PRECISION STRIKE ASSOCIATION

Precision Strike

Annual Programs Review

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10 - 11 March 2009
Fort Waldon Beach, FL

Tuesday, 10 March 2009

OPENING REMARKS:
Major General David W. Eidsaune, USAF—Commander, Air Armament Center and Air Force Program Executive Officer for Weapons, Eglin AFB

NEW ADMINISTRATION & TECHNOLOGIES—INDUSTRY'S PERSPECTIVE ON CHANGES FOR PRECISION STRIKE
Douglas Young— Vice President for Business Development, Strike and Surveillance Systems Division , Northrop Grumman Corporation

JOINT STRATEGIC PLANNING SYSTEM:
Jay Rouse— Senior Policy Analyst supporting the Joint Staff in J-5 Deputy Directorate for Strategic Plans and Policy

WEAPONS TECHNOLOGYPROJECTS & ROADMAP:
*Colonel Kirk Kloeppel, **USAF***—Director, Munitions Directorate, Eglin AFB

PRECISION STRIKE—AN OSD PERSPECTIVE:
Keith Sanders—Deputy Director, Portfolio Systems Acquisition (Air Warfare), Office of the Deputy Under Secretary of Defense (Acquisition and Technology).

USAF GUNSHIP PRECISION ENGAGEMENT OPERATIONS—SPECIAL OPERATIONS IN THE KILL CHAIN:
*Lieutenant Colonel Brenda Cartier**, USAF***—Commander, 4 SOS, Air Force Special Operations Command, Hurlburt Field

Wednesday, 11 March 2009

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ACQUISITION STRATEGIES FOR C4ISR:
Timothy J. Harp—Deputy Assistant Secretary of Defense (C3ISR & IT Acquisition), NII/CIO, OSD

ARMY'S FUTURE PRECISION STRIKE WEAPONS SYSTEMS:

- **Small Guided Munitions—Path Ahead**
  Steven L. Borden—Deputy PM, Small Guided Munitions, Joint Attack Munition Systems Project Office
- **Guided Multiple Launch Rocket System (GMLRS)—An Alternative Warhead to address the DPICM Target Set**
  *Colonel Dave Rice**, USA***—PM, Fires-Rockets & Missiles
- **Precision Strike Suite—Special Operations Forces (PSS-SOF)**
  LtCol Benjamin Greiner, USA—TCM FSC3, Fort Sill
- **EXCALIBUR and Precision Guidance Kit—Update on Precision Artillery Munitions**
  *Colonel Ole Knudson**, USA***—PM for Combat Ammunition Systems

F-35—JOINT STRIKE FIGHTER PROGRAM:
*Captain John K. Martins, **USN***—Director, Air Vehicle, F-35 Lightning II Program Office

FLEXIBILITYOUR PRECISION WEAPONS BRING TO THE FIGHT:
Dr. Bruce Simpson—Director, 308th Armament Systems Wing, Eglin AFB

AGENDA
TUESDAY, 10 MARCH

0700 **REGISTRATION / BUFFET BREAKFAST**
(Sponsored by Orbital Sciences Corp.)

0800 **ANNUAL REVIEW WELCOME:**
Bill Dalecky—Chairman of the Board, Precision Strike Association

0805 **EVENT CHAIR WELCOME:**
Lieutenant Colonel Kenneth Britt, USA (Ret)—Senior Analyst for Precision Strike Division, Headquarters, U.S. Army

0810 **OPENING REMARKS:**
Major General David W. Eidsaune, USAF—Commander, Air Armament Center and Air Force Program Executive Officer for Weapons, Eglin AFB

0820 **NEW ADMINISTRATION & TECHNOLOGIES—INDUSTRY'S PERSPECTIVE ON CHANGES FOR PRECISION STRIKE**
Douglas Young— Vice President for Business Development, Strike and Surveillance Systems Division , Northrop Grumman Corporation

0900 **KEYNOTE ADDRESS—JOINT PRECISION ENGAGEMENT:**
Major General David M. Edgington, USAF—Chief of Staff, United States Joint Forces Command

0945 **NETWORKING REFRESHMENT BREAK**

1015 **JOINT STRATEGIC PLANNING SYSTEM:**
Jay Rouse— Senior Policy Analyst supporting the Joint Staff in J-5 Deputy Directorate for Strategic Plans and Policy

1100 **WEAPONS TECHNOLOGY PROJECTS & ROADMAP:**
Colonel Kirk Kloeppel, USAF—Director, Munitions Directorate, Eglin AFB

1145 **LUNCHEON & 13TH ANNUAL WILLIAM J. PERRY AWARD CEREMONY**
- Luncheon (Sponsored by Raytheon Co. & Northrop Grumman Corp.)
- Presentation of William J. Perry Award to the **USSOCOM Stand Off Precision Guided Munition Quick Reaction Team**
- Recipient's Remarks by ***Colonel James Geurts, USAF***—PEO for Fixed Wing Systems, USSOCOM

1315 **PRECISION STRIKE—AN OSD PERSPECTIVE:**
Keith Sanders—Deputy Director, Portfolio Systems Acquisition (Air Warfare), Office of the Deputy Under Secretary of Defense (Acquisition and Technology).

1410 **USE OF LASER TECHNOLOGY IN PRECISION ENGAGEMENT:**
Larry Phillips—Deputy PM for High Energy Laser Technology Demonstration Program, Army Space & Missiles Defense Command

1445 **NETWORKING REFRESHMENT BREAK** (Sponsored by Kaman Precision Products)

1515 **USAF GUNSHIP PRECISION ENGAGEMENT OPERATIONS—SPECIAL OPERATIONS IN THE KILL CHAIN:**
Lieutenant Colonel Brenda Cartier, USAF—Commander, 4 SOS, Air Force Special Operations Command, Hurlburt Field

1600 **INTERNATIONAL PERSPECTIVE:**
Chair: ***Jim Pennock***—MBDA Missile Systems
- **Use of Precision Strike Assets within a Multinational Perspective—Challenges & Lessons:**
  Lieutenant Colonel Sylvain Gagné, MSc, CD—Chief of Joint Fires and Targeting at the Multinational Regional Command South in Afghanistan APR-DEC 07
- **Employment of Precision Weapons by the Royal Air Force:** ***Wing Commander Jim Mulholland MA BSc(Hons)***
  RAF Assistant Director Weapons Directorate of Equipment Capability (Deep Target Attack)

1730 **INFORMAL ANNUAL MEETING & EVENING RECEPTION WITH HEAVY HORS D'OEUVRES—ALL PARTICIPANTS ARE INVITED & ENCOURAGED TO ATTEND** (Sponsored by Lockheed Martin Corp.)
Bill Dalecky—Annual Meeting Chair

AGENDA
WEDNESDAY, 11 MARCH

0700 **CONTINENTAL BREAKFAST** (Sponsored by Honeywell Int'l)

0730 **ACQUISITION STRATEGIES FOR C4ISR:**
Timothy J. Harp—Deputy Assistant Secretary of Defense (C3ISR & IT Acquisition), NII/CIO, OSD

0815 **ARMY'S FUTURE PRECISION STRIKE WEAPONS SYSTEMS:**
Chair: ***Lieutenant Colonel Kenneth Britt, USA (Ret)***—Precision Strike Division (DAPR-FDS), ODCS G-8 – Force Development

- **Small Guided Munitions—Path Ahead**
  Steven L. Borden—Deputy PM, Small Guided Munitions, Joint Attack Munition Systems Project Office
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0945 **NETWORKING REFRESHMENT BREAK** (Sponsored by DRS Technologies)

1015 **F-35—JOINT STRIKE FIGHTER PROGRAM:**
Captain John K. Martins, USN—Director, Air Vehicle, F-35 Lightning II Program Office

1100 **LUNCHEON** (Sponsored by ATK)

1145 **LUNCHEON ADDRESS—FUTURE DIRECTION FOR INDUSTRY:**
John J. Cronin—ATK Senior Vice President & President, ATK Mission Systems

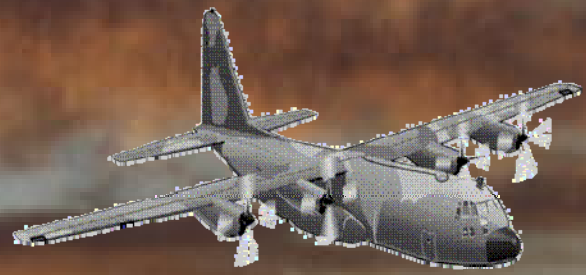
1230 **AIR SYNERGY WITH COALITION FORCES:**
Chair: ***Colonel Bill DeMaso, USAF***—AF/A5RC

- **Overview—Advancing the Precision Team:** ***Brig Gen Charles W. Lyon, USAF***
  Deputy Director, Operational Capability Requirements, DCS for Operations, Plans and Requirements, Headquarters USAF
- **A-10, F-15E, MQ-9:** ***CAS Platform Rep***
- **Air Ground Operations:** ***Lt Col Dan Spires, USAF***—Air Combat Command, Weapons and Tactics, Langley AFB
- **AF Special Operations:** ***Craig Walker, USAF***
- **Using Air Force Precision Fires in Afghanistan:**
  - ***Lt Col Jeff Fischer, USAF***—Electronic Attack Branch Chief
  - ***Lt Col André Mouton, USAF***—Wing CC Mentor/Deputy Lead, Ops Team Air Corps Advisory Group, Afghanistan

1400 **FLEXIBILITY OUR PRECISION WEAPONS BRING TO THE FIGHT:**
Dr. Bruce Simpson—Director, 308th Armament Systems Wing, Eglin AFB

1445 **CLOSING REMARKS:** ***Bill Dalecky***

Small Guided Munitions – Path Ahead

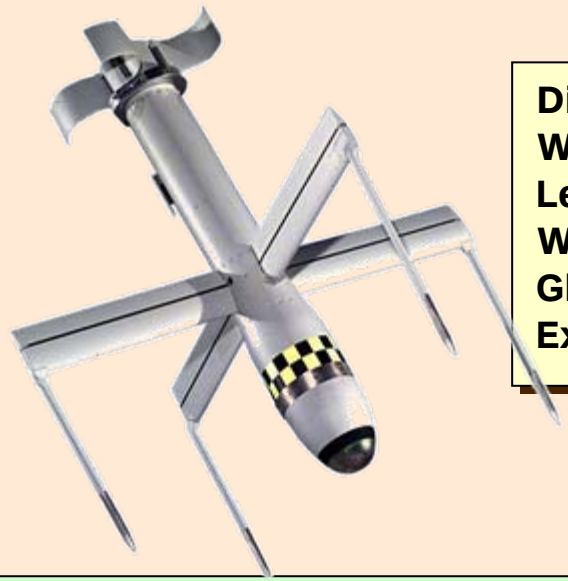


Small Guided Munitions Product Office

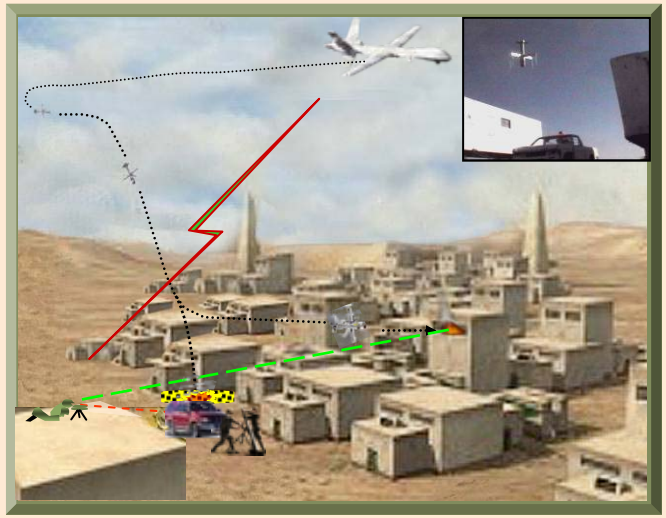
SGM

11 Mar 09

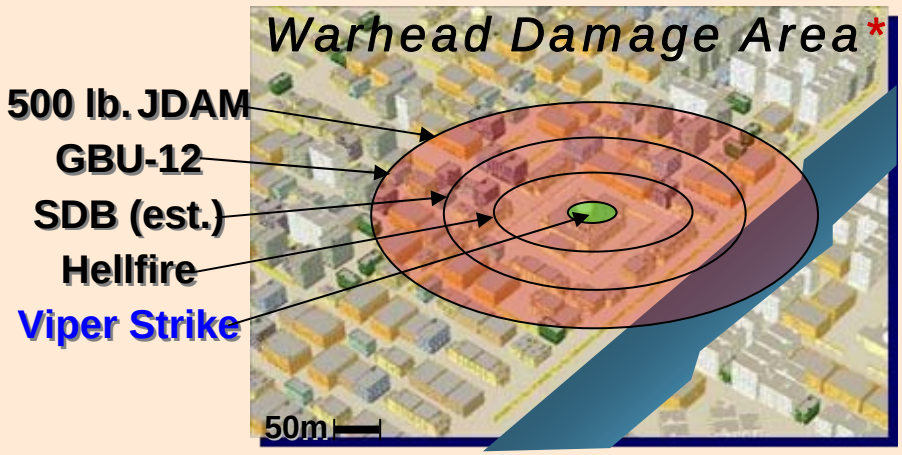
Viper Strike Snapshot



Diameter	5.5 in
Wingspan	36 in
Length	36 in
Weight	44 lb
Glide Ratio	9:1
Explosive	2.3 lb



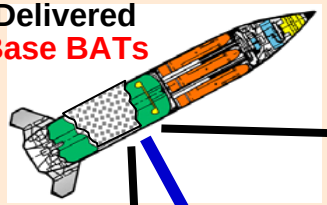
- GPS / INS Navigation + SAL Terminal
- Precise <1m CEP
- Low Probability of Collateral Damage
- GPS Extends Glide Range to 10+km
- Agile: 360 deg. off-axis, steep/shallow, direct/indirect attack
- Key Target Set Capable
  - Personnel
  - Moving/Stationary Targets
  - Room in a Building



*Joint Pub 3-09.3 Joint CAS (.1% PI)

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 Munitions Fielded

Hunter - Base BAT Demo

Proof of Principle

Operational Capability

Convert Block II Base BAT to Viper Strike Munitions

AC-130-Viper Strike ACTD

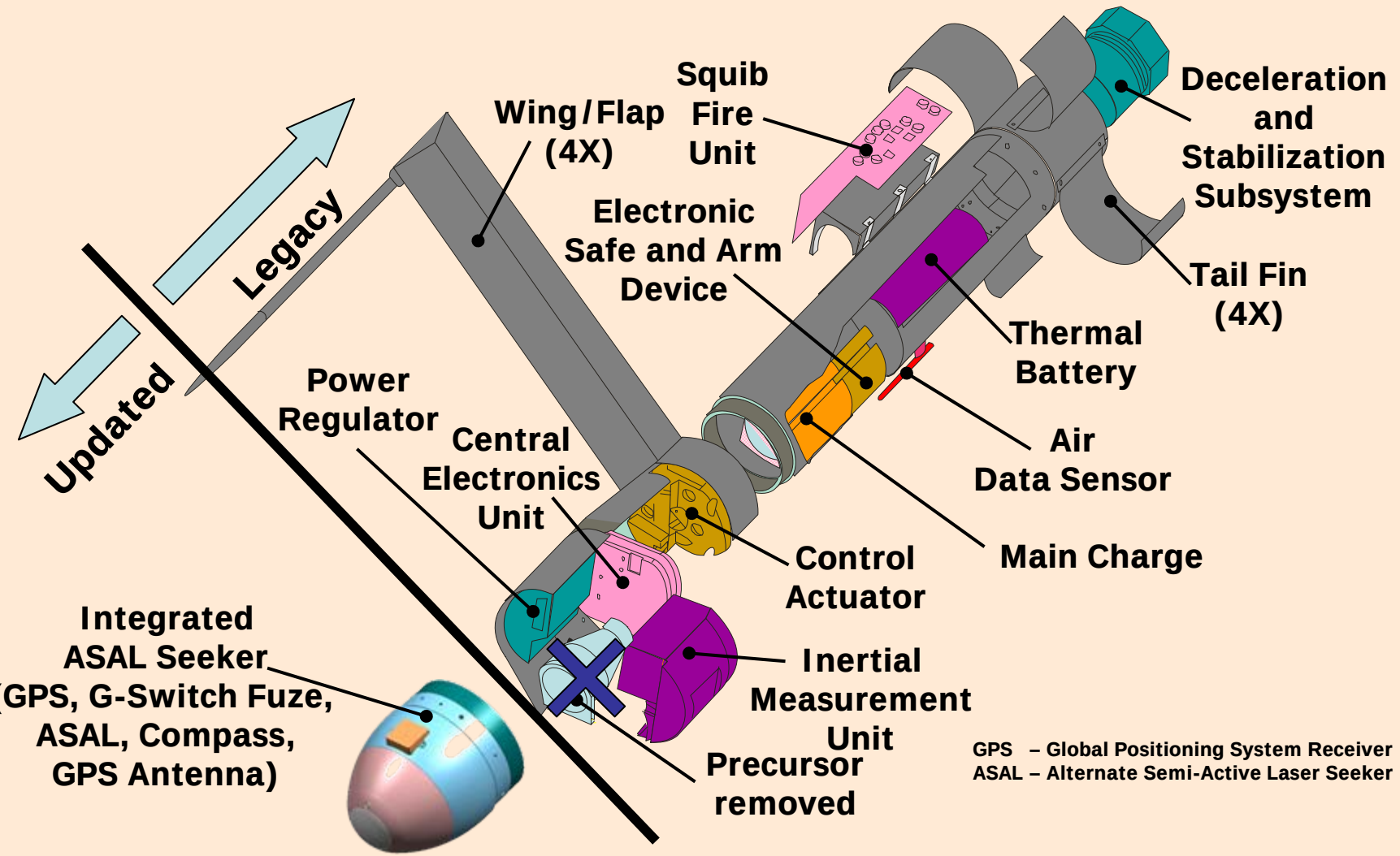
Platform Integration

Multiple Manned & Unmanned Platform Viper Strike Demos

New Production Viper Strike Munition Requirements

Viper Strike Operational Use on Multiple Platforms for Multiple Missions

Viper Strike Subsystems



GPS – Global Positioning System Receiver
ASAL – Alternate Semi-Active Laser Seeker

Viper Strike Variants

Direct Attack Fielded Capability 2004

GPS Fielded Capability 2008

GPS

Air or Ground Designation

- *8.5 to 18K ft AGL*
- *Up to 24.7K ft MSL External Carry*
- *Up to 31K ft MSL Internal Carry*

1600’

10K’ AGL

Self, Buddy, or Ground Designation

Ground Designation

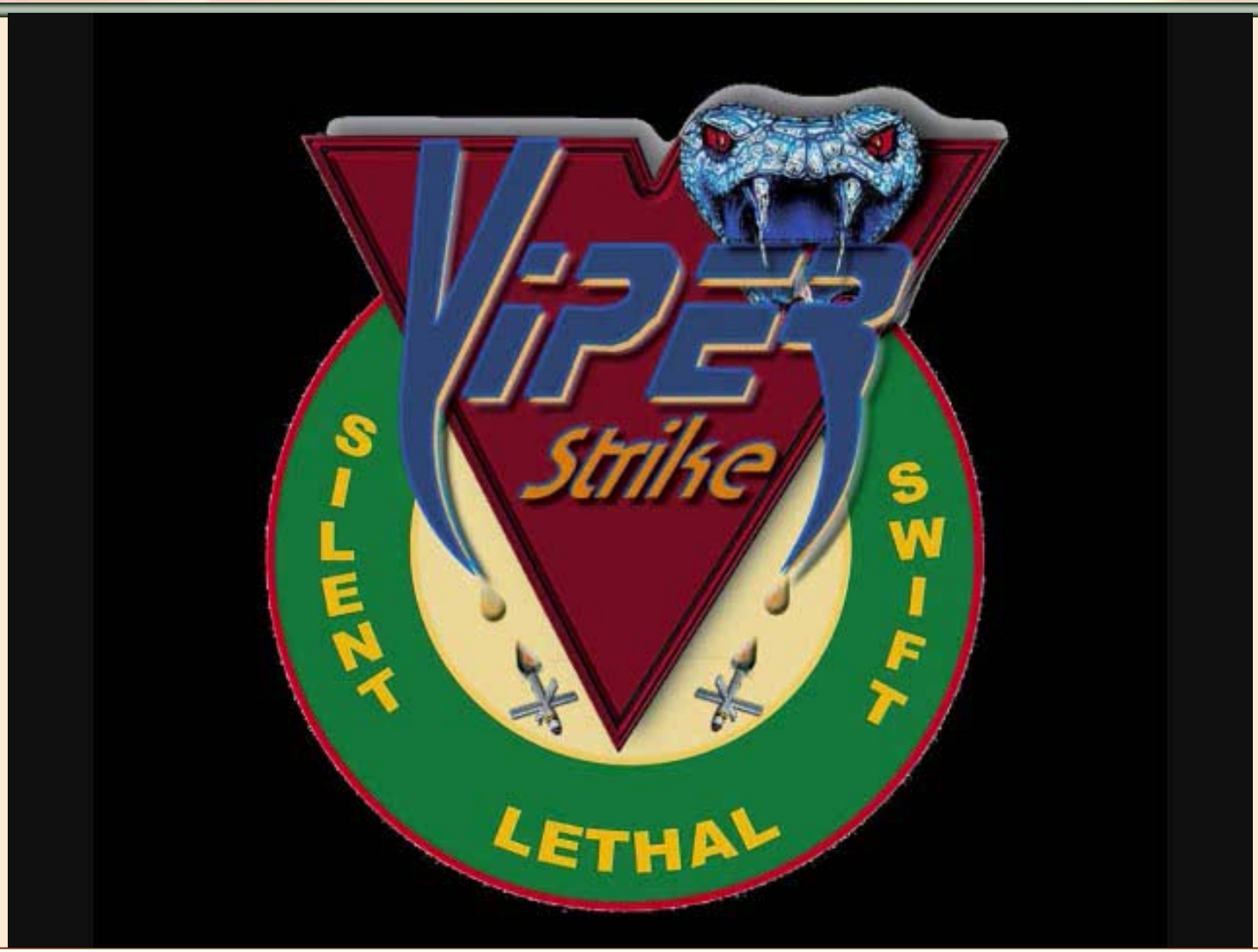
Target Position

3 to 10+km

Viper Strike
Direct Attack Capabilities

- Launch Altitudes – 8K' to 13K'
- Low Circular Error of Probability – Less than One Meter CEP
- Low Collateral Damage – 16 Meters for Urban Targets
- Top Down Blast Effect – Limits Damage in Urban Canyons
- Moving Targets – Up to 30 mph
- Danger Close – ATEC Approved at 50 Meters
- Double the Payload – Half the Weight of Hellfire
- Multiple Laser Designation Options – Air, Buddy, or Ground
- Day or Night Capability
- Stand Off – 1/2km to 1km
- Tandem shaped charge warhead for armored targets
- Only Qualified Weapon for Hunter Class UAS
- Capability Fielded in OIF – Proven & Certified
- First Weapon employed from an Army UAS in combat

