided Mortar Munition (PGMM)

Requirements

Precision Guided Mortar Munition

Suppression → Destruction



High Explosive

- Area Effects
- High Volume Fire
- Defeat Targets in the Open
- Suppress Personnel Under Cover

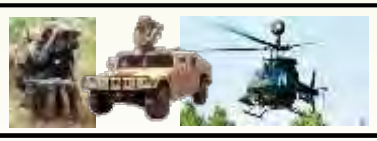
Precision Guided

- Precision Effects
- 1-2 Rounds to Effect Target
- Incapacitate Personnel Under Cover
- Low Collateral Damage
- Reduced Logistics Footprint

PGMM gives Battalion Commanders Organic Precision Strike, Destructive Capability

Incremental Requirements

PGMM

	Today	2010	TBD**	TBD**
	M934A1 High Explosive	XM395 PGMM	XM395A1 PGMM	XM395A2 PGMM
		Increment 1	Increment 2	Increment 3
Lethality	Area Fire*	< 2 rounds Destruction	< 2 rounds Destruction	< 2 rounds Destruction
		Troops Protected by Earth & Timber Bunkers, Masonry Structures, Lightly Armored Vehicles		
Range	7.2 km	7.2 km →	10 km →	12 km
Compatibility				

* Suppression of Enemy Troops

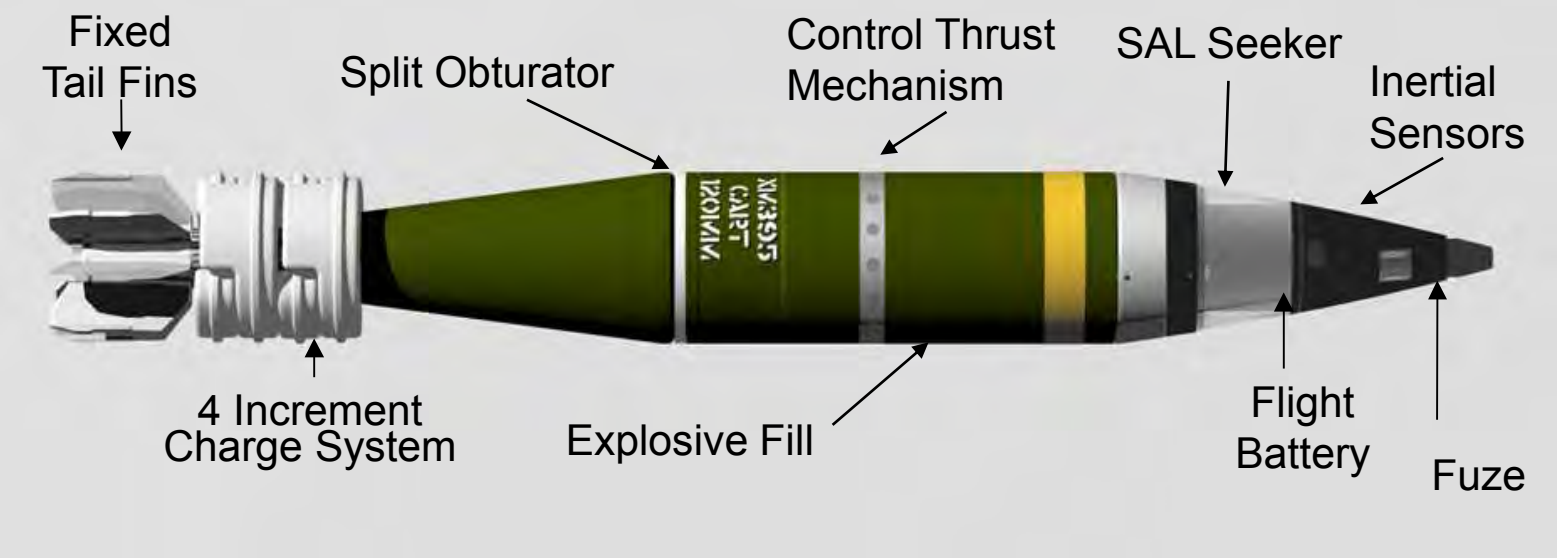
** Dependent on availability of funding and subject to further requirements analysis and approval

Incremental Development will Build on each Version's Successful Fielding and Employment

XM395
Precision Guided Mortar Munition (PGMM)

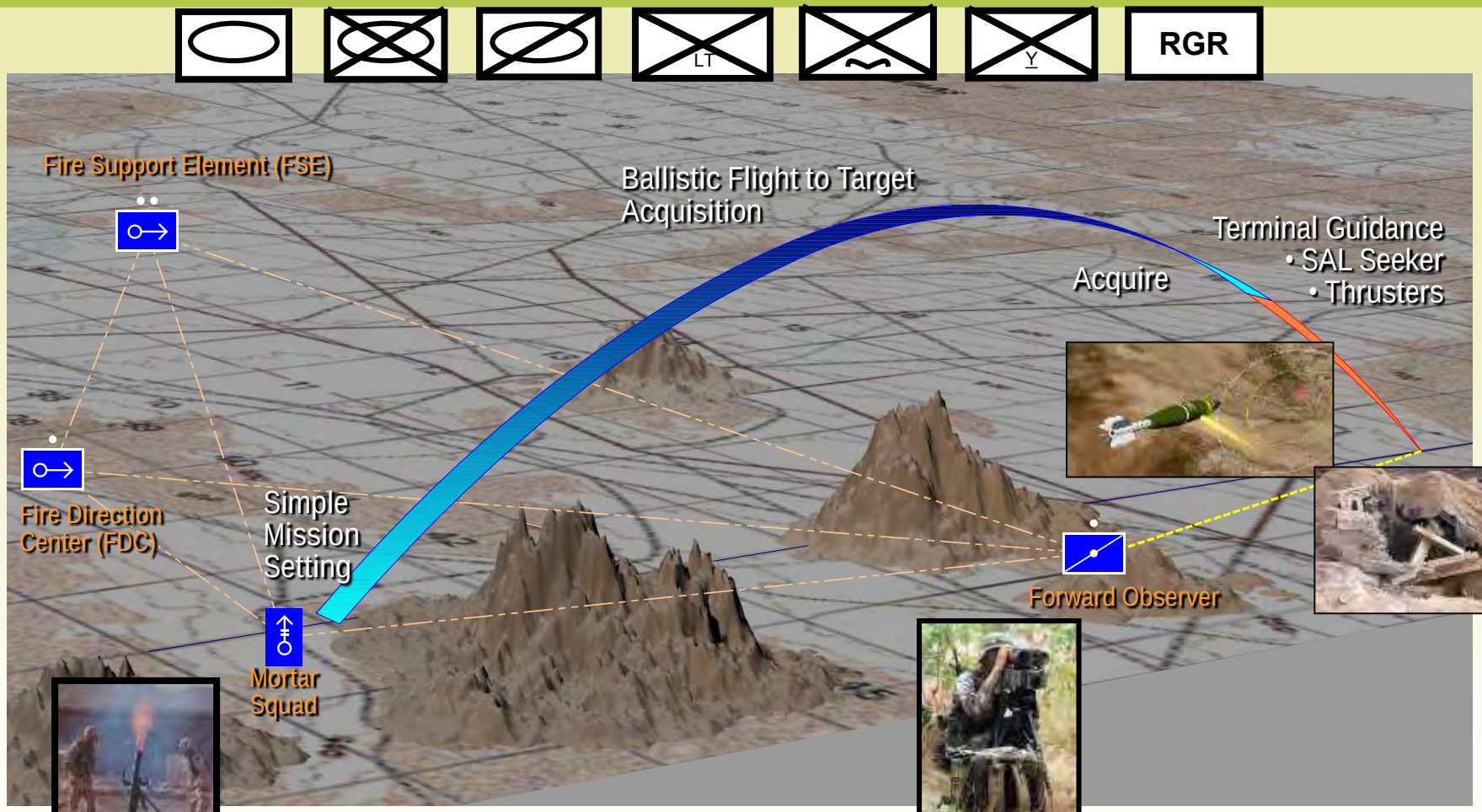
Material Solution

PGMM Material Approach



- Sensor:
  - Strap-down, Semi-Active Laser
- Warhead & Fuze:
  - Unitary Charge, Modified Conventional Fuze
- Airframe:
  - No moving parts, similar to conventional round
- Guidance & Control:
  - Accelerometers, Control Thrusters

PGMM Operational Concept



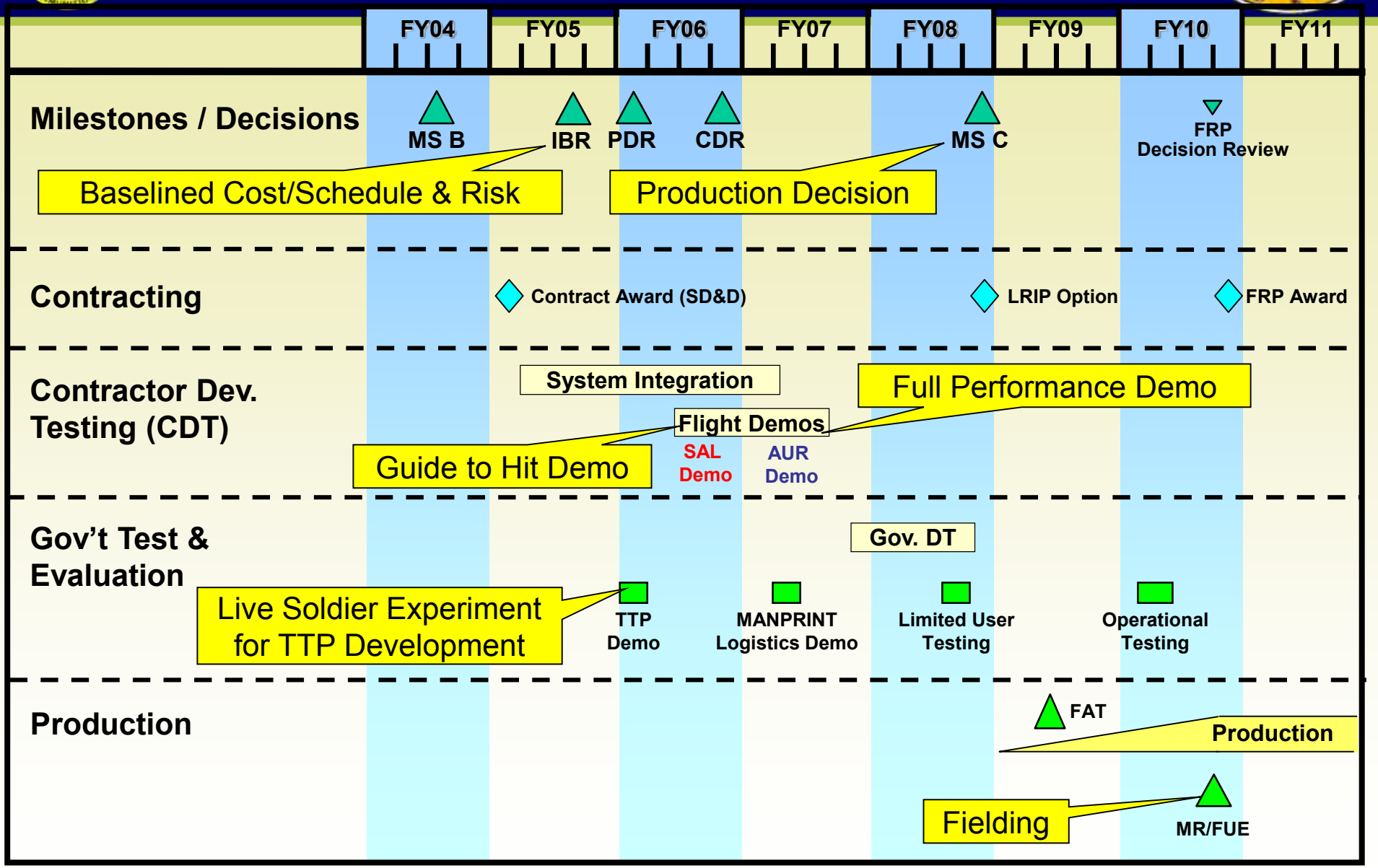
Leverages Existing Fire Support Systems
Reduces Collateral Damage

Masonry Structures
Earth and Timber Bunkers
Light Armor Vehicles

Precision Munitions Increase Warfighter Effectiveness

PGMM (Increment I) Program Schedule

2 June 2005



FRP: Full Rate Production
IBR: Integrated Baseline Review

TTP: Tactics Techniques Proc.
AUR: All Up Round

Gov. DT: Government Development Testing
FAT: First Article Test

MR: Material Release
FUE: First Unit Equipped

M95
Mortar Fire Control System
(MFCS)

Key Enabling System for PGMM

Mortar Fire Control System
Growth Strategy

MFCS Heavy (H)

Current

PDA

SINCGARS Radio

Gunner's Display

Commanders Interface

Driver's Display

Pointing Devices

V2 Software

LHMBC

R-PDA (Type-B)

Battery Holder

AA Battery Adapter

V2.1 Software

Objective
Future Combat System (FCS)

MFCS Software

Objective
MFCS-Light
Dismounted

Mortar Fire Control System (Heavy)

System Description

Program Summary

- Version 1 Fielded to the 1st Cav Div (May 03)
- Version 2 Successfully completed Stryker IOT (Feb 04)
- Version 3 JVMF interoperability (Oct 04) SW Block 1
- Version 4 Capabilities for full MR (FY06) SW Block 2
- FY04 Fielding to 3ID & SBCT3
- Production funded through FY07
- Ongoing product improvements

MFCS (H) Heavy

User Payoff

- Command & Control: Interfaces with AFATDS and FBCB2
- Responsiveness: 8 versus 1.5 min for fire for effect
- Accuracy: Reduces CEP from 230 meters to 75 meters
- Survivability: Eliminates soldier dismount, Enables disbursed Operations, "Shoot and Scoot"
- More kills per combat load through improved accuracy (one round to adjust, FFE)

Qualification Program Successfully Completed, Fielding now Underway

Incremental Development Plan

Increment I - Light Weight Hand Held Mortar Ballistic Computer (LHMBC)

- **Ballistic Solutions** for all Mortars, all Missions
- **Digital Communications** with the Fire Support Network (AFATDS - FDC)
- **GPS** - Weapon Position Location Data

Increment II - Mortar Fire Control System – Light (MFCS-L)

- *Ballistic Solutions for all Mortars, all Missions*
- *Complete Digital Linkage with the Fire Support Network (AFATDS - FDC - **Guns**)*
- *GPS Weapon Location*
- **Weapon Pointing (Indirect)**
- **Direct Lay Day / Night Engagement**

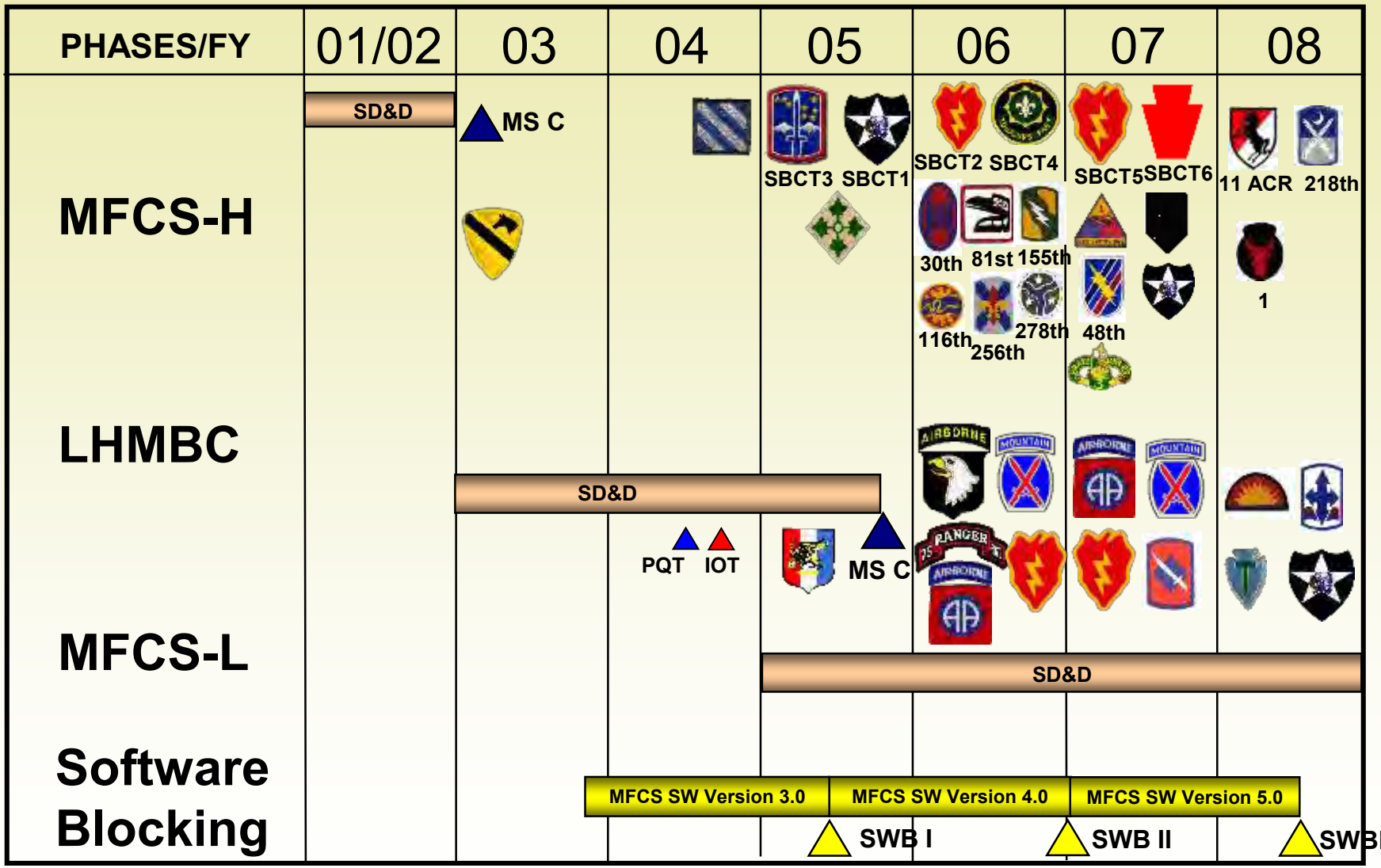
Incremental Development

- *Ballistic Calculations*
- *Weapon Position (GPS)*
- *Digital Communication*
  - *AFATDS - FDC*
  - *AFATDS/FDC – Guns*
- *Weapon Pointing and Aiming*

Inc I LHMBC — ***Inc II MFCS-L***

Requirement Documents
Inc I - MFCS ORD 1994 (LHMBC UFD 2003)
USMC MBC ORD 2002
Inc II - FCS ORD 2004

Mortar Fire Control Fielding Schedule



Schedule Supports Modularity

Summary

- PGMM – Precision Mortar Capability
  - Maneuver Commanders “Hip Pocket” Precision Strike Capability
  - Low Collateral Damage

- MFCS-(Light and Heavy) being fielded to Light, Heavy and Stryker BCTs – Responsive, Accurate, Survivable

Precision Mortar Systems

ACCURATE – LETHAL - RESPONSIVE

Contact Information

Material Developer:

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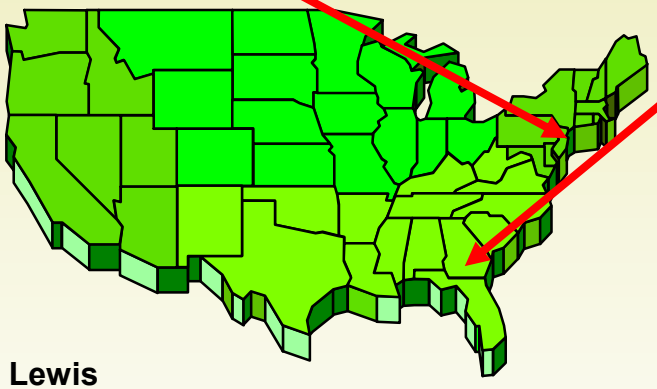

Combat Developer:

US Army Infantry Center

Directorate of Combat Developments

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Chief, Firepower Division
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OPM Mortars will Host the 2005 Mortar Conference on 18-20 October in Morristown, New Jersey, USA.

Contact Office of the Product Manager for Mortar Systems (Mr. Lee Bickley at 973-724-7625 or lbickley@pica.army.mil) for additional information

www.NDIA.org w4.pica.army.mil/pmmortars

Joint Fires Integration and Interoperability Team (JFIIT)

EXECUTIVE OVERVIEW

Col David Brown, USAF
JFIIT Commander

New Organization

Joint Combat Identification Evaluation Team (JCIET)

Joint Close Air Support Joint Test Team (JCAS JTT)

Joint Fires Integration and Interoperability Team (JFIIT)

Mission

Investigate, assess, and improve the integration, interoperability, and operational effectiveness of Joint fires and combat identification

The Joint Fires Team

1. **Operators**
   - **Ground maneuver**
   - **Aerial and surface fires**
   - **SOF**
   - **TACP / FAC / ETAC**
   - **Nonlethal/IO**
   - **Air defense/superiority**
   - **Command and control**
   - **ISR**
2. **Organic test design, data collection, and analysis capabilities**
3. **Deployable**

ETAC	**Enlisted Terminal Attack Controller**	**ISR**	**Intelligence, Surveillance, and Reconnaissance**
FAC	**Forward Air Controller**	**SOF**	**Special Operations Forces**
IO	**Information Operations**	**TACP**	**Tactical Air Control Party**

What JFIIT Will Do For Joint Capabilities

1. **Training assessments = *feedback***
   - **Participants—improve task execution**
   - **USJFCOM**
     - **Improve Joint task definition/requirements**
     - **Improve Joint training context**
   - **Services—influence Service-level tasks**
2. **Capability assessments = *quantitative information***
   - **Issues, contributing factors, and operational impact on Joint fires and combat identification**
   - **Empirical-based recommendations**
3. **Engagement on selected issues**

Service implementation of a solution = *success*!

Joint Pub. 3-09 Definitions

1. ***Joint fires*—fires produced during the employment of forces from two or more components in coordinated action toward a common objective**
   - ***Fire support*—fires that directly support land, maritime, amphibious, and special operations forces to engage enemy forces, combat formations, and facilities in pursuit of tactical and operational objectives**
   - ***Joint fire support*—Joint fires that assist land, maritime, amphibious, and special operations forces to move, maneuver, and control territory, populations, and key waters**

Scope

Joint Functional Concepts	Joint Operating Concepts				
	Major Combat Operations	Stability Operations	Homeland Security	Strategic Deterrence	….
Force Application					
Command and Control					
Battlespace Awareness					
Protection					
Net Centric Environment					
Focused Logistics					
…					

JFIIT Focus Areas
Joint Targeting
Joint Interdiction
Joint Close Air Support
Naval Surface Fire Support
Surface-to-Surface Fire Support
Joint Suppression of Enemy Air Defense
Nonkinetic Means / Nonlethal Effects
Command and Control
Intelligence, Surveillance, and Reconnaissance
Joint Theater Air and Missile Defense / Offensive Counterair
Combat Identification

Focus Areas

1. JFIIT-selected focus areas
2. Functional grouping of tasks, operational activities, and system functions directed to a common purpose
3. Facilitate interoperability and connectivity
4. Found throughout the Joint operating and functional concepts


F105
M108
M113
M112
M111
F106
M110
F107
M109
F103
F252
FORT
IRWIN
MILITARY

Vision

1. **A permanent organization that links Joint fires requirements with emerging technology, Joint training, doctrine, and TTP**
2. **Quantifiable and lasting improvements to Joint fires effectiveness**
   - **Across DOTMLPF**

Enhance and sustain a culture of jointness

DOTMLPF	**Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities**
TTP	**Tactics, Techniques, and Procedures**

JFIIT Projects

1. **Joint National Training Capability (JNTC) analysis design**
2. **Reference Point Method Quick Look Operational Study (No. 2)**
3. **Coalition Combat Identification Advanced Concept Technology Demonstration (CCID ACTD)**
4. **Patriot Positive Identification (PID) test**
5. **Concept of Link 16 Employment (COLE)**
6. **Joint Terminal Attack Controller (JTAC) equipment matrix**
7. **4th Infantry Division National Training Center (NTC) Joint fires integration**

Questions?

(850) 882-6700 (DSN 872-)

https://jfiit.eglin.af.mil

104 Biscayne Road
Eglin AFB FL 32542

The Challenge of Achieving Joint Command and Control in a Network Centric Environment

Frank J. Caravella

Raytheon Company

Joint Command and Control Campaign Lead

Agenda

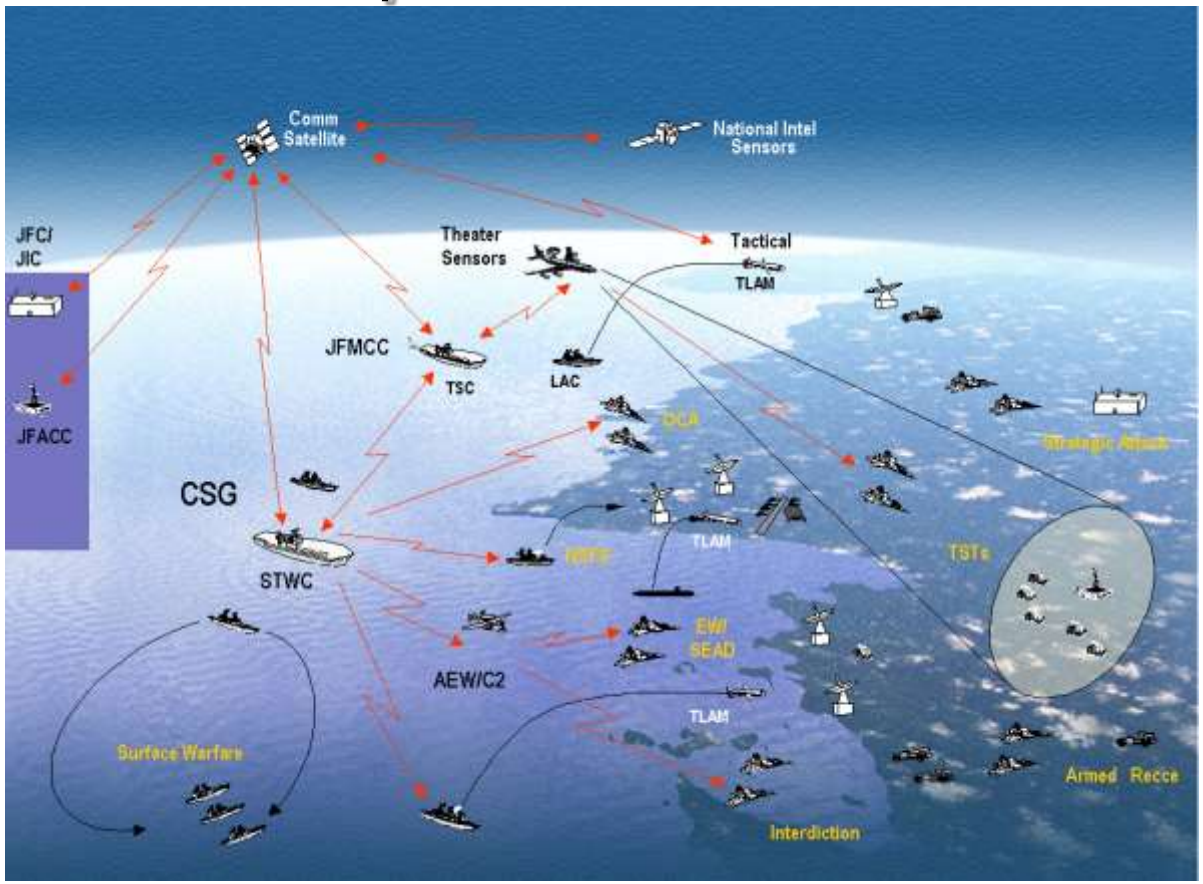
Raytheon

- **Operational Context for Joint Command and Control**
- The Joint Command and Control Acquisition Environment
- Govt and Industry challenges to the new acquisition environment
- Summary / conclusions

21st Century Warfighting Environment

Raytheon

Full Spectrum Dominance



- Exploit every source – leverage what we have
- Provide shared situation awareness / understanding
- Support dominant speed of command
- Permit precise, synchronized execution
- Allow agility and flexibility

Enabled By Network Centric Warfare

Video

Raytheon

Agenda

Raytheon

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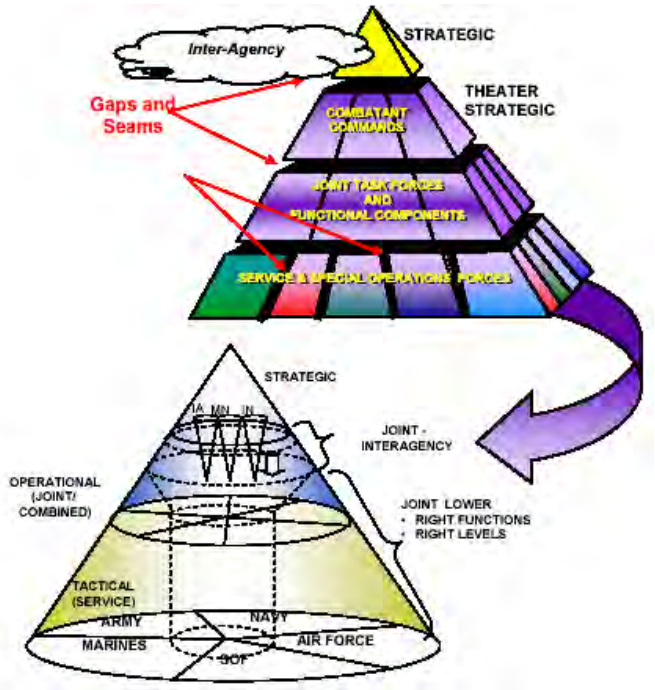
21st Century Acquisition Environment

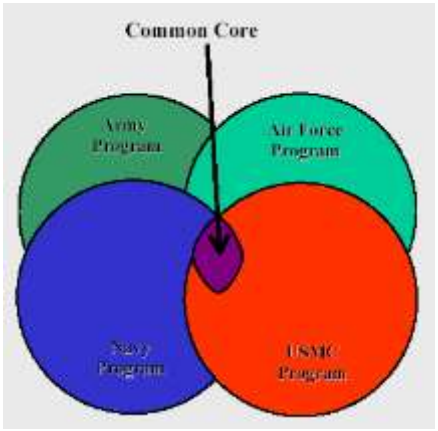
Raytheon

OIF LL: Seamless Joint Capability



- *OIF lessons learned reinforce role of joint capabilities*
- *OIF lessons learned portrayed expanding requirements for core joint capabilities at strategic, operational and tactical levels*

"Old Think"



"New Think"