Direct Attack



Viper Strike
ASAL GPS Improvements

- *ASAL GPS variant provides 360º "see and shoot" capability and significantly simplifies engagement execution versus Direct Attack VS*
- *Provides indirect and top/shallow attack capabilities (urban CAS, ground party targeting/designation)*
- *Increases standoff range by greater than 10 times that of Direct Attack*
- *Adds covert capability (no observable signature)*
- *Increases launch altitudes:*
  24.7K' MSL External Carry
  31K' MSL Internal Carry
- *ASAL Seeker dramatically increases Field-Of-View and Detection Range*
- *G-Switch replaces Impact Fuze Sensor for better reliability against soft targets*
- *GPS Munition Unit Cost reduced by > 40% in 2008*
  - *Lean Production Line Initiative eliminated many unnecessary tasks*
  - *Alternate Domestic Suppliers found for critical components*

GPS Viper Strike

Viper Strike 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*
- *(GPS) Extended Stand-off Range Attack*
  - *Up to and beyond organic sensor range*
- *(GPS) Close Air Support (CAS); Ground Party/Off Board Designate*
  - *Indirect Attack: 360° target relative azimuth attack*

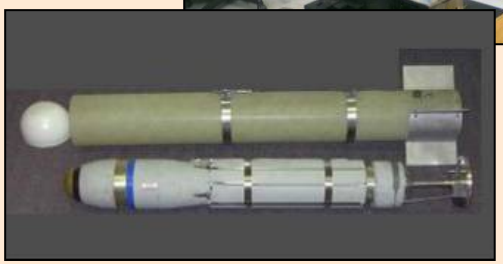
VS Weapon System

Viper Strike Munition

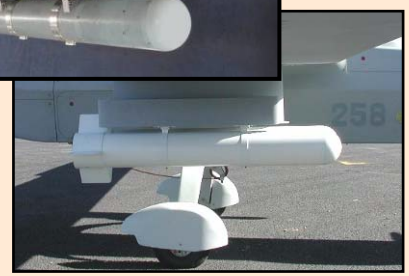
Battle Management Systems (BMS)

Laser Designators

Launch Tubes



Launcher Racks



Munition Interface Unit (MIU)

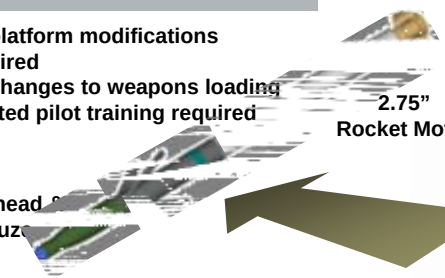
CONOPS / TTPs, Training, Logistics

BAE SYSTEMS

APKWS Proven Performance

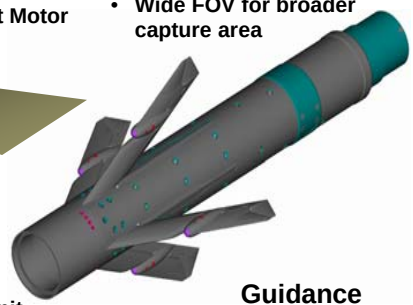
Mid-body Design is *Supportable*

- No platform modifications required
- No changes to weapons loading
- Limited pilot training required



Mid-body Design is *Reliable*

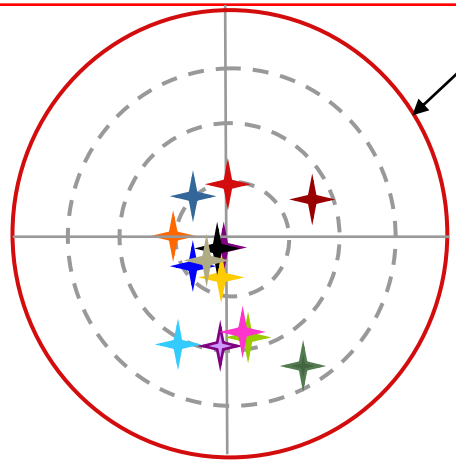
- Optics protected prior to launch from adjacent firings, sand, moisture, etc.
- Wide FOV for broader capture area



Guidance Section

No Impact on Warhead Effectiveness

- Warhead does not "fire through" guidance unit



Average laser spot to impact point <0.5m or ~1½ ft

News

September 19, 2007

USMC Cobra

BAE SYSTEMS CONDUCTS FIRST EVER SHOTS OF ADVANCED PRECISION KILL WEAPON SYSTEM FROM AN AIRCRAFT

News

December 20, 2007

U.S. Army Kiowa Warrior

BAE SYSTEMSCOMPLETES TWO TEST FIRINGS OF ADVANCED PRECISION KILL WEAPON SYSTEM FROM ARMY HELICOPTER

Raytheon
Customer Success Is Our Mission

Raytheon Missile Systems' Griffin™ Missile System

- Substantial internal investment by Prime Contractor.
- Extensive re-use and repackaging of proven weapon components.
- Highly successful flight-test and qualification series.
- Now in low-rate initial production.
- Tests show suitability for employment from host of ground and air platforms, and ground teams.
- Powered, maneuverable, small, lightweight, accurate and lethal, with reduced risk of collateral damage.

GRIFFIN™
REAL-TIME ATTACK SYSTEM

POCs

- **LtCol Sean Hayes, PM Small Guided Munitions**

  256-313-3904

  sean.hayes@msl.army.mil

- **Steve Borden, DPM Small Guided Munitions**

  256-842-7725

  steven.borden@msl.army.mil

USAF Gunship Precision Engagement Operations:

Special Operations in the Kill Chain

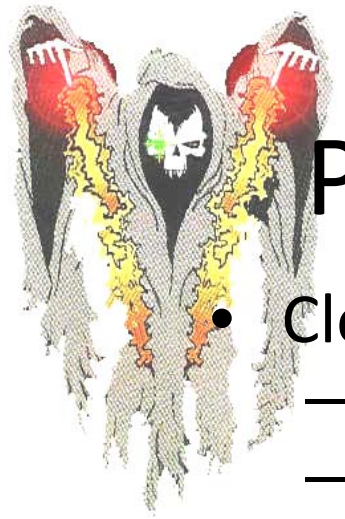
Lieutenant Colonel Brenda P. Cartier
Commander, 4th Special Operations Squadron
Hurlburt Field, Florida

Overview

- AC130U Primary Roles and Missions
- Crew Complement
- Capabilities
- Kill Chain Integration

AC-130U Aircraft

- Modified C-130
  - AC-130A first appeared in Vietnam war
  - Highly specialized fire platform
- All based at Hurlburt Field, Florida
  - Limited number: 17
- Deployable worldwide
- Designed to support ground forces



Primary Roles and Missions

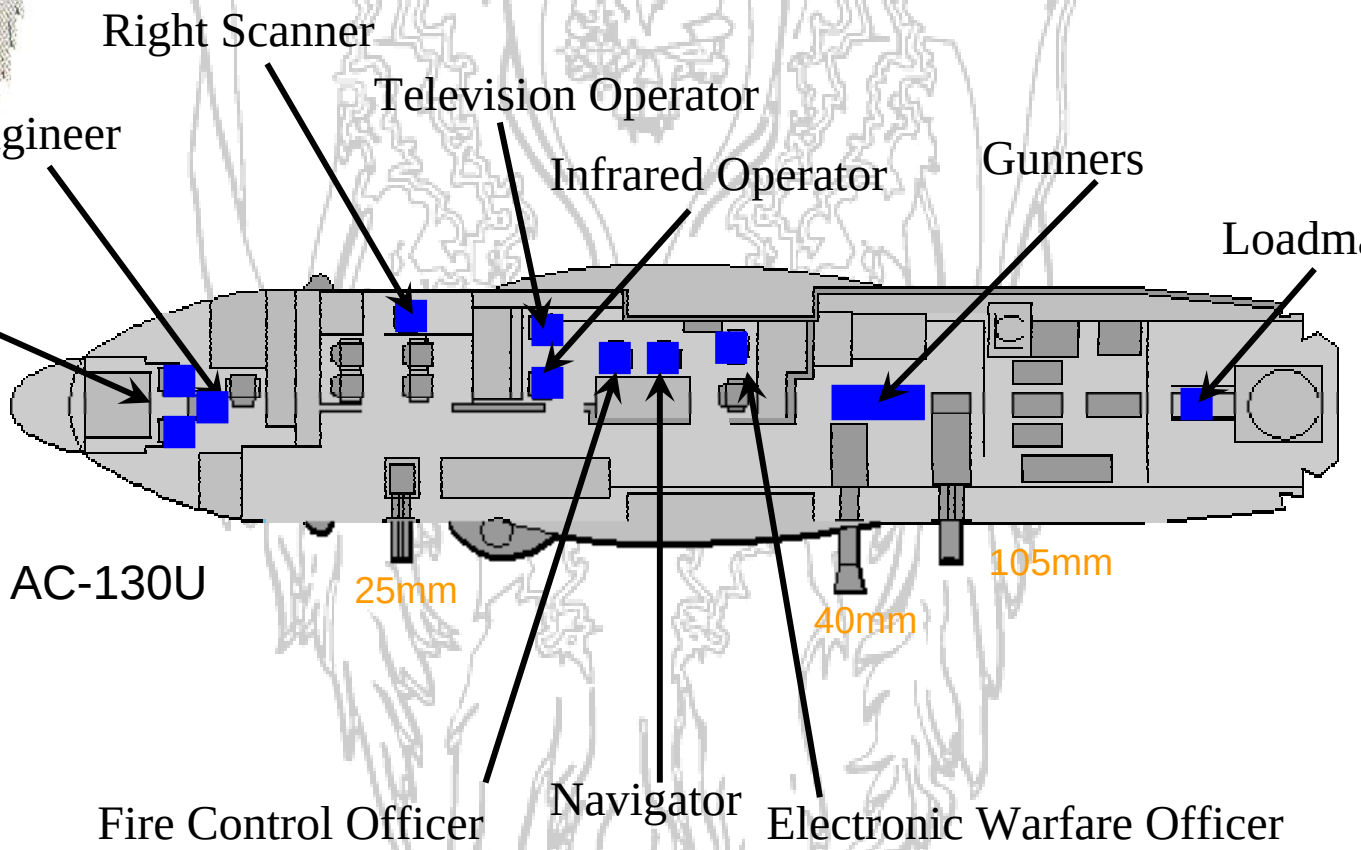
- Close air support
  - Airbase / point defense
  - Convoy escort
- Air interdiction
  - Pre-planned
  - Targets of opportunity
- Personnel recovery / combat search and rescue
- Reconnaissance
- Helicopter support
  - Landing zone identification / security
  - Enroute escort
- Military Operations in Urbanized Terrain
- Infiltration /exfiltration

Gunship Deployments

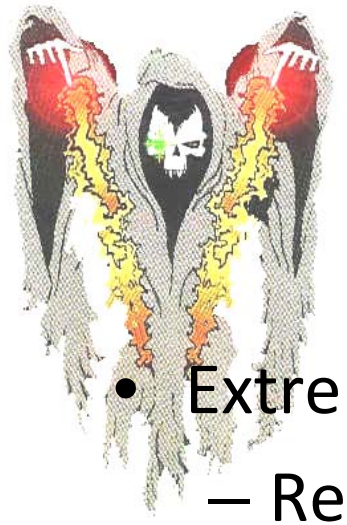
- Feb 03 - Today OIF - Iraq
- Sep 01 - Today OEF - Afghanistan
- Mar - July 99 - ALLIED FORCE - Kosovo
- 96 - ASSURED RESPONSE - Liberia
- 93-99 - DENY FLIGHT/JOINT ENDEAVOR - Bosnia
- 94 - SUPPORT DEMOCRACY - Haiti
- 92-94 - RESTORE HOPE - Somalia
- 91 - DESERT STORM - Iraq/Kuwait
- 89 - JUST CAUSE - Panama
- 83 - URGENT FURY – Grenada

- 4 SOS has been continuously deployed since Jan 03

AC-130U Crew Complement

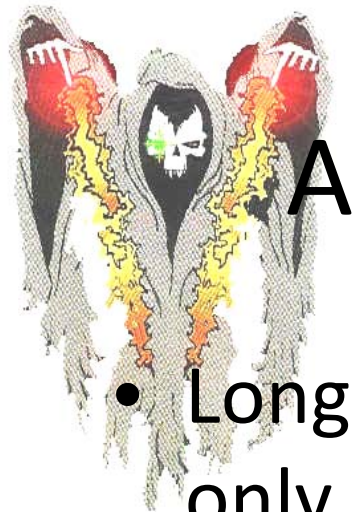


Any Time… Any Place



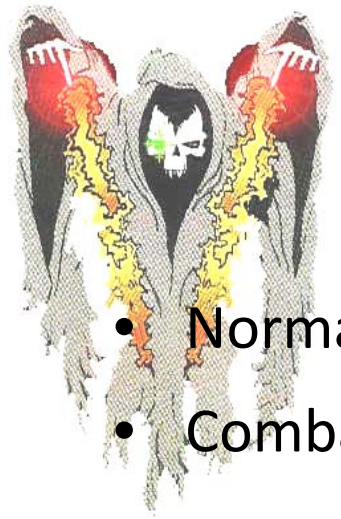
Why Gunships?

- Extremely accurate gunfire
  - Reduce collateral damage
  - Real time BDA
- Long loiter time
- High SA of ground situation
  - 13 man gunship crew vs single seat asset
- Tailored weapons effect
  - Weapon/fuse combination chosen for specific targets



AC-130U Specialized Capabilities

- Long loiter time (5.5 hour unrefueled / limited only by crew with aerial refueling)
- Low yield weapons
- Optimized for night operations
- Ground situational awareness
- Training heavily focused on CAS



Performance

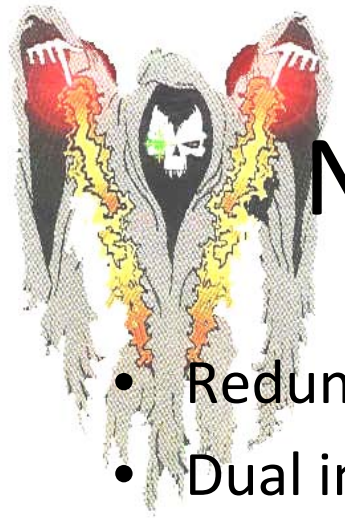
- Normal T/O weight: 155,000 lbs
- Combat load:

  3000 x 25mm

  256 x 40mm

  100 x 105mm

- Max fuel endurance: 6.5 hrs unrefueled
- Routine missions: 6 – 12 hours / 5 hour loiter time
- Shooting altitudes: 4,000 AGL - 18,000 MSL



Navigation and Fire Control

- Redundant fire control computers
- Dual inertial navigation systems
- Global positioning system
- APQ-180 Strike radar
- Infrared detection set
- All light level television
- Head up display

Communications

- 4 x UHF LOS radios
- 2 x VHF LOS radios
- 2 x SATCOM (voice only) radios
- 1 x SATCOM (data) radio
- 2 x HF radios
  - All securable
  - 1 x UHF Have Quick II capable
  - 1 x VHF FM SINCGARs capable

Sensor Suite

- Infrared Detection Set (IDS)
  - Wide, medium, narrow fields of view
- ALL-TV
  - LIA, LTD/RF
  - Wide, medium, narrow fields of view
- Strike radar
  - Gives us our all-weather capability

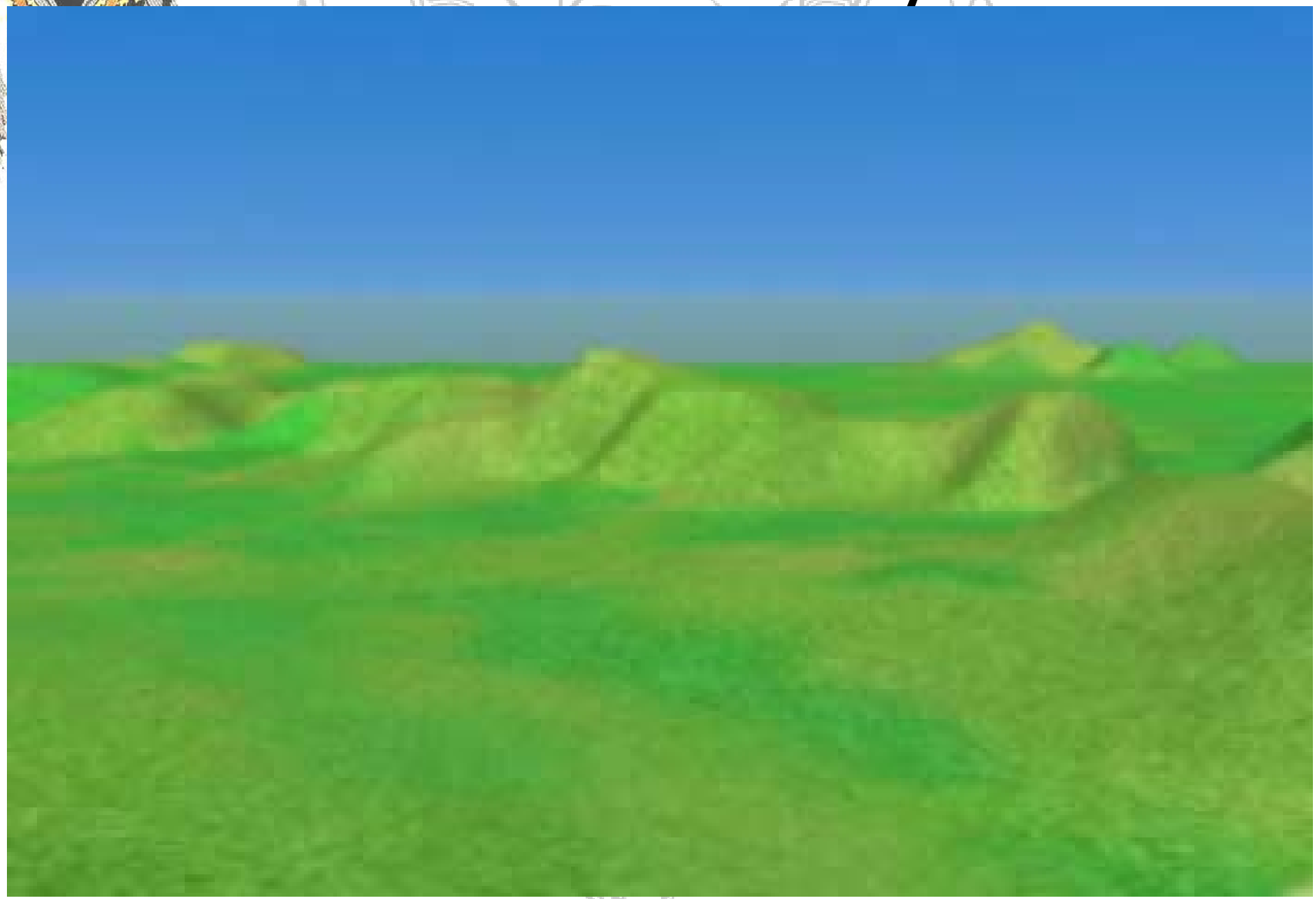
AC-130 Armament

- 25mm Gatling gun
- 40mm Bofors cannon
- 105mm cannon
- All guns are trainable
  - Guns on hydraulic mounts move with sensors

Defensive Systems

- Radar warning receivers
- Electronic countermeasures
  - Radar jammer
  - Chaff
- Infrared warning receiver
- Infrared countermeasures
  - Flares
  - Infrared shields
  - Directed infrared countermeasures

Attack Geometry



Kill Chain Integration

- Find: Onboard sensors, networked assets, Ground Forces
- Fix: Kinetic or Onboard Sensors
- Track: Onboard Sensors
- Target: Gun/Ammo selection, marking
- Execute: Employ weapons
- Assess: Onboard sensors, networked assets, Ground Forces

Kill Chain Video

Limitations

- Unable to loiter in radar threat environment
  - Defensive systems are escape aid ONLY
- Daytime significantly increases vulnerability
- Limited capability against hardened targets
  - Requires coordinated weapons delivery
- Limited radar resolution
  - Targets must be radar significant or offsets used
- Limited use of LIA in target Area
  - Compromises gunship/ground party location

USAF Gunship Precision Engagement Operations:

Special Operations in the Kill Chain

Lieutenant Colonel Brenda P. Cartier
Commander, 4th Special Operations Squadron
Hurlburt Field, Florida

Air Armament Center

Deliver War-Winning Technology, Acquisition, Test, Sustainment…
Expeditionary Capabilities to the Warfighter

Precision Strike Association

Welcome to the Emerald Coast!

Dave Eidsaune, Maj Gen, USAF
USAF Program Executive Officer for Weapons
Commander, Air Armament Center

10 Mar 2009

U.S. AIR FORCE

Integrity - Service - Excellence

Eglin AFB – Full Spectrum Operations

Research

Development/Acquisition

Developmental Test

Operational Test

Combat Training/ Operations

Arming Warriors

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

AFRL MUNITIONS

AIR ARMAMENT CENTER

AFOTEC

53rd WING

DEFENSE THREAT REDUCTION AGENCY

33 FW

20th SPACE CONTROL SQDN

NAVY EOD SCHOOL

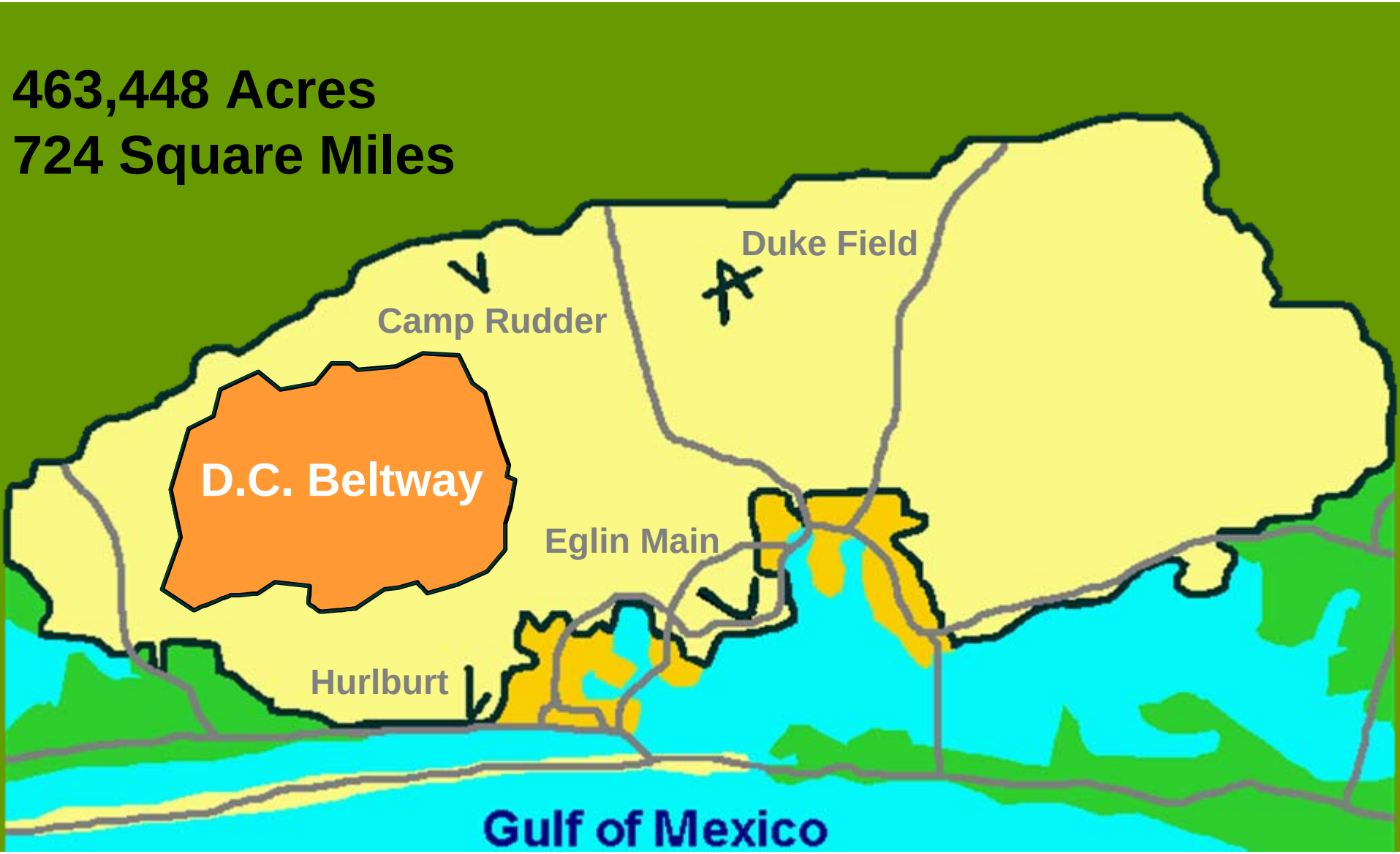
COAST GUARD

ARMY RANGERS

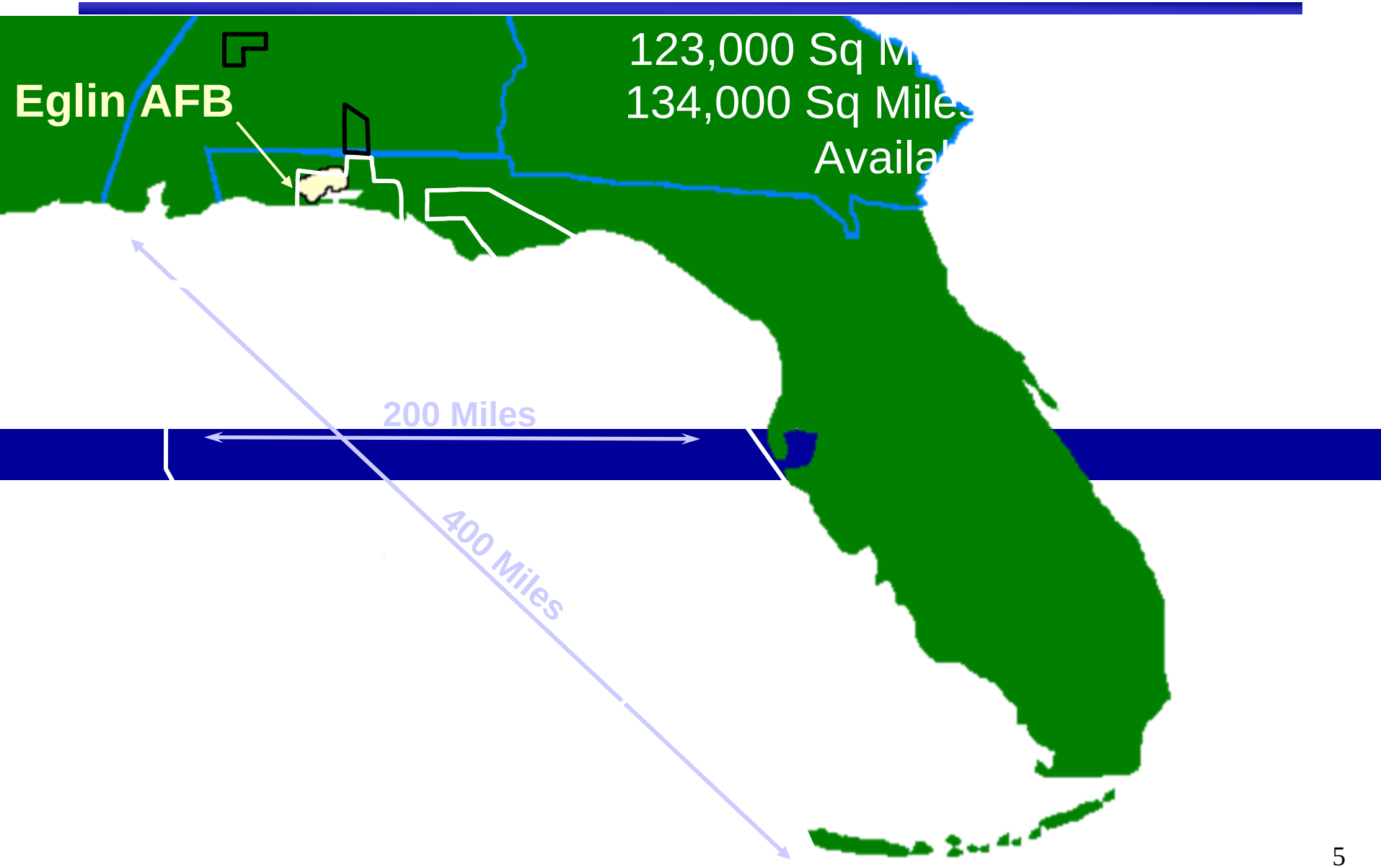
ARMY 7TH SFG

919th SPECIAL OPS WING

Eglin Land Ranges



Eglin Water Ranges



Eglin Video

Precision Strike – Revolutionary Change

Acquisition Strategies

Tim Harp
DASD(C3ISR & IT ACQUISITION)

11 March 2009

Topics

- ***Information Technology Acquisition Environment***
- DoD IT Acquisition Challenges
- DoD IT Acquisition Context
- DoD IT Acquisition Process
- Observations

The Emerging Intelligence Enterprise

- The processes are evolving
  - Systems are less stove-piped and more data centric
  - Moving away from proprietary systems
  - Service Oriented Architecture are providing access to data stores
  - Moving toward a more responsive, agile acquisition process

- But the fog of war is lifting slowly and unevenly
  - Iraq's experience has validated the view that network operations aren't just about the technology
    - While new technology is an enabler …
    - Real transformation is "relevant technology," responsive acquisition processes, leadership optimizing change and rapid CONOPS development

Current Generation of C4I War Fighters

Today's leaders & soldiers are digital natives and use IT technologies to their advantage for situational awareness and collaborative, agile decision making

The Environment:*

- **Lack of information and services that are visible, accessible and understandable**
- **Information "silos"-- capability needed to move information from one stove-pipe to another**
- **Hard-wire interfaces aimed at predetermined needs unresponsive to dynamic environment**
- **Continue to not leverage the latest information technology solutions available commercially**

"Digital Natives" trapped in industrial-era institution

*** Source: DSB Summer Study 2006**

Information Technology Style

- **Digital Native**
  - A person who has grown up with digital technology such as computers, the Internet, mobile phones, and MP3
    - Typically born after 1980
- **Digital Immigrant**
  - A person not born into the digital world:
    - has adopted many aspects of the technology, but just like those who learn another language later in life, retains an *accent* because they still have one foot in the past
    - challenged to communicate effectively with digital natives
- **Analog**
  - A person who chose to not adopt emerging technology

Source: Prensky, Mark; *Learning in the Digital Age*; Educational Leadership, December 2005/January 2006; Volume 63; Number 4 Pages 8-13

Recent Legislation (10 U.S.C. Chapter 144A)

- Defines Major Automated Information System (MAIS) in statute
- Requires an MAIS annual report to Congressional defense committees (analogous to a Selected Acquisition Report)
- Designates USD(AT&L) and Service Acquisition Executives as Senior Officials responsible for programs
- Requires Program Managers to report quarterly to the Senior Official any variance from the original baseline
- Imposes a time-certain development requirement of 5 years from Milestone A to Initial Operational Capability (IOC)
- Defines 2 new MAIS program deviation reports to Congress
  - Significant program change
  - Critical program change

Need to Change -- Congress Demanding It

- FY07 National Defense Authorization Act
  - Section 816. Major Automated Information System (MAIS) programs codified in statute
    - Requires annual reports to Congress for IT (FY 09)
    - Nunn-McCurdy-like reporting when breaches occur
  - Section 811. Time-certain development for DoD IT business systems
    - Milestone Decision Authority (MDA) must certify that system will achieve IOC in
      5 years or less before granting Milestone A approval
- FY09 National Defense Authorization Act
  - Section 811. MAIS programs
    - Defines “5 years to IOC” requirements

Need to Change -- Others Highlighting It

- May 19-20, 2008 DSB Meeting
  - Hon John Grimes (ASD(NII)/DoD(CIO))

    "Hardware development processes ill-suited to IT acquisition"
  - LTG Jeff Sorenson (Army CIO/G-6)

    "How we can make it better…. Policy – Acquiring IT not like tanks"
- Defense Acquisition Performance Assessment (3/2006)
- Beyond Goldwater Nichols Reports (2003/2004)
- GAO Assessment on "Information Technology: DOD's Acquisition Policies and Guidance Need To Incorporate Additional Best Practices And Controls" (July/2004)*
  - "*As you know, the way in which DOD has historically acquired information technology (IT) systems has been cited as a root cause of these systems failing to deliver promised capabilities and benefits on time and within budget*"

Need to Change -- New Leadership

- The Federal Government has an overriding obligation to American taxpayers… Since 2001, spending on Government contracts has more than doubled, reaching over $500 billion in 2008. During this same period, there has been a significant increase in the dollars awarded without full and open competition and an increase in the dollars obligated through cost-reimbursement contracts. *President Obama, March 04, 2009*

- Members of a special congressional panel will meet this week to begin charting an ambitious agenda: finding the underlying causes of failures in the defense acquisition process and recommending how to fix them. *Washington Post March 09,2009*

- It takes longer to declare a new [program] start than the lifecycle of the software package… It's not technology. This is culture. This is the imperative to change and be convinced that that imperative is real and will advantage us… Getting "the inertia going to get the system changed is the challenge that's in front of us." *Joint Chiefs Vice Chairman Gen. James Cartwright, March 04, 2009*

- Better Weapon System Outcomes Require Discipline, Accountability and Fundamental Changes in Acquisition Environment
  - *GAO Report (June 3, 2008)Testimony Before Committee on Armed Services, U.S. Senate*

Leveraging Previous Work

- Beyond Goldwater-Nichols Reform, Center for Strategic & International Studies (CSIS), March 2004/July 2005
  - Many organizational structures and processes initially constructed to contain a Cold War superpower in the Industrial Age are inappropriate for 21st century missions
- 2006 DSB Summer Study on Net Centric Capabilities
  - Information “silos”-- capability needed to move information from one stove-pipe to another via ad hoc solutions
  - Hard-wire interfaces aimed at predetermined needs
  - Much of IT in theater has been supplemental funded and not part of a “planned” capability putting in question the long term viability
- Transitioning Defense Organizational Initiatives, *An Assessment of Key 2001-2008 Defense Reforms*, CSIS, November, 2008
  - Study effort aimed at informing the next Secretary of Defense’s transition decisions
- Other ongoing DSB and National Academies studies

Topics

- Information Technology Acquisition Environment
- ***DoD IT Acquisition Challenges***
- DoD IT Acquisition Context
- DoD IT Acquisition Process
- Observations

*Information Technology (IT)**

<u>Information Technology</u>: Any equipment or interconnected system …of equipment that is used in automatic :

- acquisition
- storage
- manipulation
- management
- movement
- control
- switching
- interchange
- transmission
- reception

of data or information by the executive agency

* Title 40 USC (formerly known as the Clinger Cohen Act of 1996)

Program Definitions/Thresholds

- **Major Defense Acquisition Program (MDAP) (10 USC 2430)**
  - Dollar value as estimated by USD(AT&L) to require an eventual total expenditure
    - RDT&E of more than $365 million in FY 2000 dollars or
    - Procurement of more than $2.190 billion in FY 2000 dollars
  - MDA designation as special interest
- **Major Automated Information System (MAIS) (10 USC 2445)**
  - Dollar value of AIS estimated by the DoD Component Head
    - Program costs (all appropriations) in any single year in the excess of $32 million in fiscal year (FY) 2000 dollars,
    - Total program costs in excess of $126 million in FY 2000 dollars
    - Total life-cycle costs in excess of $378 million in FY 2000 dollars
  - MDA designation as special interest
- **Major System Acquisition (41USC 403(9))**
  - A system shall be considered a major system if:
    - Total expenditures for the system are estimated to exceed $750,000 (based on fiscal year 1980 constant dollars)
    - Designated by the head of the agency responsible for the system

DoD past attempts to adapt IT acquisition

Initiatives

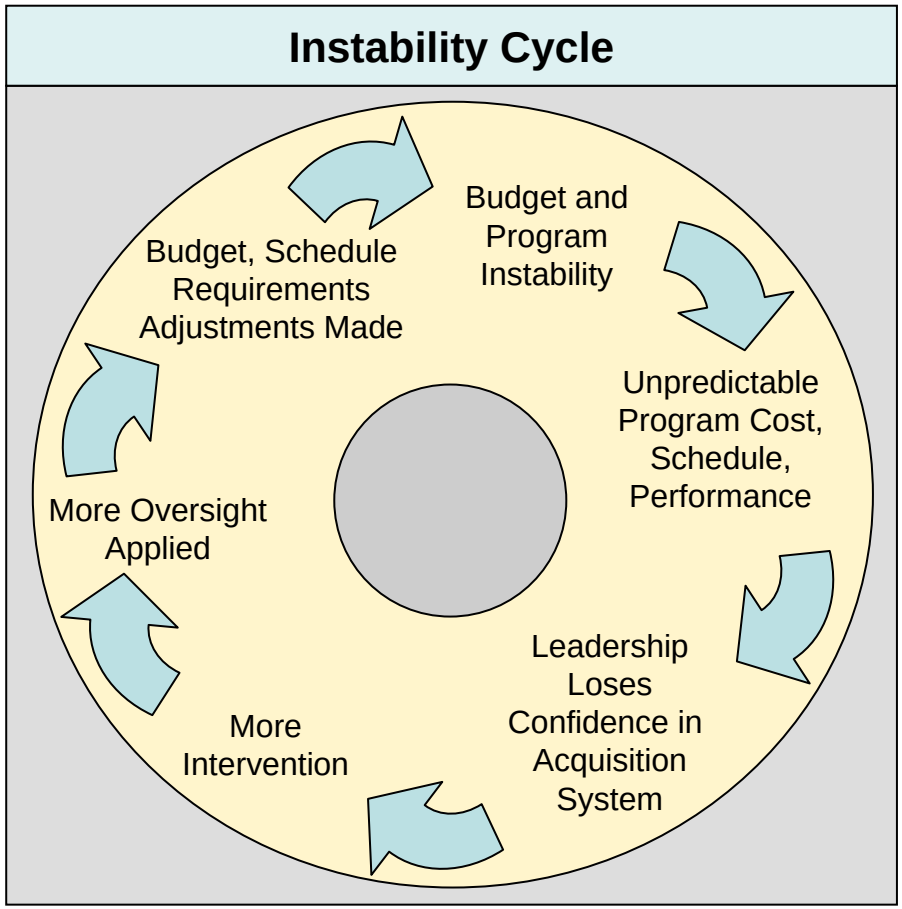
- CIM - Corporate Information Management
- CCA - Clinger Cohen Act
- RIT- Rapid Improvement Team
- BMMP – Business Management Modernization Program
- BTA/ERAM – Business Transformation Agency/ Enterprise Risk Assessment Model

Lessons

- Need requirements and Funding stability
- IT acquisition needs to be aligned with mission sponsor
- Most effective if limited to 50,000 to 75,000 ESLOC
  - 5-10 people and 12 month increments
- Change management is key to success – its not about the system

The Government-Induced Cycle of Instability

- Because our major processes are not well integrated,
  - we have an unrecognized , government-induced and long-standing cycle of instability
  - which causes unpredictability in costs, schedule, and performance
  - that ultimately results in development programs that span 15-20 years with substantial unit cost increases
  - leading to loss of confidence in DoD acquisition systems.