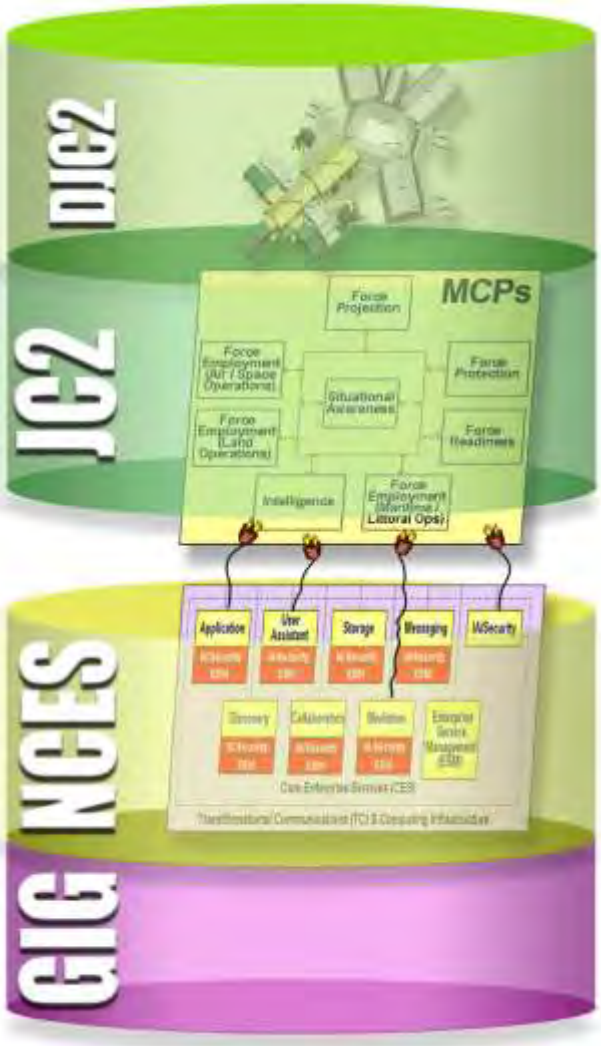
Paradigm Shift to "Born Joint"

Implementing Warfighting Capability In An Enterprise Services Architecture

Raytheon

Warfighting Capabilities

Pathfinders & Feeders



JC2 Mission Capability Packages

Key warfighting applications for decision superiority

NCES

Common set of information services that provides for timely, ubiquitous edge user access to decision quality information within the Global Information Grid

JC2 and NCES Acquisitions Are Interdependent

Possible Acquisition Structure*
(Family of Programs with Joint PEO)

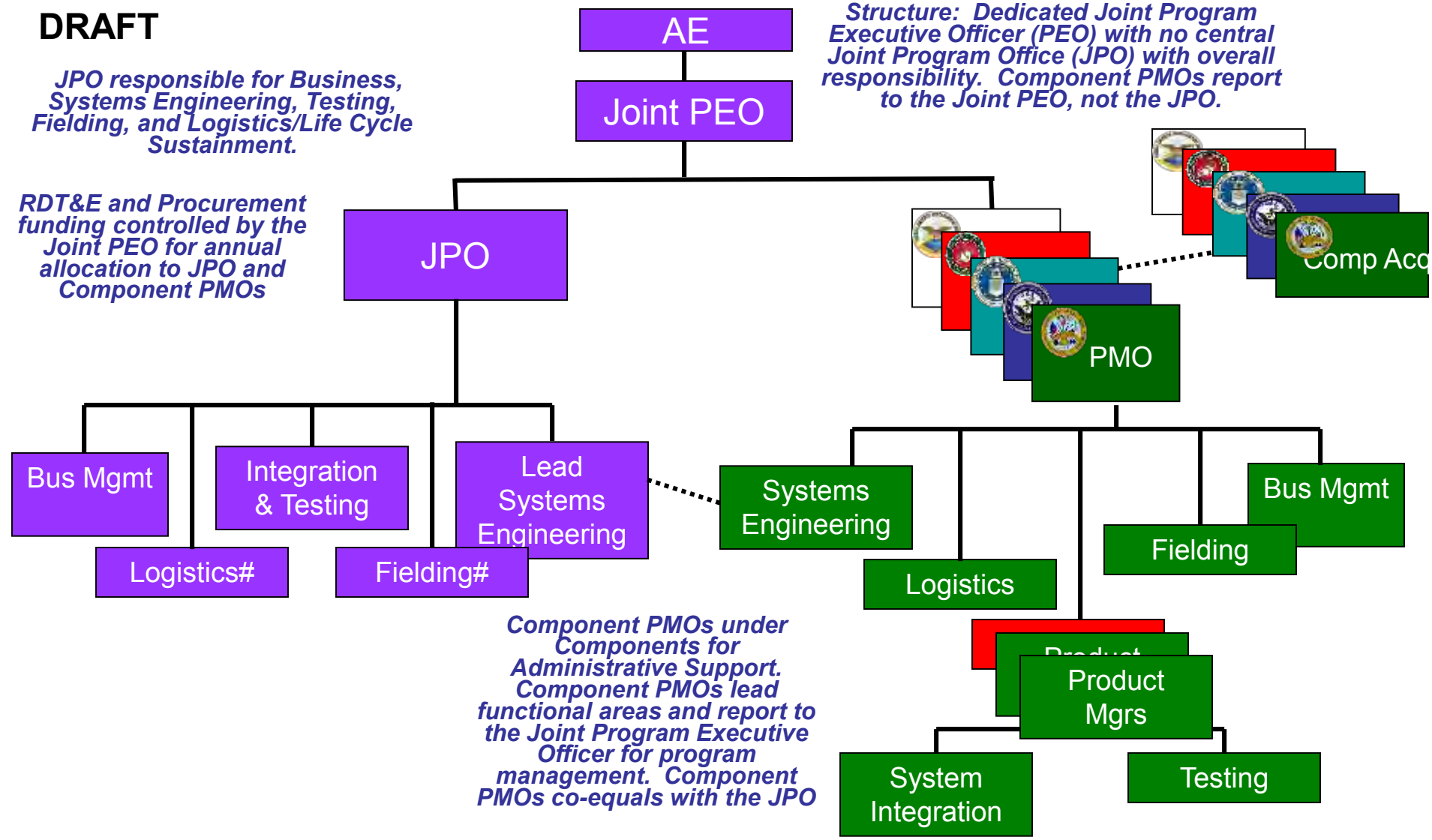
Raytheon

DRAFT

JPO responsible for Business, Systems Engineering, Testing, Fielding, and Logistics/Life Cycle Sustainment.

RDT&E and Procurement funding controlled by the Joint PEO for annual allocation to JPO and Component PMOs

Structure: Dedicated Joint Program Executive Officer (PEO) with no central Joint Program Office (JPO) with overall responsibility. Component PMOs report to the Joint PEO, not the JPO.



Component PMOs under Components for Administrative Support. Component PMOs lead functional areas and report to the Joint Program Executive Officer for program management. Component PMOs co-equals with the JPO

 # Overall Planning

***=From OSD/NII**

Note: Pre-Decisional Draft Information

Agenda

Raytheon

- Operational Context for Joint Command and Control
- The Joint Command and Control Acquisition Environment
- **Govt and Industry challenges to the new acquisition environment**
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Technical Challenges:
Technical Environment

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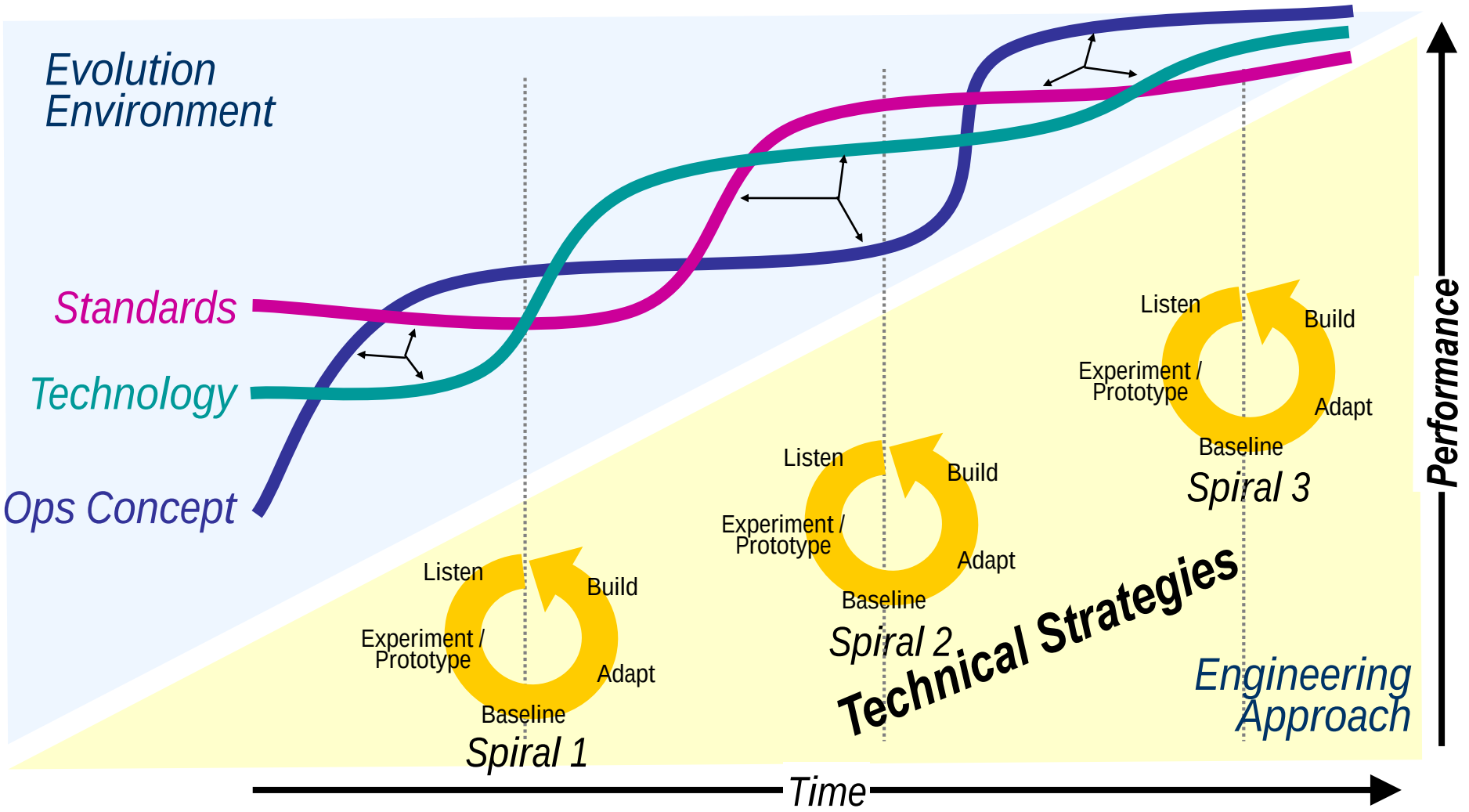
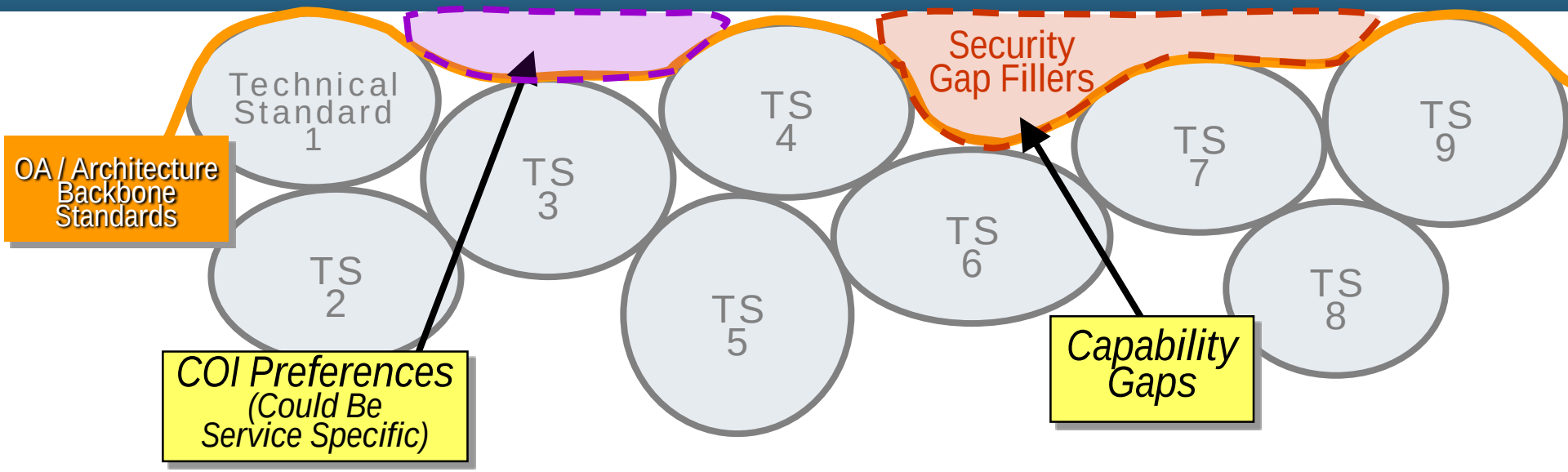


Technical Challenges:
JC2 / NCES Technical Standards Gap

Raytheon

Desired Core Service Capability
C2 ERA, NOA, SOSCOE, NESI

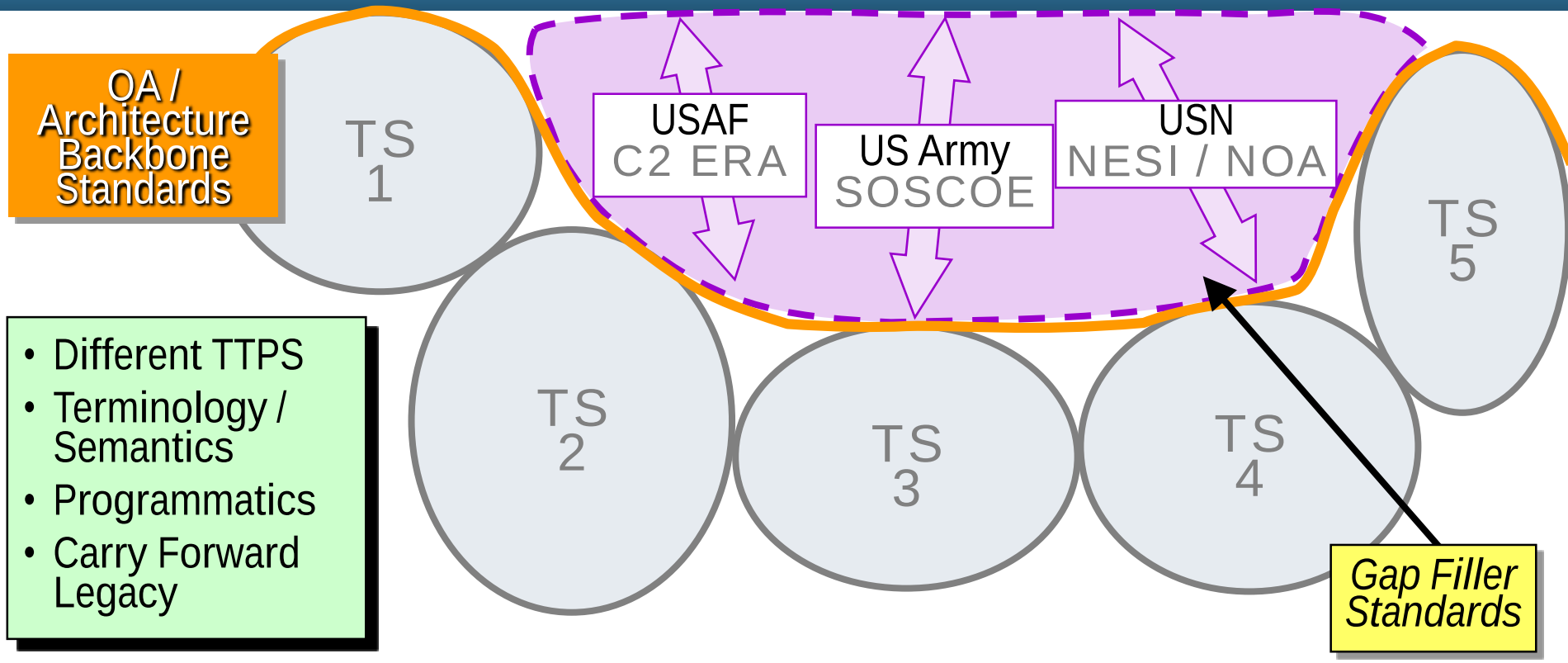


Development / Fielding in Parallel with Standards Evolution Creates Fiscal and Operational Risk

Technical Challenges:
Multiple Technical Approaches

Raytheon

Desired Core Service Capability
C2 ERA, NOA, SOSCOE, NESI



- Different TTPS
- Terminology / Semantics
- Programmatics
- Carry Forward Legacy

Each Military Community is Trying to Fill Technical Standards Gaps

Joint Service
Interoperability Challenge

Raytheon

COI Workflow Service

MCP-Defined Services Ex (SA)

Other COI Services
(Includes Military Service Differences)

Gap

BEA WLI Basic Workflow

Desired Core Service Capability
C2 ERA, NOA, SOSCOE, NESI

OA / DIB Standards

Satisfying Core Enterprise Service Criteria Does Not Assure COI Interoperability

Joint Service
Interoperability Challenge

Raytheon

COI Collaboration Service

MCP-Defined Services Ex (SA)

Other COI Services

- Army Unique
- Navy Unique
- USAF Unique
- USMC Unique

Desired Core Service Capability
C2 ERA, NOA, SOSCOE, NESI

When Providing Operational COI Services, All Stakeholders Must Be Considered

Joint Service
Interoperability Challenge

Raytheon

COI Collaboration Service

MCP-Defined Services Ex (SA)

- Army Unique
- Navy Unique
- USAF Unique
- USMC Unique

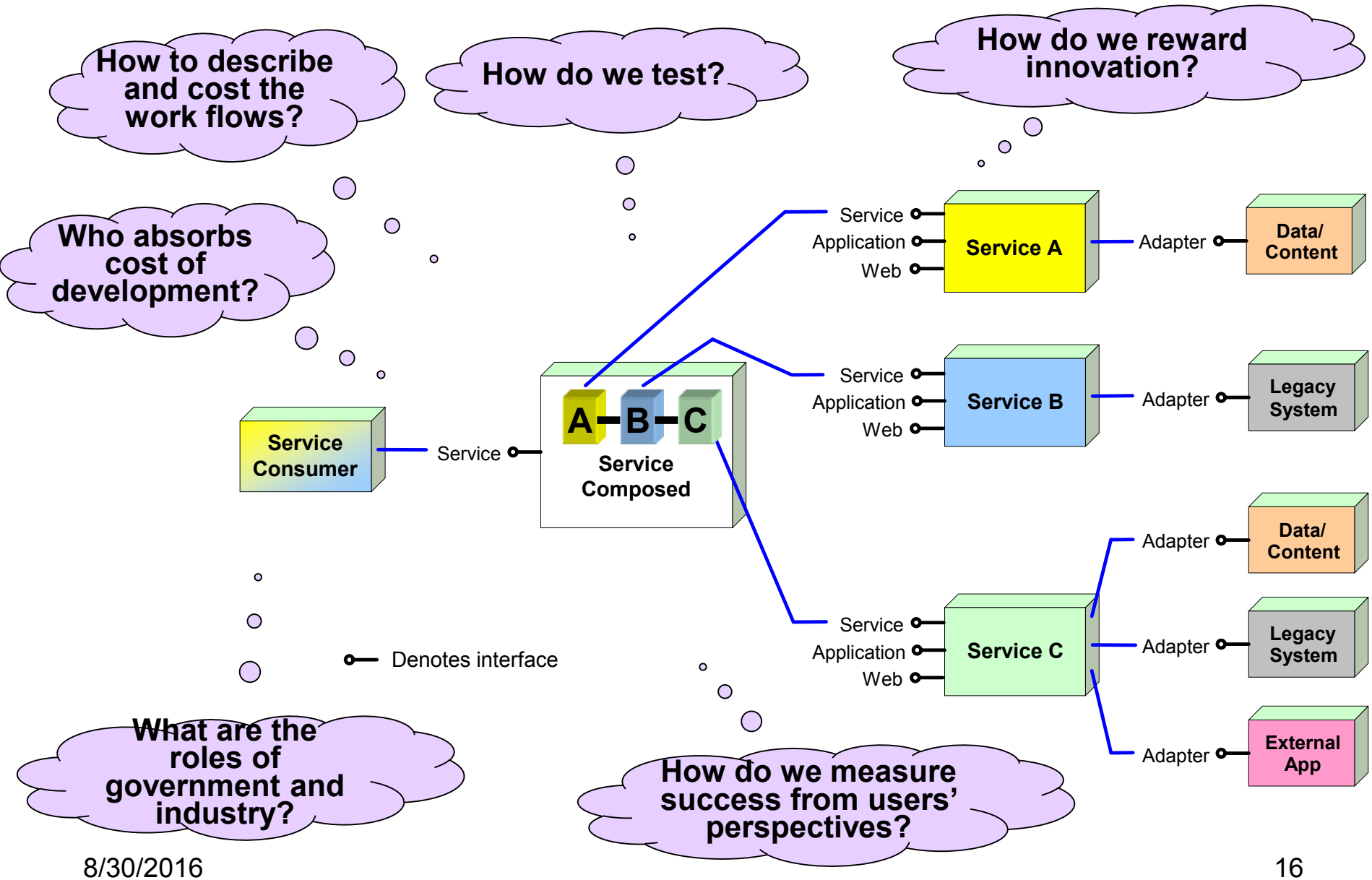
Other COI Services (Includes Military Service Differences)

Desired Core Service Capability
C2 ERA, NOA, SOSCOE, NESI

Providing Truly Joint Functional Services Requires Addressing All Service-Unique Needs

Acquisition Practices Challenges:
Acquisition of Composable Capability

Raytheon



Business Case Challenges: **Acquisition in an Open Architecture Environment**

Raytheon

Benefits

- Makes warfighting sense
- Provides technical foundation for NCW
- Facilitates interoperability
- Facilitates non-proprietary solutions
- Enables rapid response to change in requirements
- Provides business opportunities as systems integrator

Challenges

- Cross-service requirements definition
- Joint acquisition strategy
- Contracting rigidity
- Leveraging commercial technologies, products, skills, and best practices for DoD enterprise outcomes
- Integrator role

Government Perspective

OA is less expensive

- Life cycle costs
- Dynamic reuse
- Non-proprietary
- Re-invigorates competition

Defense Industry Perspective

Business case is challenging

- Less emphasis on production quantity
- Cross-COI best of breed
- First on-scene
- Where's the ROI?

OA Provides Both Opportunity And Risk

Agenda

Raytheon

- Operational Context for Joint Command and Control
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Roles

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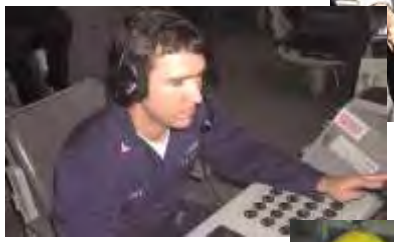
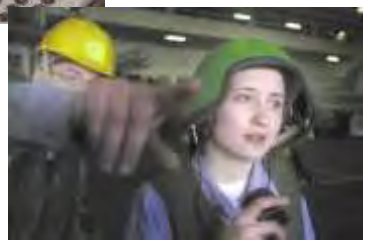




- **Gov't focus:**
  - Cross-DoD requirements coordination
  - MCP requirements definition
  - COI work flow definition
  - Technical Standards selection
  - Budget priorities and discipline
- **Industry strengths:**
  - Innovation
  - Engineering experience & discipline
  - Practical application of technology
  - DoD cross-customer technical solution coordination
  - Structured and organized for rapid capability delivery
- **Gov't / Industry partner in:**
  - Criteria for enterprise success
  - Innovative acquisition practices
  - User representation throughout development of capability

JC2 Development Will Involve Multiple DoD Organizations And Multiple Industry Participants

Bringing It All Together

Raytheon

ENVIRONMENT

- Multiple players
- Rapid acquisition and short development
- Government expects spiral / incremental capability introduction
- Complex technical issues
- Limited resources – both money and personnel

WHAT WE NEED…

- Government / Industry partnering from capability definition through experimentation, fielding, and lifecycle maintenance
- Clearly defined roles and responsibilities
- Close coordination between requirements identifiers and solution developers
- Open and flexible technical solutions
- Resource alignment

Need Clarity of Acquisition Environment

Air Armament Center

Keynote Address
Precision Strike Association

Summer PEO Forum

27 Jul 2005

Maj Gen Robert
"Chedbob" Chedister

Integrity - Service - Excellence

Why Am I Here?

Give a Keynote Address Related to Precision Engagement Capabilities for the Future

What's the Desired Outcome?

Outline Some Issues

Be Interesting

Be Thought Provoking

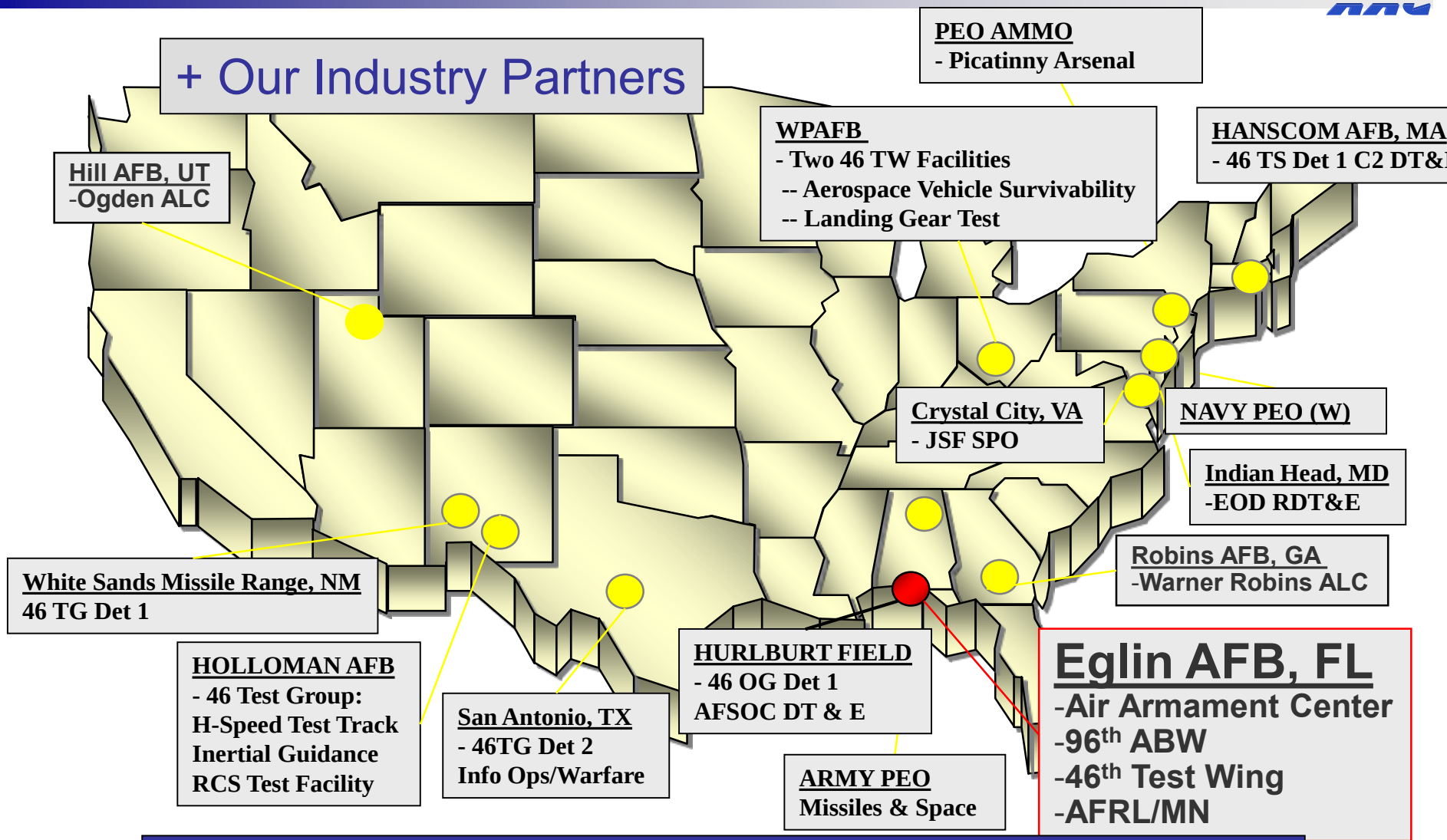
The Plan

- USAF Air Armament Enterprise Overview
- Air Armament Historical Review
- Future Air Armament Opportunities
- Future Technology Opportunities
- Future Acquisition Opportunities

Disclaimer – This is ChedBob's Perspective

USAF Air Armament Enterprise Overview

USAF Air Armament Enterprise



The Only Enterprise with Lab, SPO's, Test, and Users Together – A Great Combination

What We Do at AAC

From Concept to Employment

- **Science & Technology w/ AFRL, DTRA and Others: Develop the idea and produce a tech demonstration**
- **Product Support w/ Acquisition Organizations: Manage the Development of the weapons**
- **With 46TW, 53d W, AFOTEC and Sister Services Conduct Test & Evaluation to prove weapon readiness**
- **With ALC's and Sister Services Sustain and Demil the stockpile**
- **Run an AF base supporting Expeditionary Air Force**

Arming the Warriors

Transition Technology to Weapon Systems and Provide War Winning Capabilities On Time, On Cost

We Have Been Well Recognized

JDAM

David Packard Excellence in Acquisition Award

Perry Award at the Precision Strike Conference

PAW

2003 John J. Welch Award

David Packard Excellence in Acquisition Award

WCMD

Outstanding AFMC Contracting Team Award

JASSM

David Packard Excellence in Acquisition Award

Air Armament Academy

1st Annual USD AT&L Workforce Development Award

SFW

DoD Value Engineering Award

B-2 Shelter

Jacobs Master Builder Award

AMRAAM

Bernard J. Schriever Award

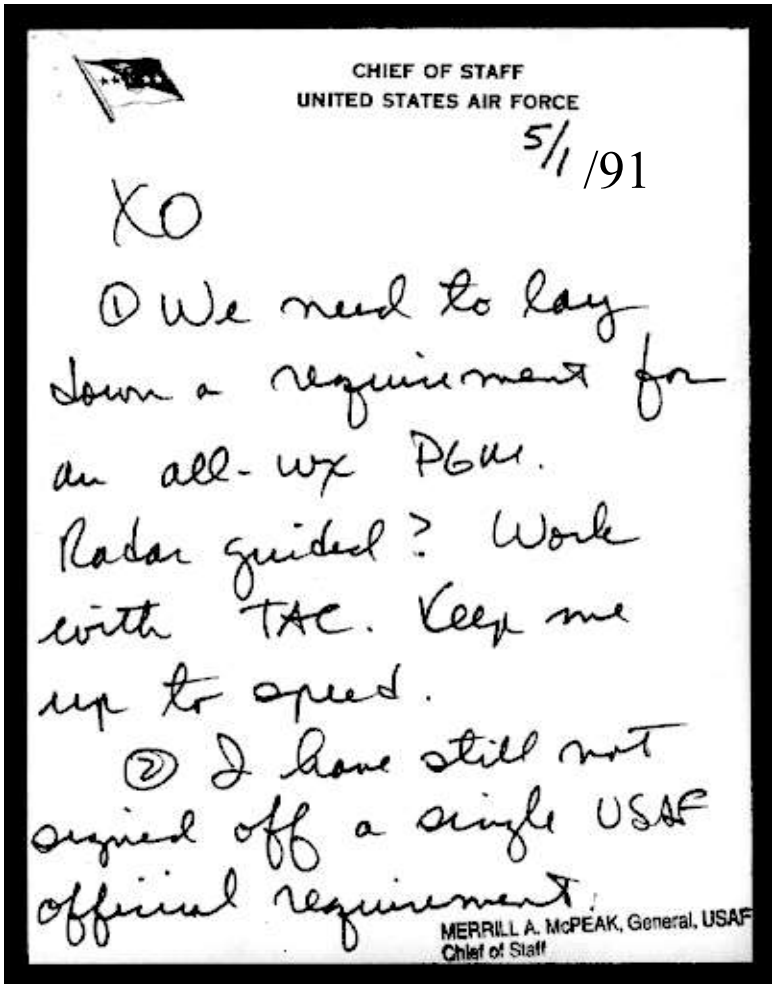
Outstanding AF System Program Director

Outstanding AF Program Manager

SDB

2004 John J. Welch Award

Air Armament Historical Review



CHIEF OF STAFF
UNITED STATES AIR FORCE

5/1 /91

XO

① We need to lay down a requirement for an all-wx PGM. Radar guided? Work with TAC. Keep me up to speed.