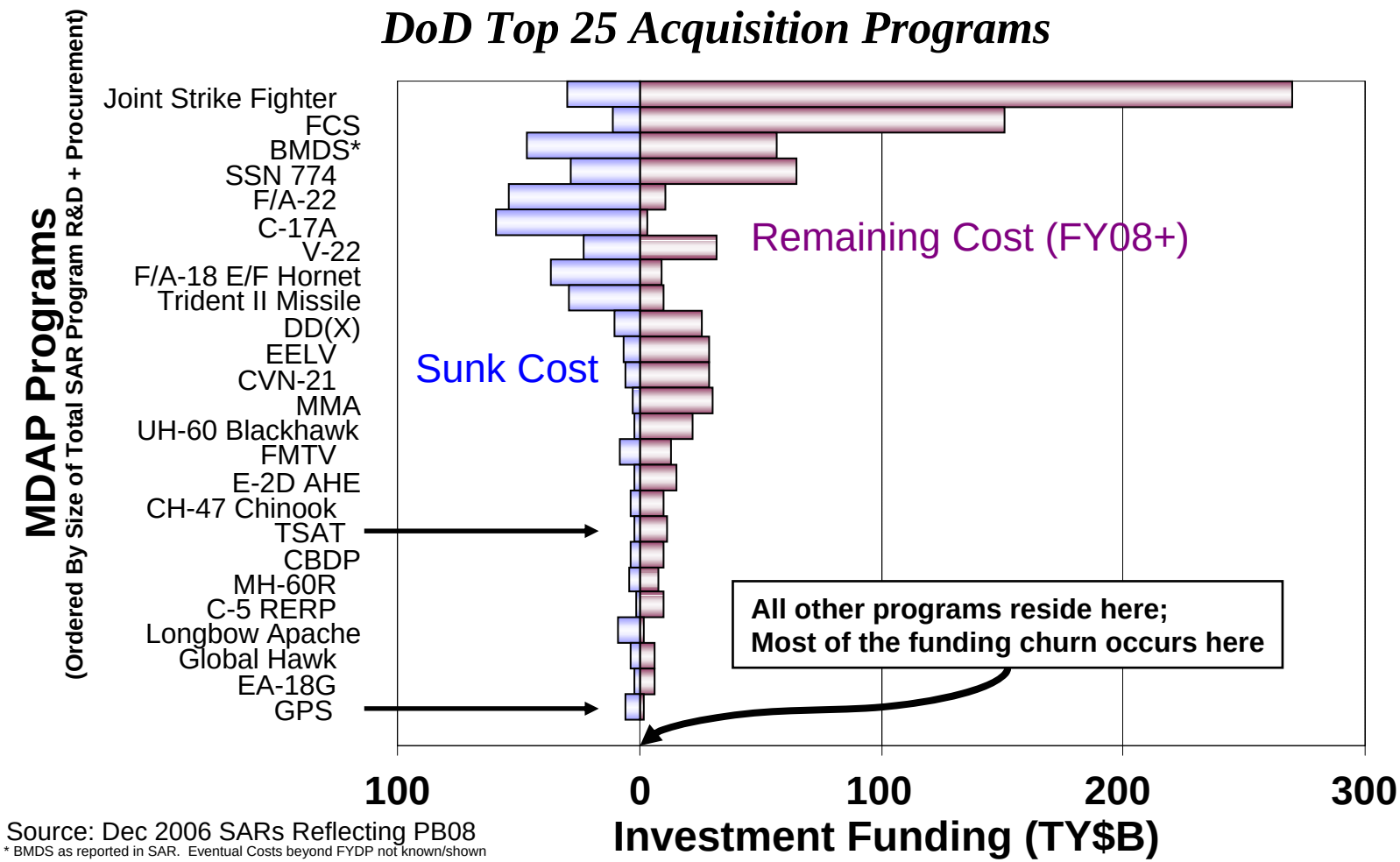
Major contributing factors to program instability are funding and requirements instability

IT Requirements Challenges

- *Considerable trade space for IT requirements*
- *Moore's Law drives the IT development environment*
  - Technology changes faster than the PPBS
  - Technology changes faster then the Acquisition cycle
  - Many Traditional S&T functions now performed by industry
    - COTS vs GOTS
    - Independent of DoD programs
    - Constant pressure to adopt "better" solution
  - Technology Readiness Assessments no longer as relevant
    - Technology is largely matured commercially
- *Evolving warfighting concepts drive requirements change*
  - JUONS drive ACTD/JCTD/other rapid acquisition efforts
    - Compete with programs of record

IT requirements instability occurs at levels below those tracked by JCIDS and DAB processes

Funding Perspective



Source: Dec 2006 SARs Reflecting PB08

* BMDS as reported in SAR. Eventual Costs beyond FYDP not known/shown

IT programs are at the tip of the tornado – more turbulent

Topics

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- ***DoD IT Acquisition Context***
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- Observations

Net Centric Environment: Context

Strategic Challenge – UNCERTAINTY

"Uncertainty is the defining characteristic of today's strategic environment." *(National Defense Strategy)*

–Leave behind the reasonable predictability of the past

–Adjust to an era of surprise and uncertainty

Strategic Response – AGILITY

"We have set about making US forces more AGILE and more expeditionary." *(Quadrennial Defense Review)*

–Enterprise-wide: Battlefield Applications; Defense Operations; Intelligence Functions; Business Processes

–Capabilities Based: Access, Share, Collaborate

–Fundamental Changes: Process, Policy, Culture

–Emphasis Shift: From moving the user to the data – to moving data to the user

Net Centricity Confronts Uncertainty with Agility

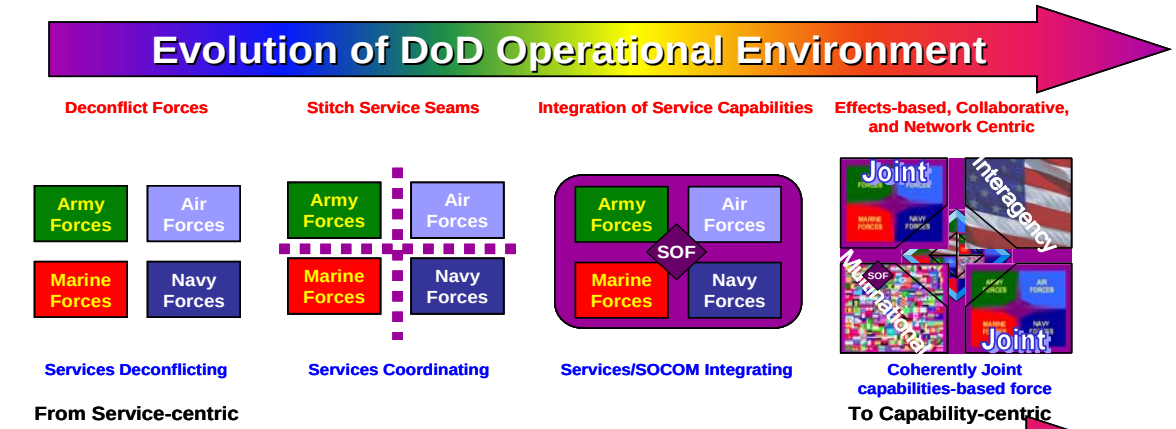
IT Evolution

Pre-1990's	Today
• GOTS Hardware & Software	• COTS Hardware & Software
• Functional code development	• Interface and integration code
• Back room non-combat	• Ubiquitous, embedded
• Stovepipe independent systems	• Net-centric
• Centralized	• Distributed
• Unique data definition	• Authoritative data sources
• Dedicated interface design	• Net-enabled
• System security	• Information Assurance
• Big Bang Operational test	• Integrated, dynamic DT/OT
• Service-oriented warfare	• Joint Warfare
• Packard Commission	• Clinger-Cohen

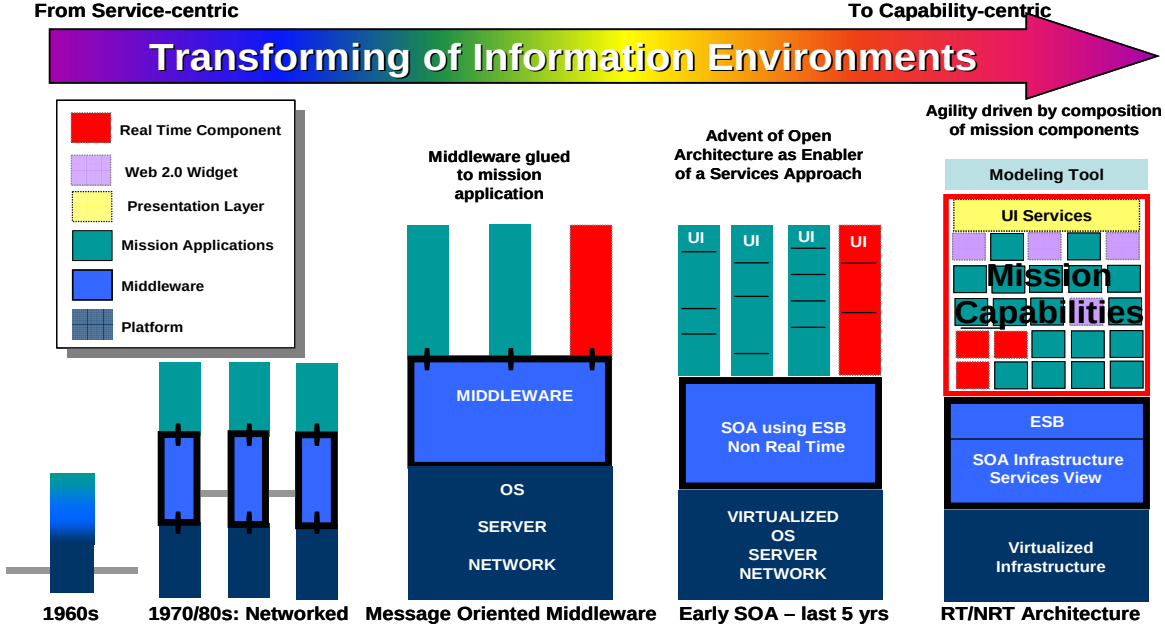
IT system development characteristics - no longer weapon system-like

The Co-Evolution

Leveraging IT to Support Mission Operations



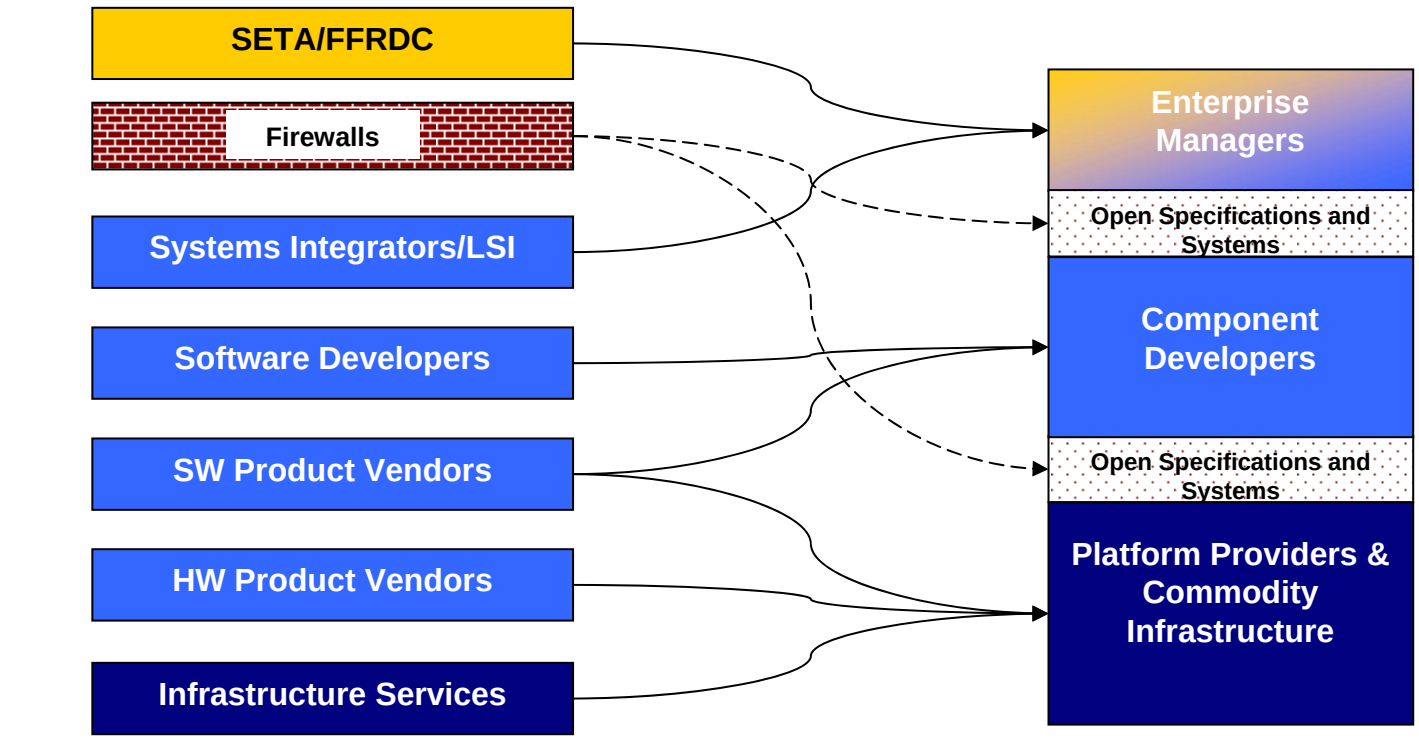
Mission needs drive this transformation



Commercial IT trends drive transformation

DoD is behind industry – now at early SOA phase

Changing Roles



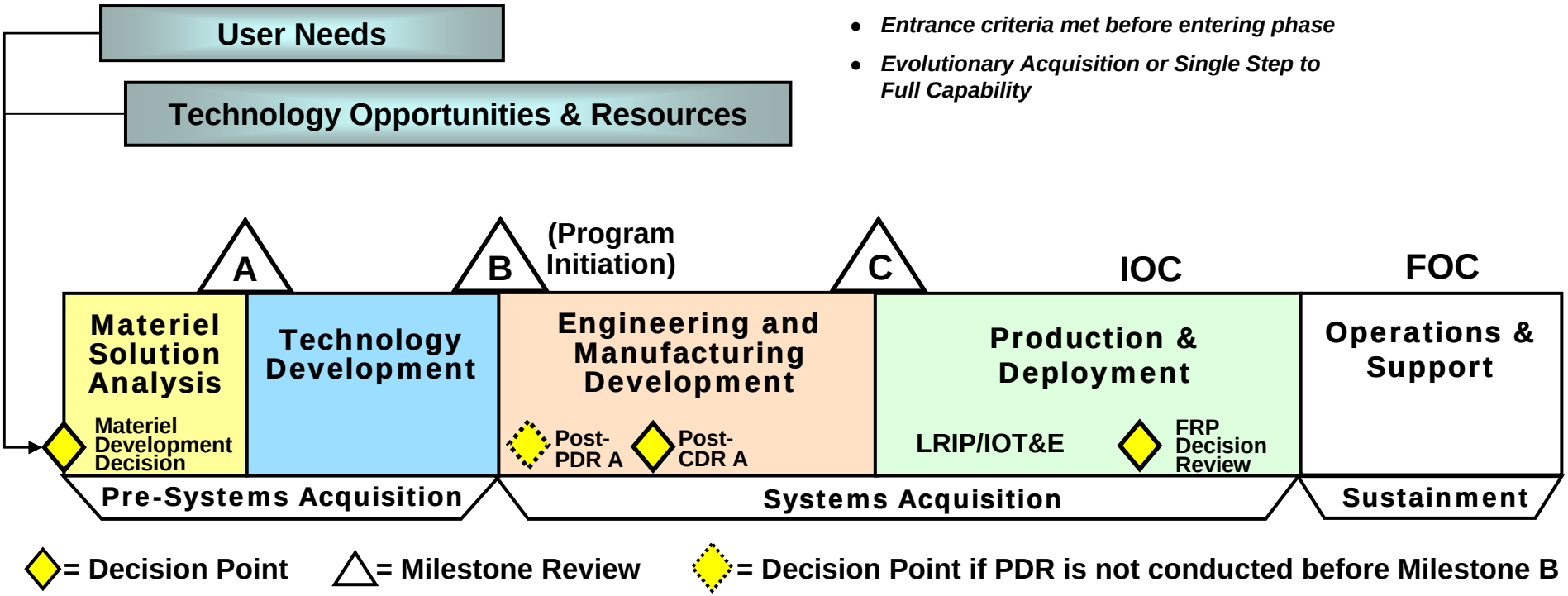
As the market evolves, the roles and how contractors interact must evolve as well. Traditional firewalls become published open system specifications.

Topics

- Information Technology Acquisition Environment
- DoD IT Acquisition Challenges
- DoD IT Acquisition Context
- ***DoD IT Acquisition Process***
- Observations

Latest Acquisition Process (Dec 2008)

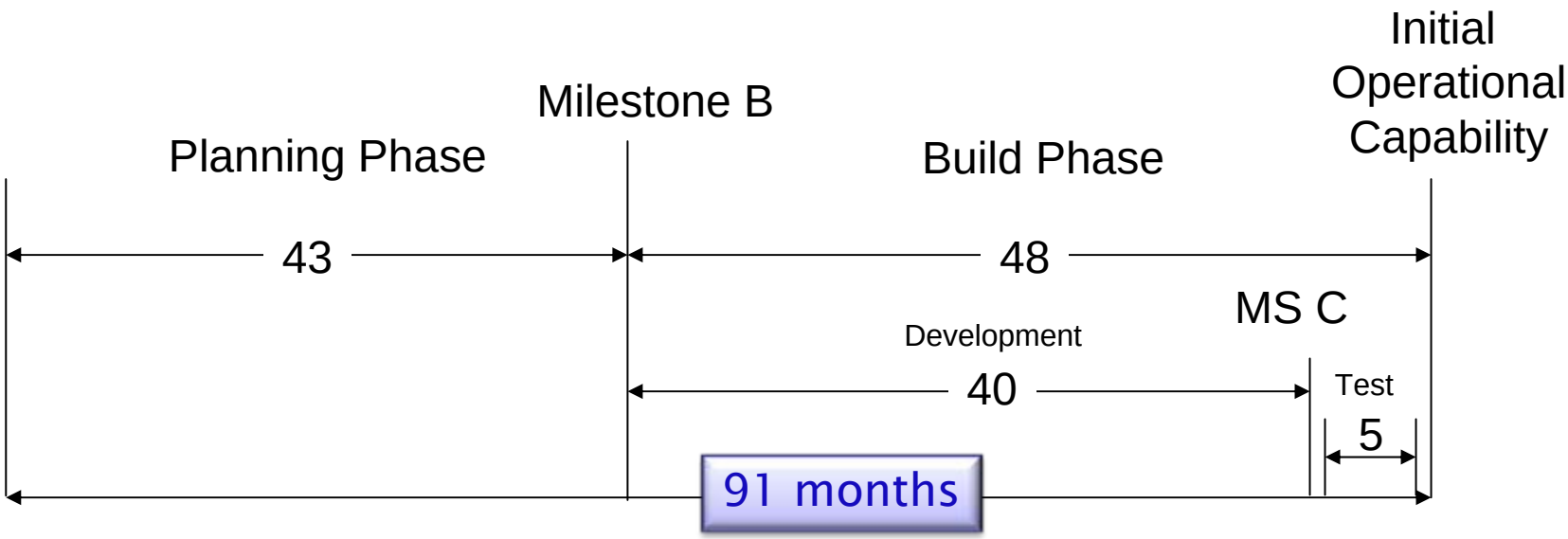
- *The Materiel Development Decision precedes entry into any phase of the acquisition management system*
- *Entrance criteria met before entering phase*
- *Evolutionary Acquisition or Single Step to Full Capability*



Deliberate toll gate decision process fundamentally unchanged for over thirty years – Analog