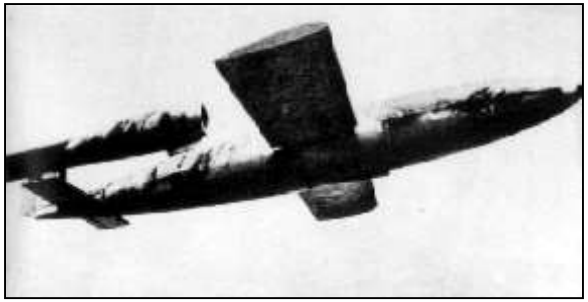
② I have still not signed off a single USAF official requirement.

MERRILL A. McPEAK, General, USAF
Chief of Staff

Air Armament – A Historical Perspective

1911- First Bomb dropped

1918 - Kettering Bug



1928- German V-1

1943 - SD 1400 “Fritz X”

Air Armament – A Historical Perspective

1953 - AIM-9 “Sidewinder”

1968 - GBU-10 Laser Guided Bomb

1998 – B-2 Use of JDAM in Kosovo

Air Armament A Capability Transformation Success Story

Accuracy

1943

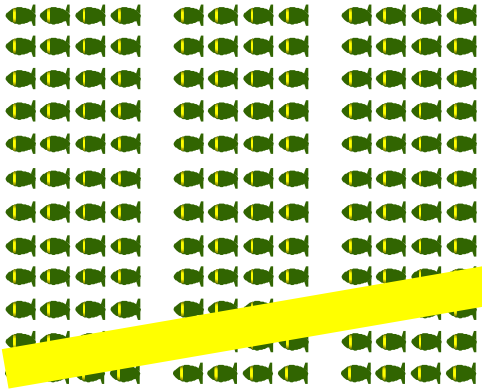
1500 B-17 sorties

9000 bombs (250#)

3300 ft CEP

One 60' x 100' target

W.W.II



1970

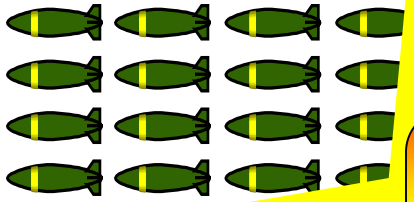
30 F-4 sorties

176 bombs (500#)

400 ft CEP

One Target

Vietnam



1991

1 F-117 sortie

2 bombs (2000#)

10 ft CEP

Two Targets per Sortie

Desert Storm

1999

1 B-2 sortie

16 bombs (2000#)

20 ft CEP

16 Targets per Pass

All Weather

Accuracy

Revolutionary Technologies

Laser Guidance

GPS Guidance

B-2 Drop of 80 JDAMs

Precisely Struck 80 Different Targets in One Pass

Air Armament In Review


AIM-9


AGM-65


M-117


MK-82


MK-83


MK-84


AGM-84


AGM-88
HARM


AIM-120


GBU-10,12


GBU-15


AGM-86C/D
CALCM


GBU-27


GBU-24


GBU-28


AGM-130


CBU-103
WCMD


CBU-105
WCMD


AGM-154
JSOW


GBU-31


GBU-37


AGM 88
SLAM


SLAM-ER


AGM-114
Hellfire

AIM-9X


CBU-107
WCMD


SDB


GBU-38


JASSM


JASSM (ER)


JDAM (ER)


WCMD
(ER)


DRAAM


WASAAMM


TDLS


TMMLW


Active
Denial

Lead Developer
XXX – USAF
XXX – USA
XXX – USN

Prior | 70s | 80s | 90s | 00s | Future

Future Air Armament Opportunities

Future Air Armament Opportunities

- Old/New Aircraft Integration with Old/New Weapons
- Universal Aircraft Interface
- Weapon Testing in Future
- Long Range Strike
- Networked Weapons
- Hitting Moving Targets in Weather
- Directed Energy as an Air Delivered Weapon

Aircraft –Weapon Integration 1

	JDAM GBU-31	JDAM GBU-32/35	JDAM GBU-38	WCMD CBU-103/104 105 & 107	WDMC-ER	SFW CBU-97	JSOW AGM-154A
F-16C/D	Block 50 40 30	Block 50 40 30	Block 50 40 30	Block 50 40 30	Block 50 40 30	Block 50 40 30	Block 50 40 30
	● ● ●	○	● ● ●	● ● ●	◍	● ●	● ●
F-15C/D							
F-15E	●	○	●	◍		●	●
F-117A	◍			◍			
F/A-22A		◍	○				
A/OA-10A	◍		◍	◍		●	
B-1B	●		◍	●		●	●
B-2A	●		●			●	●
B-52H	●		○	◍			●
F-35A JSF	◍	◍	○	◍		○	◍
J-UCAS	◍	○	○				
Predator			◍				
F/A-18C/D	●	●	●				●
F/A-18E/F	●	◍	◍				●
F-14B	●		○				
F-14D	●		○				
AV-8B		●	◍				
P-3/S-3	○						

Funded = ◍

Unfunded = ○

Done = ●

Aircraft - Weapon Integration 2

	JASSM AGM-158			JASSM-ER			SDB-1 GBU-39			AMRAAM AIM-120 Phase 1/2			AMRAAM AIM 120 Phase 3			AMRAAM AIM-120 Phase 4			AIM-9X			MALD		
F-16C/D	50	40	30	50	40	30	50	40	30	50	40	30	50	40	30	50	40	30	50	40	30	50	40	30
	●	◍	○	○	○	○	○	○	○	●	●	●	◍	◍	◍	◍	○	○	◍	◍	◍	◍	◍	◍
F-15C/D										●			◍			◍			●					
F-15E		○			○			◍		●			◍			◍			○					
F-117A		○						○																
F/A-22A								◍		◍			◍			◍			○					
A/OA-10A								○																
B-1B		●			◍			○																
B-2A		●						○																
B-52H		●			○			○															◍	
F-35A JSF		○						○		◍			◍			○			◍					
J-UCAS								○																
Predator								○																
F/A-18C/D		○								●			◍			◍			●					
F/A-18E/F		○								●			◍			◍			◍					
F-14B																								
F-14D																								
AV-8B																								
P-3/S-3		○																						

Funded = ◍

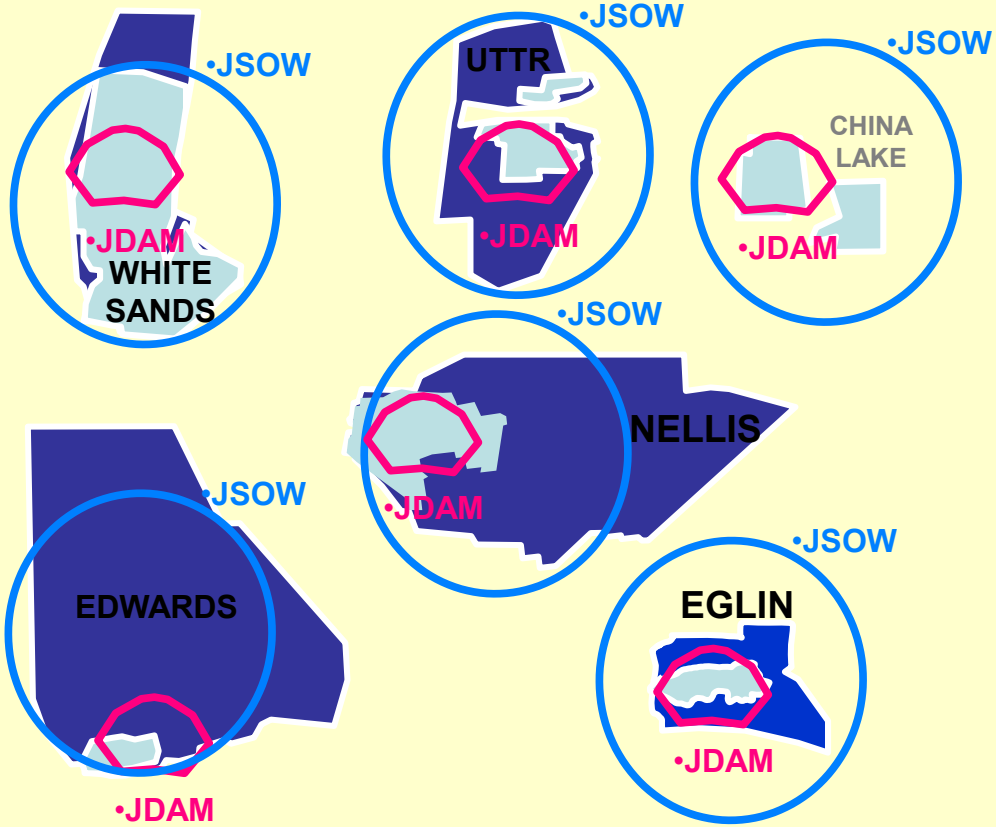
Unfunded = ○

Done = ●

Universal Armament Interface (UAI) Technical Approach

Program Objective: Decouple weapon integration schedules from aircraft OFP update cycle

Weapon Footprint Reality



• JDAM
50 kft, 1.5M

• JSOW
Medium Altitude, 0.7M

DoD Land

DoD Airspace

Weapon Footprint "A Solution"

- JDAM
  50 kft, 1.5M

- JSOW
  Medium altitude, 0.7M

Weapons Testing in the Future

Air Force
Army
Navy
Marine Corps
NASA

New Strike Weapons Challenges

Strike Long Range Targets Quickly

Best way to meet requirement = Networked Weapons

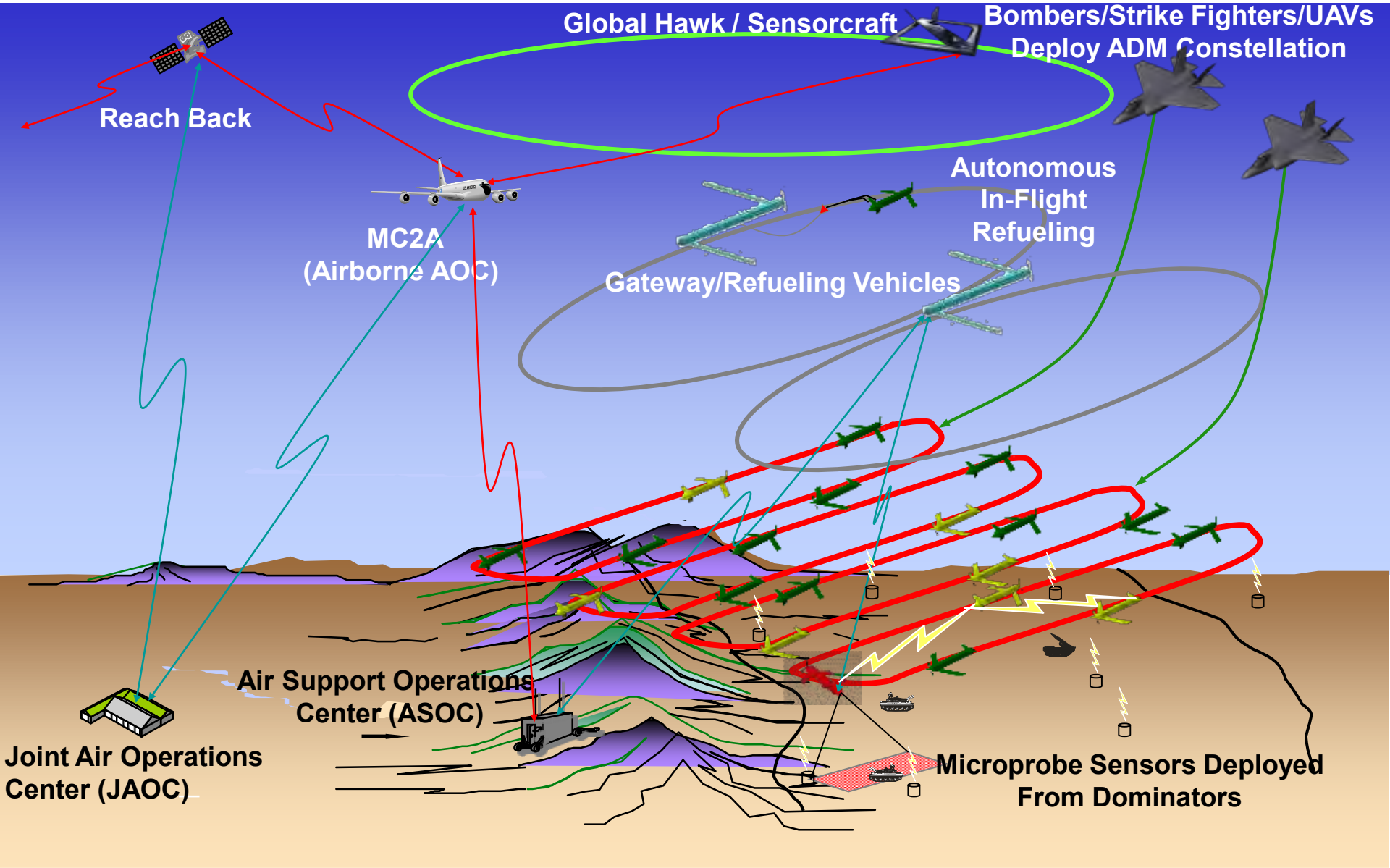
Joint Air-to-Surface Standoff Missile (JASSM / AGM-158)

- **Precision Guided Standoff Weapon For High Value Targets**
- **Range: Greater Than 200 NM**
- **Length: 14 Ft**
- **Weight: 2200 Lbs**

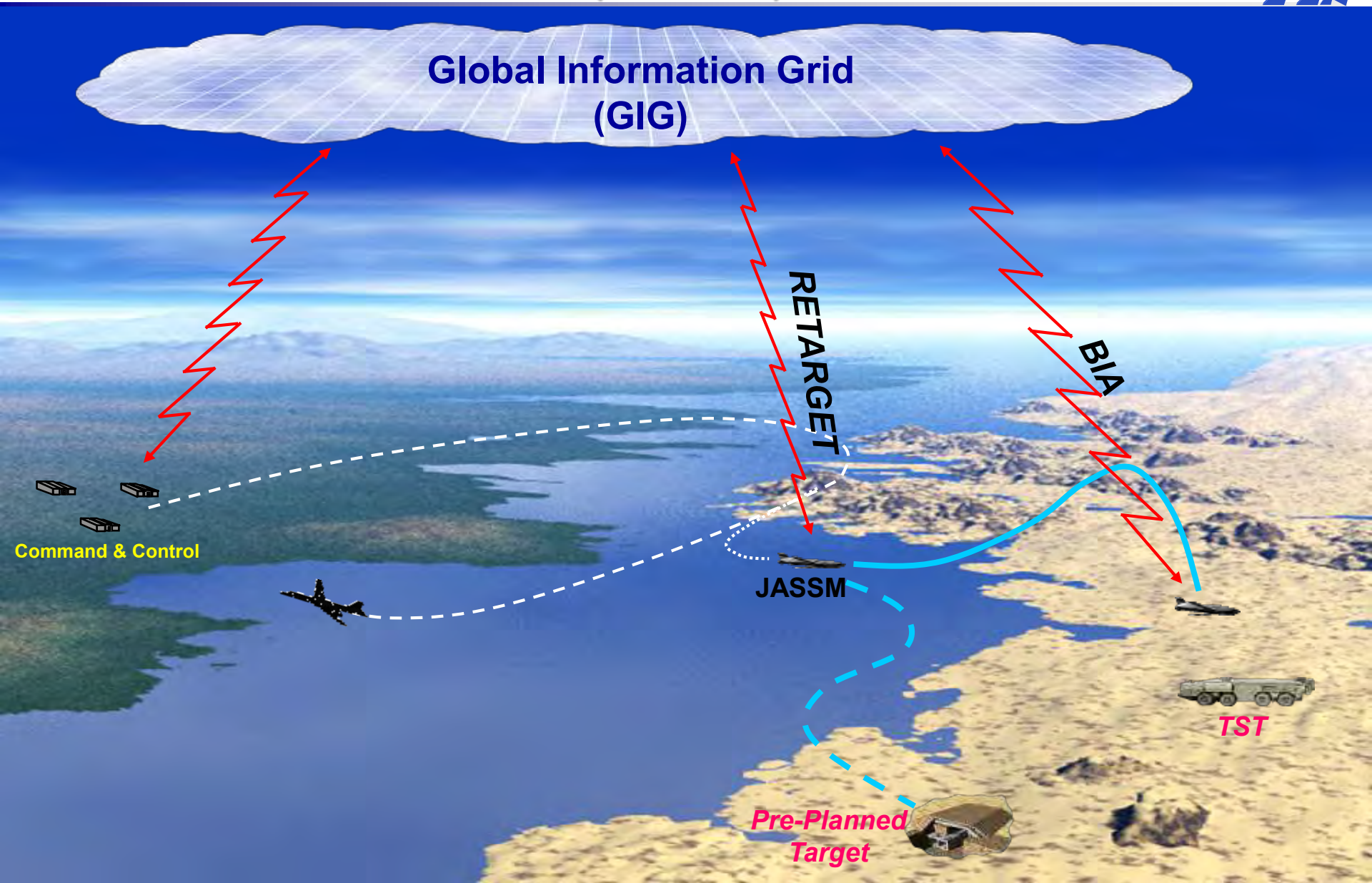
✓	**Technology**	**Mature and Proven**
✓	**Lethality**	**Proven**
✓	**Survivability**	**Proven**
✓	**Effectiveness**	**Proven**
✓	**Multi-Platform Integ**	**Tested on B-1, B-2, B-52, F-16**
✓	**Affordability**	**Achieved**
o	**Reliability**	**We're Working On It!**


Hardened Bunker Defeat
Hardened Target Performance
Demonstrated Accuracy
Navigation and Target Attack
High Jamming Performance
Soft Target Precision

Networked Weapons



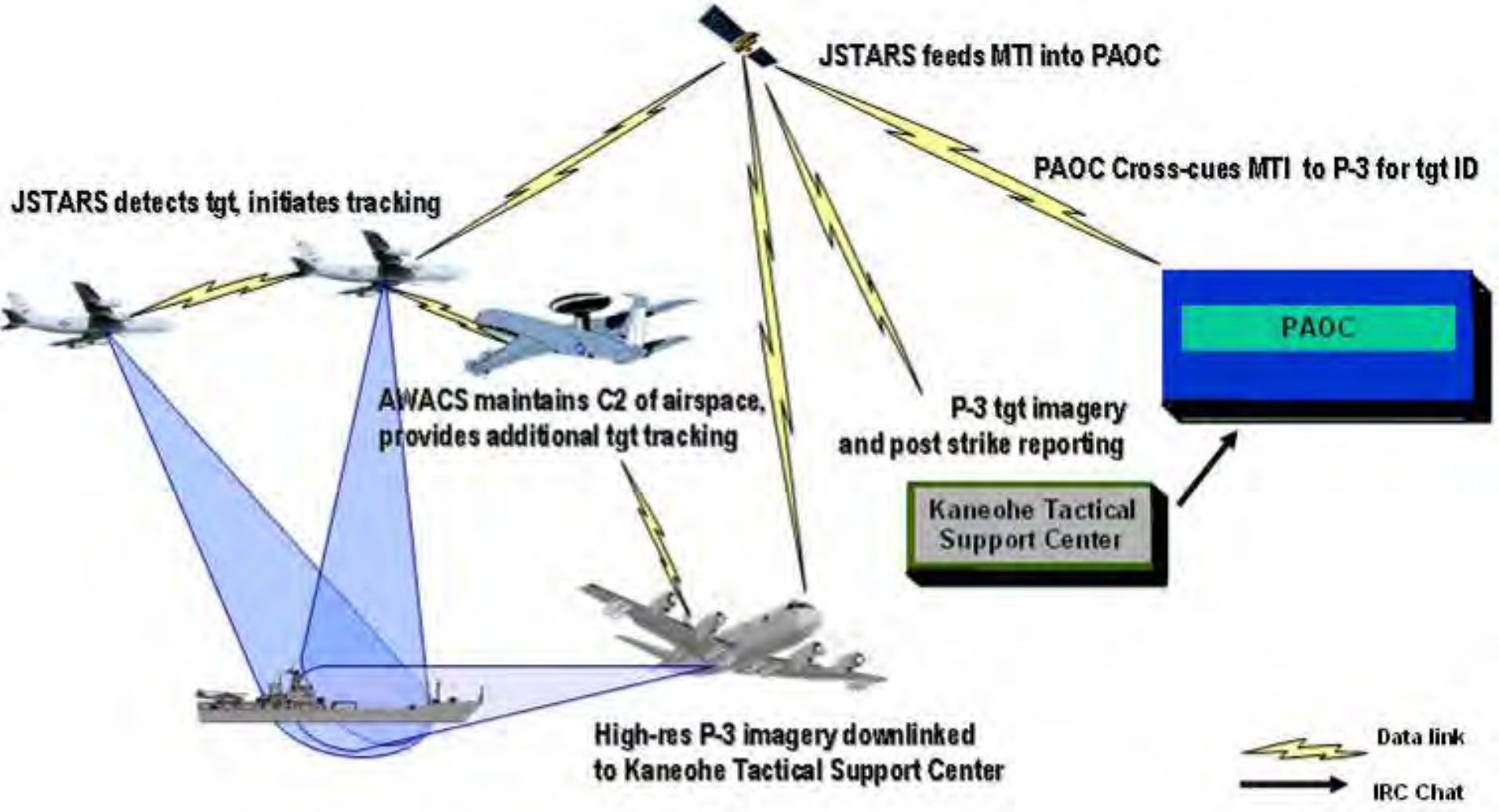
JASSM Data Link Concept
(Notional)



New Strike Weapons Challenges

Hit a moving target in weather

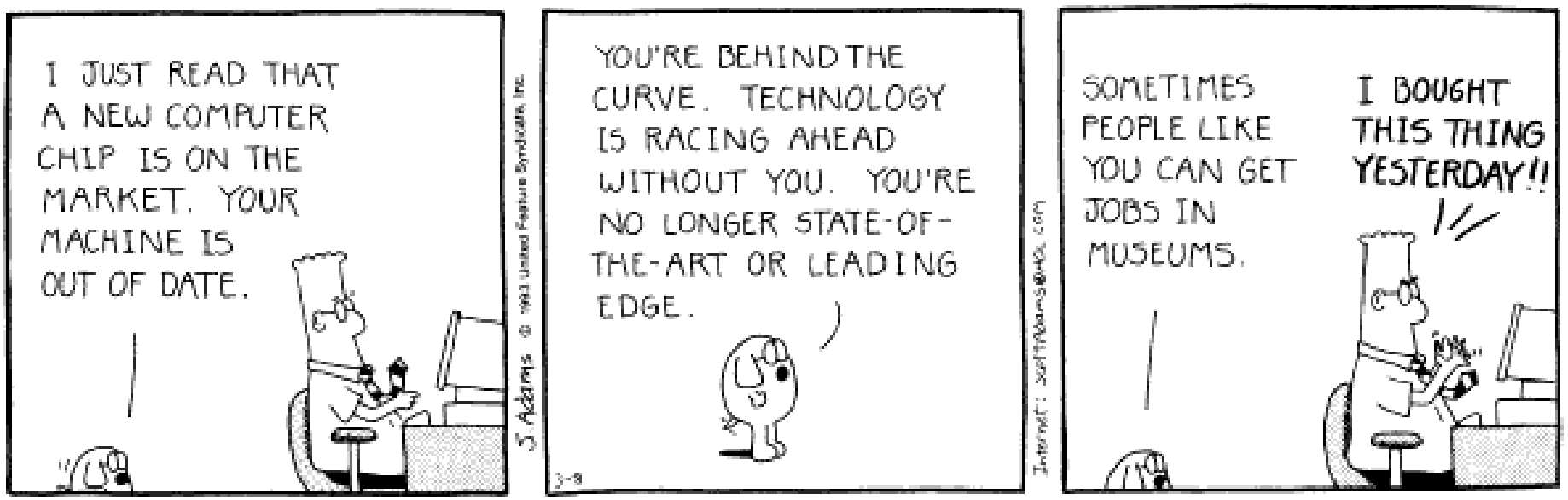
RESULTANT FURY (RF)
Operational Concept



Directed Energy

- Team Eglin is closely monitoring ongoing DE efforts:
  - AFSOC Advanced Tactical Laser ACTD
  - AFSOC Laser Gunship
  - AFRL's Laser Strike Fighter
- Preparing to meet test range needs for these advanced systems
  - 46 TW/CV is AFMC designated DE Test Management Lead
- Program Update: DE Workshop a success!

Future Technology Opportunities



Toward the Next Horizon…

1947 — 1997 — Today — Future

"The first essential of airpower is pre-eminence in research."
GENERAL H. H. ARNOLD

Mandated 35% Manpower Cut

4 Super Labs +

One Lab
HQ + Sectors
9 Technology Directorates
AFOSR

New Realities & Opportunities
- Changes in the AF
- Global Changes
- Customer Expectations
- Grow Future Workforce

oneAFRL

The means to achieve a new future…

Unfinished Business
- Horizontal Integration
- Project Management
- AFOSR integration
- Sectors
- Electronic knowledge

Other Issues
- Fractured tech leadership / development
- Multiple vs. corporate process
- Vertical stovepipes *too* strong
- Complex operating model
- Span of control / functional interfaces
- Dependence on customer $$

The Journey Continues

Focused Long Term Challenges

- Anticipatory Synchronized Operations
- Tailored persistent collection for Predictive BattleSpace Awareness
- Robustly collect and deliver effects for difficult targets in urban environments
- Globally maneuver to and through anti-access/area-denied environments to deliver effects rapidly and/or persistently
- Remotely direct sense and render ineffective CBRNE Targets
- Complete all missions with impunity in a high threat aerospace environment.
- Covertly deliver integrated suite of cyber effects to influence adversary activity
- Integrated Information Defense System
- Tactical space access and operations
- Space superiority
- Anticipatory Support For Air and Space Fleet Readiness

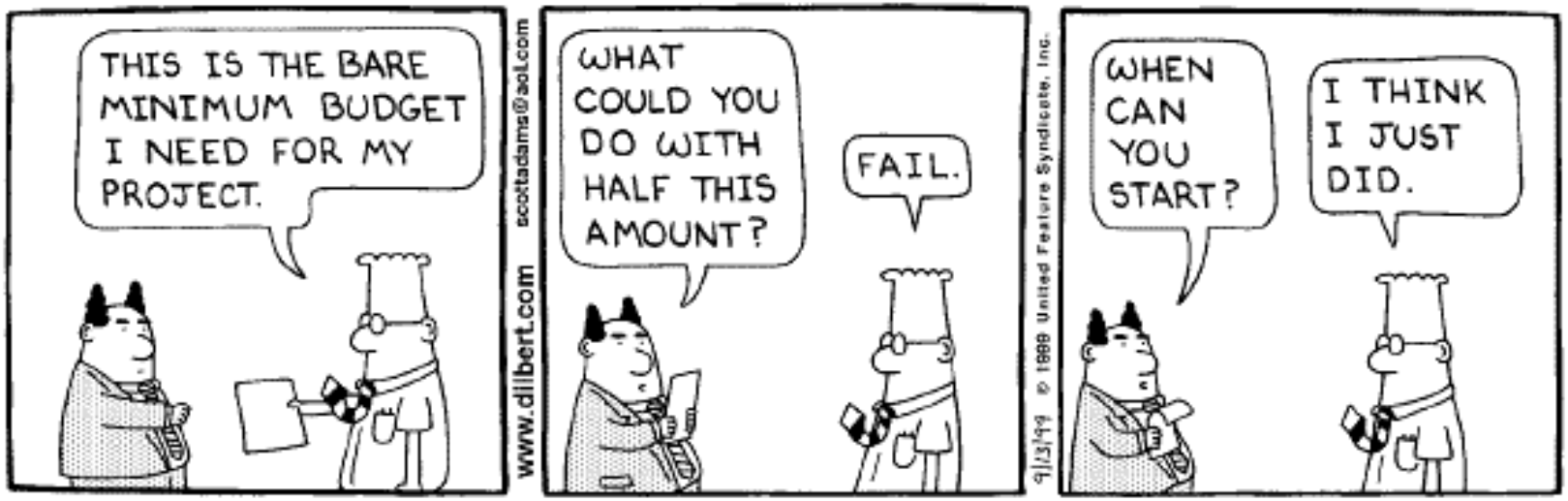
If ChedBob Were King of Weapons Technology Development & Insertion

- All Platforms & Weapons Would Require UAI
- All Future Precision Weapons Would Be Net Capable
- We Would Be Working On An ACTD For A Suite Of Miniature Munitions For UAV's
- All Weapons Test Instrumentation Would Be Strap On, Miniaturized and Interoperable With All Ranges,
- We Would Be Busy Working On A DE Weapon ACTD – Now
- All Future Fuzes Would Be Electronic Vice Electro-mechanical
- Weapons S&T Funding Would Equal Other Sectors.

Future Acquisition Opportunities

"It's Tough To Transform Without Changing"

- Gen Speedy Martin April 3, 2004



… Not Just the Air Force

- **Joint Operations**

Joint Requirements

Joint Acquisitions

"We are focused always on programs, always on platforms. We are going to change that…
Not only with ourselves but how we…
join with the other Services, with coalition partners."

-- General John Jumper, Chief of Staff of the Air Force

Acquisition – A Study In Paradox

- **It Is All About Relationships, Yet Is Driven By Cold Hard Data.**
- **It Is Gut-deep Patriotism, Yet It Is Driven By Politics And The Stock Market.**
- **It Is Based On Rules Codified In Voluminous Laws, Regulations, And Policy Directives, Yet The Rules Change Constantly And Are Subject To Vastly Different Interpretations.**

Acquisition - A Labyrinth

Acquisition Team

Industry

Requirements
Services
OSD
Joint Staff
Combatant Commanders
Congress

Workforce
Personnel Systems
Civilian
Military
Support Contractors

Planning Programming & Budgeting Systems (Services, OSD, Congress, Industry)

Political Structure

Arms Linked vs. Length

We are more likely to get

<u>What</u> the warfighter needs

- ***Capability Development Document (CDD)***

<u>When</u> they need it

- ***Required Assets Available (RAA)***

At a <u>price</u> we can afford

- ***Unit price within CDD threshold and program budget***

If we team with Industry

Business Practices That Have Worked For AAC

- **Integrated Functional Expertise**
- **Simplified Source Selection Procedures**
- **Clear Specification Accountability and Control**
- **Codified Long Term Agreements**
- **Design Life Warranties**
- **Integrated Development, Production And Sustainment**
- **Incremental Growth In Product Performance**

If ChedBob Were The King Of Acquisition

- **All Weapons Programs Would Be Joint**
- **Fewer Programs – Adequately Manned And Funded**
- **All Programs Would Require a Competitive CAD Phase**
- **HHQ Would Set Policy But Stay Out Of Execution After No Milestone B**

Closing

- **Carpe Diem**
- **Get a Message to Garcia**
- **Three Questions**

Precision Effects v. Precision Munitions

BG Philip Coker, Director of Capabilities Developments
US Army TRADOC Futures Center

"Challenging the Norm"

***Transformation** -- more than modernization; a holistic change to create a strategically responsive force that is dominant across the full spectrum of military operations.*

"I want to ride with risk-takers, I want thinkers who can give me the great ideas. And if you get one good idea out of 20, that's a great idea that you might not have had if your thought processes are narrow and if you do not reward creativity."

- GEN Kevin P. Byrnes
Oct. 8, 2003


254702

"Nature of this Opportunity on Precision Effects"

Precision Effects ***-- ability to more rapidly and accurately locate and attack targets, providing the required operational responsiveness and the desired effects (lethal and non-lethal) on targets with the greatest efficiency.***

- Precision Effects Study Senior Advisory Group (SAG) definition

Expectation from the Precision Effects SAG was that increased Precision Effects result in logistical efficiencies at a reasonable cost, as well as an increased ability to meet restrictive Rules of Engagement (ROE) requirements

Current Army NLOS Munitions Capable of Providing Precision and Near-Precision Effects

Hit to kill precision	**Accuracy**
• **Bat – (acoustic and IR)**	**< 5 M**
• **Semi-active Laser (SAL) Bat (laser guided)**	**< 5 M**
• **Copperhead – (laser guided)**	**< 5 M**
• **Sense and Destroy Armor (SADARM) – (MMW and IR)**	**< 5 M**
• **Precision Guided Mortar Munition (PGMM)**	**< 5 M**

Accurate delivery	
• **Guided MLRS (DPICM) – area effect (bomblets)**	**< 15 M**
• **Guided MLRS (Unitary) – 200 pound-class warhead**	**< 10 M**
• **Army Tactical Missile System (TACMS) – area effect (bomblets)**	**<150 M**
• **Army TACMS Block IA – area effect (bomblets)**	**<100 M**
• **Army TACMS Quick Reaction Unitary – 500 pound-class warhead**	**< 10 M**
• **Excalibur – 155mm High Explosive**	**< 10 M**


Guided MLRS-Unitary

ATACMS-

Quick Reaction Unitary


Excalibur
4 READY
ID Status Play
Rec Shutter

Challenge is No Longer Accuracy of Munitions

- **Quickly develop a usable target location with great accuracy**
- **Rapidly close sensor-to-shooter link**
- **Efficiently clear fires**
- **Timely and accurate battle damage assessment**

Potential Future Precision and Near-Precision Capabilities

- **Course Correcting Fuze / Precision Guidance Kit**
- **Kinetic Energy Artillery with Precision and Extended Range (KEAPER) – enhanced capability on the order of 500 KM range and 2-4 meter accuracy**
- **Advanced Hypersonic Weapon (AHW) - transformational capability on the order of 6,000 KM range with 35 minute time-of-flight and < 10 meter accuracy**
- **Counter Rocket, Artillery and Mortar (C-RAM)**


C-RAM


PRECISION


PROTECTION


MASS


MANEUVER

Questions?

BG Philip Coker, Director of Capabilities Developments
US Army TRADOC Futures Center

Imagine….and act

Greg Gardner

VP, Government and Homeland Security Solutions

Oracle Corporation

ORACLE

Today…
If you are driving across the desert and your car breaks down, the only guy who benefits is a heavily tattood fellow named Earl who owns the only repair shop for miles…

Tomorrow…it will work like this…a chip in the engine detects an impending failure and sends a notification not only to you but also via satellite to the nearest repair shop, the nearest parts source, and, if necessary, the nearest auto rental shop…and also to the manufacturer of the part so failure rates can be tracked and inventories adjusted…Wow! A global supply chain in which everyone benefits….and your life is better

C3 Vision (v 2.0) 2002

TODAY… If an expeditionary military mission requiring ground forces is directed, it is often given primarily to a single service….witness the Marines at Kandahar, the earlier Army Ranger raid at that same airfield during the early days of Opn Enduring Freedom…and Army-centric Opn Anaconda.

WHY?

In large measure, because today our C3 systems are developed, procured, and deployed by our Services with minimal interoperability.

TOMORROW….These missions will be conducted by seamlessly integrated and inter-netted joint forces.

IT WILL WORK LIKE THIS:

The President determines that a country or organization must be swiftly defeated. The responsible Regional Combatant Commander, provided accurate, real-time knowledge of the readiness and location of all US forces, as well as reach-back to national level expertise by the Joint C2 System, builds a joint force package that optimizes the capabilities of each Service and SOCOM. Using this same Joint C2 System, the designated Joint Task Force Commander plans and rehearses the mission virtually in a secure, collaborative information environment. At the same time, using several UAVs, he establishes a Wide Area Relayed Network (WARNET) over the objective area. The JTF moves toward the target from dispersed bases, maintaining constant situational awareness and collaboration while enroute. Upon arrival, elements of the force, with common situational understanding from the Joint C2 system, deliver devastating, closely synchronized, kinetic and non-kinetic joint effects …no boundaries…no coordination lines. The enemy destroyed, elements of the JTF secure objectives, others return to base…. still sharing common situational understanding. The Commander of NORTHCOM uses this same Joint C2 System to share Homeland Defense information amongst it's Service Components and with other Agencies.

WOW!

National Leadership, Combatant Commander, Joint Force Commander, Component Commanders, and Service and SOCOM tactical elements – at home and abroad - all seamlessly networked by an integrated Joint C2 System….not a collection of Service-centric systems and connected nets and websites but a pervasive, ubiquitous information-centric infrastructure….a powerful vision.

The Big Idea: Automate routine, rules based processes so warfighters spend brainpower solving tough problems…

- Two Scenarios…
  - Time Sensitive Targeting/Adaptive Planning
  - Information Management in Net-Centric Operations

- Thanks up front to:
  - Doug Miller, Gary Shaffer, and Marty Hendrix of SAIC
  - Rick Hays-Roth, MAJ Bob Hesser, LCDR Dan Reiken of Naval Post Grad School
  - Geoff Brown and Tom Mayhew of Oracle

Enablers…

- Standards based tools
- Evolution of the “GIG”…commercial and military
- Emergence of Service (Process) Oriented Architectures tying together loosely-coupled and geographically dispersed services
- Evolution of the vision of the “Semantic Web” where data is defined and linked in such a way that it is used by machines, not just displayed

- Willingness to share data and information for operational effectiveness and cost savings

Time Sensitive Targeting and Adaptive Planning

- Today…

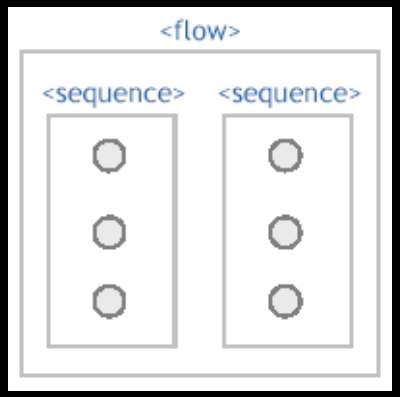
  We partially automate mission planning, preparation, and execution, but many processes are fragile, not too flexible, and not optimized

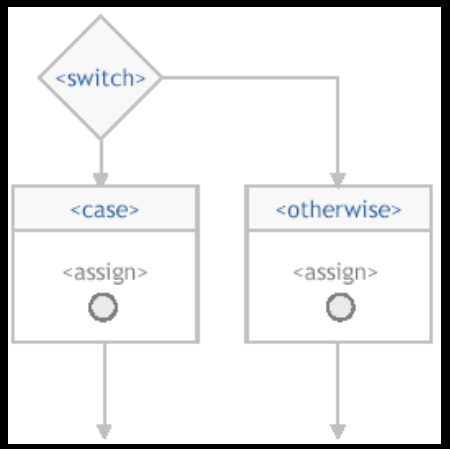
- Tomorrow…

  We will leverage the power of modern information technology to weave together services and processes into a seamless, flexible system that optimizes modern information technology

Its based on standard versions of Extensible Markup Language (XML)…

- <invoke> a web service synchronously
- <assign> and manipulate XML documents
- <scope>, <faultHandlers> catch and manage exceptions
- Initiate asynchronous processing in parallel <flow> of execution
- <receive> asynchronous callbacks from long running services/processors
- <switch> on a set of pre-defined constraints





…woven into Business Process Execution Language (BPEL)…

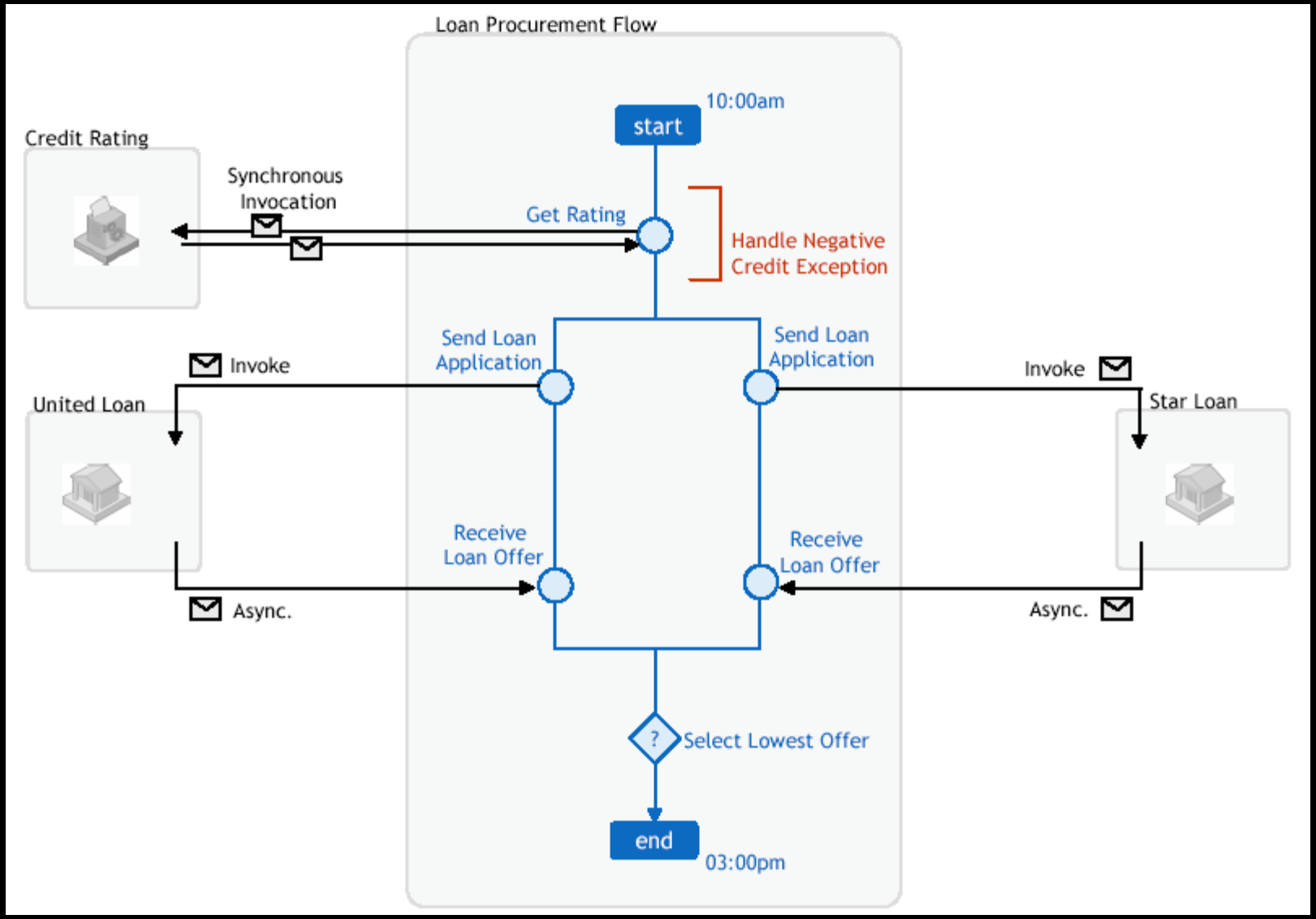
```
    <!-- ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
     ORCHESTRATION LOGIC: Set of activities coordinating the flow of
     messages across the services integrated within this business process
     ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ -->
    <sequence name="main">
        <!-- Receive input from requestor.
             Note: This maps to operation defined in HpacClient.wsdl
             -->
        <receive name="receiveInput" partnerLink="client" portType="tns:HpacClient" operation="initiate" variable="input"
                 createInstance="yes"/>
        <!-- Asynchronous callback to the requester.
             Note: the callback location and correlation id is transparently handled
             using WS-addressing.
             -->
        <assign><copy>
                <from variable="input" part="parameters" query="/HpacClientRequest/lat">
                </from>
                <to variable="hpacRequest" part="lat"/>
            </copy>
            <copy>
                <from variable="input" part="parameters" query="/HpacClientRequest/lon">
                </from>
                <to variable="hpacRequest" part="lng"/>
            </copy>
        </assign><invoke partnerLink="hpacWS" portType="WSClient:WSClient" operation="getCasualityInfo" inputVariable="hpacRequest"
                    outputVariable="hpacResponse"/><invoke partnerLink="hpacWS" portType="WSClient:WSClient" operation="getShapeFile"
                    inputVariable="shapeRequest" outputVariable="shapeResponse"/><assign><copy>
                <from variable="shapeResponse" part="getShapeFileReturn">
                </from>
                <to variable="output" part="parameters" query="/HpacClientResult/result"/>
            </copy>
        </assign><invoke name="callbackClient" partnerLink="client" portType="tns:HpacClientCallback" operation="onResult"
                         inputVariable="output"/>
    </sequence>
</process>
```

…that enables the Orchestration of Web Services

- Compose Operational Processes and Threads, from Business Process Execution Language (BPEL) based on common standards
- Specifies how collections of services are jointly used to realize more complex functionality
  - Describes the data shared between the services
  - Transactional states and joint exception handling
  - Separates the flow (execution) from the services themselves
  - Partnerships/Organizations
- Once deployed they can be consumed by other Operational Processes and/or services

XML based Work flow for Web services….

BTW: Your bank and “Lending Tree” do this now…

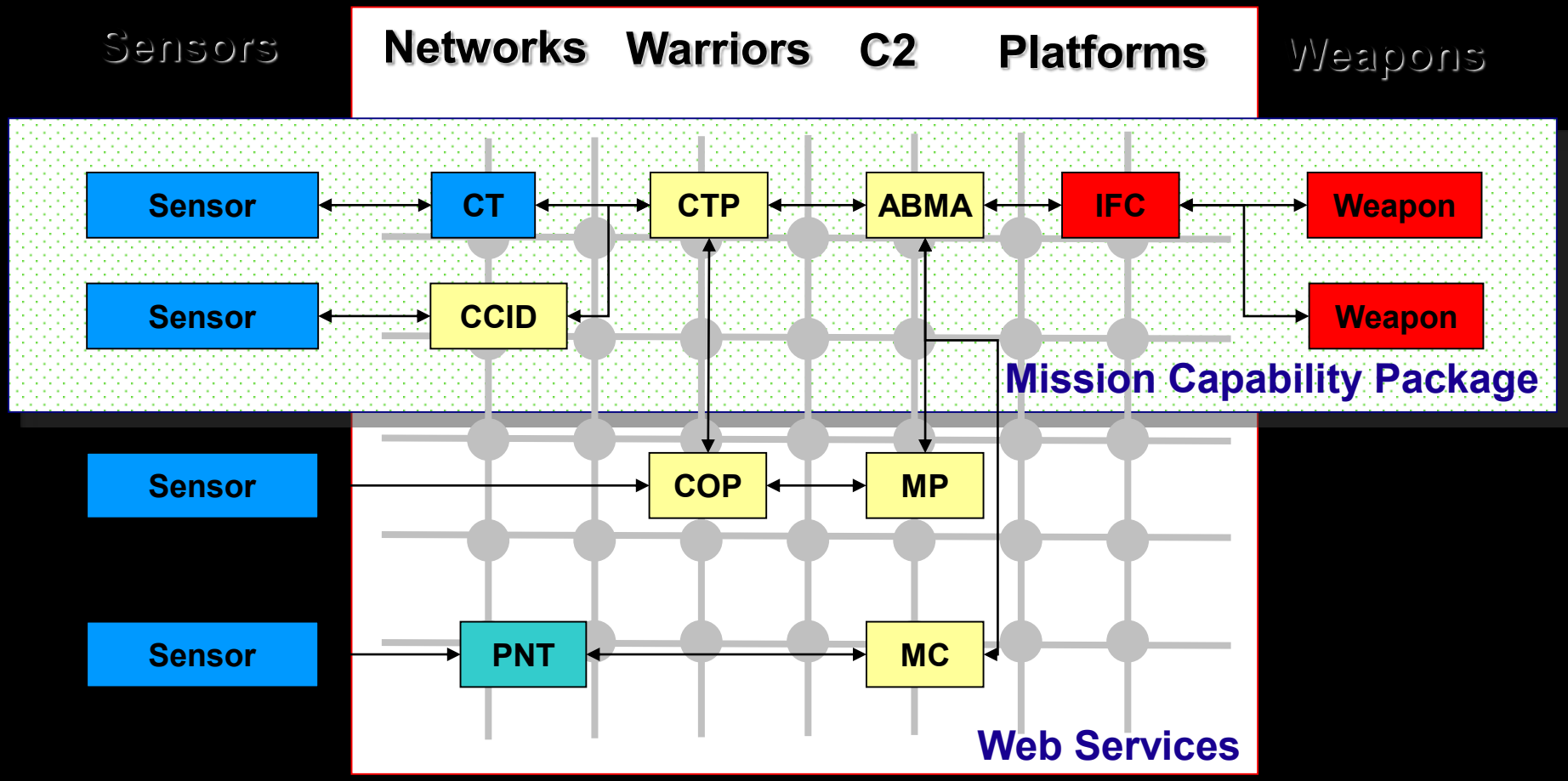


Mission Capability Packages…

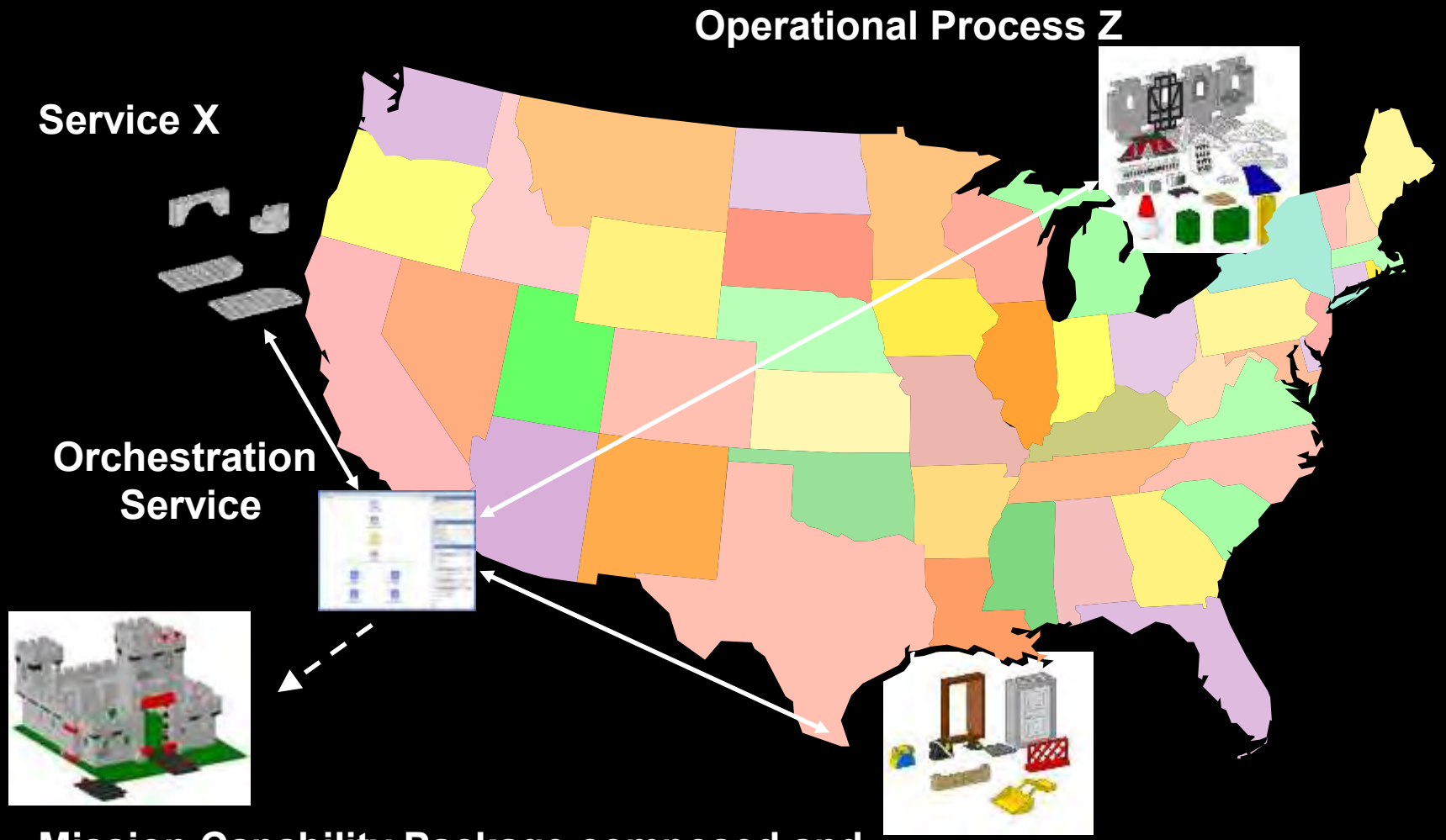
- Integrate a specific set of joint sensors, platforms, weapons, warriors, networks, command and control systems for the purpose of performing mission-specific engagements.
- Ability to dynamically re-configure and re-allocate assets “on the fly” based on current mission needs.

FnEP Masters Thesis, NPS, MAJ Robert Hesser and LCDR Dan Rieken

Mission Capability Packages



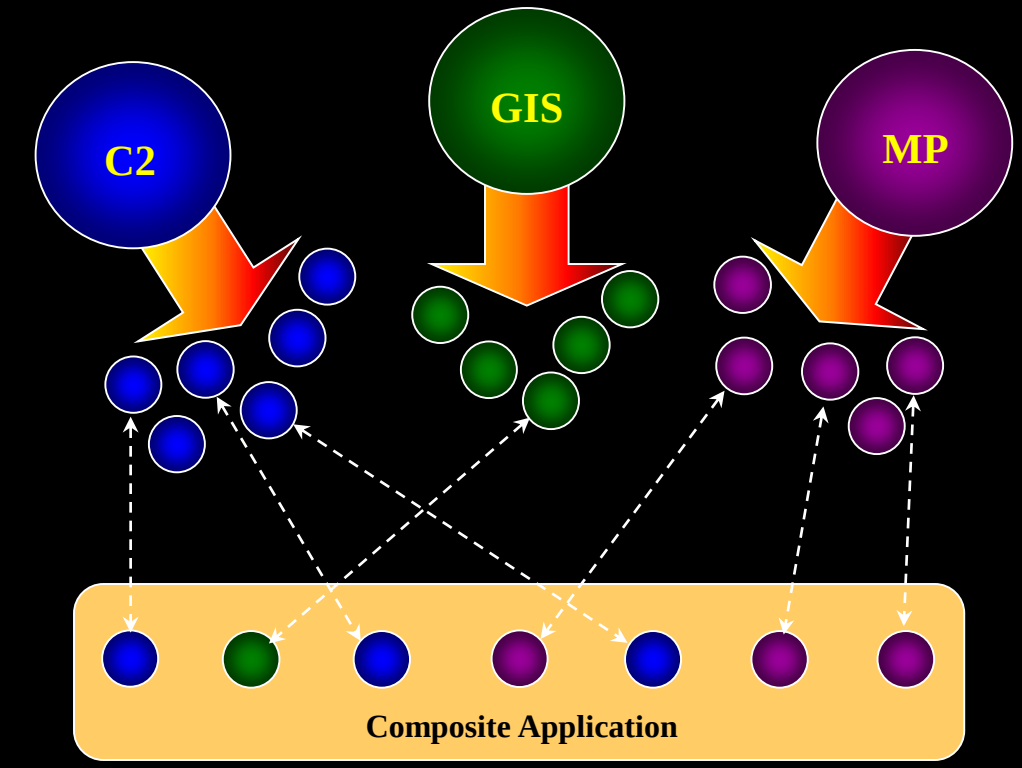
Orchestrating Distributed Services



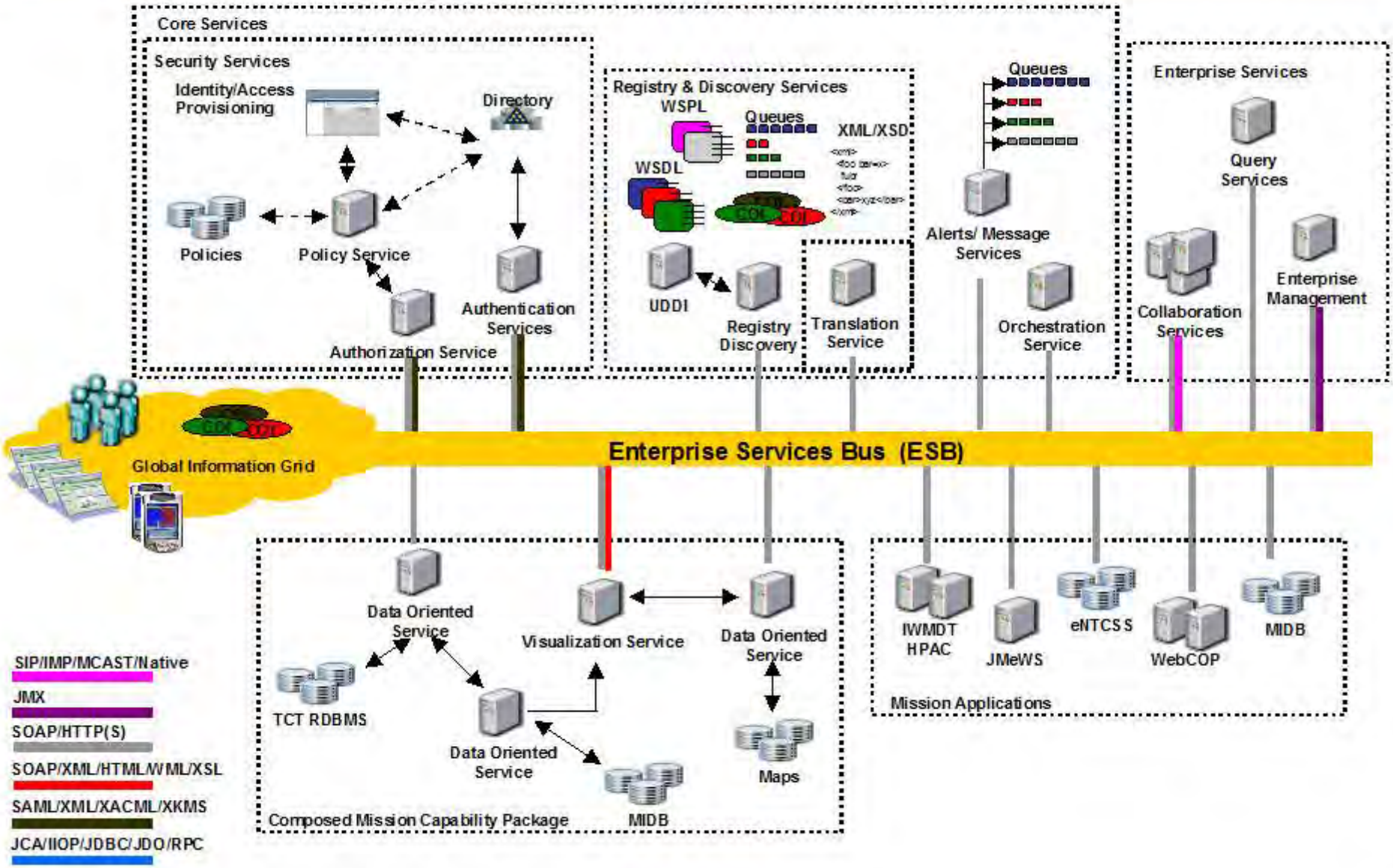
Mission Capability Package composed and orchestrated from services X, Y, & OP Z

Technology Vision Applied

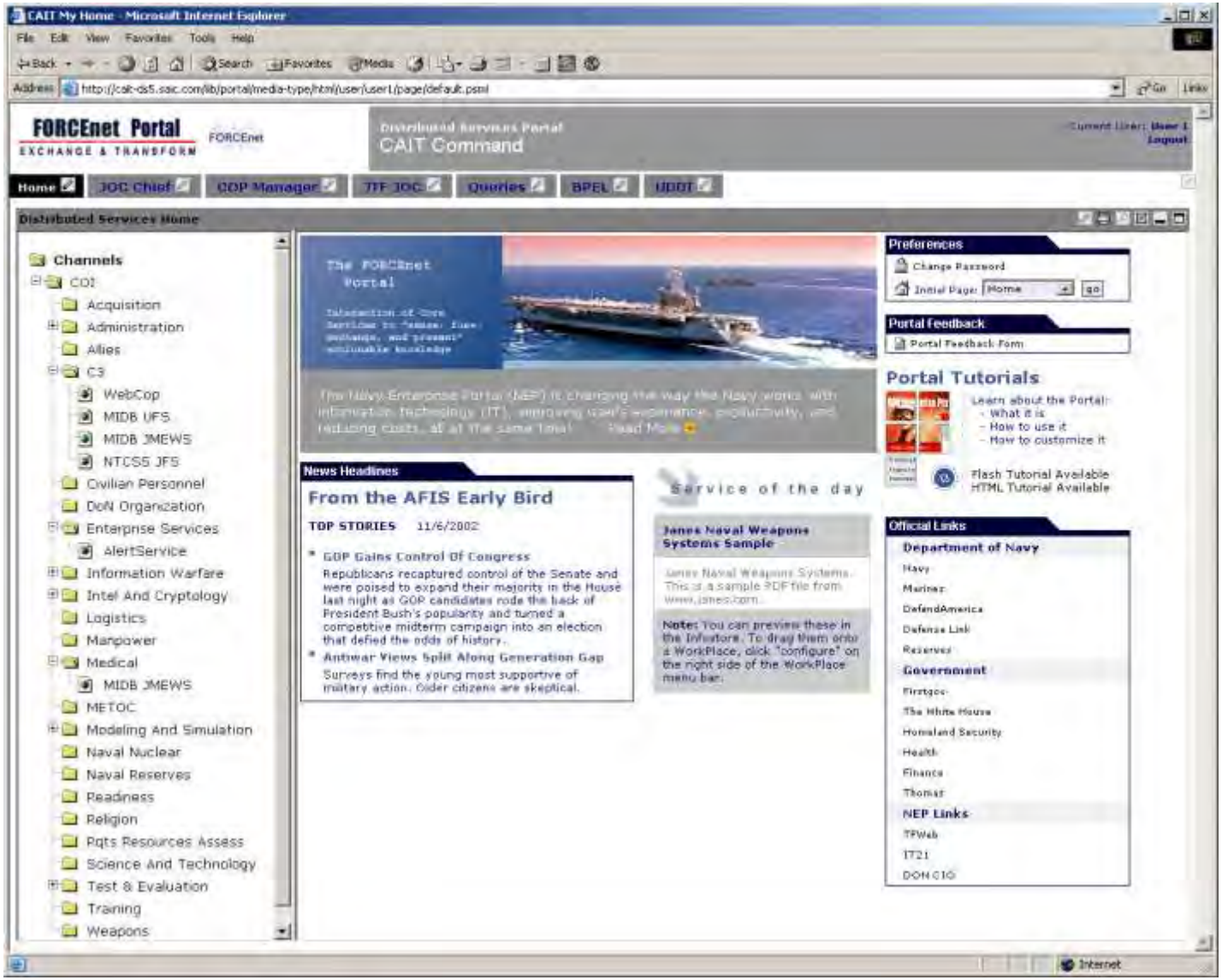
PLAN | FIND | FIX | TRACK | TARGET | ENGAGE | ASSESS