DoD IT Acquisition Cycle-Time

Average for all 32 MAIS reaching IOC in 2004-9

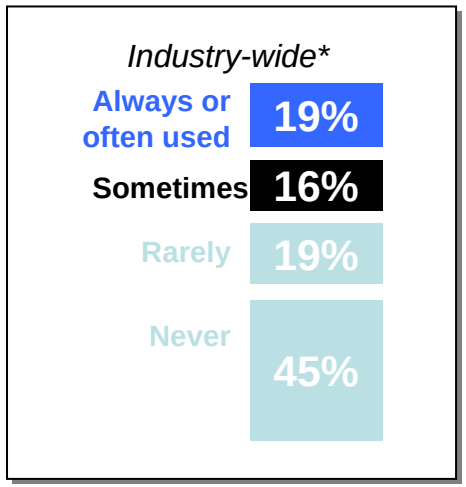


Note: Equivalent non-MAIS Average is 8.5-16 years

Counterbalance to Speed of IT Innovation

Eliciting the "Right" Technology – IT programs

- Challenge of bringing most relevant technology



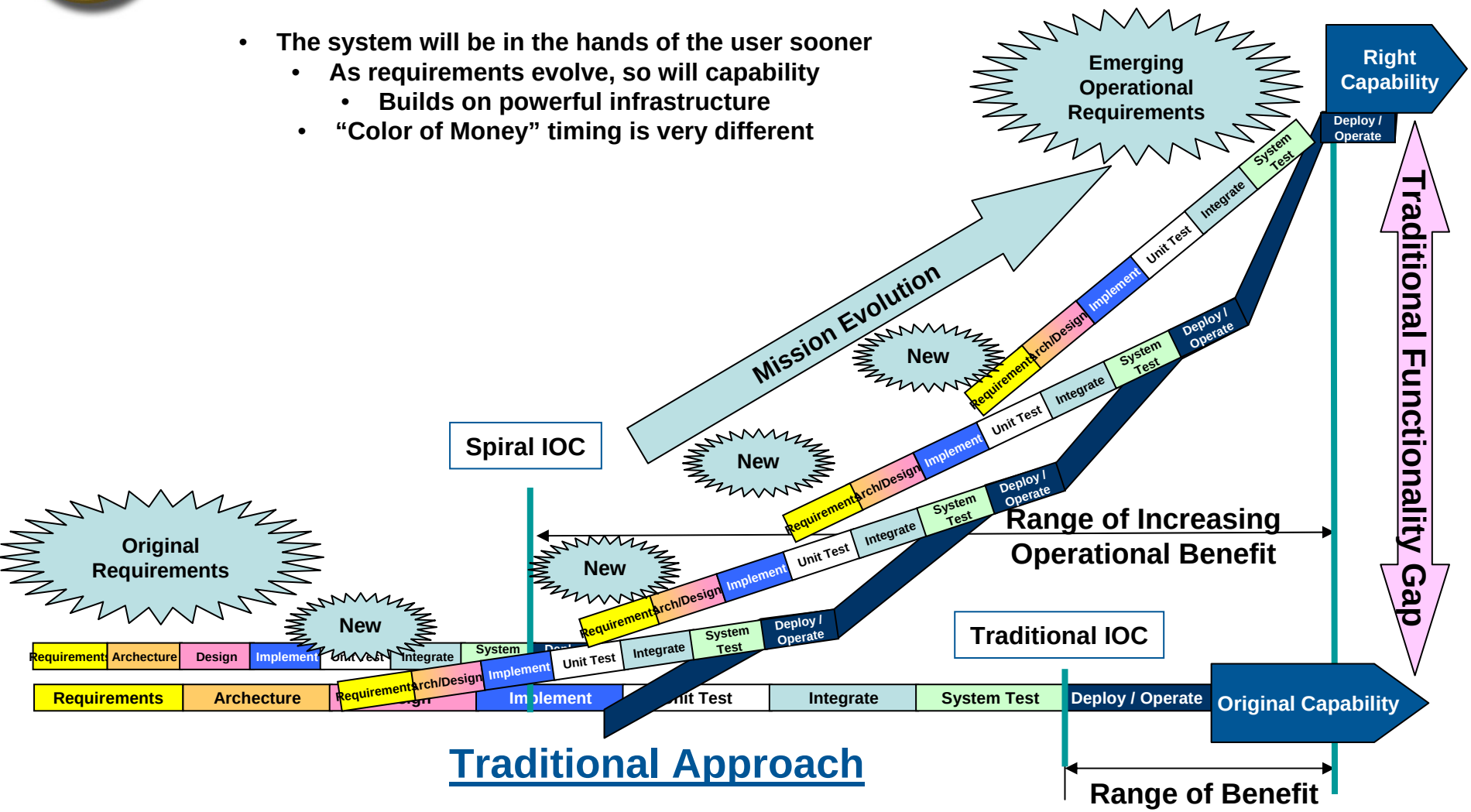
*Source: "The Chaos Chronicles," The Standish Group, 2003.

- Independent research organization (Standish Group) report nearly two-thirds of the features built into technology solutions represent waste
- 2 of top 3 reasons for program failure due to lack of user involvement and incomplete - misunderstood requirements

- Spiral acquisition model offers multiple opportunities
  - Prioritize requirements based upon
    - User feedback
    - Realized risk (knowledge based decisions)

Spiral Approach Adds Value

- The system will be in the hands of the user sooner
  - As requirements evolve, so will capability
    - Builds on powerful infrastructure
  - "Color of Money" timing is very different



Requires strong enterprise governance

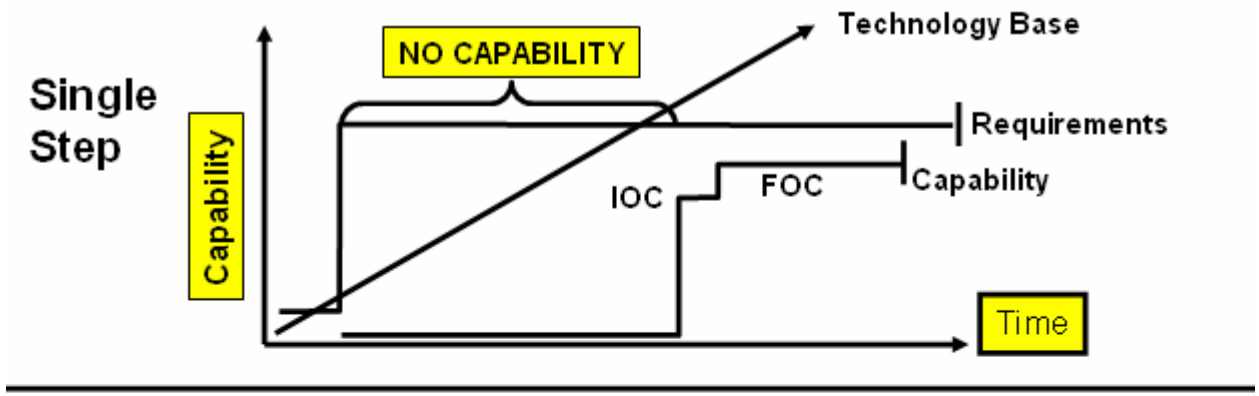
Balancing Extremes in Acquisition

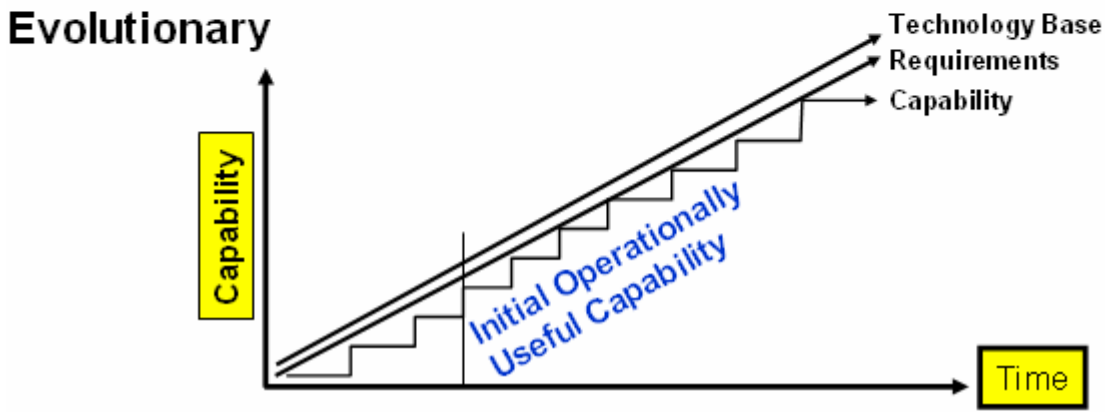
	"Classic Waterfall"	"Spiral"	"Extreme"
	Deterministic		*Evolutionary*
Project Management	• Detailed plan for entire project • **Scope-boxed phases** • Track progress by milestones completed	• Plan for entire project; varying granularity • **Time-boxed phases** • Track progress also by **value delivered**	• **No plan for entire project** • Limited concept of phases • Track progress for only current deliverable
	Big up front design		*Just in time, quality*
Development Process	• Design all before in complete detail • End-to-End Enterprise Architecture • **Integrate only once** • **One big testing phase**	• Design to support risk and value-driven design • Executable enterprise architecture planning • **Multiple deliveries** • **Combined DT/OT (Early & continuous testing)**	• **Design all just-in-time – nothing up front** • Minimal design documentation • Continuous integration • **No dedicated test**
	Low		*High*
Collaboration	• **User involvement only at project start and completion** • **"Throw it over the wall" requirements communication model** • Communication via periodic status meetings (quarterly or greater)	• **Frequent, regular User involvement** • Cross-group collaboration via frequent checkpoints • **Strong governance with cross-functional teams**	• Continuous face-to-face User involvement • Daily standup meetings • **Self organizing collaboration & teams**

Where Do You Start ?

- Stable requirements
  - Smaller programs, loosely coupled based on commercial standards
- Stable funding
  - Shorter duration, parallel efforts
  - 5-5-5
- Competition
  - Design to match market capabilities
  - Know your supplier

Appropriate Acquisition Models
Balancing Extremes





Picking the Right Metrics

- Earned Value Management
- Headcount
- Software – DRs, Code Production
- Critical Path/Integrated Master Schedule
- Risk Cubes/Risk Management
- Critical Events: SRR, SDR, PDR, CDR

Picking the Right Acquisition Model

- Experimentation
  - Advanced Concept Technology Demonstration
- Quick Reaction Capability
  - Immediate Operational Need
- Spiral Model
  - Information Technology
- Traditional Model
  - Platforms

Topics

- Information Technology Acquisition Environment
- DoD IT Acquisition Challenges
- DoD IT Acquisition Context
- DoD IT Acquisition Process
- ***Observations***

My Observations
Creating World Class Acquisition Environment

- Trained and Experienced PM's critical for success
- Before program enters development, performance criteria must be finalized
- Technology maturity before committing to program
- Stable funding a pre-requisite for program success
- **Apply correct acquisition model**
- Partnering with proven (competent & motivated) contractor
- Follow deliberate and disciplined process; **select & use appropriate management metrics**

Precision Strike Annual Review

"Munitions Roadmap for the Future"

Col Kirk Kloeppel
Director
Munitions Directorate

AFRL
THE AIR FORCE RESEARCH LABORATORY
LEAD I DISCOVER I DEVELOP I DELIVER

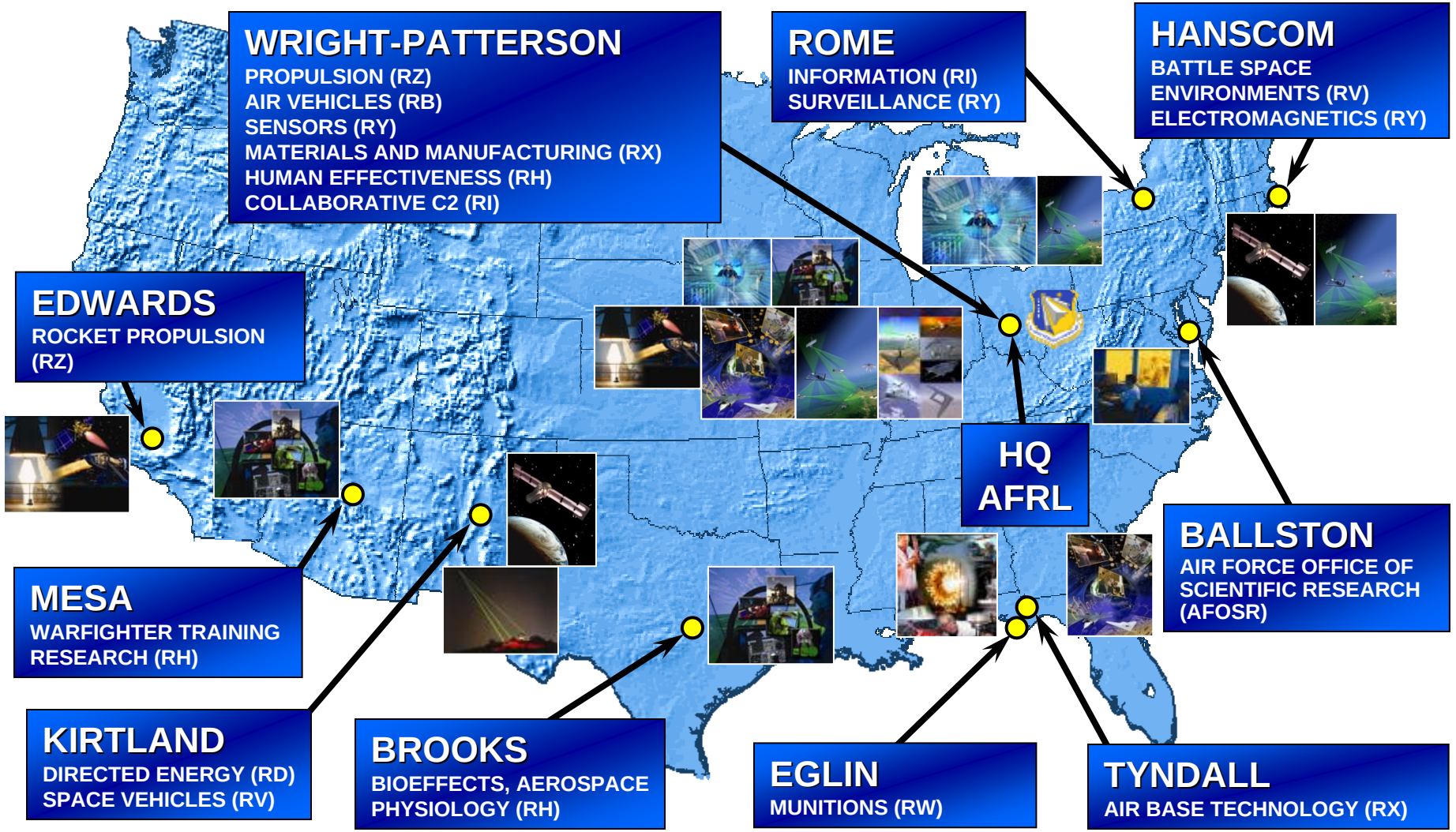
Weapons Video

Outline

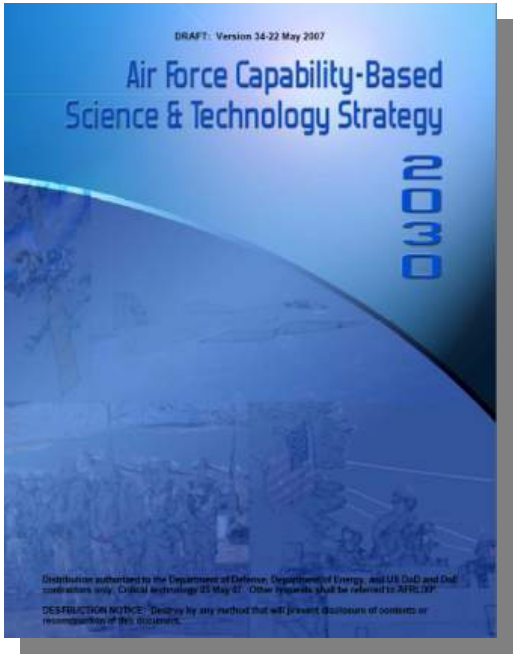
- AFRL Introduction
  - Sites World-wide
  - AFRL Strategic Plan
  - AFRL Focused Long-Term Challenges (FLTCs)
- Munitions Directorate (RW)
  - Vision / Mission
  - Capability Based Planning
- Strong Record of Demonstrating Integrated Capabilities
- Conclusions

AFRL

40 Sites World-Wide



Capability-Based S&T Strategy – Strategic Planning Vectors



The *Air Force Capability-Based Science & Technology Strategy* presents a considered and incremental approach to transforming the science and technology (S&T) investment focus of AFRL. It offers a strategic look at aligning the priorities for nurturing and developing core competencies as well as aligning the pursuit of particular technologies toward the solution of high-priority problems. --- Executive Summary, pg 4

S&T Strategy

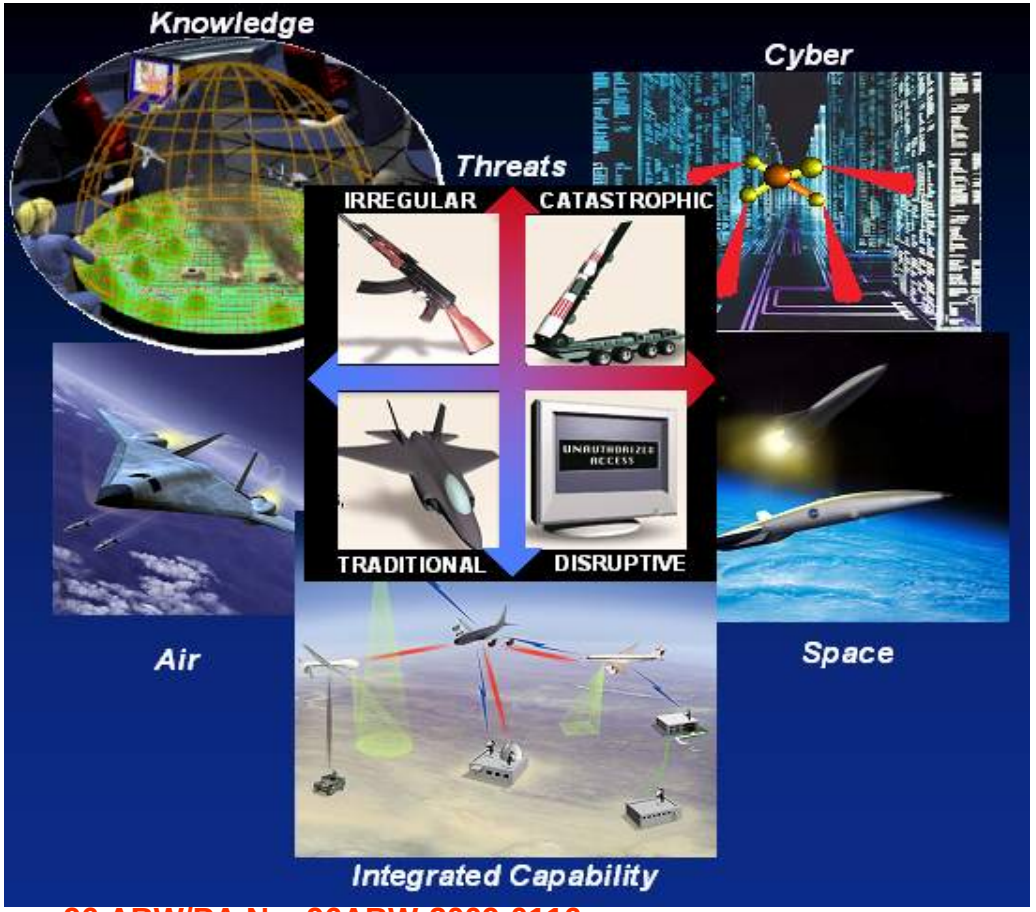
Anticipate, find, fix, track, target, engage And assess – anything, anywhere, anytime

- **Universal Situational Awareness**
- **Deliver Precision Effects (DPE)**
- **Access and Survive in the Battlespace**

Focused Long Term Challenges

Delivering the Air Force S&T Vision Through Leadership, Discovery, Innovation, and Integration.