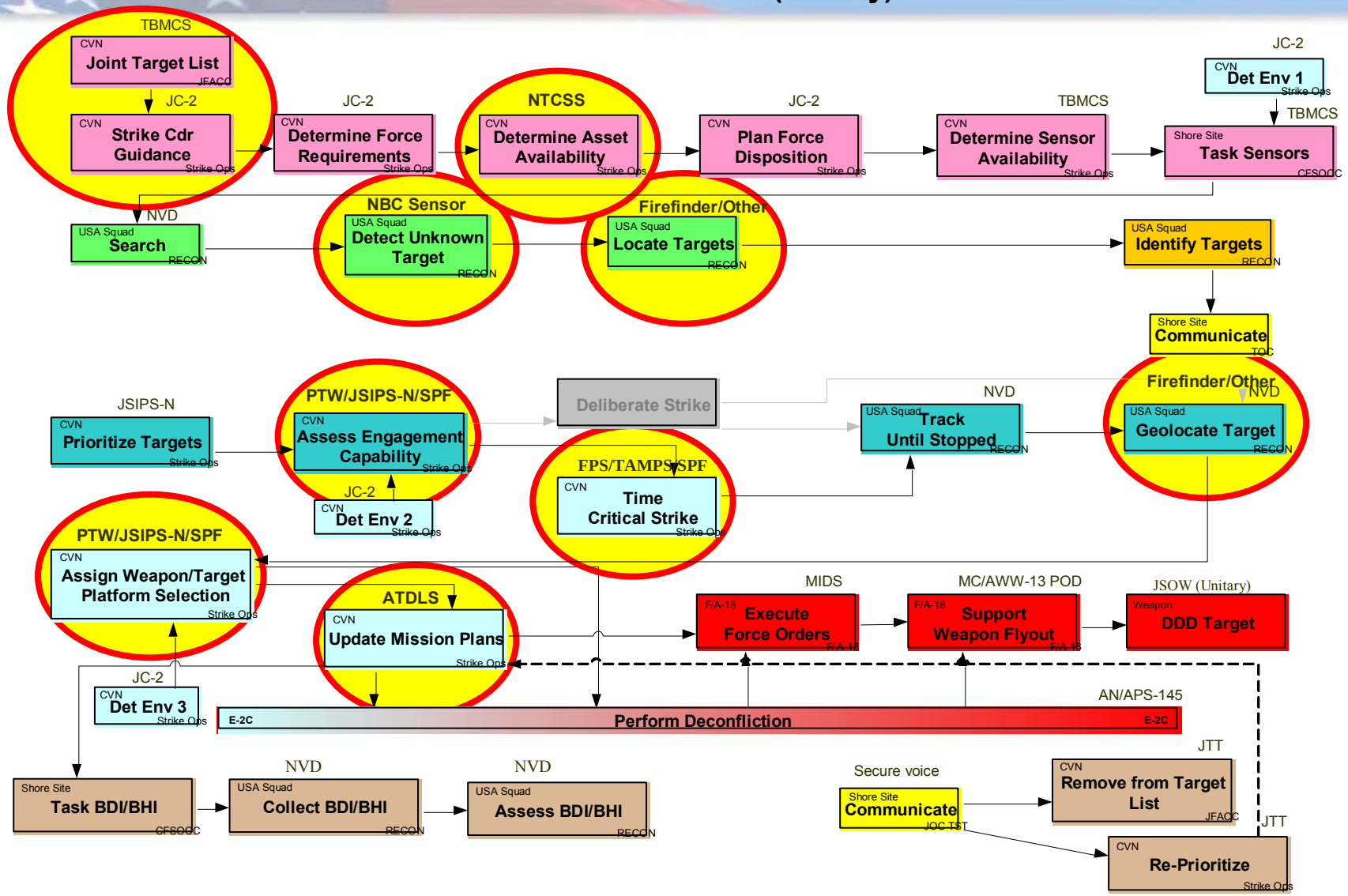
- Deliver components rather than systems
- Components are provided as information services
- Components can be arranged in any way to provide overall composite application
- Component design provides flexibility, higher re-use, and better manageability


Core Services
Security Services
Identity/Access Provisioning
Directory
Policies
Policy Service
Authentication Services
Authorization Service
Registry & Discovery Services
WSPL
Queues
XML/XSD
WSDL
UDDI
Registry Discovery
Translation Service
Queues
Alerts/ Message Services
Orchestration Service
Enterprise Services
Query Services
Collaboration Services
Enterprise Management
Global Information Grid
Enterprise Services Bus (ESB)
Data Oriented Service
Visualization Service
Data Oriented Service
TCT RDBMS
Data Oriented Service
Maps
Composed Mission Capability Package
MIDB
IWMDT HPAC
JMeWS
eNTCSS
WebCOP
MIDB
Mission Applications
SIP/IMP/MCAST/Native
JMX
SOAP/HTTP(S)
SOAP/XML/HTML/WML/XSL
SAML/XML/XACML/XKMS
JCA/IIOP/JDBC/JDO/RPC

Portal with Discovery

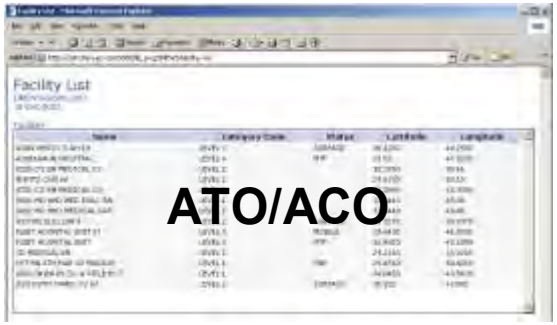


Scenario - MTW-W
TACSIT - Strike Against Re-Locatable Soft Target
Use Case - F/A-18 w/JSOW (Unitary)

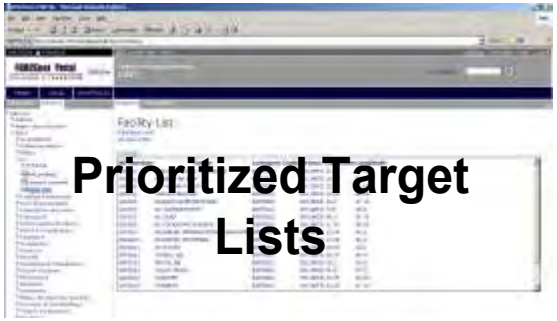


Time Sensitive Targeting

From TBMCS (via SPF)

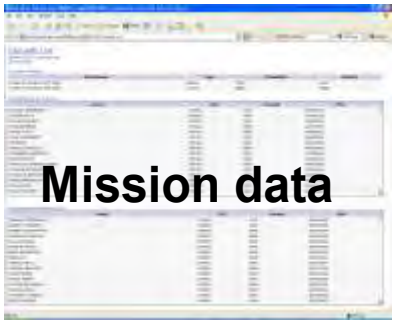


From JIPTL and JTL



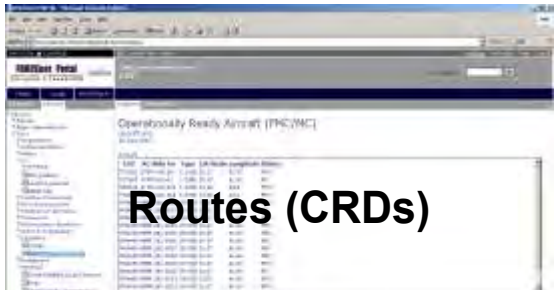
BPEL

From SPF

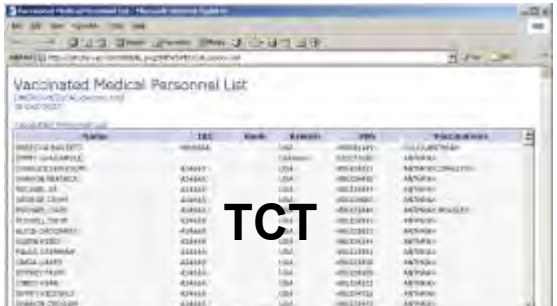


To ABM

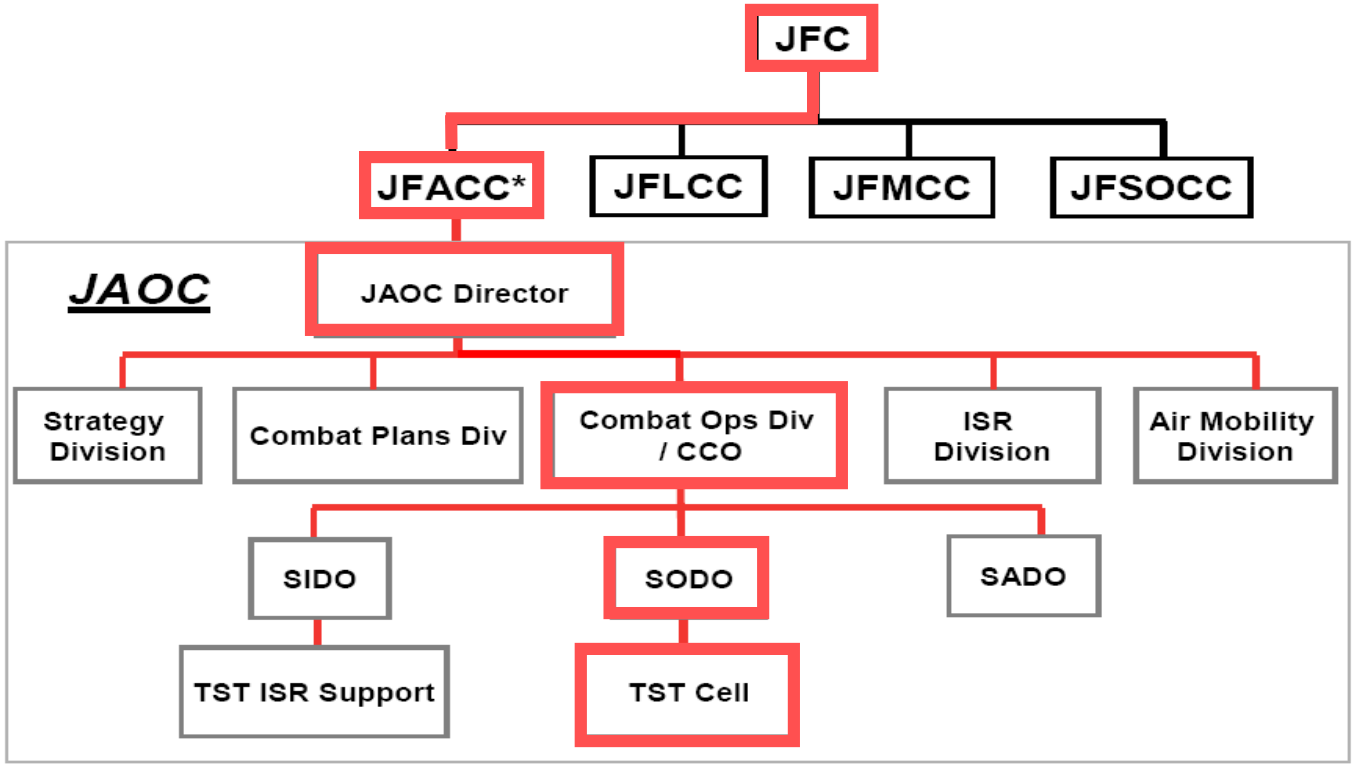
From SPF



From COP



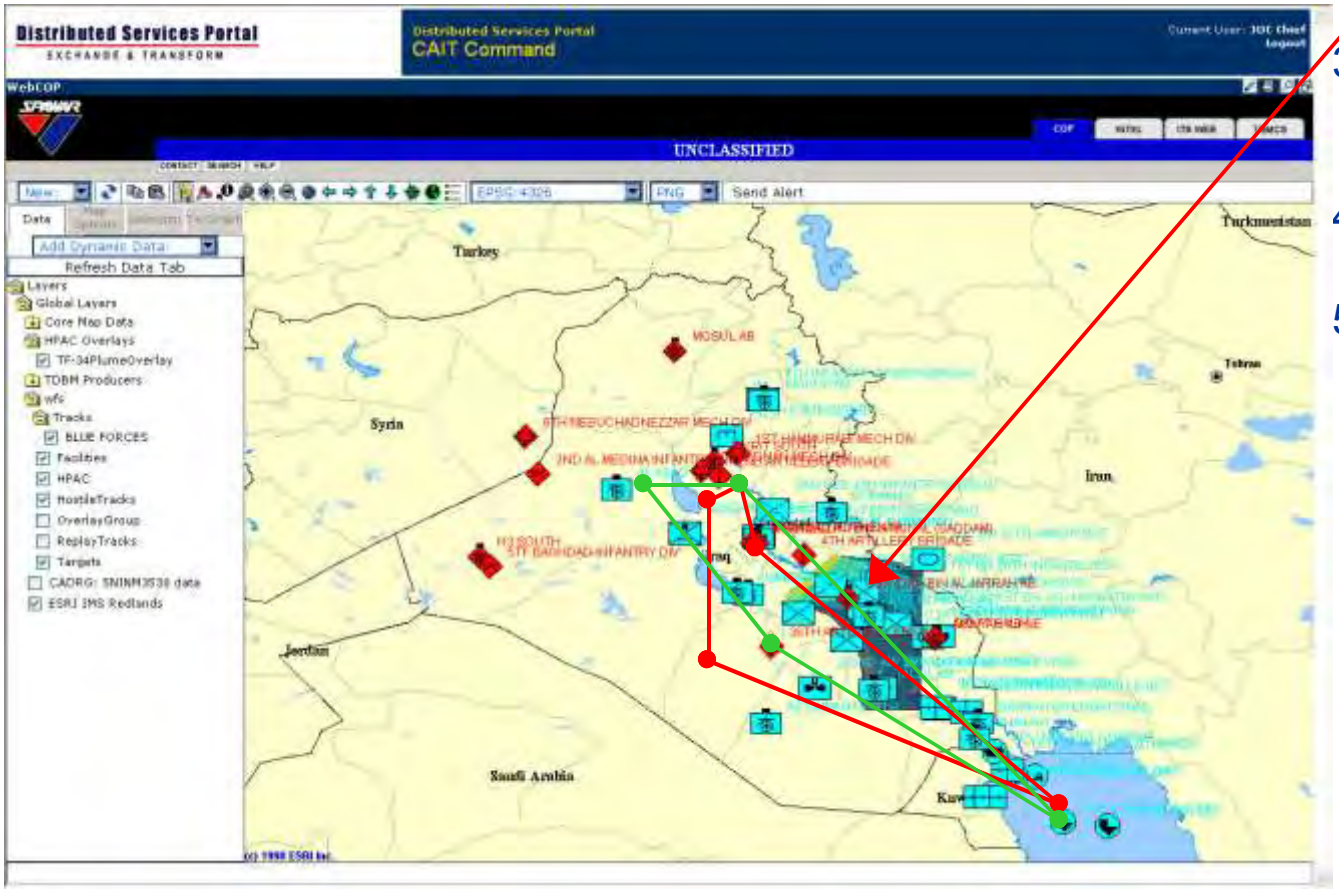
JAOC Procedures



**In most cases, the COMAFFOR will also be the JFACC*

AOC TCT Cell fuses routes, mission data

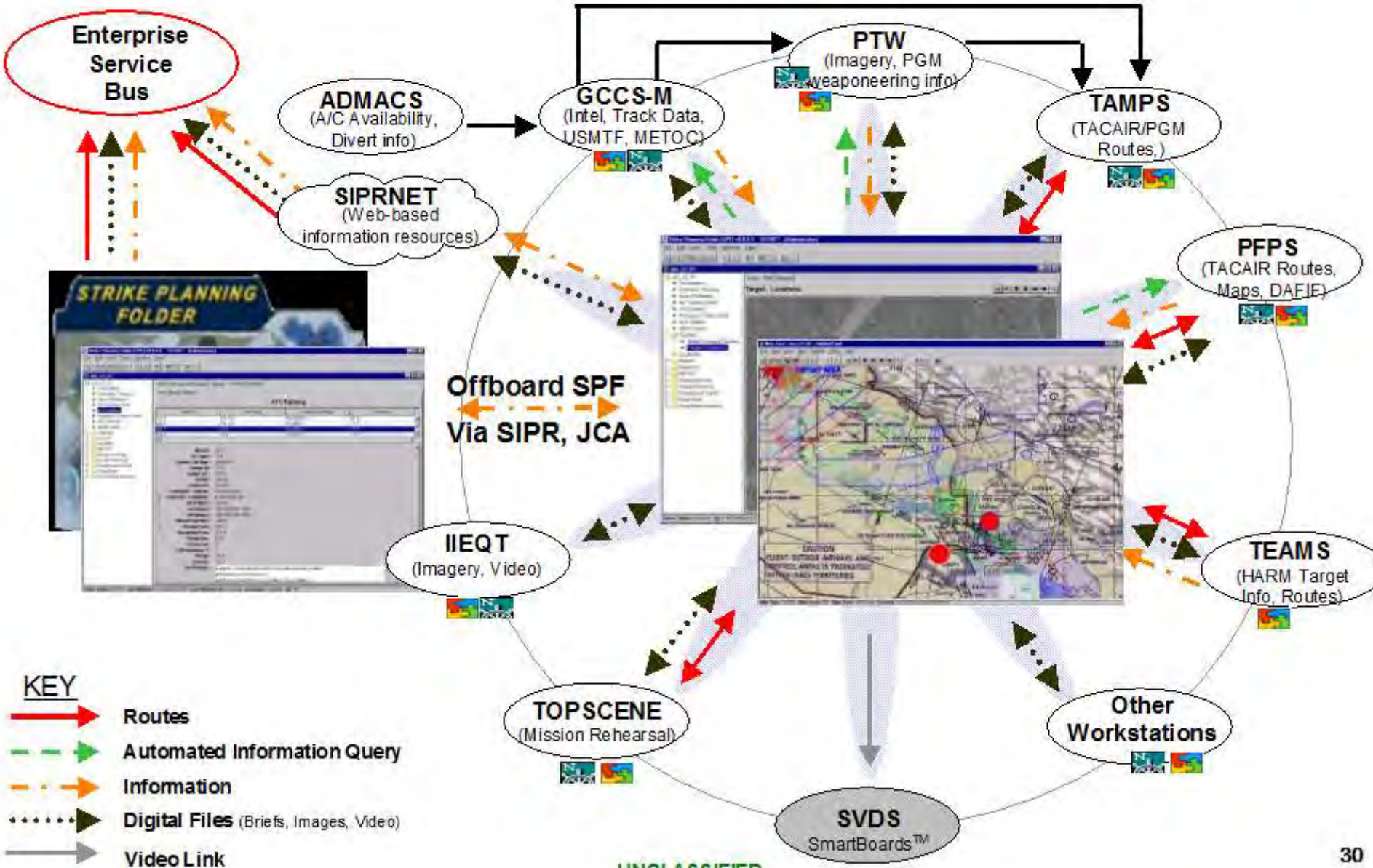
Mission ID	Mission Name	Vehicle ID	Vehicle Type	Vehicle Call Sign
409	TESTER ONE	7	F-16	Dopey
409	TESTER ONE	7	F-16	Dopey
409	TESTER ONE	7	F-16	Dopey
323	TESTER TWO	3	EA-6B	SLEEPY
323	TESTER TWO	3	EA-6B	SLEEPY
323	TESTER TWO	3	EA-6B	SLEEPY
429	TESTER THREE	3	EA-6	DOC
429	TESTER THREE	3	EA-6	DOC
429	TESTER THREE	3	EA-6	DOC



1. Missions that met some criteria are displayed in the Missions portlet
2. Corresponding routes are displayed in COP
3. TCT Cell determines weapon/target pairing for given TCT
4. Get approval from JCB, JAG, and Coalition
5. Through new automated approaches such as OBMS and MBMS, TCT cell generates a divert alert to shooters and publishes the COA to the JTF.JFACC.ABM topic

Operational Battle Management System
Mission Battle Management System

Strike Planning Today with SPF



Valued Information in Real Time (VIRT)

- Today…

  While we talk about Net-centric operations in which Joint, coalition, ad hoc operations "integrate seamlessly" and "share a common understanding", each operator gets all needed information, cycle times drastically reduced, and cooperating units self synchronize…and we posit that plentiful information & unlimited bandwidth will make it so…actually, people don't make good decisions when they are time-stressed and overloaded with information

- Tomorrow…

  We will synchronize groups by having them operate on semantically aligned and high-value information, we will determine what concepts operators' missions depend on and make those standard, we will notice what beliefs underlie mission plans and COAs, we will automatically inform operators when data changes affect their beliefs and plan rationales, and we will create an open market for delivering valued information to users

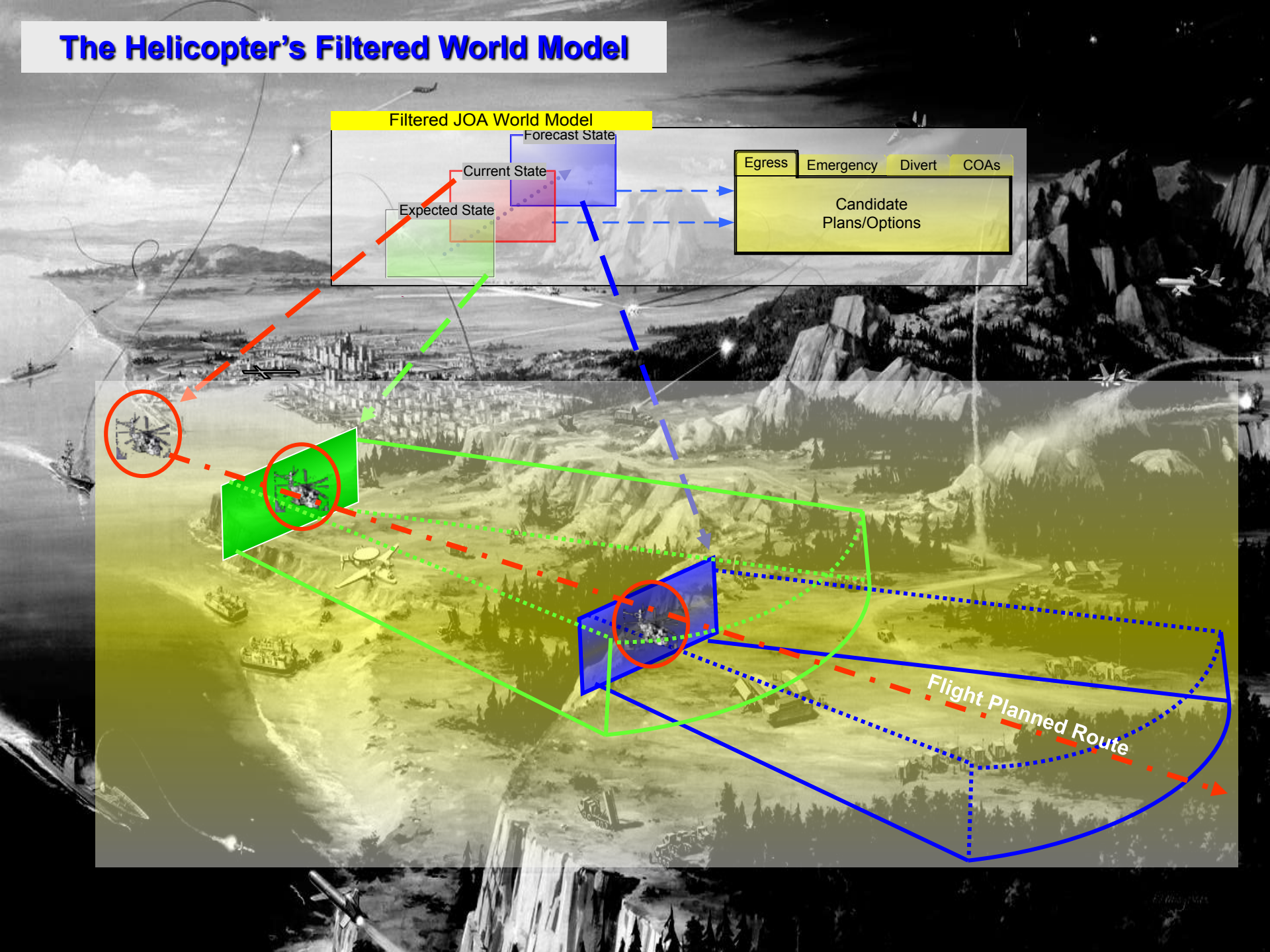
Idea: A Model-based Communication Network (MCN)

- "State-Full" vice "State-Less" Networking
  - Maintain shared state among collaborators
  - State = current values of models, *e.g.*
    - The route plan, position, velocity of an aircraft
    - The current and future position and behavior of a unit
    - The hypothesized position, status and intention of a system
- A shared world model is the goal
  - Collectively, what the collaborators believe
  - Distributed, replicated for efficiency
  - Autonomously updated, through dead-reckoning
- Like a distributed blackboard of hypotheses
  - Re-conceptualize Common Operational Picture
  - Obviate "communication" of non-news
  - Emphasize "information," especially valuable information

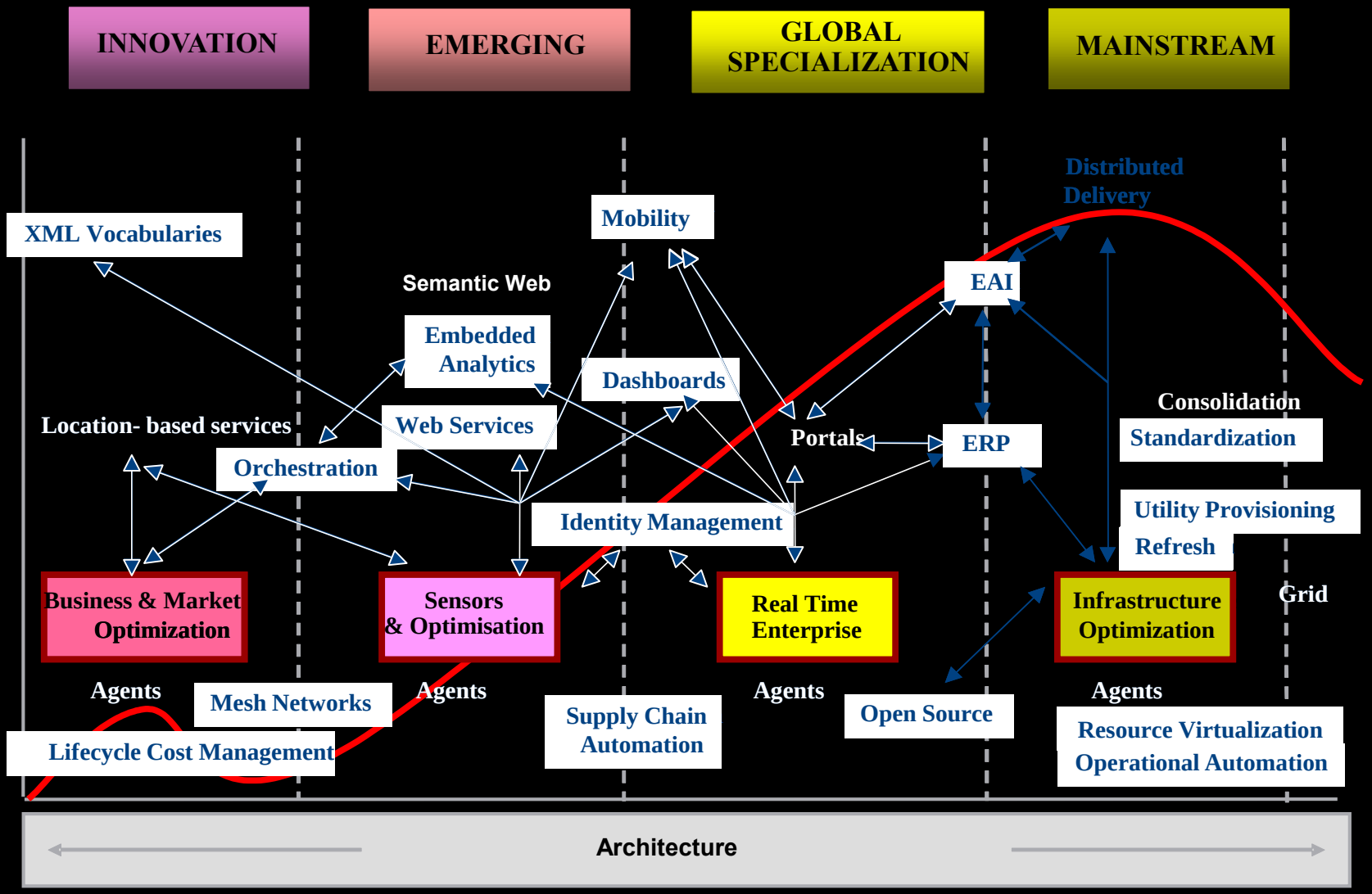
Examples

- Pilots need weather information
  - Planning, Monitoring, Executing phases
  - Mission phases: Take-off, En Route, Descent, Approach, Land
  - Phase-specific risks
  - Weather information affects risks
  - Operator preferences alter risk assessment
- SEALS need weather information
  - Similar to above, but phases: approach, swim, land, …
  - Weather affects risks, such as detection

The Helicopter's Filtered World Model



Summary: Infrastructure Evolution



Cautions…and conclusion

- It ain't just "hype", the potential is real, and the importance cannot be understated..
  - But ….effective execution is hard…know your limitations, start small then scale fast…
- Hurdles of culture, process and willingness to share information all must be overcome…with the right incentives
- The enemy gets a vote…

- It's all about leadership and organizational commitment


QUESTIONS
ANSWERS

Precision Strike

27-28 July 2005

EXCALIBUR XM982

Presented To:

Precision Strike Association
Summer PEO Forum

Presented By:

Mr. Chris Grassano
Deputy Product Manager for Excalibur
(973) 724-5246
chris.grassano@us.army.mil

Excalibur Basics

- 155 mm Precision-Guided Extended Range Munition for Cannon Artillery
- Cooperative development
  - ✓ USA and Sweden
- Family of Munitions

UNITARY
Block I

SMART
Block II

DISCRIMINATING
Block III

Raytheon

TACOM ARDEC

BOFORS DEFENCE

TSM CANNON

FMV

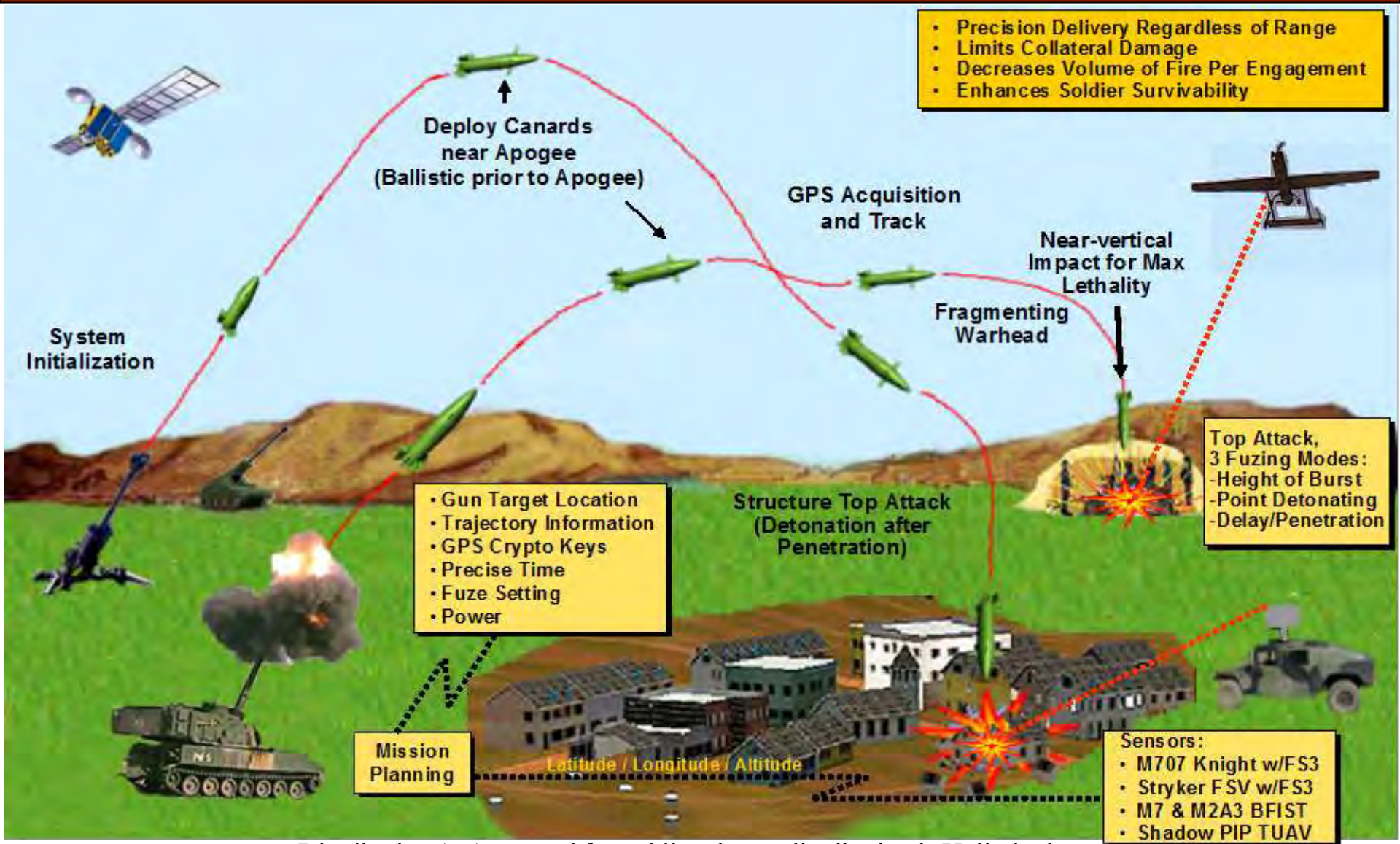
Block I Variants and Requirements

- **Block Ia-1** Initial Capability
- **Block Ia-2** Improves on Ia-1 performance; more reliable, capable of higher charge level, tested anti-jam
- **Block Ib** Compact guidance section; more capable, more reliable, lower cost, could add SAL seeker

	Unitary Block		
Capability	**Block Ia-1**	**Block Ia-2**	**Block Ib**
Delivery Accuracy	10-20m CEP(U)	10-20m CEP(U)* 20-30m CEP(J)	10m CEP(U)* 20m CEP(J)*
Range	24-26 km	39-cal: 30-40 km 52-cal: 50-60 km	39-cal: 35-40 km* 52-cal: 50-60 km
Reliability	> 60%	85+%*	90+%*
Effectiveness	ORD Threshold (M107)	ORD Threshold* (M107)	ORD Threshold* (M107)
Platform & Charge	LW155 (TAD) Paladin MACS 3-4	LW155 (TAD) Paladin NLOS-C FH77BD MACS 3-5	LW155 (TAD) Paladin NLOS-C FH77BD MACS 3-5

*Denotes KPPs in addition to Interoperability-Top Level IERs. Block Ia-1 has no KPPs.