1. Anticipatory Command, Control & Intelligence (C2I)
2. Unprecedented Proactive Surveillance & Reconnaissance (S&R)
3. Dominant Difficult Surface Target Engagement/Defeat
4. Persistent & Responsive Precision Engagement
5. Assured Operations in High Threat Environments
6. Dominant Offensive Cyber Engagement
7. On-demand Theater Force Projection, Anywhere
8. Affordable Mission Generation & Sustainment



AFRL Munitions Directorate
Vision & Mission

Vision:
Precision Engagement …
Delivering Desired Effects

Mission:

Lead the discovery, development, integration and transition of affordable precision engagement technologies for our air, space, and cyberspace force

Munitions Directorate Organization

Executive Officer
Capt Josef Peterson

Director
Col Kirk Kloeppel

Deputy Director
Ms Gail Forest

Associate Director
Dr John Wilcox

Chief Scientist
Dr Bob Sierakowski

Adv Guidance Division
Mr James Moore

Ordnance Division
Mr Scott Teel

Assess & Demo Division
Col John Williams

Munitions Directorate Product Divisions

Financial
Mr Paul Higgins

Contracting
Ms Stacey Darhower

Corp Development
Ms Effie Krug

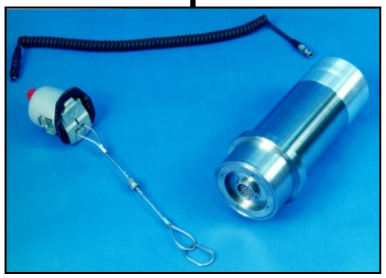
Integration & Ops Division
Mr Rich Mook

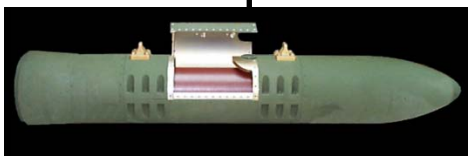
Senior IMA
Col Mark Koch

Ordnance Division (RWM)

ORDNANCE DIVISION

Core Competency
Sub Core Competency





ENERGETIC MATERIALS BRANCH

EXPLOSIVES

- Hard Target Explosives
- Focused Energy Warhead Explosive
- Advanced Energetics
- Dense Metal Explosive
- Explosive Characterization, Processing & Experimentation
- MK-series Insensitive Munitions Technology

FUZES BRANCH

FUZES

- Penetration Fuzing
- Point Burst Fuzing
- Advanced Initiation
- Battle Damage Sensing

DAMAGE MECHANISMS BRANCH

WARHEADS

- Focused Energy Warheads
- Unitary Warheads

ORDNANCE INTEGRATION BRANCH

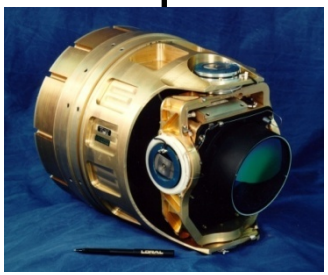
WARHEADS

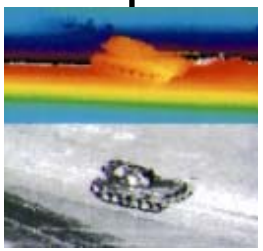
- Surface & Air Target Defeat
- Agent Defeat
- Hard Target Defeat
- Alternative Payloads

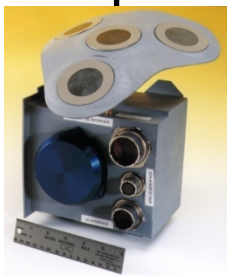
Advanced Guidance Division (RWG)

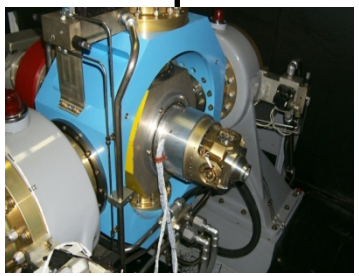
ADVANCED GUIDANCE DIVISION

Core Competency
Sub Core Competency







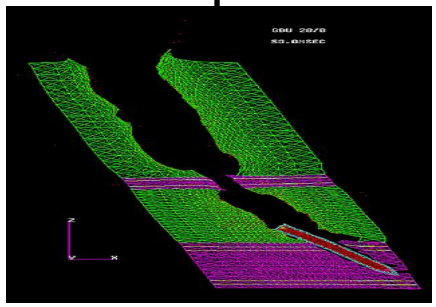


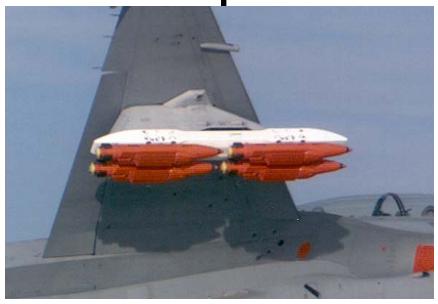
SEEKERS BRANCH	SIGNAL & IMAGING PROC / ALGORITHMS BRANCH	NAVIGATION & CONTROL BRANCH	GUIDANCE SIMULATION BRANCH
SEEKERS	**PROCESSING / ALGORITHMS**	**NAVIGATION & CONTROL**	**ASSESSMENTS**
• LADAR • Passive IR • SAR • Multispectral	• Algorithms • Processors	• Tactical INS • Anti-jam GPS • Autonomous Control • Cooperative Control	• Synthetic Scene Generation • Weapon Digital Simulation & Analysis • Hardware-in-the-Loop Simulation

Assessment & Demonstrations Division (RWA)

ASSESSMENT & DEMONSTRATIONS DIVISION

Core Competency
Sub Core Competency

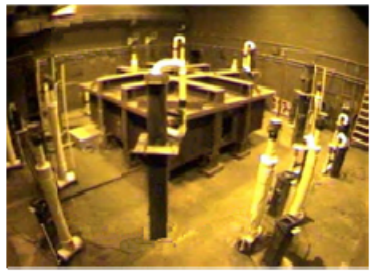




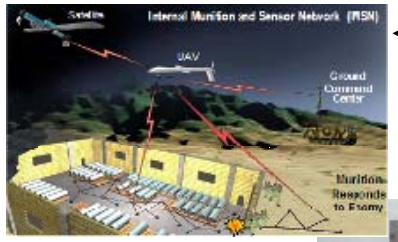
LETHALITY & VULNERABILITY	COMPUTATIONAL MECHANICS	FLIGHT VEHICLES INTEGRATION
ASSESSMENT	**ASSESSMENT**	**MUNITION INTEGRATION**
• Lethality / Vulnerability Methods • Lethality / Vulnerability Analysis	• Computational Weapon / Target Solid Mechanics • Computational Weapon / Target Fluid Mechanics	• Subsystem Integration • Integrated Technology Planning • Micro Air Vehicles • Weapon / Platform Integration

Capability Based Technologies

CBRNE Neutralization Technologies



Improved Diagnostic and Analysis Methods

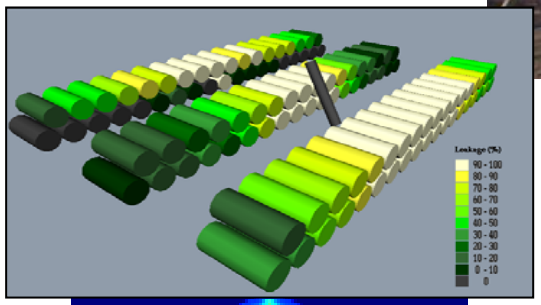


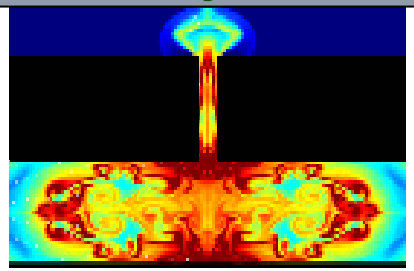
Networked Munitions

Rigid Foams

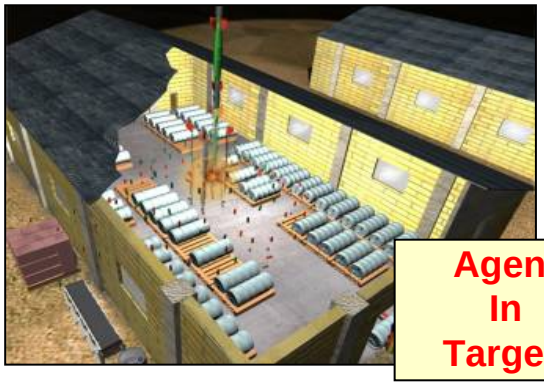
Cooperative Robotics

CBRNE Denial Concept Development





Development of Advanced Disruption Payloads



Weapon Borne Sensor Concept Evaluation

External Plume Neutralization

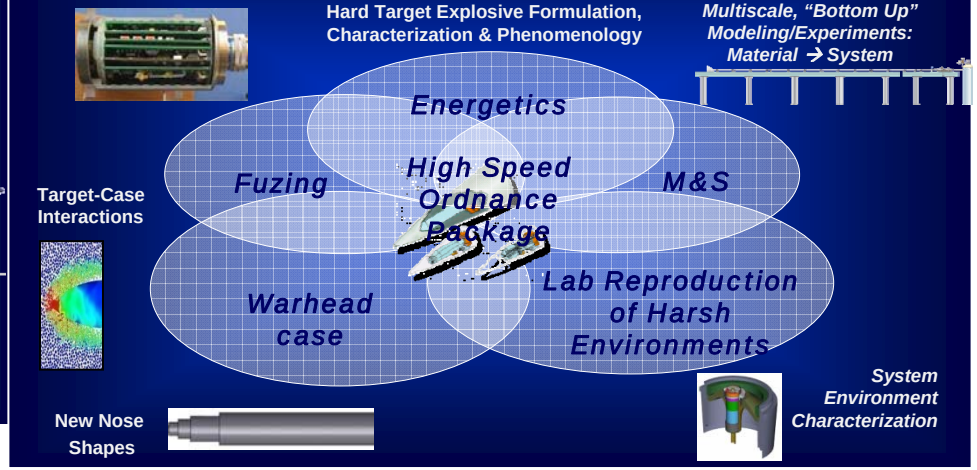
HDBT Neutralization Technologies

Boosted Penetrator Development

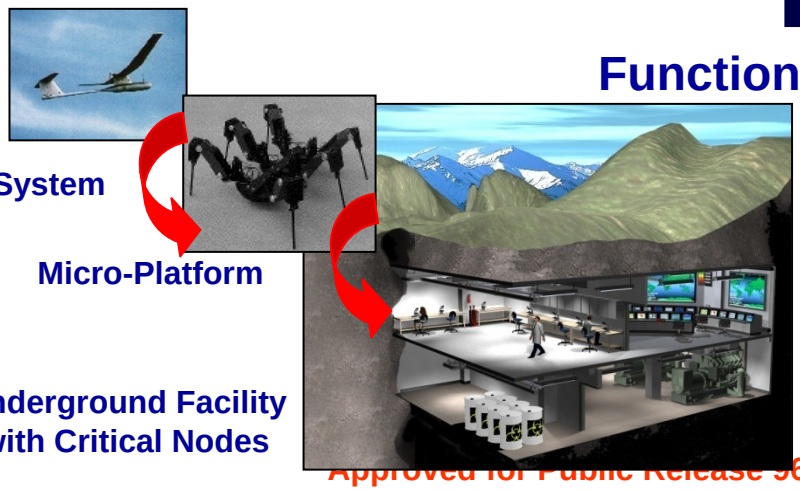
Demonstrate an ordnance package that can be internally carried on F-35, and survive high speed impacts and into reinforced concrete and function at the appropriate time.

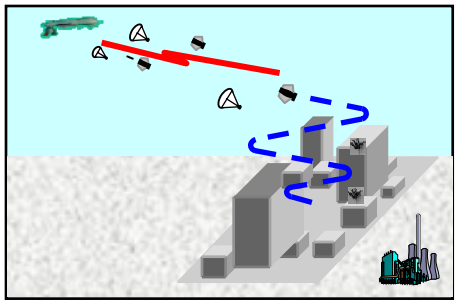
High Speed Penetrator Development

Provide intercontinental, quick response in an anti-access/area denied environment to deliver effects on hard & deeply buried targets.

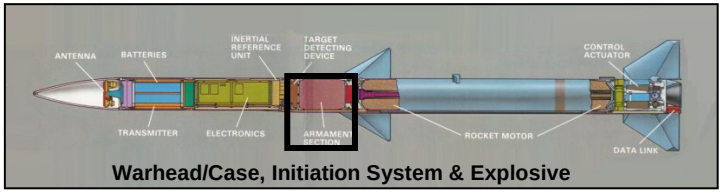


Functional Defeat





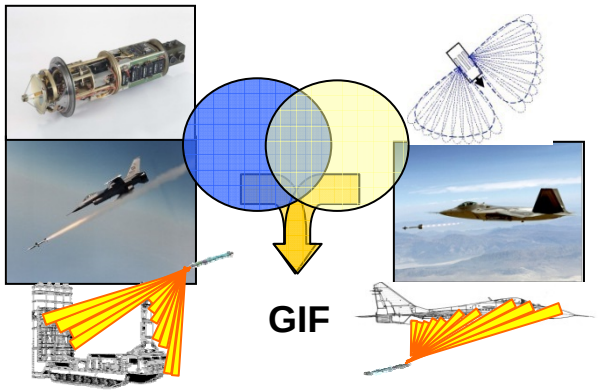
Air Dominance Technologies



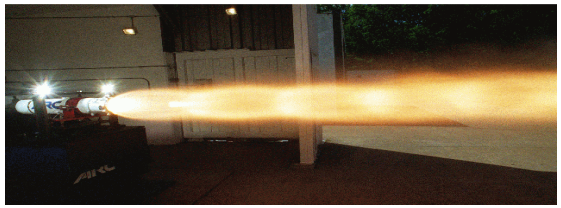
Adaptable Multi-Point Initiated Mass-Focusing, Enhanced Lethality Warhead

High Maneuverability Hybrid Aerodynamic Fin / Reaction-Jet Control System

Potential Joint Demonstration

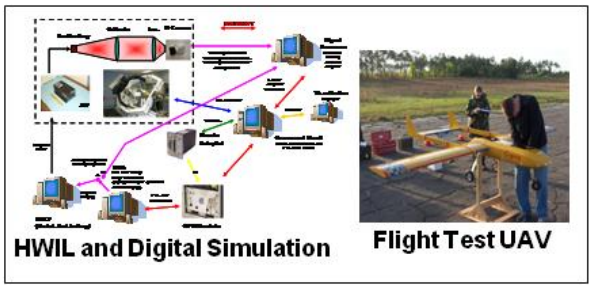


Guidance Integrated Fuzing (GIF) Weapon Seeker/Fuzing Integration With Dual-Role Target Set Capability

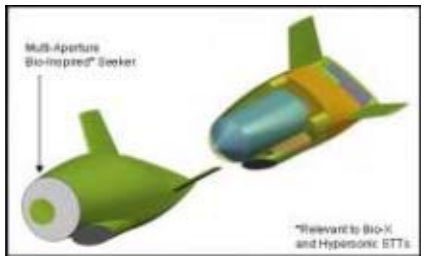


Multi-Pulse Solid Rocket Motor & Other Advanced Propulsion Concepts

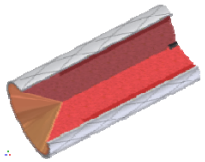
Mobile Target Neutralization Technologies



Micro- Munition Guidance and Control Test Bed



Precision Guided Submunition Airframe, Integration, & Demo



Precision Guided Submunition Warhead

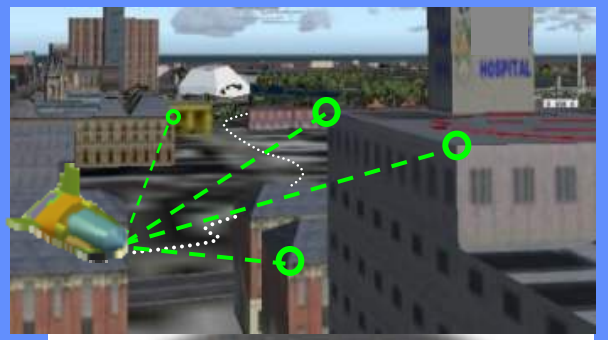
Miniaturized Datalinks

Multi-Functional Materials & Structures

Integrated Systems

Low Speed, Unsteady Aerodynamics

Vision Based Guidance



Complex Aero-elastic Structural Interaction

Precision Navigation & Timing

Weapon Data Links

Fixed, Rotary & Flapping Wing Flight

Rapid Prototyping

Swarming, Cooperative Control, Collective Vision

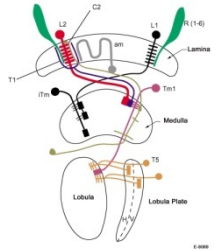
Power Systems & Thermal Management

Miniaturized Payloads

Cybernet Neutralization Technologies

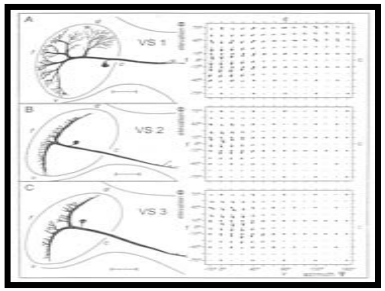
Revolutionary Technologies

Compound Eye Modeling To Enable Designs Of Miniature Wide Field Of Regard Sensors

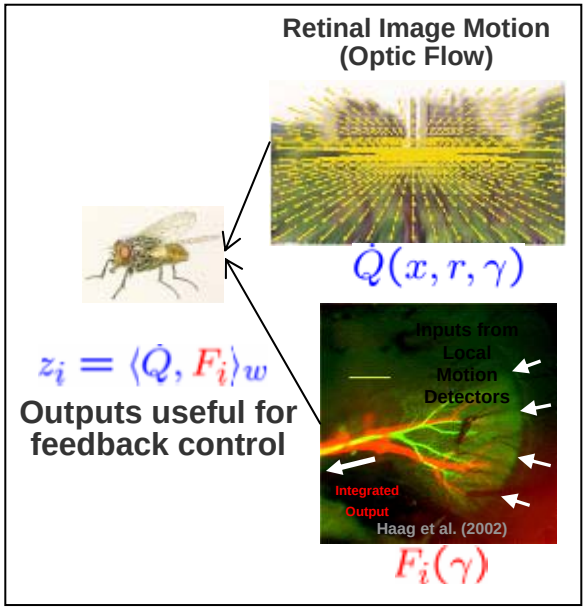


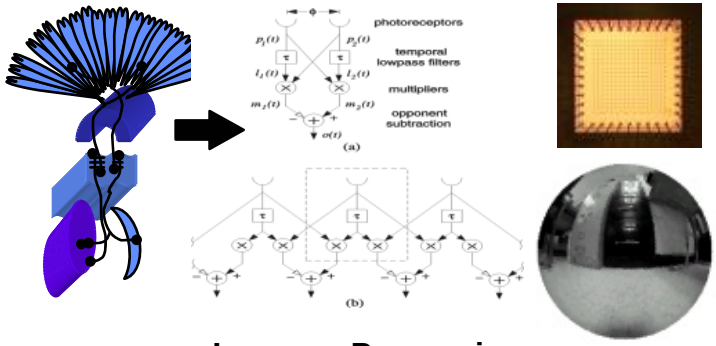
Translate Elementary Motion Detection Circuitry To Software Which Can Be Realized In Silicon

Understanding Raptor Flight Mechanics And Aerodynamics To Enhance The Agility Of Micro Munition Vehicles



Translate Optic Flow Algorithms To Software Which Can Be Realized In Silicon



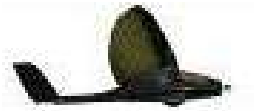


Increase Processing Efficiencies For ATR And Terminal Guidance By Going From Biological Understanding To Electronic Implementation

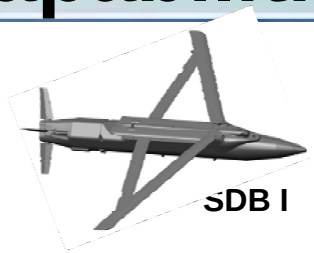
Merge Control Theory With Biological Vision Motion Processing To Establish Merits Of Biology-inspired Concept For Collision Avoidance

Munitions Centric

Strong Record of Demonstrating Integrated Capabilities



BATCAM

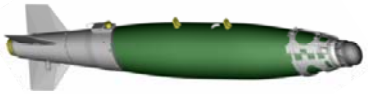


SDB I

GBU-28 “Bunker Buster”

Shredder ATD

AMRAAM



JDAM

LGB

BLU-121

Crash-Pad

FLM

PAW

MOAB

HTSF

JASSM

Conclusion

- Munitions technology investment gives high ROI
- Mid term munitions outlook characterized by
  - Increased lethality (per munition and airframe)
  - Persistence
  - Smaller Weapons potential for UAVs
  - Network centric / Cooperative control
  - Low Collateral Damage
- AFRL/RW relies on industry partnering to achieve our mission
  - R & D contracts goal: 50% of budget
  - Growing Revolutionary Technology Initiatives

LEAD | DISCOVER | DEVELOP | DELIVER

AFRL Munitions Directorate

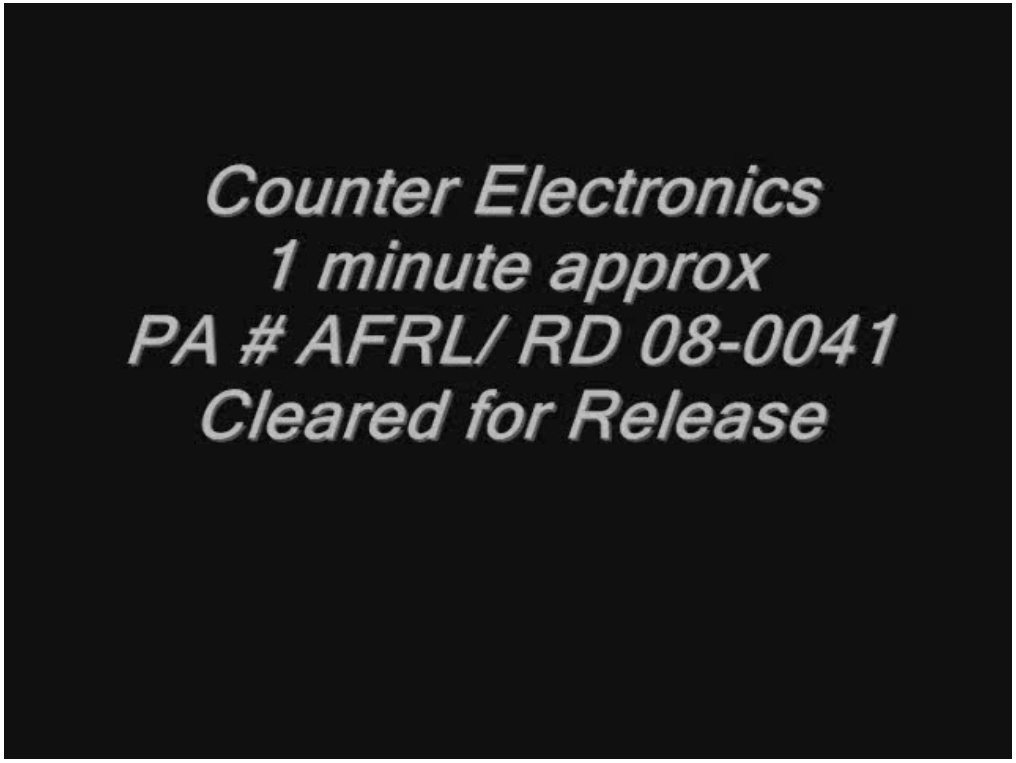
http://www.eglin.af.mil/afrl_rw/

We Deliver the Warfighter's Best Bang for the Buck !!