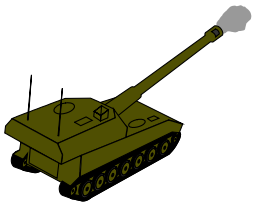
Operational Concept



Operational Scenario Animation

Excalibur Safety Features

- Excalibur will be the most insensitive Artillery projectile in the inventory
- Positive Feedback on Fuze Setter; Soldiers & Marines will know fuze is set
- Base Cover lands in Danger Area Echo (~250 meters from gun)
- Two arming environments (setback & spin); fuze safe for overhead fire
- Fuze will not arm until round is within 3 sec TOF to aim point
- FDC will compute Ballistic Impact Point (BIP)
  - ✓ AFATDS computes default BIP on gun-target line
  - ✓ FDC examines default BIP and either accepts or selects a different (safe) area
  - ✓ FDC selected area for new BIP (e.g., a FFA) need not be on gun-target line
  - ✓ If necessary, FDC enters new BIP location into AFATDS & re-computes mission
  - ✓ If round fails in-flight self-test then canards will not deploy & fuze will not arm
  - ✓ Faulty round would impact in BIP and warhead would not detonate



Insensitive Munitions Summary

Requirement	System Reaction Type / Assessment	Comment
Bullet Impact (BI)	Not more severe than Type 5	Type 5	
Fragment Impact (FI)	Not more severe than Type 5	Type 5	
Sympathetic Detonation (SD) Diagonal Acceptor	No Type 1	< Type 1	
Sympathetic Detonation (SD) Adjacent Acceptor	No Type 1	< Type 1	
Fast Cook-Off (FCO)	Not more severe than Type 5	Type 5	
Slow Cook-Off (SCO)	Not more severe than Type 5	Type 4	Warhead reacted after ~7 hours in the oven. Intend to request waiver for initial production and incorporate design improvements in future production buys. Potential to improve reaction by changing warhead liner design or changing explosive fill.
Shaped Charge (SC)	No Type 1	**By Analysis**	Waiver Planned.

Excalibur more insensitive than any other Artillery Projectile in the inventory.

Will seek waiver for Slow Cook-Off and Shape Charge Jet Impact.

Technical Progress Summary 1

Inertial Measurement Unit (IMU)

- ✓ IMUs survived tests at MACS-5
- ✓ Continuing with 2 vendors
  - ✓Honeywell
  - ✓BAE

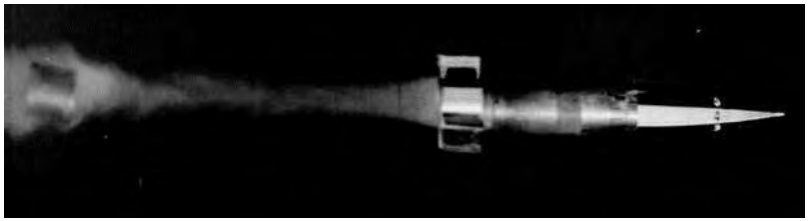
Guidance & Navigation

- ✓ GNU Electronics demonstrated gun-hardening gun firing tests (MACS-5)
  - ✓Mission Computer
  - ✓Power Conditioning Unit
  - ✓GPS Receiver
  - ✓AJ Boards

Canard Actuator System (CAS)

- ✓ Survived Overstress Airgun Test, 17kGs and Gunfire at MACS 4
- ✓ Canards deployed & guided to target during GG-A

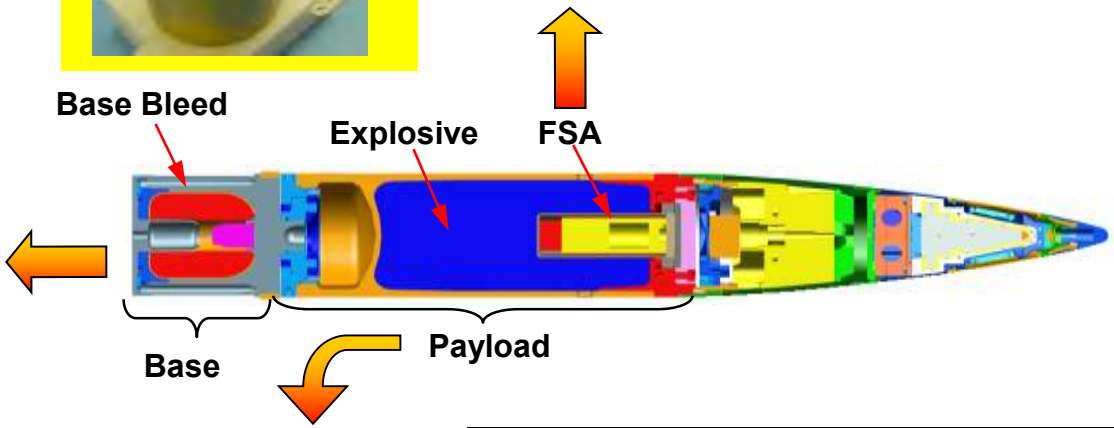
Technical Progress Summary 2



Base with Fins

Fuze Safe & Arm

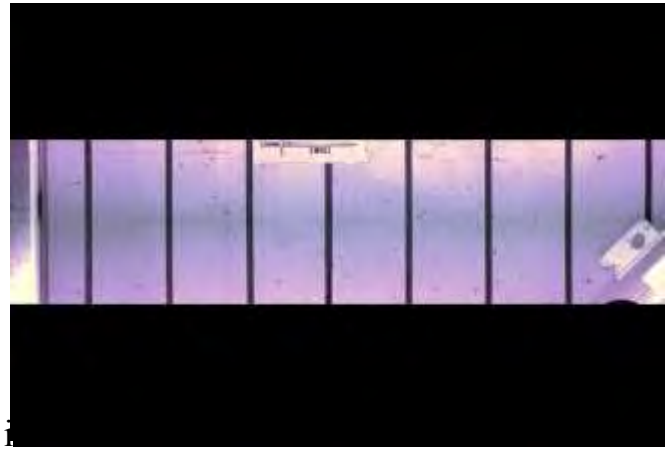
- ✓ Tactical design established
- ✓ Second Arming defined
- ✓ Accepted by US & Swedish Fuze boards



- ✓ Base with Roll Control tested – will support Early Fielding Block Ia-1
- ✓ Base Bleed development ongoing for Block Ia-2

Unitary Payload

- ✓ Arena, penetration and IM tests completed



Excalibur Container & Pallet

- Each Excalibur projectile comes in its own foam-filled steel container
  - ✓ Provides Environmental Protection over lifecycle
  - ✓ Helps meet Insensitive Munitions requirements
  - ✓ Successful container CDR; Meets all reqmts
  - ✓ Pallet testing successfully completed
- Nine containers to a pallet
- Straps inside speed projectile removal

ACCURACY:
Demonstrated at Guided Gunfire A Test Series

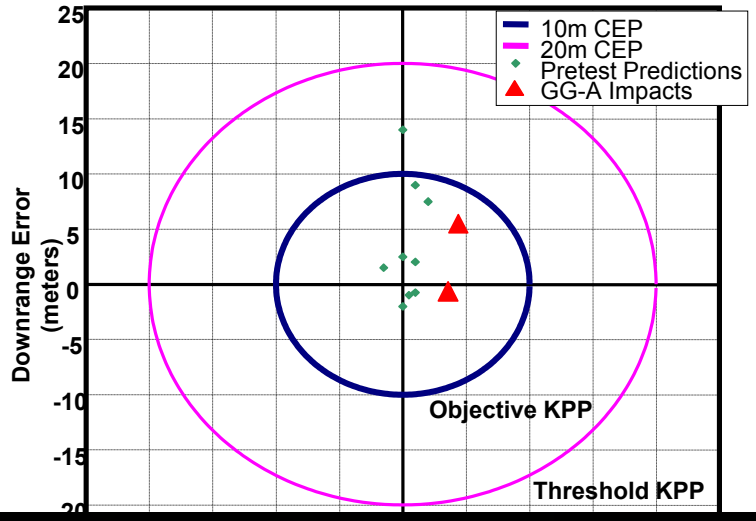
Range to target: 20 Kilometers

Objectives

- Demonstrate that projectile de-rolls when commanded, correctly orients, acquires GPS, calculates a navigation solution and guides a non-ballistic trajectory to a point on the ground

Configuration

- 3 Projectiles fired at MACS-4 charge from LW155 & Paladin cannons
  - Guidance & Navigation Unit (GNU)
    - Tactical computer & flight software
    - C/A Code (civilian) GPS
  - Tactical Canard Actuator System (CAS)
  - Encrypted Telemetry System (in place of tactical HE warhea



Results

- ✓ <u>All objectives successfully met</u>; 2 of 3 rounds impacted in target area
  - ✓ Demonstrated Accuracy: 3.4m & 6.9m
  - ✓ Full Functionality of Guidance and Navigation System
  - ✓ Guided to Programmed Target Location
  - ✓ Performed Terminal Tip over Maneuver over Target
  - o Projectile #2 flew ballistic
    - Shortcoming of GPS C/A code caused large change in navigation solution; round went into fail-safe mode
    - All future guidance tests will use military Y-code GPS which will not have this problem

Urgent Fielding Effort

- On 24 March the Army Resources & Requirements Board on validated the CFLCC Urgent Need Statement for a precision cannon munition
  - ✓ Excalibur designated as the materiel solution
  - ✓ Recommended allocating additional funding
- On 14 April Excalibur Conducted MS C Review
  - ✓ Brief conducted five months early
  - ✓ Acquisition Decision Memorandum signed 23 May
- On 27 May OSD approved the TEMP to support Urgent Fielding
- In mid June Army allocated additional funding
- On 22 June Army signed a Low Rate Initial Production contract with Raytheon
- Program on track to field projectiles to CFLCC in Iraq by the end of March 2006

Urgent Fielding Fuze Setter

- Schedule does not allow integration of EPIAFS with host howitzers
- Picatinny is developing a stand-alone Excalibur fuze setter using EPIAFS and off-the-shelf components
  - ✓ EPIAFS Fuze Setter, PIK and Cable
  - ✓ Ruggedized Personal Digital Assistant (RPDA)
  - ✓ SINCGARS ASIP Radio
  - ✓ DAGR GPS and Remote Antenna
- Communicates with AFATDS/BCS
  Emulates an M109A6 Paladin
- Envisioned for Paladin Units
  (but should work with any 155mm/39cal system)

Major Upcoming Test Events

- Guided Gunfire B
  - ✓Demonstrate initialization, projectile flight performance and Fuse Mode functionality
  - ✓Various ranges and charges
  - ✓Exposure to environmental conditioning
- Sequential Environmental Tests - Safety
  - ✓Extreme environmental conditioning
  - ✓Loose cargo and drop testing
  - ✓Sand & Dust exposure
  - ✓Fired at charges up to PIMP+5%
- First Article Test for XM982 (Block Ia-1)

Questions?

Precision Strike Association
Summer PEO Forum

Precision Strike Capabilities for the Future Battlefields

RADM Tim Heely
Program Executive Officer
Strike Weapons and Unmanned Aviation
27 July 2005

NAVAIR

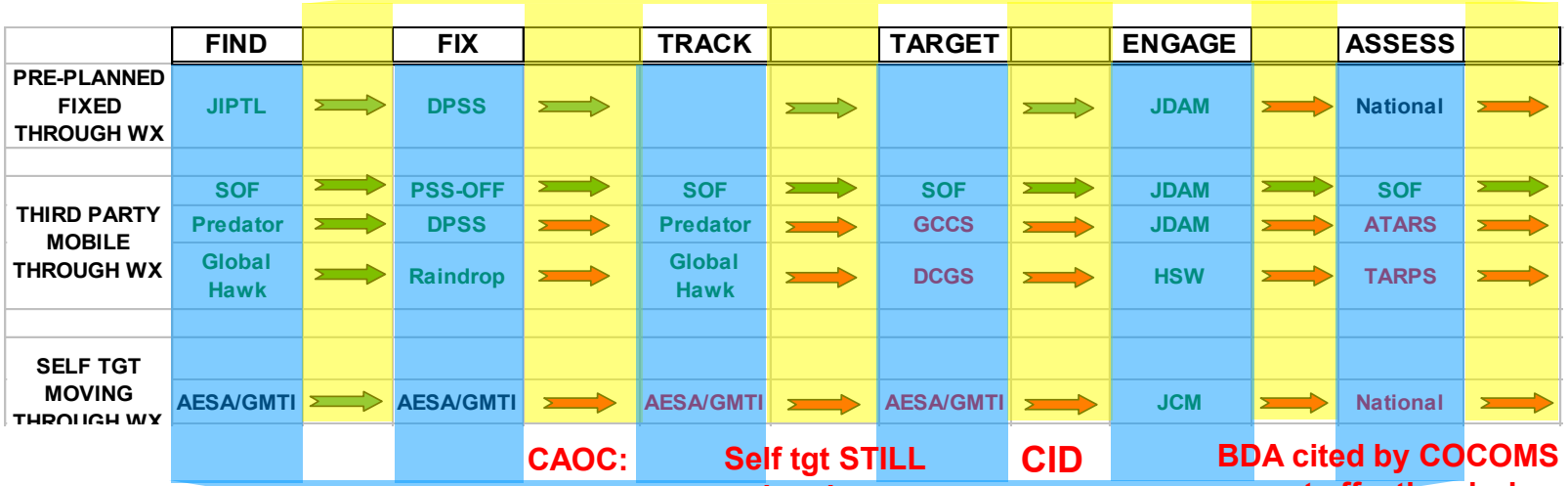
Battlefield of the Future has Expanded

- Transitioning from the “Cold War” Mentality
- Future Threats and Battlefields Include:
  - Littoral Areas
  - “Asymmetric” Threats
  - Global War on Terrorism (GWOT)
  - Time Sensitive Targeting (TST)
- Requires Flexible Solutions:
  - Precision Guidance
  - Small Warheads – Low Collateral Damage
  - Persistent Intel / Surveillance / Reconnaissance (ISR)

“Don’t Fight the Next War Like You Fought the Last One”

The Kill Chain is Essential to Mission Success

THIS IS FORCENET



CAOC: Bugsplat CID Clearance to Engage

Self tgt STILL involves CAOC analysis / clearance to fire

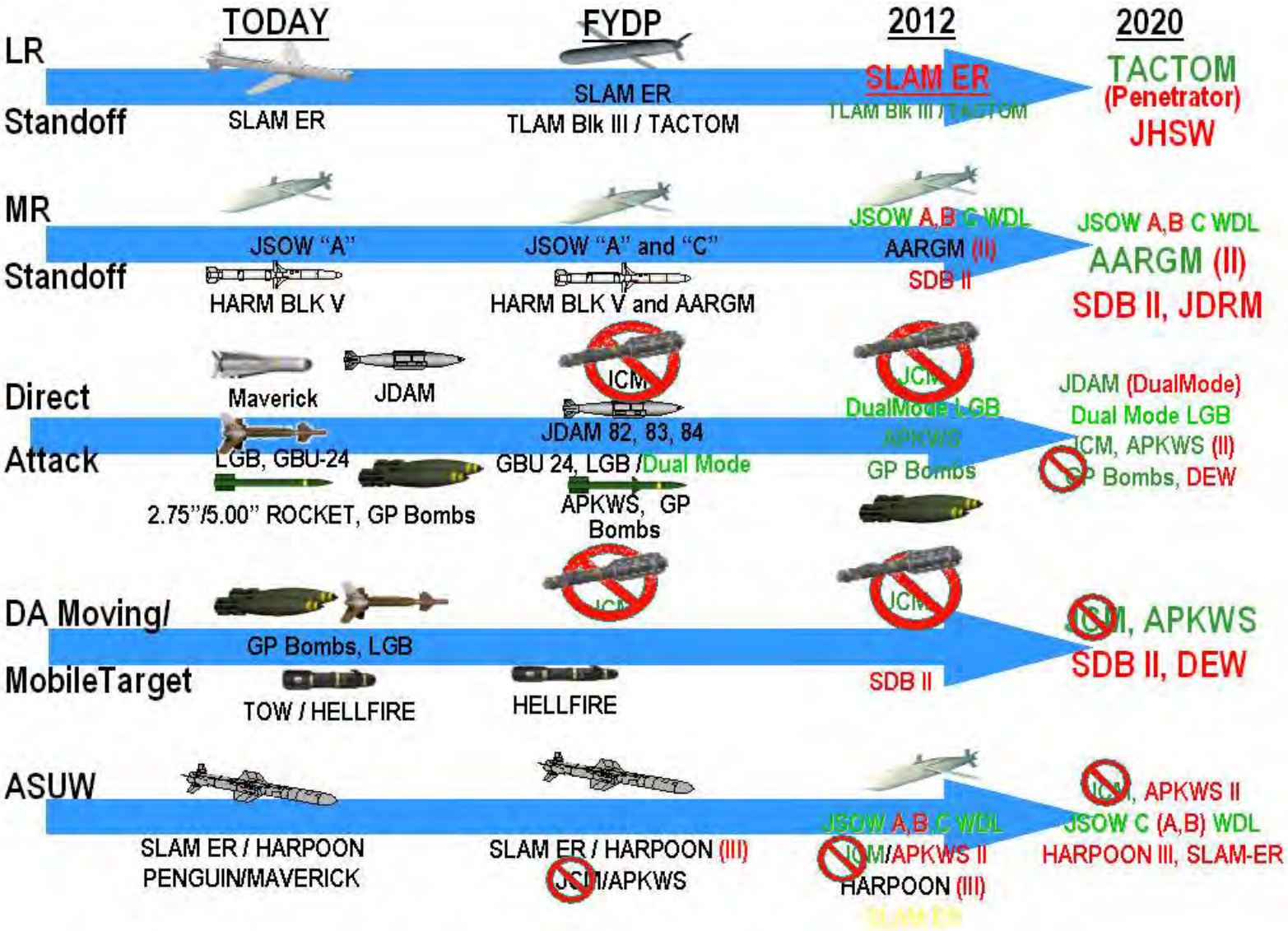
CID Chain of custody

BDA cited by COCOMS as not effective during OIF/OEF Information was collected but CAOC was not capable of analyzing 700 combat sorties / day

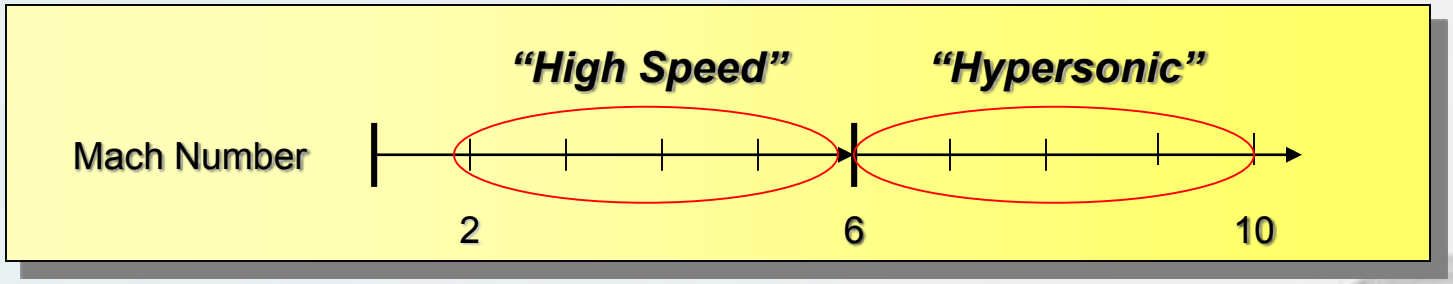
THESE ARE PROGRAMS

FORCENET Is the Enabler That Links the Kill Chain

Potential Weapons Investment Strategy



Global Strike Weapon
(High Speed Weapon)



JCIDS → AoA → JOINTNESS/Funding → Milestone B

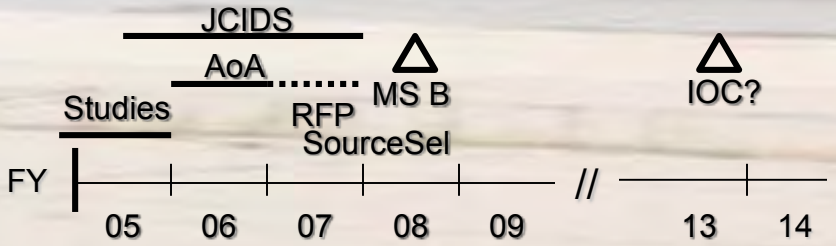
What it is:
A *Weapon SYSTEM*, NOT just a speed/propulsion…

- Target Set
- Launch Platform
- P_K
- C4ISR ConOps
- Cost Analysis
- TRL Assessment

Potential missions/targets:
TCS, Relocatable Targets, Fixed Targets, Counter-WMD, GWOT, HDBT, SUW, …

Potential launch platforms:
TacAir, Surface Ships, Submarines, Bombers, …

Notional Schedule



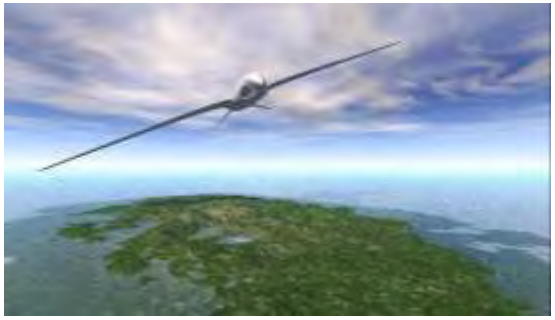
It all depends on… the CAPABILITIES Required

UAV Programs of Record

GLOBAL HAWK

Two Air Vehicles and Ground Systems Procured
Delivery in FY05 w/modified Sensors
Future: Development of Naval Doctrine

BAMS UAV



Full and Open Competition Effort
Future: Persistent Maritime and Littoral ISR

J-UCAS

DARPA Project: Penetrating ISR
Weaponized/Network Ready: Carrier Deployable
Future: Multi-service missions - Common Operating System

PIONEER

OIF Deployment – 900+ Hours Oct-Nov 04
Target Location, CID, and BDA
Future: New Payloads and Engine

UAV Programs of Record

FIRE SCOUT

Flight Testing at Webster Field
Future: 4-bladed w/open systems architecture

EAGLE EYE

USCG Deepwater UAV – acquiring 69 aircraft
Starting in FY06 USMC Developing CONOPS for use with MV-22

DRAGON EYE

Successful Deployment in OIF
IDIQ Contract – Up to 1026 Units
FY04 – 41 units
FY05 – 45 units plus 40 attrition units
Future: Updated Payload and Propulsion

NEPTUNE

SOCOM Program: Land/Sea operations – pneumatic catapult launching system,water or skid landing Interchangeable color TV or IR camera

In Summary …

- All Components of the Kill Chain Are Critical
- Flexibility Remains Key Element to Continued Success
- We Continue to Align for Joint Warfare -- Globally
- We Continue to Look for Efficiencies to Recapitalize

Weapon Roadmaps will Evolve to Support The Warfighter

Viper Strike Overview

July 2005

LTC John Oxford
PM Submunitions

Viper Strike Overview

Diameter	5.5 in.
Wingspan	36 in.
Length	36 in.
Weight	42 lb.
Glide Ratio	10:1
Warhead	2.3 lb.
FOV	14^0

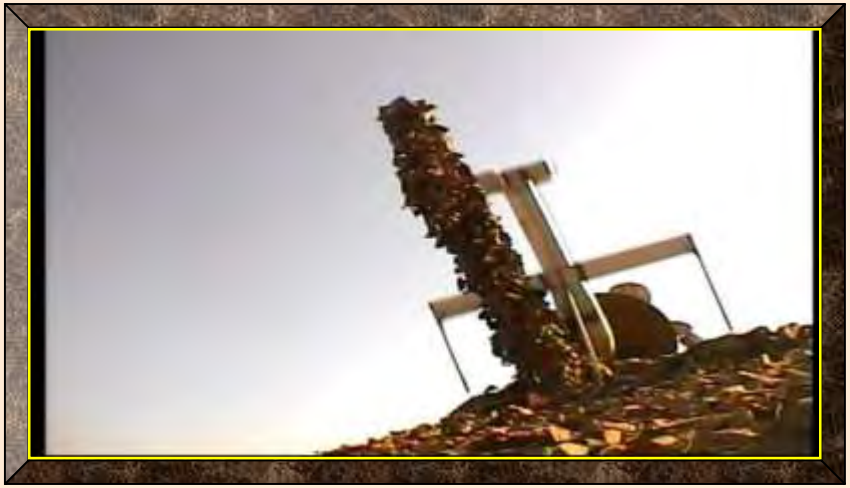
- Discrete effects precision munition
  - Semi-active laser (SAL) seeker
  - Near 0 CEP
  - Small warhead
  - Hit-to-kill

  } Low Collateral Damage
- Production airframe/seeker
- Successful Army Demos (9 for 9)

Path Ahead:	Improvement	Demo
• GPS	Extend range 10+ miles	2005
• Frag belt	**Personnel targets, plus "less than lethal" mode**	**2005**
• Datalink	Max range moving targets plus multiple near-simultaneous target attack	2006

Viper Strike's Greatest Hits

July 2003



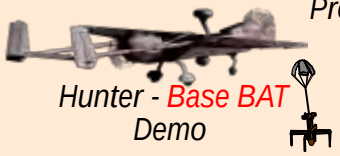
Viper Strike Lineage

ATACMS Delivered Base BATs

Eagle Eyes Multi-Mode Seeker Proof of Principle

Viper Strike SAL Seeker Proof of Principle Demos I & II

Hunter-Viper Strike Quick Reaction Capability Fielded

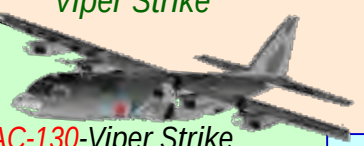


Hunter - Base BAT Demo

Proof of Principle

Operational Capability

Convert Block II Base BAT to Viper Strike



AC-130-Viper Strike ACTD

Viper Strike **"TO GO BOX"** Capability

Predator/IGNAT Viper Strike Demo

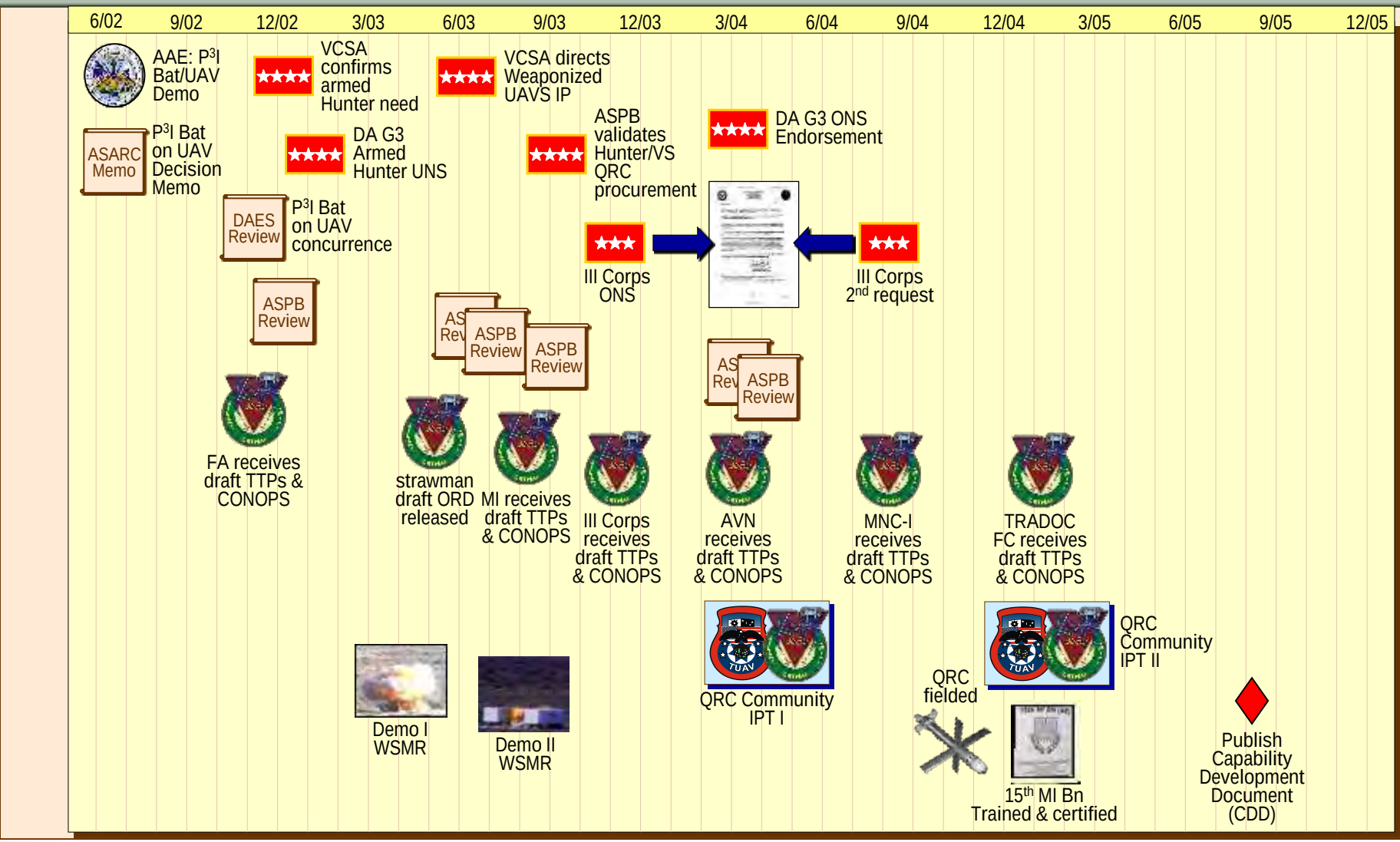
New Production Viper Strike Munition Requirements

AC-130 - Viper Strike Operational Use

Multi-Platforms/ Multi-Missions (i.e. C-RAM)

Predator - Viper Strike Operational Use

Viper Strike's Evolving Requirement



Current Capabilities

- **Launch Altitudes** – *8 to 13k' and No Need to Maneuver*
- **Low Circular Error of Probability** – *Less than One Meter*
- **Low Collateral Damage** – *16 Meters for Urban Targets*
- **Top Down Blast Effect** – *Limits Damage in Urban Canyons*
- **Moving Targets** – *Up to 40 kph with Some Target Maneuvering*
- **Danger Close** – *ATEC Approved at 50 Meters*
- **Double the Payload** – *Half the Weight of Hellfire*
- **Multiple Laser Designations** – *Air, Buddy, or Ground*
- **Day or Night Capability** – *All Laser Designators*
- **Stand Off** – *1/2 to 1km Current ; 5km w/GPS*
- **Current HE and Kinetic Warheads** *plus Frag Sleeve Funded*
- **Only Current Munition** *for Class II & III Weaponized UAVS*
- **Capability Fielded in OIF** – *Proven & Certified*
- **Active Production Facility** *at Redstone Arsenal*
- **No Munition Restrictions** *Beyond Aircraft Limitations*

Current Missions

- *"Golden Shots"*
  - *Pinpoint a moving armored car in a motorcade*
- *Restricted (Minimal Collateral Damage) Urban Targets*
  - *Reach down into cordoned urban canyons*
  - *Near vertical angle of attack projects warhead shrapnel into the target and ground minimizing collateral damage*
- *Convoy & TOC ISR & Security*
  - *At 10k' AGL, UAVs relatively unseen, unheard, and undetectable*
  - *Allows observation of enemy preparations, IED placement, and ambush points*
- *Key Infrastructure ISR & Armed Response*
  - *Refineries, pipelines, politically sensitive locations, etc.*
- *Monitor critical situations with timely response*
  - *Undetected observation without ground troops in harm's way*
- *Army asset under Army control*

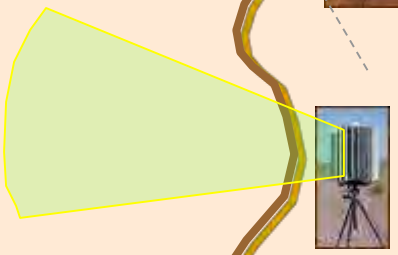
Viper Strike in the C-RAM Mission

Hunter-Viper Strike
self lasing & deploying

target data

Weapon Release
Authority

Hunter UAV
Ground Control
Station



Mortar

FAADC²
AMDWS

state vectors

Base Defense
Ops Center

MRL

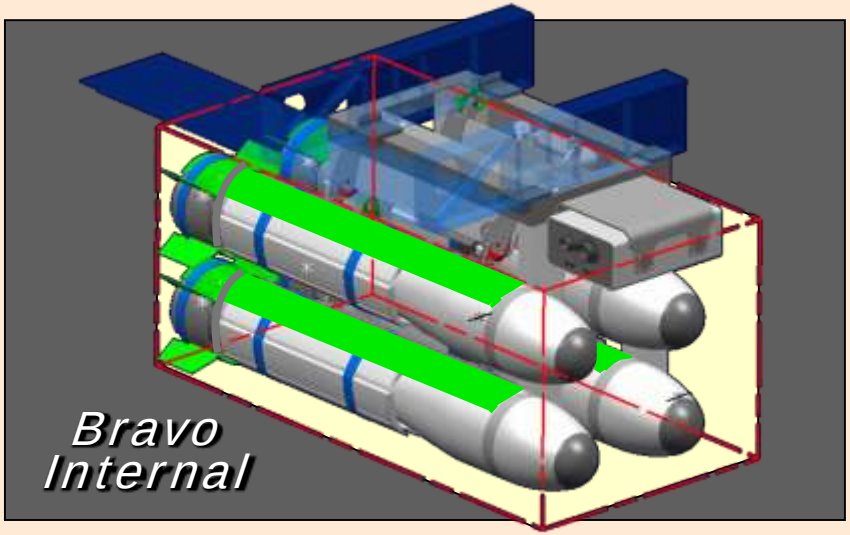
Joint Data
Exploitation
Center

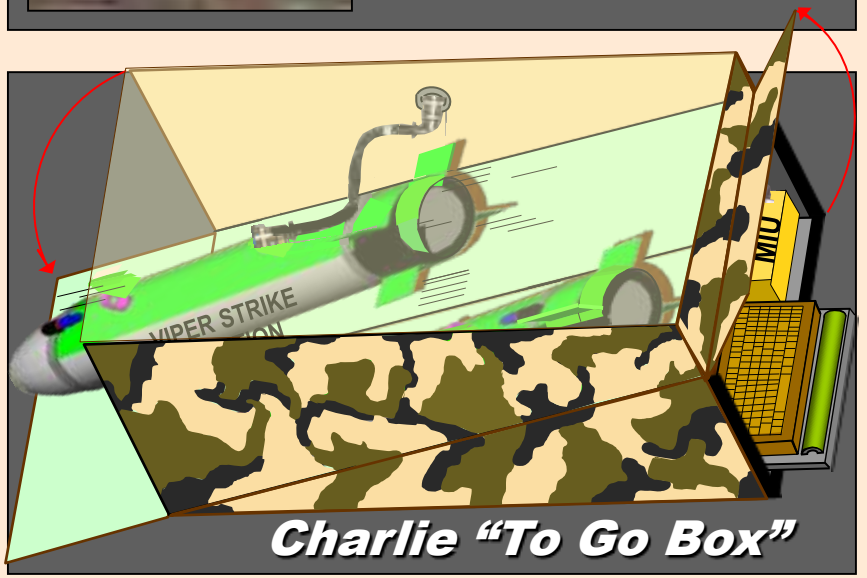
LOGISTICS BASE

Viper Strike CRAM Demo

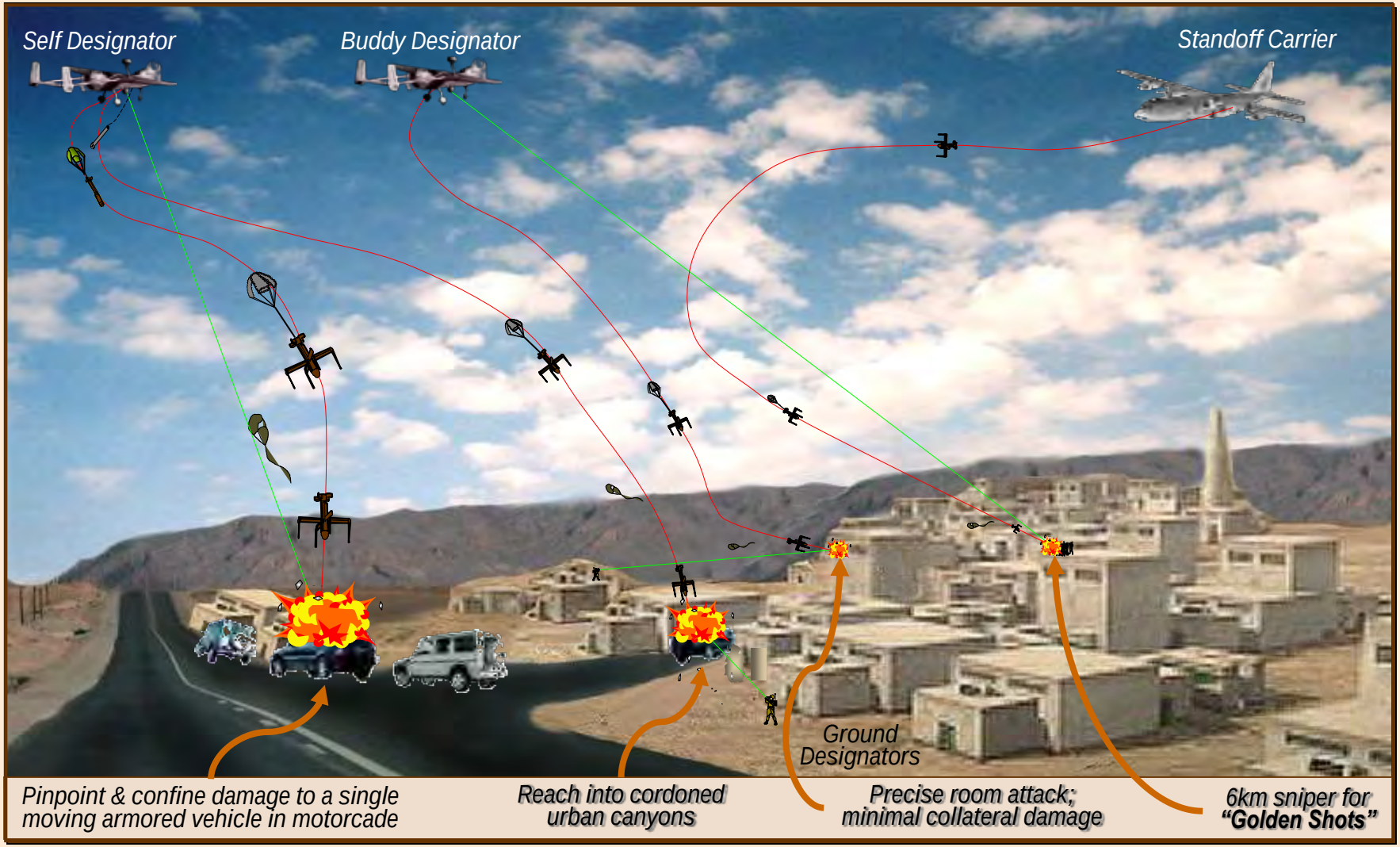
Various Carriers

Various Packages





Future Capabilities



Summary: Fielded & Certified!

Acquisition at the Air Armament Center

AGMSW

July Precision Strike Conference 2005

Air-to-Ground Munitions Systems Group
Mr. Thomas Robillard, SES
Director

Why Are We Here?

Communicate What's Going On With Precision Strike From An Air-to- Ground Munitions Systems Wing Perspective

Learn From Each Other

Desired Outcome

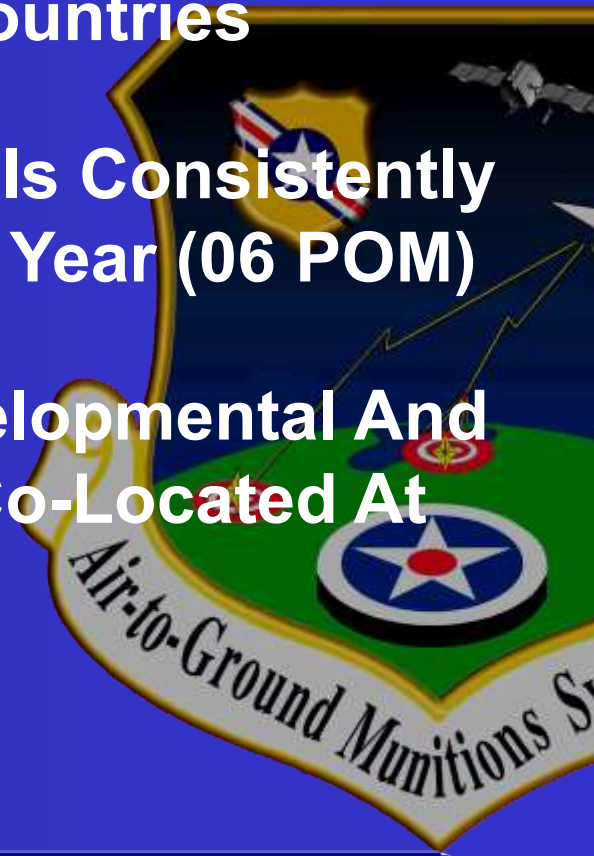
Benefit From Cross-Talk

Get More Effective At Joint Service Technology Transitions

Air Armament Center (AAC)

AGMSW

- Provides Weapons And Combat Support Systems To AF, Navy, Army, And More Than 30 Countries
- Air Armament Modernization Budget Is Consistently 2-3% Of Total AF Budget ~$300m Per Year (06 POM)
- Laboratory, Acquisition Offices, Developmental And Operational Test Organizations Are Co-Located At The AAC



AFMC / AAC MISSION

Deliver War-winning Technology, Acquisition Support, Sustainment, And Expeditionary Capabilities To The Warfighter

AFMC /AAC Strategic Goals

AGMSW

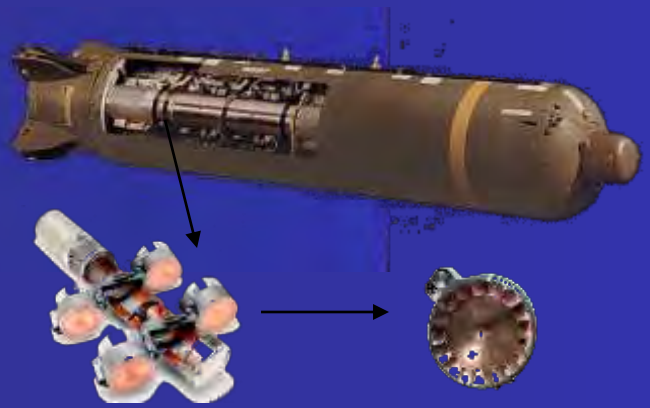
- Develop And Transition Technology To Maintain Air, Space, And Information Dominance
- Develop, Field, And Sustain War-winning Expeditionary Capabilities On Time, On Cost
- Provide Opportunities For Career Development And Progression
- Operate Quality Installations And Ranges
- Sustain A Healthy, Fit, Safe, And Ready Workface
- Organize And Resource The Command To Improve Accountability And Increase Effectiveness
- Achieve Agile Acquisition Through Speed And Credibility

Air-to-Ground Munitions Systems Wing (AGMSW)

AGMSW

Joint Direct Attack Munition (JDAM)

Joint Air Surface Standoff Missile (JASSM)



Sensor Fuzed Weapon (SFW)

Small Diameter Bomb (SDB)

Air-to-Air Missile System Wing (AAMSW)

AGMSW

Harm Targeting System (HTS)

Advanced Medium-Range, Air-to-Air Missile (AMRAAM)

QF-4 Full Scale Target

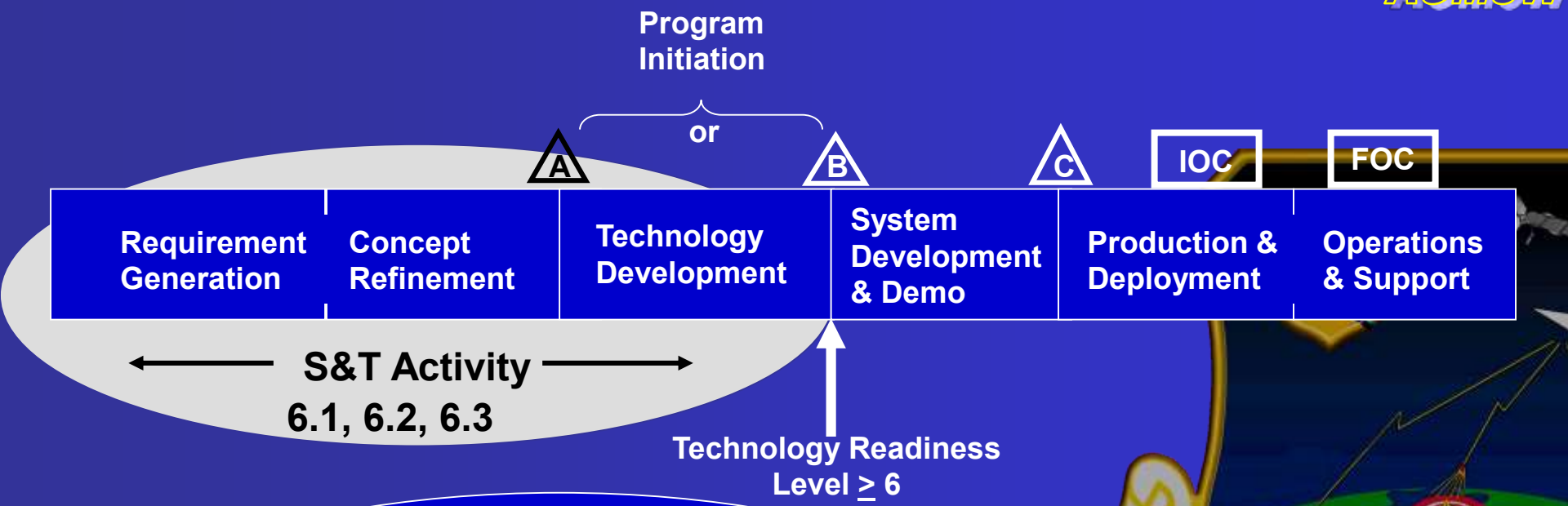
Sidewinder AIM –9X

Miniature Air Launched Decoy (MALD)

Air Force Sub-Scale Aerial Target (AFSAT)

Technology Transition
The DoD 5000 Process

AGMSW



Top-Down Direction
- SecDef
- SecAF
- CSAF

Combatant Commander Needs
- Integrated Priority List (IPL)
- Urgent Need Requests

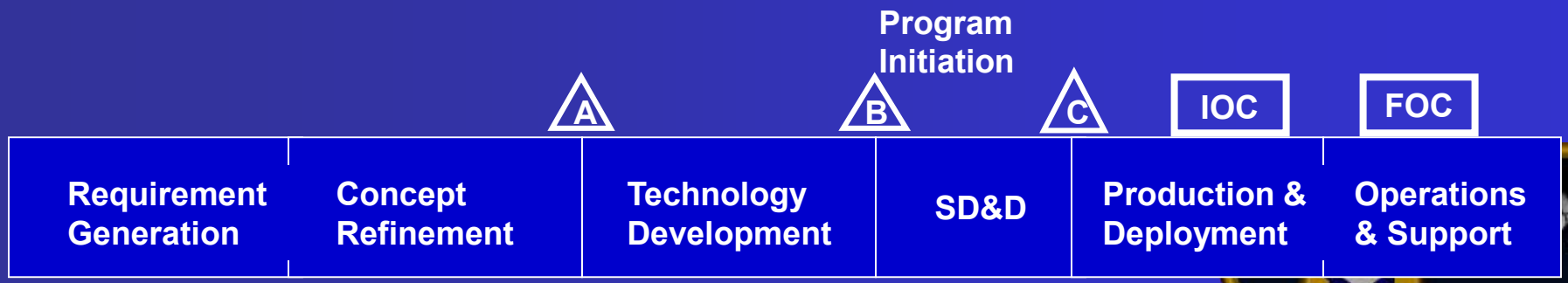
REQUIREMENTS

Technology Transition
- ATDs
- ACTDs
- Exercises
- Experiments
- Battlelab Initiatives
- SPO Initiatives
- Industry

Capability Based Planning
- CONOPS
- CRRA

Who Does Technology Transition & Program Starts?

AGMSW



Pre-Systems Acquisition

- AF Research Laboratory/Munitions Directorate
  - Technology Maturation
  - Integrated Concepts/Demos
  - Expertise
- AAC/XR
  - Initial Program Cadres
  - Quick Reaction Programs
  - Guides S&T Investment

Acquisition Offices

Air-Ground Sys WG
Air-Air Msl Sys WG
Air Combat Sup Sys GP

Sustainment

Air Logistic Centers

Multi-service and International Stakeholders: Industry, Warfighters, Laboratories, Service, OSD Staffs, & Congress

The DoD 5000 Process For New Programs "Behind the Textbook"

AGMSW

- Identify Technology That Provides Warfighter Additional Capability
  - Better And/Or Cheaper Than Current Inventory
  - Fills Capability Gap(s)
- Assess Risk And Understand Technology Maturity
  - Conduct Risk Reduction, Concept & Technology Development Activities
  - Demonstrate Maturity
- Develop Focused Story That Articulates Capability In Warfighter Terms
- Lab, Industry, Acquisition Community Relay Story To Stakeholders
- If Story Is Good, Funding And Direction Will Come
- Acquisition Program Begins

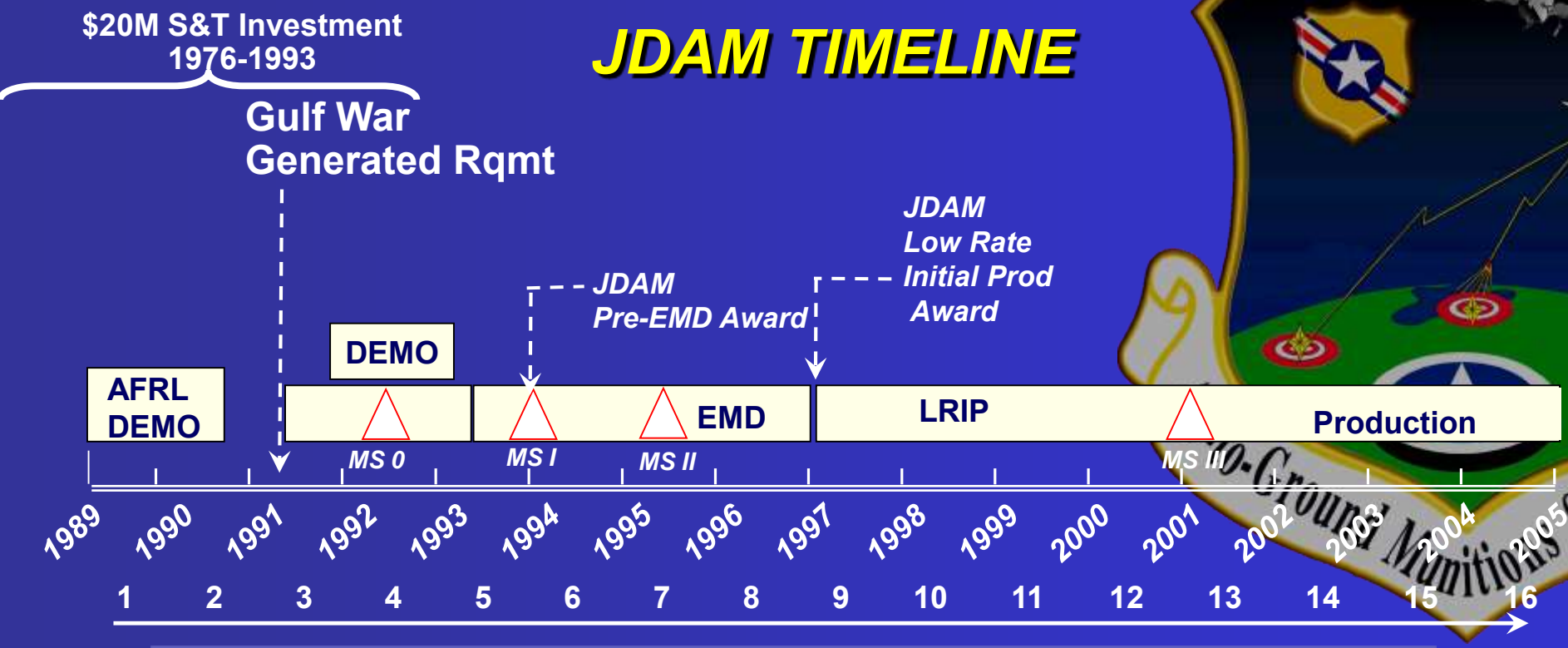
This Process works best when "PULLED" by capability needs and takes 5 years or more

JDAM Story

AGMSW

- AFRL Inertial Guidance Technology Demonstration 1989-1990
- Gulf War – 1991 – Need For Accurate All-Weather Weapons

JDAM TIMELINE



5 Years from Technology Demonstrations,
3 Years From Identified Need to Milestone I

JDAM Start-up

AGMSW

- Competing Concepts
- Technology Maturity Debates
  - GPS Technology Was New For Use In Weapons
  - Inertial Navigation Systems Were Expensive
  - Can You Make It Affordable For Large Quantity, Expendable Weapons?
- Use/Reliability Of Autonomous Weapons
  - Existing Concepts Of Operations Were Based On Data Linked Weapons Or Carpet Bombing
- Funding
  - Had To Marry Up With POM Cycle
  - Had To Sell New Acquisition Strategy – Promised Affordability
    - Cost Vice Performance Trades
    - Performance Specifications
    - Long Term Pricing Agreements

JDAM For OEF and OIF

AGMSW

- Prior to 11 Sept 01 Attacks
  - 700 Units Per Month
  - Aircraft

MK 82 (500 lb)	MK 83 (1000 lb)	MK 84 (2000 lb)	
None	F/A-18 C/D	F-16 Blk 50	F-14
		F/A-18 C/D	B-2
		B-52	B-1

- Today
  - 2800 Units Per Month
  - More Aircraft Integrations - Smaller Bombs

MK 82 (500 lb)		MK 83 (1000 lb)	MK 84 (2000 lb)	
B-2	F-15E*	F/A-18 C/D	F-16 Blk 50	F-14
F-16 Blk 30*	F/A-18 C/D	F/A-18 E/F	F/A-18 C/D	B-2
F-16 Blk 40*	MQ-9* (FY06)	AV-8B	F/A-18 E/F	B-1
F-16 Blk 50*	B-1 (FY06)	F-22 (FY-06)		B-52

* Quick Reaction Capability

Precision + Low Collateral Damage + Platform Flexibility in Months Vice Years

JDAM Today

AGMSW

- Accuracy: Less Than 6 Meters
- Cost: Less than 50% Original Estimated Unit Cost
- Number Produced To Date: 104,320
- Number Used In Conflict: 15,180

  (AF: 11,570, Navy: 3,610)

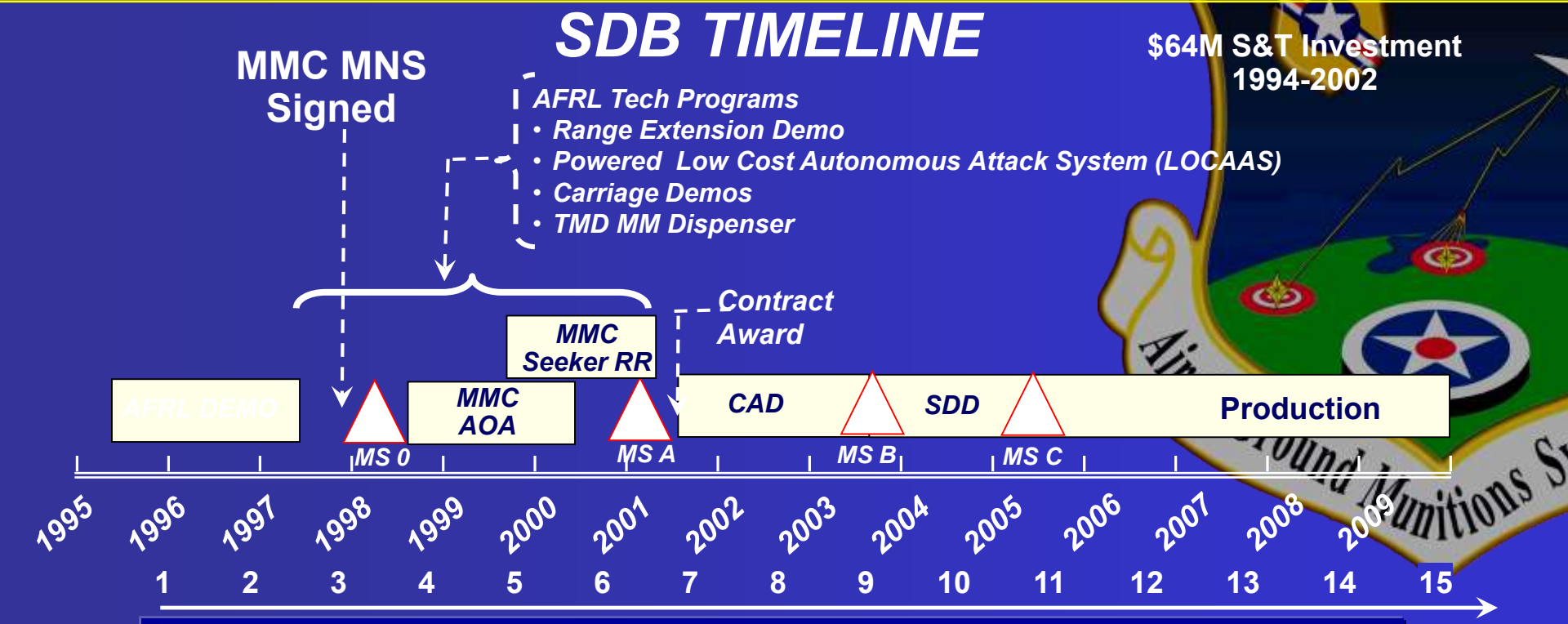
Small Diameter Bomb (SDB)

SDB Story

AGMSW

- Aircraft Internal Bays Limit Number Of Weapons Carried
- Increased Need For Near-zero Collateral Damage
- Improved INS/GPS Accuracy Over Time Allowed For Smaller Weapons and Multiple Carriage

SDB TIMELINE



6 Years From Technology Demonstration,
3.5 Years From Identified Need to Milestone A

SDB Start-up

AGMSW

- Challenges
  - Belief That Nothing Smaller Than 2,000 lbs Could Sufficiently Damage Targets
  - Bomb Damage Assessment – How Will We Know What Damage Was Incurred With Small Amount Of Explosive?
  - Worry That We Couldn't Mission Plan That Many Weapons
  - Funding – 4 Years "Below-the-line" In POM
- What Happened:
  - Lab, Industry, Acquisition And Warfighter Communities Collaboratively Built And Told The SDB Story
    - Lab Demo, Live Fire, B-2 With 80 500 lb JDAMS, ...
  - Top-down Directed Funding For Program In FY01 & Out
    - 04 POM Fully Funded Baseline Program

Lessons Learned

AGMSW

- Capabilities Needed In Actual Combat Drive Technology Transitions
  - Create Battlefield Effects With Near-zero Collateral Damage
  - Integrate Seamlessly Into Fully Joint Warfighting
- Multitude Of Diverse Stakeholders Must Converge To Successfully Transition Technology
  - Industry, Warfighters, Service & OSD Staffs, Congress
- Aircraft Integration Is The Slowest, Most Costly Driver
  - 5-8 Platforms (F-18 E/F, FA-22, JSF, B-2, B-52, F-15, F-16, B-1, UAVs)

Joint Programs

AGMSW

"Now More Than Ever.....!!"