Doing Business with AFRL/RW

- Near Term Non-R&D Support Contract (Logistics Material Support Activity) Solicitation / Award 1Q09/ 2Q09
- Near Term R&D Contracts
  - External Plume Neutralization
  - Munitions Based Sensor / Seeker
  - CBRNE Denial Concept
  - Precision Guided Submuntion Demo
  - Joint Dual Role Air Dominance Missile Demo
  - Armament Technologies BAA-RWK-08-001
  - Revolutionary Technologies BAA-RWK-08-002
  - Battlefield Airmen BAA-RWK-08-003
- SBIR Program – 13 Draft Topics
- Revolutionary Guidance & Ordnance Technology – White Papers & Proposals Anytime

Directed Energy
High Power Microwave (HPM) Counter-Electronics



Enables attack on high value electronic targets with minimal collateral damage; virtually eliminating high post-conflict reconstruction costs!!!!

Warfighter Benefits

Unique capabilities that disrupt through destroy:

- **Command, Control, and Communications (C^3) Centers**
- **Integrated Air Defense Systems (IADS)**
- **WMD Production Facilities**
- **Cyber War Targets**
- **Enemy Infrastructures**

Cannon Artillery and Mortar Precision Effects

Presented by: COLONEL Ole Knudson
Project Manager for
Combat Ammunition Systems
973 724-2003, ole.knudson@us.army.mil

What Level of Precision is Needed?

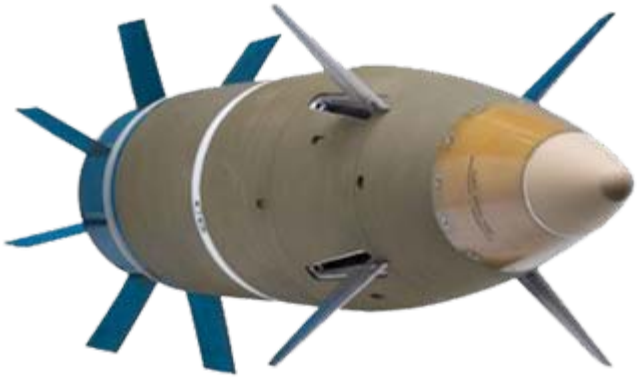
- Urban Density Can Vary Widely Over Small Distances Between Terrain Elements
- Munitions with Varying Levels of Precision May Be Most Cost-Effective

Cannon Artillery and Mortar Precision Effects Capabilities

- All weather 24/7 continuously “loitering” precision capability
  - ✓ Responsively and precisely attack targets… can precisely “mass” fires
  - ✓ Minimizes collateral damage…“discretion” & “close” engagements
  - ✓ Inherent scalability with multiple shooters and multi-round missions
  - ✓ Dramatically reduced logistics burdens (less qtys and transport/storage)

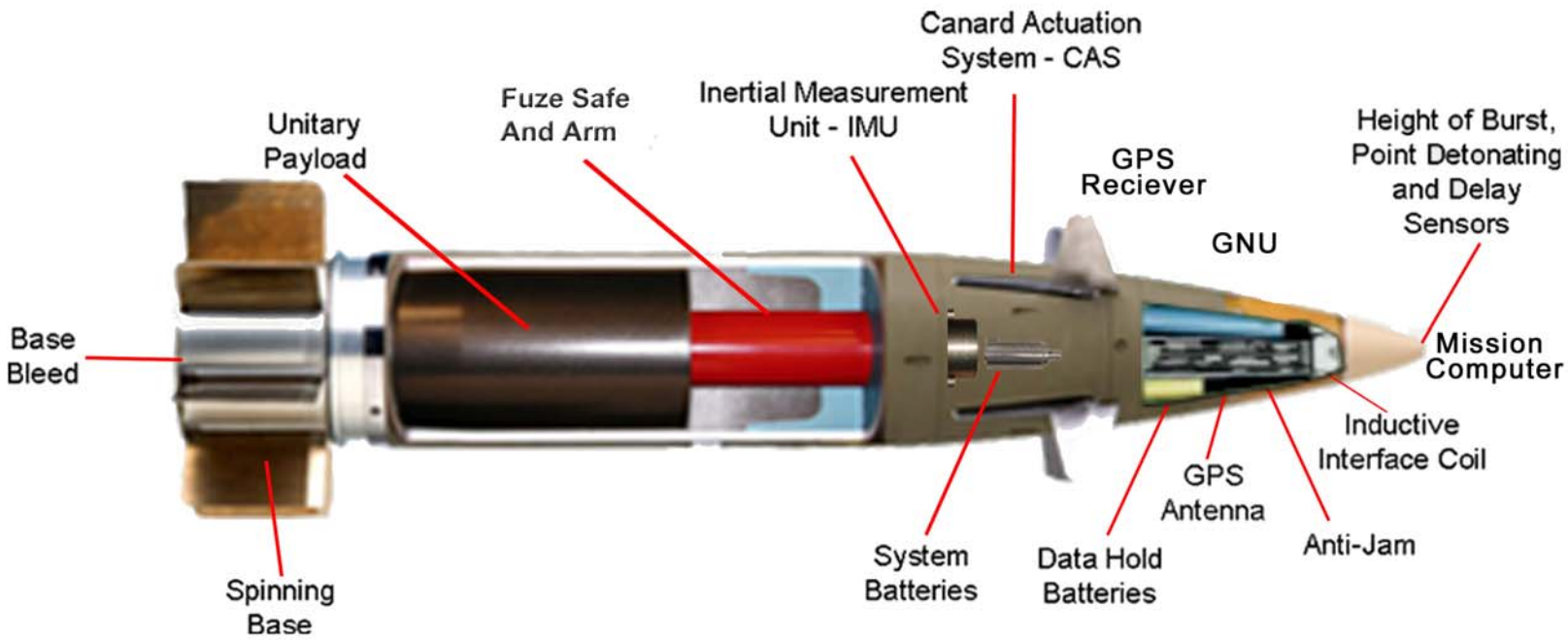
- Employed with current cannon artillery & mortar systems and structure… & accurate targeting systems (FS3, LLDR, PSS-SOF)
  - ✓ Easily additive to current systems and capabilities… “compatibility” is key
  - ✓ Maintains current Smoke & Illum capabilities
  - ✓ Maintains area fire & suppressive fires capabilities… “precise” area fires?

XM982 Excalibur

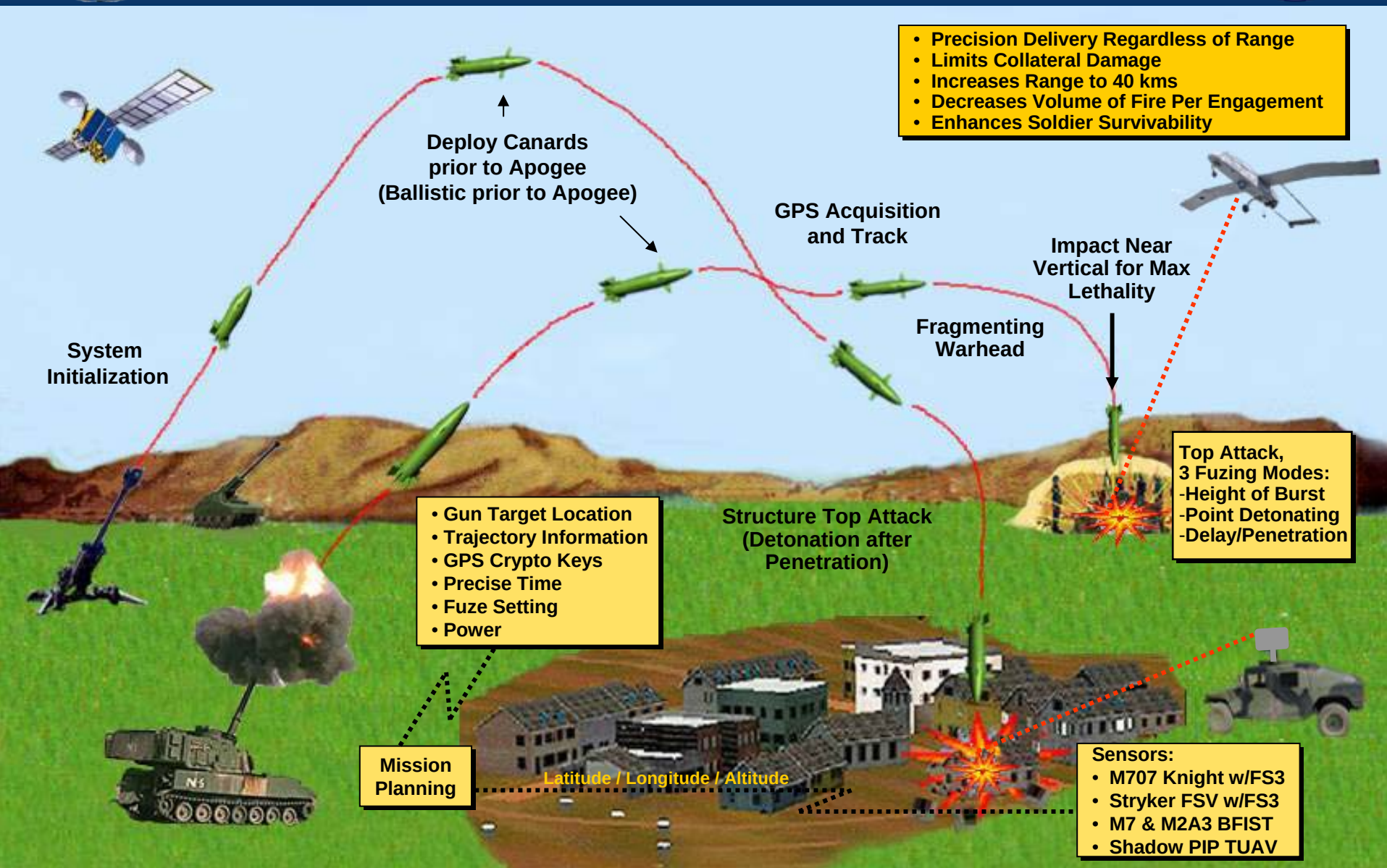


System Characteristics/Description:

- ✓ Precision Guided 155mm Cannon Ammunition (CEP < 10m)
- ✓ Fin Stabilized, Gliding Air Frame
- ✓ All Weather, Day/Night, Fire & Forget, Urban/Complex Terrain
- ✓ Compatible with NLOS-C, Paladin and LW155 Howitzer Platforms
- ✓ One Meter Length / 106 lb



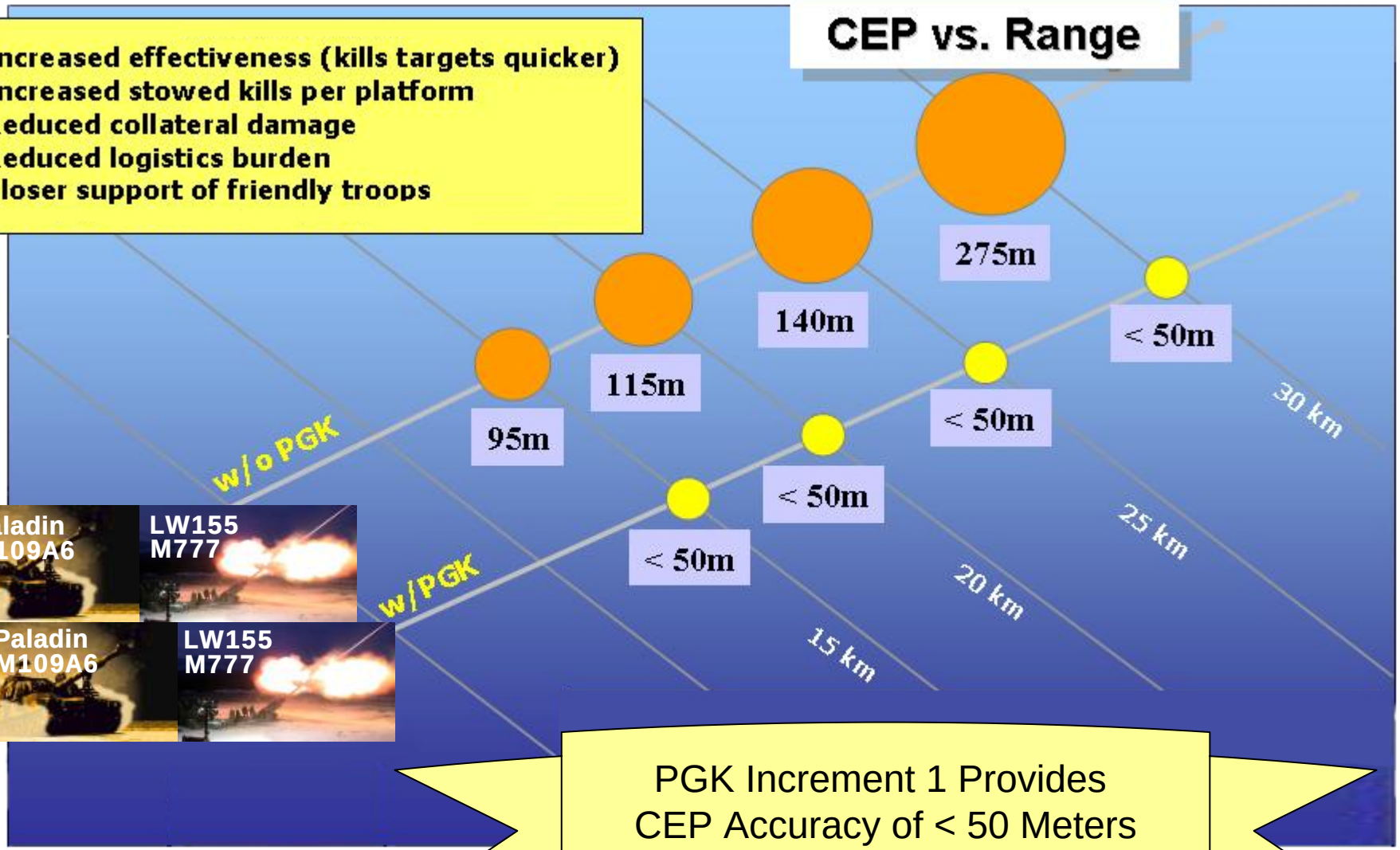
Excalibur Concept of Operations

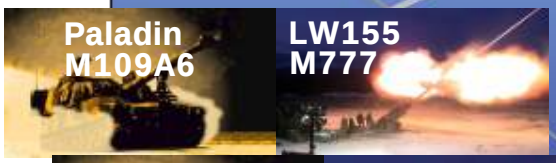


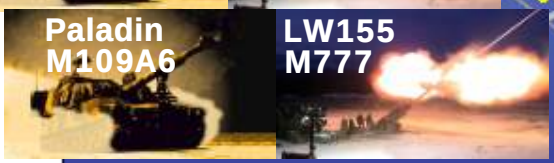
Excalibur Video

Precision Guidance Kit (PGK)
155mm Projectile Accuracy

- Increased effectiveness (kills targets quicker)
- Increased stowed kills per platform
- Reduced collateral damage
- Reduced logistics burden
- Closer support of friendly troops





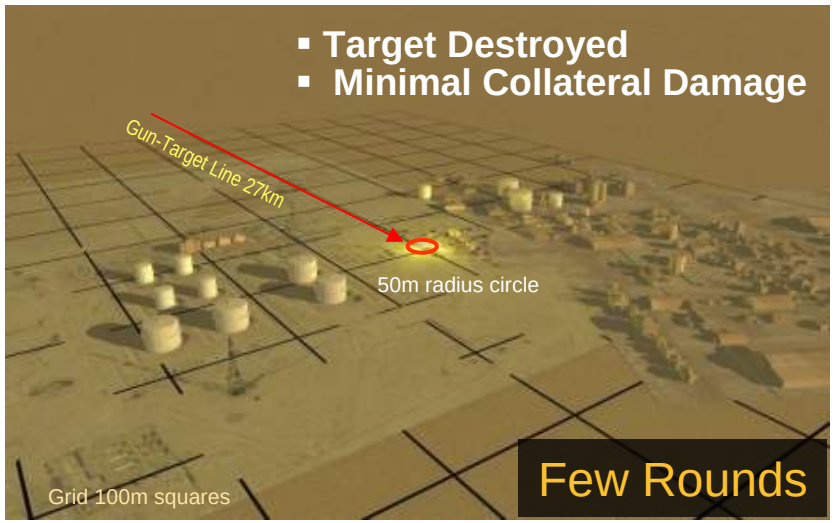


PGK Increment 1 Provides
CEP Accuracy of < 50 Meters

Operational Benefits

Today's Capability: 183m CEP*

PGK: ≤50m CEP



* **M109A6 (Paladin) at 27km: 155mm (HE) M549A1**

- **Improves Accuracy – Significantly Reduces Ballistic Dispersion**
- **Significantly Decreases the Time Needed to Achieve Desired effects**
- **Minimizes Collateral Damage and Enables Closer Support to Friendly Troops**
- **Increases Number of Kills per Basic Load of Ammunition**
- **Greatly Reduces Logistics Burdens**

PGK Design (Increment 1)

- Fits in standard 155mm High Explosive artillery projectile fuze wells (deep intrusion)
- GPS guidance (incorporates SAASM)
- 20 Year Storage Life (no battery)
- Proximity & Point Detonating Fuzing

PGK Video

Emerging Needs/ Future Requirements

- IBCT Organic Precision Requirements
  - ✓ 40 Plus IBCTs within Army structure…have mortars &105mm
  - ✓ PGK-2 is funded…implemented with 105mm digitization
  - ✓ Need for organic very responsive precision with <10m CEP
- "Cheap" or "Very Affordable" Precision
  - ✓ Key technologies… GPS, Fuzing, Power, AJ, & SALs
  - ✓ ARDEC/ARL CRADA efforts to mature components and integrated concepts…applicable to artillery and mortars
  - ✓ Several Industry efforts ongoing…will enable competition
  - ✓ Wider use in training…confidence, proficiency, and quantities

Is Very Affordable Precision "Coming Soon"?