AAC/XR Roadmap Vision

N78 1Q 2004 (POM 06)

	TODAY	FYDP	2012	2020
LR Standoff	SLAM ER	SLAM ER TLAM Blk III / TACTOM	SLAM ER TLAM Blk III / TACTOM	TACTOM (HSW)
MR Standoff	**JSOW "A"** HARM BLK V	**JSOW "A" and "C"** HARM BLK V and AARGM	JSOW AARGM SDB II	JSOW AARGM SDB II
Direct Attack	Maverick JDAM LGB, GBU-24 **2.75"/5.00" ROCKET, GP Bombs**	Maverick JDAM 82, 83, 84 GBU 24, LGB APKWS, GP Bombs	JDAM LGB JCM, APKWS GP Bombs	JDAM JCM, APKWS GP Bombs
DA Moving/ MobileTarget	GP Bombs, LGB TOW / HELLFIRE	JCM HELLFIRE	JCM SDB II	JCM SDB II

A Lesson From Air-to-Air

AGMSW

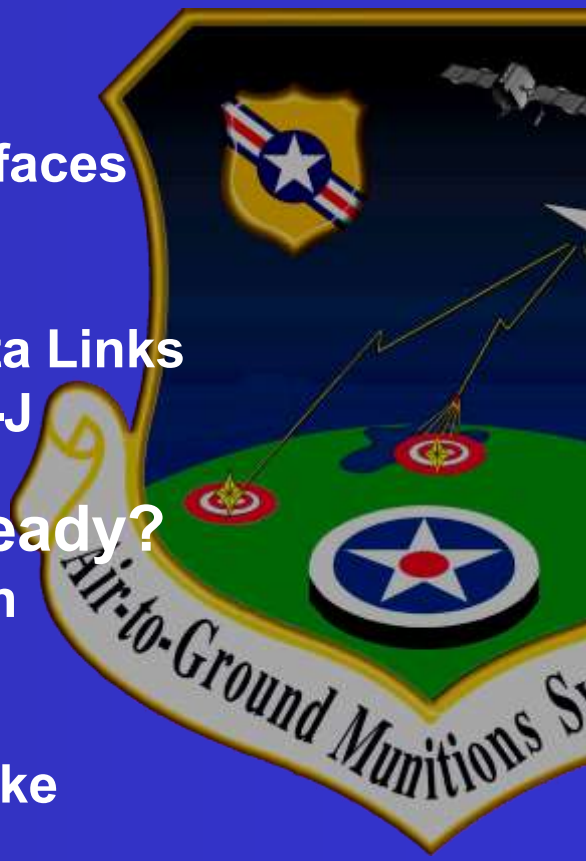
- Joint Air Dominance Organization (JADO)
  - Air-to-Air Focus
  - USAF/ USN Focus
  - In Start-up Mode
- Need to Incorporate Precision Strike
  - Air-to-Air/ Air-to-Ground Framework
  - Capability Focus Independent of Service or Launch Platform (SLAMRAAM)

Joint is not a Four Letter Word

Preparing For The Future

AGMSW

- Small Diameter Bomb
  - Field More Precise, 250 lb Bomb In FY06
- Universal Armament Interface
  - Develop Plug-and-Play Aircraft/Weapon Interfaces
- Net-Ready Weapons
  - Establish Interface Standard For Weapon Data Links
    - ACTD FOR SDB, JASSM, JSOW-C, MALD-J
- Directed Energy Application – Are We Ready?
  - 8-10 Feb 05 Workshop Focused On Transition
- Armament Symposium – 4-5 Oct 05
  - Focus Areas: CBRNE, CAS, Long Range Strike




QUESTIONS?

Historical Perspective
Infusion of Weapon New Starts

AGMSW

FY94 FY95 FY96 FY97 FY98 FY99 FY00 FY01 FY02 FY03 FY04 FY05 FY06

JDAM

WCMD

JASSM

= ACAT I Programs

SDB I

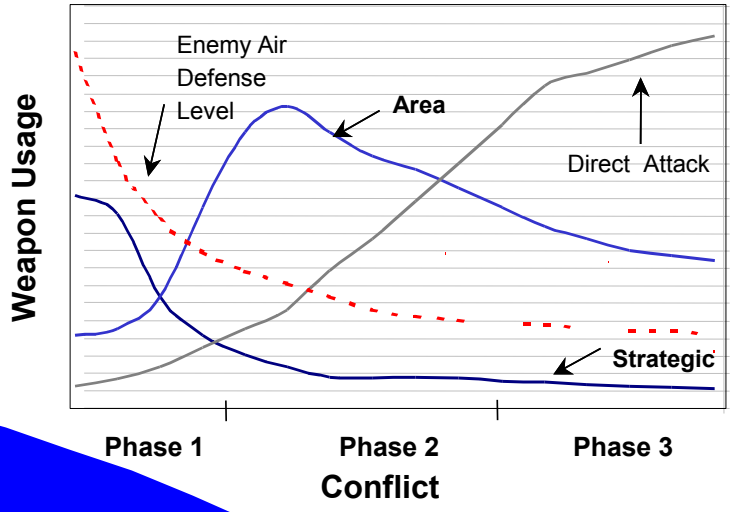
MALD

JASSM-ER

SDB II

Budget Priorities Rule Technology Transitions

Phased Threat Distribution



SLAM-ER
Tomahawk
JASSM

JSOW
SLAM-ER
GBU-24
TACTOM
ARGM
Harm

JSOW
JDAM
LGB
Hellfire
Guns
Rockets

Phase I — High Value — First day/early — Low quantity

Phase II — Medium Threat — Early / mid — Moderate quantity

Phase III — Low Threat — Mid/duration — Large quantity

Point / Direct | Area / Point | Strategic / Theater

Precision Strike Summer PEO Forum

Capabilities Integration Directorate

Precision Engagement –
"Creating Effects Based Operations for Future Battlefields"

AIR ARMAMENT CAPABILITY FOR THE FUTURE

Lynda Rutledge
Technology Transition & Concept Development
AAC/XRS
Eglin AFB, FL

28 July 2005

PRECISION STRIKE CAPABILITIES For The FUTURE BATTLEFIELDS

Capabilities Integration Directorate

- Today's Weapons Are Excellent…but We Need to Continue Improving to Prepare for Future Conflicts
- Current Precision Weapons Have Filled Many Capability Objectives
- Key Objectives Still Remain Where Precision Engagement Is Critical
  - Counter CBRNE
  - Urban Attack/Close Air Support
  - Long Range Strike
- Must Start Planning Today to Meet Our Objectives

OVERVIEW

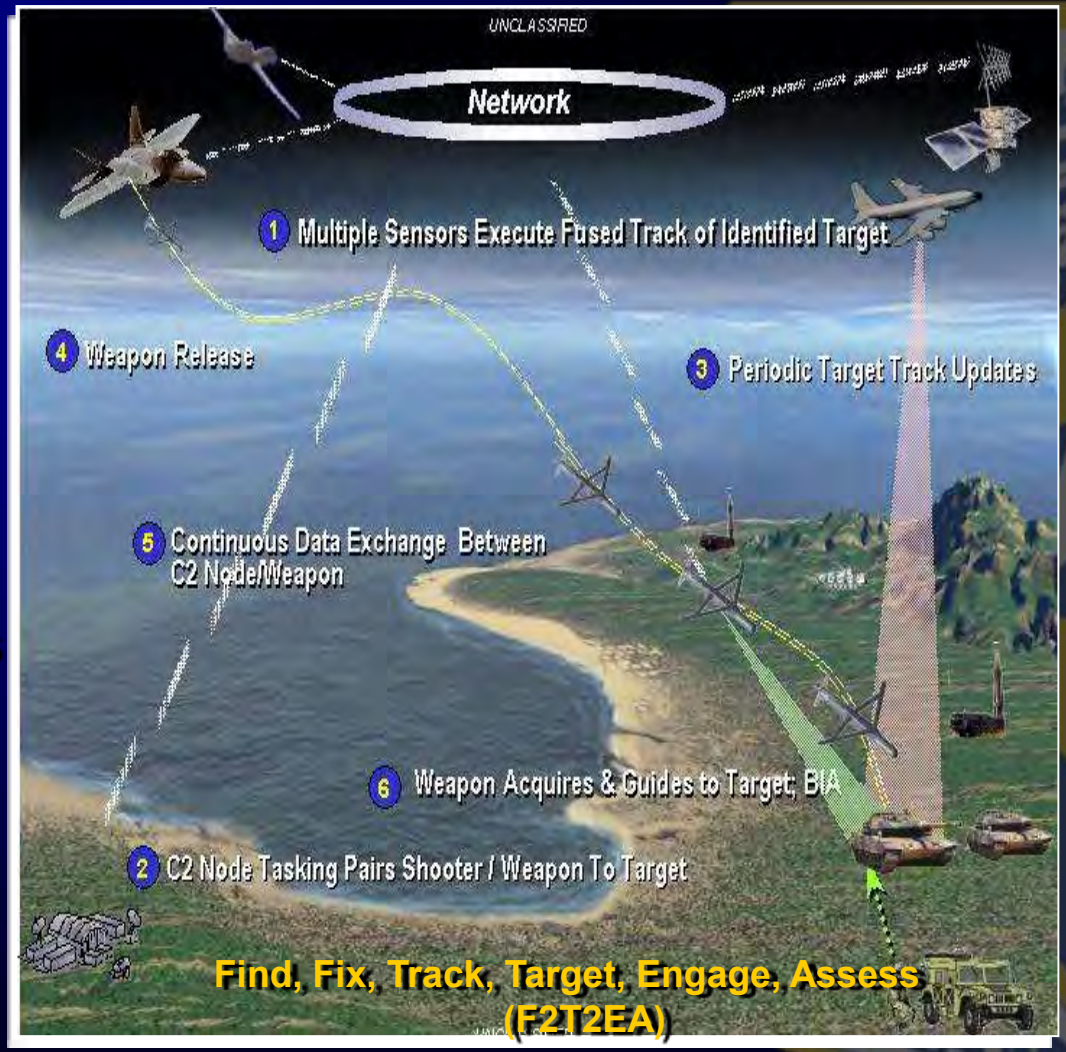
Capabilities Integration Directorate

- **Near Term Capability Enablers**
  - **Weapons Data Link Network ACTD**
  - **Universal Armament Interface (UAI)**
- **Mid to Far Term Capabilities**
  - **Counter-CBRNE Systems**
  - **Urban / Close Air Support Weapons**
  - **Long Range Strike**
- **Emerging Technologies**
  - **Directed Energy**

WEAPONS DATA LINK NETWORK (WDLN) ACTD

Capabilities Integration Directorate

- Networked Weapons Provides Opportunity for Revolutionary Improvements in Warfighting Capability
- Interoperability Is Key to Successful Integration
- Joint FY05 ACTD Develops Architecture and Message Standards
- Demonstrates Weapon Integration into Network Centric Warfare



Pathfinder for Network-Enabled Weapons Capability

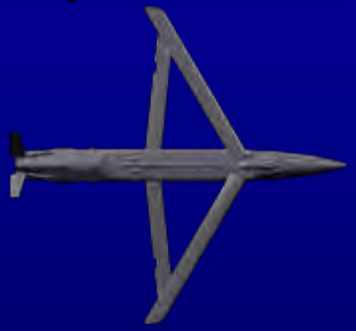
WHY NETWORKED WEAPONS

Capabilities Integration Directorate

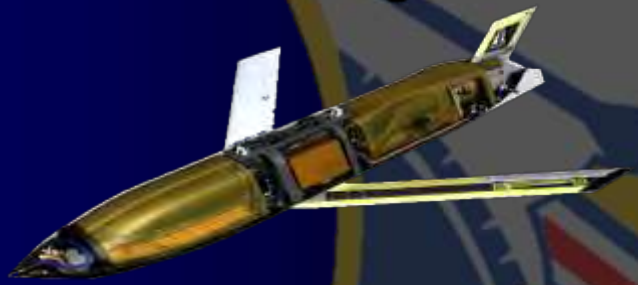
- Weapon In-Flight Target Update
- Weapon Retargeting
- Weapon In-Flight Tracking
- Weapon Bomb Impact Assessment (BIA)
- Weapon Abort

PATHFINDER DEMO WEAPONS

- *Initial Networked Design Concepts Developed and Demonstrated*
- *Compliant with Network Architecture and Interface/Message Standard*



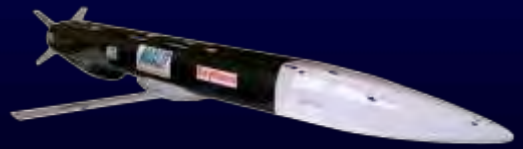
Small Diameter Bomb (SDB)



Joint Air-to-Surface Standoff Missile (JASSM)

Joint Standoff Weapon (JSOW)

Wind Corrected Munitions Dispenser (WCMD-ER)



Miniature Air Launched Decoy – Jammer (MALD)

(Not Demonstrated)

UNIVERSAL ARMAMENT INTERFACE

Capabilities Integration Directorate

TODAY'S CHALLENGE

- Each Weapon Has Its Own Unique Interface Requirements and Its Own Interface Control Document (ICD)
- Weapon Integration Activities Are Tied To Platform Pre-Planned OFP Update Schedules
- <u>Finding:</u> Weapon Interfaces With Aircraft Operational Flight Programs (OFPs) are Driver of Integration Schedule/Cost

UAI Addresses the Challenge

WHAT IS UAI?

Capabilities Integration Directorate

- UAI is an Initiative to Develop Standardized Software Interfaces in Aircraft, Weapons and Mission Planning
- Industry Consortium Formed to Develop the Standard
- Decouples Weapon Integration Schedules from Aircraft OFP Update Cycle
- Reduces The Effort Required To Integrate Weapons Onto Platforms

UAI is a Process Improvement that Reduces Weapon Integration Costs & Schedule

UAI STATUS

Capabilities Integration Directorate

- Baseline ICD Developed And Being Verified
- F-15E Will Become UAI Capable During Suite 6
  - Implementation Currently In Progress
- JASSM, JDAM - First UAI Weapons
- Others To Follow Based On ACC Approved Roadmap

OVERVIEW

Capabilities Integration Directorate

- Near Term Capabilities
  - Weapons Data Link Network ACTD
  - Universal Armament Interface (UAI)
- Mid to Far Term Capabilities
  - Counter-CBRNE Systems
  - Urban / Close Air Support Weapons
  - Long Range Strike
- Emerging Technologies
  - Directed Energy

COUNTER - CBRNE CONCEPTS

Capabilities Integration Directorate

- **OBJECTIVE:** Capability To Defeat CBRNE Targets While Minimizing Collateral Damage
- **REQUIREMENT:**
  - Draft Capabilities Development Document In Coordination
    - Increment 1 – Disrupt And Deny
    - Increment 2 – Bulk Neutralization

C-CBRNE. . . .

COUNTERFORCE AGENT DEFEAT - INCREMENT I

Capabilities Integration Directorate

- **OBJECTIVE:** Defeat Hardened Chemical and Biological Storage Facilities

- **ASSUMED REQUIREMENTS:**
  - Ability to Engage Hardened Weapons of Mass Destruction Targets
  - Target Disruption – Agent Denial
  - Minimize Agent Release – Low Collateral Effects

- **DESCRIPTION:**
  - Various Warheads, Legacy Guidance, Fuzes
  - Potential Fills: High Temp Incendiary, HE Burster Charge, Submunitions, White Phosphorus, Others To Be Assessed

- **SCHEDULE:**
  - FY06-FY08 AFRL Advanced Tech Demo
  - FY08 POM Submittal
  - FY08 SDD Start
  - FY 12 Production Start

C-CBRNE. . . .

COUNTERFORCE AGENT DEFEAT - INCREMENT II

Capabilities Integration Directorate

- **OBJECTIVE:** Capability to Defeat Chemical and Biological Storage and Production Facilities
- **REQUIREMENT:**
  - Ability to do Bulk Neutralization of Chemical and Biological Agents
  - Minimize or Negate Collateral Effects
- **DESCRIPTION:**
  - Delivery and Fill Concepts Being Assessed
- **SCHEDULE:**
  - FY05: Planned Phase I - 9-Month DOD Study
  - FY 07/08: Phase 2, If Required

URBAN / CLOSE AIR SUPPORT

Capabilities Integration Directorate

- **OBJECTIVE:**
  - Capability to Attack Urban/CAS Targets
- **REQUIREMENT:**
  - Precision, Standoff, Adverse Weather, Single/Multiple Shot, Minimal Collateral Damage
  - Fighter and AFSOC Aircraft

URBAN / CLOSE AIR SUPPORT. . . .

USAF F-35 CAS WEAPON

Capabilities Integration Directorate

- **OBJECTIVE:**
  - F-35 "Point and Shoot" Capability Suitable for Close Air Support (CAS) and Forward Air Control – Airborne (FAC-A) Missions
- **ASSUMED REQUIREMENTS:**
  - Launch & Leave, Post Release Guidance, Third Party Guidance, Guide on Coord, Min Employment Altitude, Stand-Off Range, Internal/External Carriage, Time of Flight
  - Identify New Capabilities Rqmts Through the JCIDS Process
- **DESCRIPTION:**
  - Develop a CAS Weapons Roadmap for F-35
  - Synch Rqmts with CAF 2025 Flt Plan and POM Submissions
  - Multiple current inventory and future weapons being assessed
- **SCHEDULE:**
  - FY 06 – Initial Capability Document (ICD)

URBAN / CLOSE AIR SUPPORT. . . .

VERY SMALL MUNITION (VSM)

Capabilities Integration Directorate

- **OBJECTIVE:**
  - Ability to Attack Urban/CAS Targets with Multiple Effects, Low Collateral Damage
- **REQUIREMENT:**
  - Persisent System of Systems ICD
  - Precision, Standoff, Adverse Wx, Affordable, Single/Multiple Shot
- **DESCRIPTION:**
  - Small, GPS-INS/Laser Guided Munition
  - Blast-Frag, Shape Charge Variants
  - Short Flight Time, Standoff Range
  - Integration – Future AFSOC Aircraft
- **SCHEDULE:**
  - FY08 POM Submittal

LONG RANGE STRIKE

Capabilities Integration Directorate

- **OBJECTIVE:**
  - Capability To Achieve Desired Effects Rapidly, Persistently, On Any Target, In Any Environment, Anywhere, At Any Time

- **REQUIREMENT:**
  - **Phase I - Bomber Forces Upgrade:** Link-16 Connectivity, Radar, Targeting, Increased Precision, Stand-Off
  - **Phase II - Field Mid-Term Strike Capability:** Responsive, Persistence – L/O, Speed, Intra-Theater Range, Survivability, Improved Lethality, GIG
  - **Phase III - Field Long Range Strike Capability** – Responsive, Persistent – L/O, Speed, Long Range, Survivable, GIG, Transformational Technologies

NEXT GENERATION LONG RANGE STRIKE AOA

Capabilities Integration Directorate

- **NGLRS ANALYSIS OF ALTERNATIVES (AOA)**
  - ACC and ASC-Led AOA To Begin Oct 05
  - AAC Assessing Candidate Weapon Concepts
  - Technology Roadmap
  - Digital System Modeling To Support AOA Modeling & Simulation
- **FOCUS ON:**
  - Stand-off, Extended Range Munitions, Including High Speed
  - Persistence Weapons
  - Close Controlled Strike With Limited Collateral Damage
  - Maritime Interdiction (Stand-off And Direct Attack)

PERSISTENT ATTACK CONCEPTs

- **OBJECTIVE:**
  - Capability To Rapidly Adapt To Changing Target Sets
  - Reduced Response Time, Minimize Collateral Effects
  - Multi-Mission: Armed Recon, Hunter-killer, SEAD/EA, Deep Strike
- **ASSUMED REQUIREMENTS:**
  - Smaller, Precise, Network-Smart, Air Launched Weapons
  - Defeat Urban And Limited Access Targets
  - Dominate, Loiter, Provide Situational Awareness, Controlled Autonomy
  - Exploit Predictive Battle Space Awareness
- **DESCRIPTION:**
  - Numerous Concepts Being Assessed

LONG RANGE STRIKE. . . .

HIGH SPEED WEAPONS

Capabilities Integration Directorate

- **OBJECTIVE:**
  - Time Critical Strike Capability Against Targets Including Theater Ballistic Missiles (TBMs) / Transportable Erector Launchers (TELs), Integrated Air Defense System (IADS), Large Surface Combatants
- **ASSUMED REQUIREMENTS:**
  - Moving Target Capable, Cruise Speed of > Mach 4, Time of Flight < 15 Minutes, Air Launched
- **DESCRIPTION:**
  - ScramJet or Dual Combustion Ram Jet, GPS/INS, Networked DataLink, Seeker
  - Navy Concept
- **SCHEDULE:**
  - FY05/06/07: JCIDS & Acquisition Activity
  - FY08: SDD Start (Navy)
  - FY14: IOC

OVERVIEW

Capabilities Integration Directorate

- Near Term Capabilities
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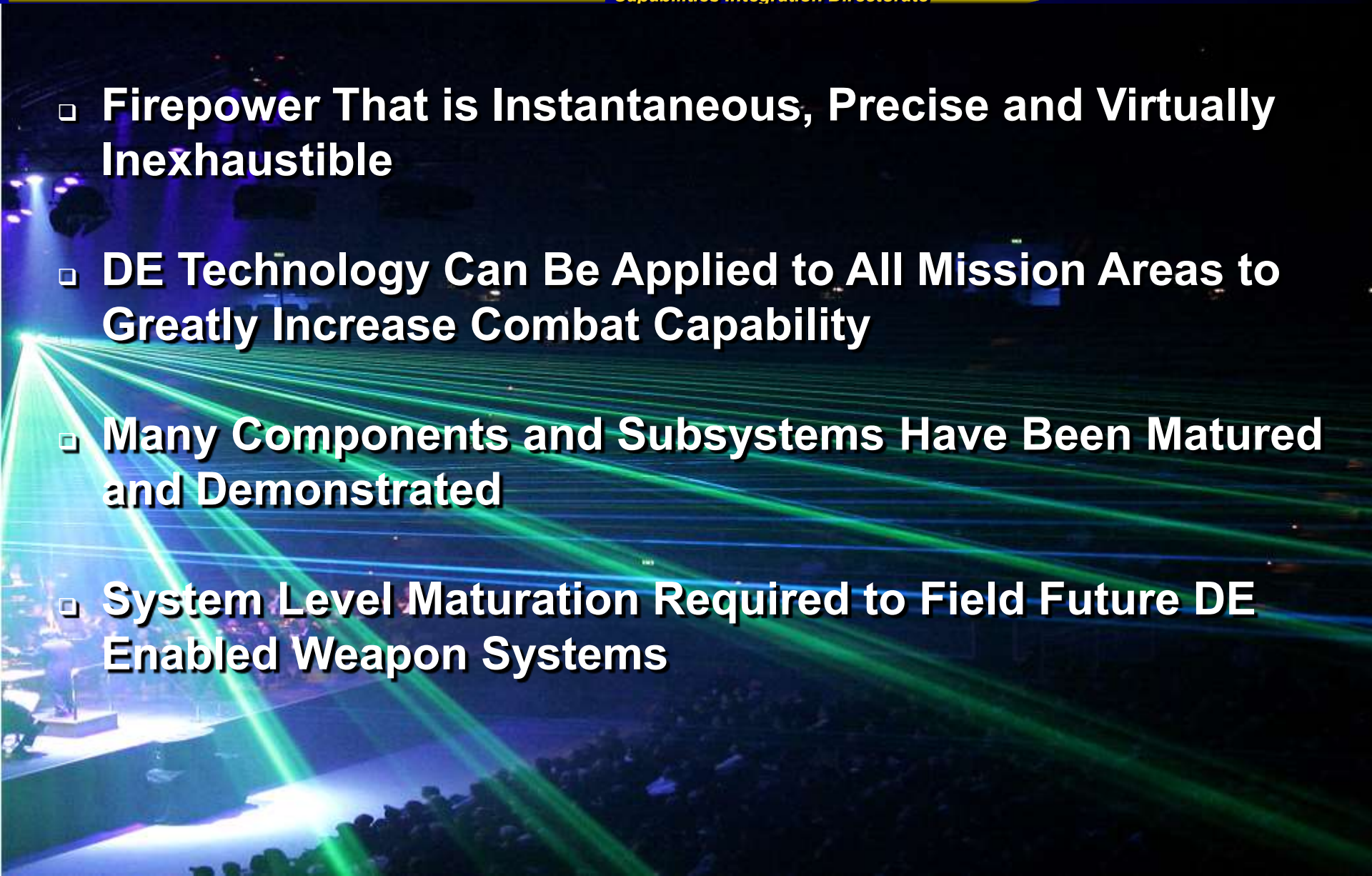
  - Directed Energy

EMERGING TECHNOLOGY . . .

DIRECTED ENERGY

Capabilities Integration Directorate



- Firepower That is Instantaneous, Precise and Virtually Inexhaustible
- DE Technology Can Be Applied to All Mission Areas to Greatly Increase Combat Capability
- Many Components and Subsystems Have Been Matured and Demonstrated
- System Level Maturation Required to Field Future DE Enabled Weapon Systems

DE ARMAMENT INITIATIVE

Capabilities Integration Directorate

AAC Initiated Process to Facilitate DE Transition Into Armament Applications

- **Objective:**
  - Bring Labs, Warfighters and Industry Together
    - Help Warfighters Visualize Using DE to Create Desired Effects on Battlefield Cheaper and/or Better Than Conventional Systems
    - Connect Warfighter, Industry, Acquisition and Lab Communities to Speed Transition
- **Outcome:**
  - Identify Areas for Further Investment and Demonstration
  - Recommendation in Fall 05 of System Level Demonstrations for DE Weaponization

SUMMARY

Capabilities Integration Directorate

- Tomorrow's Warfighting Solutions Begin Today
- AAC Is Planning Today To Meet Capability Objectives Tomorrow
- Continuing Planning and Industry Perspective Will Be Highlighted At NDIA Armament Symposium Oct 4-5, 2005

LAST SLIDE

Defense Acquisition Performance Assessment Project

7 June 2005 Mandate Issued by Mr. England

"There is a growing and deep concern within the Congress and within the Department of Defense Leadership about the DoD acquisition processes. Many programs continue to increase in cost and schedule even after multiple studies and recommendations that span the past 15 years."

"I am authorizing an integrated acquisition assessment to consider every aspect of acquisition, including requirements, organization, legal foundations…--every aspect. The output of this effort,…will be a recommended acquisition structure and processes with clear alignment of responsibility, authority and accountability. Simplicity is desirable."

Governed by Federal Advisory Committee Act, Chaired by Lt Gen (Ret) Ron Kadish

Soliciting inputs in **public** forums and on a **public** website

http://www.dapaproject.org/default.asp

PEO
Ammunition
Joint Lethality

Precision Strike
Summer PEO Forum

Presented by:
Mr. James Sutton
Deputy Program Manager
PEO Ammunition

27-28 July 2005

PEO Ammo

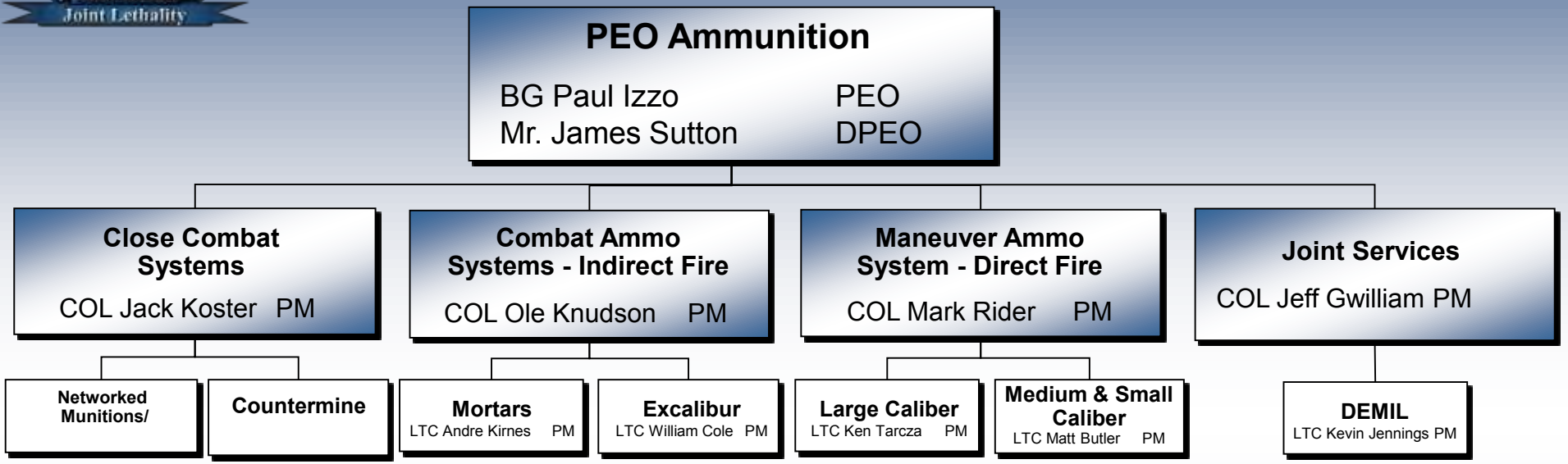
MISSION

Develop and Procure Conventional and Leap-Ahead Munitions to Increase Combat Power to Warfighters

GOALS

- **Get PGM's & Smart Weapons to Warfighters**
- **Improve and Sustain the Conventional Stockpile**
- **Satisfy the Customer, Achieve Excellence**
- **Grow World-Class People and Teams**

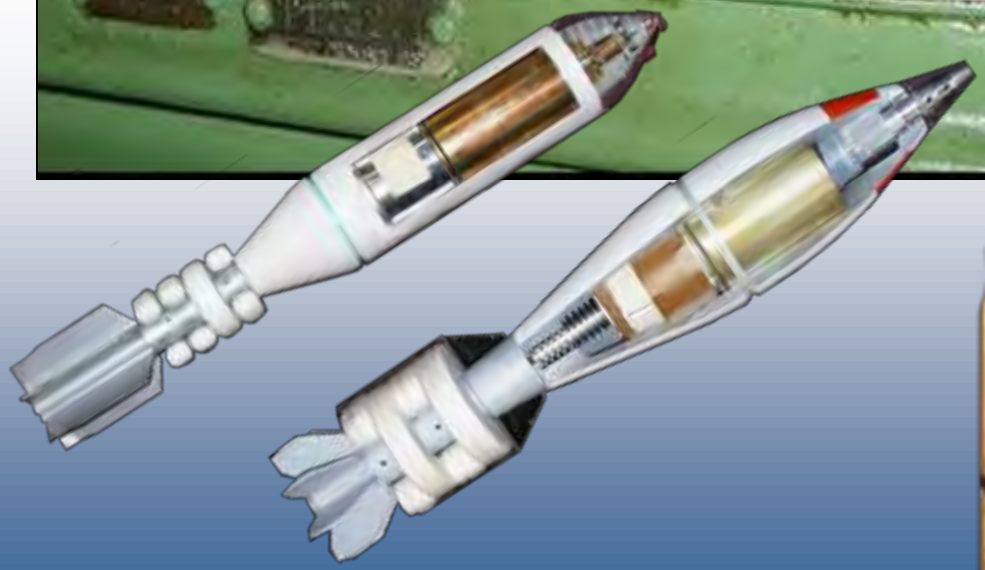
PEO Ammunition



Single Manager for Conventional Ammunition (SMCA)

- (DoDD 5160.65 14 Apr 04) Manage DoD conventional ammunition, personnel and training function.
- Create an acquisition “pipeline” that rapidly provides the warfighter with conventional ammunition.

The Past is Still Alive



The Future is Here