Joint Strike Fighter Program Update

CAPT John “Snooze” Martins
Director, Air Vehicle

F-35 Lightning II Program Office

Key Messages

- **Vision:** Deliver and sustain the most advanced, affordable strike fighter aircraft to protect future generations worldwide.
- **Mission Statement:** Be the model acquisition program for joint service and international cooperation.
- **Program Priorities:**
  - Finish Development and Deliver Essential Warfighting Capability on Schedule
  - Maintain Affordability as Key Tennant of the Program
  - Implement Sustainment Via Performance Based Outcomes
  - Preserving the Partnership

Agenda

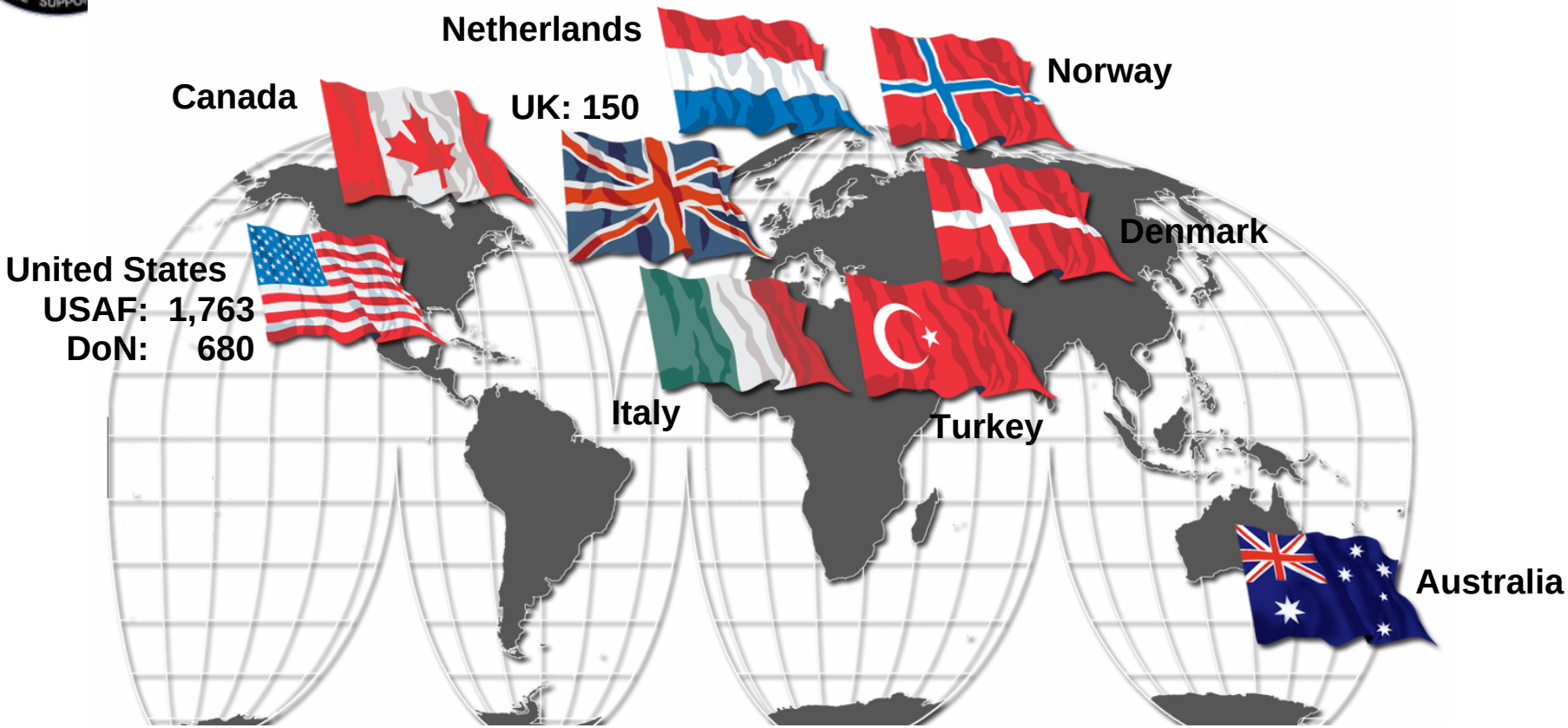
- Background
  - Program
  - Variants
- Air Vehicle
  - Air Frame
  - Sensors
  - Data Links
  - Displays
  - Weapons

Lethal, Survivable, Supportable, Affordable and Connected Node on the Joint Coalition Battlefield

Security Guidelines

- Slides and Discussions are UNCLASSIFIED

Service & International Needs



- **USAF:** Multi-role (primary air-to-ground) fighter to replace F-16 & A-10 & to complement F/A-22
- **USMC:** Multi-role, short takeoff, vertical landing strike fighter to replace AV-8B & F/A-18C/D
- **USN:** Multi-role strike fighter to complement the F/A-18E/F
- **UK (RN and RAF):** Supersonic replacement for Sea Harrier and GR-7

2,593 US/UK JSFs ***> 2,000 International JSFs***

Lockheed Martin JSF Team

NORTHROP GRUMMAN

- Center Fuselage
- Weapons Bay Door Drives
- Arresting Gear
- CV Control and Test
- Radar
- Software
- LO Support System
- Training Courseware and Management Systems

BAE SYSTEMS

- Aft Fuselage
- CV Wing Fold
- Fuel System
- Crew Escape
- Life Support
- EW System
- U.K. Support Center
- Throttle/Side Stick
- Horizontal/Vertical Tails
- Flight Control Computer
- STOVL Control and Test
- U.K. Rqts/Stores/SW

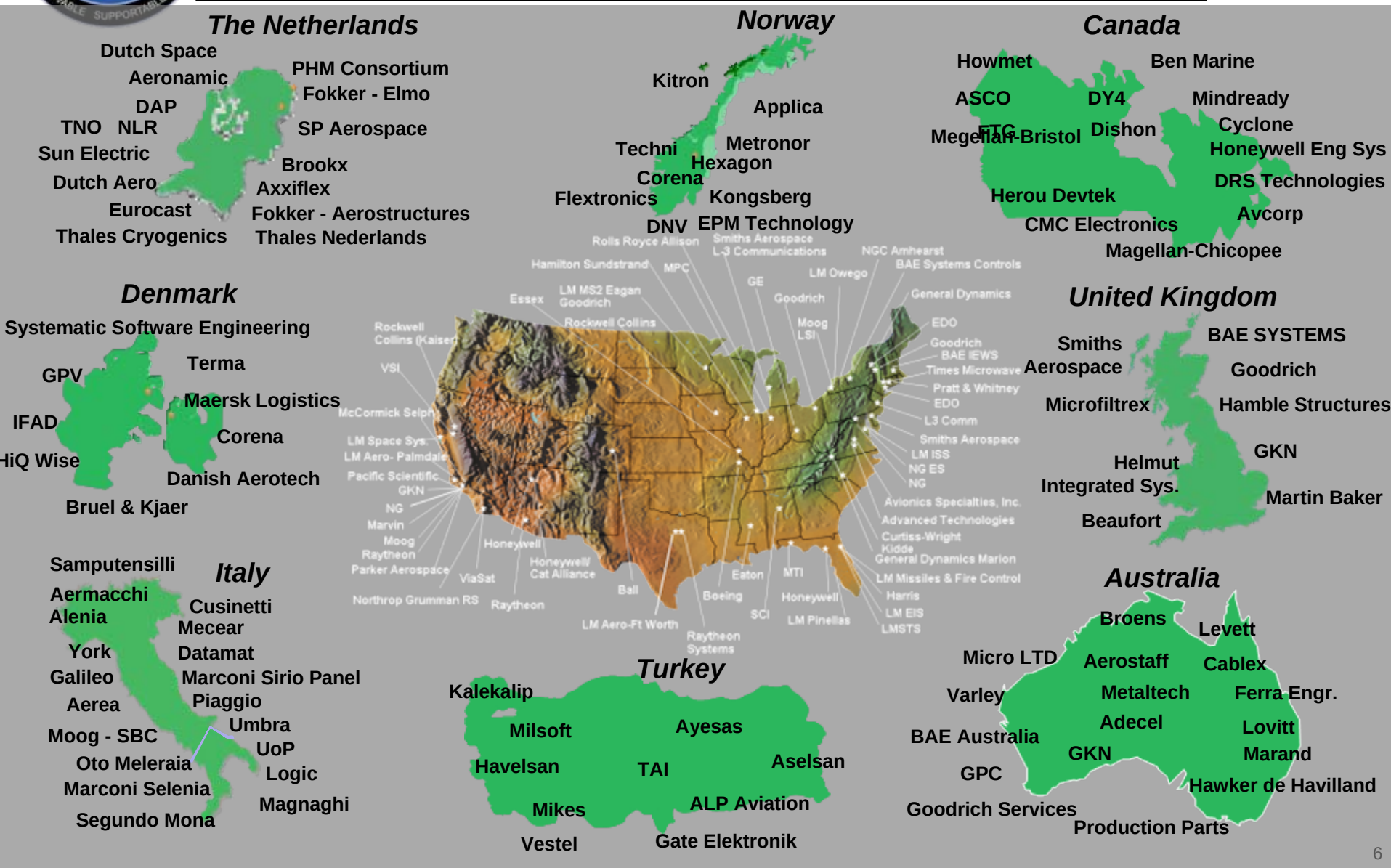
LOCKHEED MARTIN

Prime Contractor

- Air System Verification
- System Integration
- Mate Through Delivery
- Edges & Control Systems
- Autonomic Logistics
- Mission Systems
- Vehicle Systems
- Training System
- Forward Fuselage
- Wing

A Highly Integrated Best Value Team

F-35 Global Supply Sources



JSF System Development and Demonstration Phase

DEFENSE ACQUISITION MANAGEMENT FRAMEWORK

PRE-SYSTEMS ACQUISITION | **SYSTEMS ACQUISITION** | **SUSTAINMENT**

Concept & Technology Development
Decision Review
Concept Exploration — **Component Advanced Development**

System Development & Demonstration
Interim Progress Review
System Integration — **System Demonstration**

Production & Deployment
FRP Decision Review
Low-Rate Initial Production — **Full-Rate Production & Deployment**

Operations and Support
Sustainment — **Disposal**

JSF Master Schedule

FY	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CY	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015

Major Program Events

Critical Design Reviews
- USAF / USMC
- USN CDR

First Flights
- USAF
- USMC
- USN

Initial Operational Capability
- USMC
- USAF
- USN

Test Completions
- Developmental
- Operational

AA-1 (15 Dec)

CATB (23 Jan)

Low-Rate Initial Production (LRIP)

Production and Sustainment
- LRIP 1 (2)
- LRIP 2 (12)
- LRIP 3 (19)
- LRIP 4 (32)
- LRIP 5 (47)
- LRIP 6 (118)
- LRIP 7 (132)

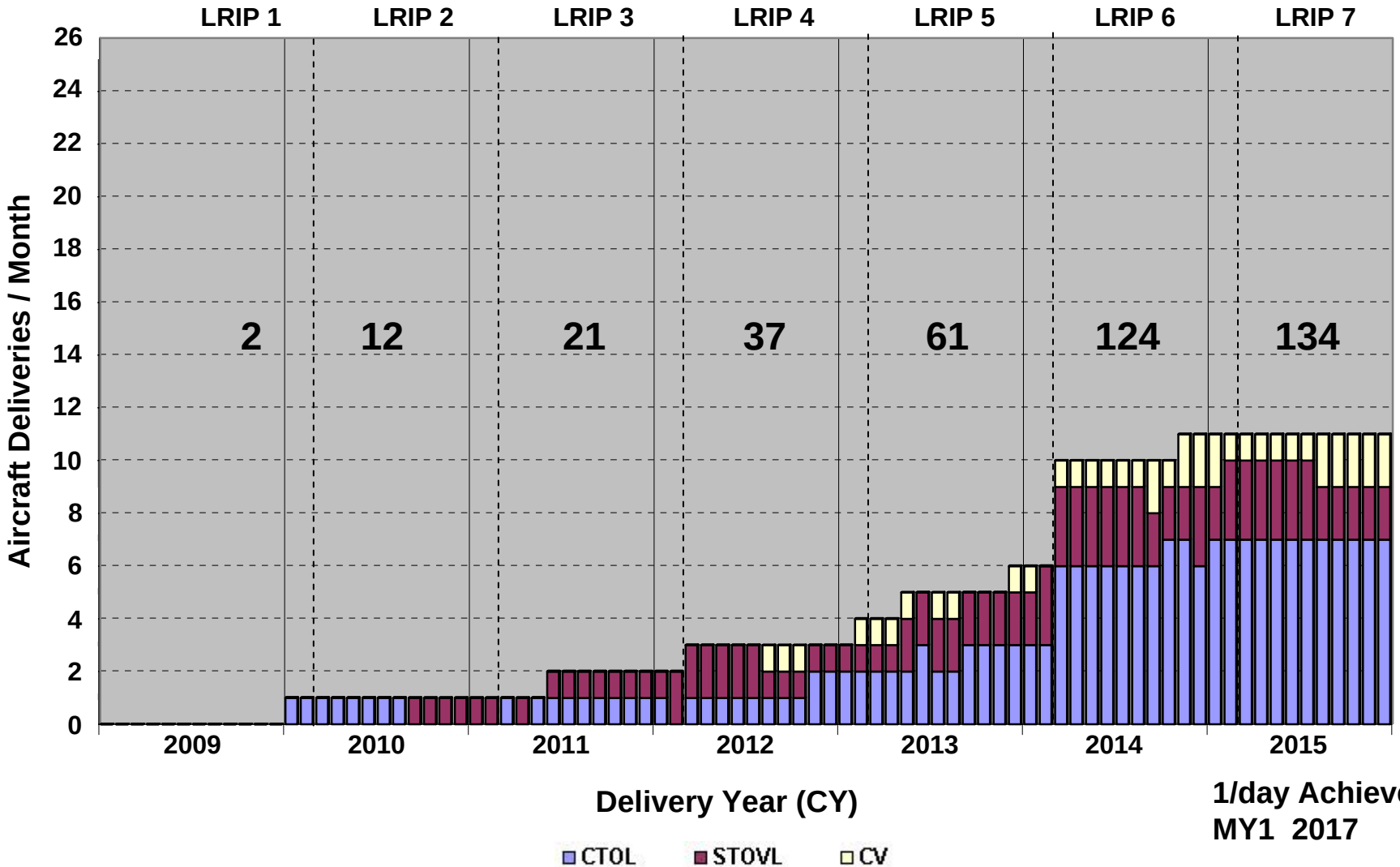
Multi-Year 1 — EOQ — MYP →

Planned U.S. Production and Sustainment
- Air Force 1,763 A/C
- Dept of Navy 680 A/C

Planned International Production > 500

EOQ = Economic Order Quantity *MYP = Multi-Year Procurement*

LRIP Deliveries by Variant



1/day Achieved
MY1 2017

Major Accomplishments

Flight Test

AA-1:
- **62 Total Flights, 99.9 flight hrs**
- **Significant risk reduction (Fuel Dump, Flight Controls, Electrical System, PTMS)**
- **Successful Edwards Deployment (Air Starts, High Fidelity Noise Data, High Sortie Completion Rate)**

CATB:
- **First Flight: 23 Jan 07**
- **37 Total Flights /105.7 Total hours/13.5 Mission Systems hours (INS/GPS integration flights)**

BF-1:
- **First Flight 11 Jun 2008**
- **14 Flights, 13.3 flight hrs (Initial Hover Pit, STOVL Doors Open in Flight, Electrical System, IPP Test)**

BF-2:
- **First Flight 25 Feb 09**

Production

- **All 19 SDD and 2 LRIP Aircraft in production**

Development

- **Autonomic Logistics Information System Operational and Supporting AA-1**
- **61% of all JSF software complete and in test**
- **All three variants tracking to NTE weight growth forecasts and meeting KPPs**

Subsystems

- **All mission Sensors Flown on Test Beds (Radar, DAS, EOTS, EW/CM)**
- **Radar Blk 0.5 software tracked open air targets over Fort Worth from the lab and displayed on PCD**
- **Electro-Optical Targeting System Planar Array Sensor re-designed and delivered to LM**

F135

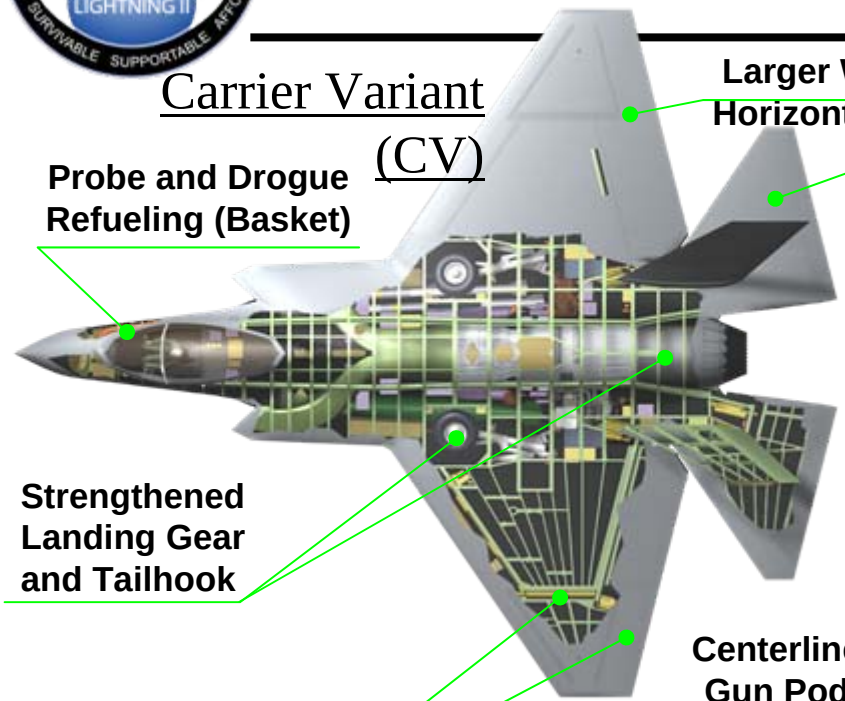
- **10,281 total hours on 13 engines (as of 6 Oct 08)**
- **Supporting AA-1 and BF-1 flight test**
- **STOVL retrofit engine on track for Jan 09 Delivery**

F136

- **712 total hours on 2 engines (002 and 003) (as of 6 Oct 08)**
- **First Engine to Test (FETT) Engine 004 successful light off**

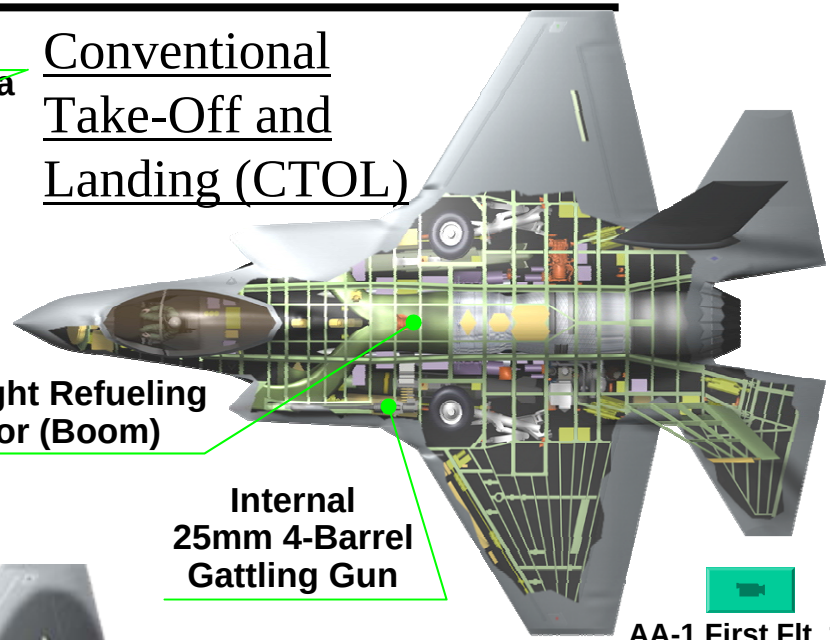
Multi-Service Design

Carrier Variant (CV)



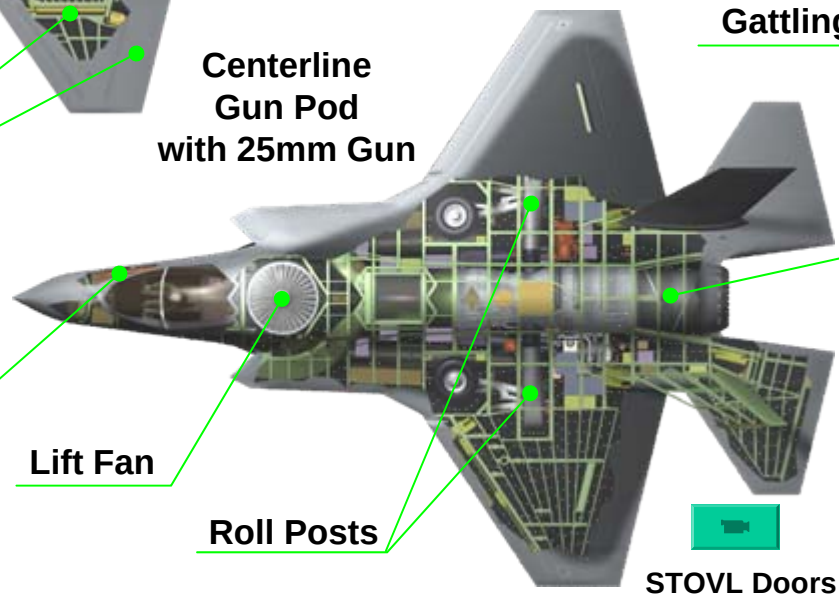
- Larger Wing and Horizontal Tail Area
- Probe and Drogue Refueling (Basket)
- Strengthened Landing Gear and Tailhook
- Wingfold and Ailerons Added

Conventional Take-Off and Landing (CTOL)



- In-Flight Refueling Door (Boom)
- Internal 25mm 4-Barrel Gattling Gun

AA-1 First Flt 15 Dec 06



- Centerline Gun Pod with 25mm Gun
- 3-Bearing Swivel Nozzle
- Probe and Drogue Refueling (Basket)
- Lift Fan
- Roll Posts

STOVL Doors inflight

Short Take-Off and Vertical Landing (STOVL)

BF-1 First Flt 11 Jun 08

IBIT

CTOL Comparison

Length	**49.7 ft**
Span	**31 ft**
Wing Area	**300 ft^2**
Internal Fuel	**7,162 lb**

Length	**50.5 ft**
Span	**35 ft**
Wing Area	**460 ft^2**
Internal Fuel	**18,307 lb**

Length	**62.1 ft**
Span	**44.5 ft**
Wing Area	**840 ft^2**
Internal Fuel	

STOVL Comparisons

Length	**56 ft**
Span	**37.4 ft**
Wing Area	**400 ft2**
Internal Fuel	**10,800 lb**
Spot factor	**1.0**

Length	**50.5 ft**
Span	**35 ft**
Wing Area	**460 ft2**
Internal Fuel	**13,400 lb**
Spot Factor	**1.09**

Length	**47.4 ft**
Span	**30.3 ft**
Wing Area	**239 ft2**
Internal Fuel	**7915 lb**
Spot Factor	**.82**

Carrier Comparison

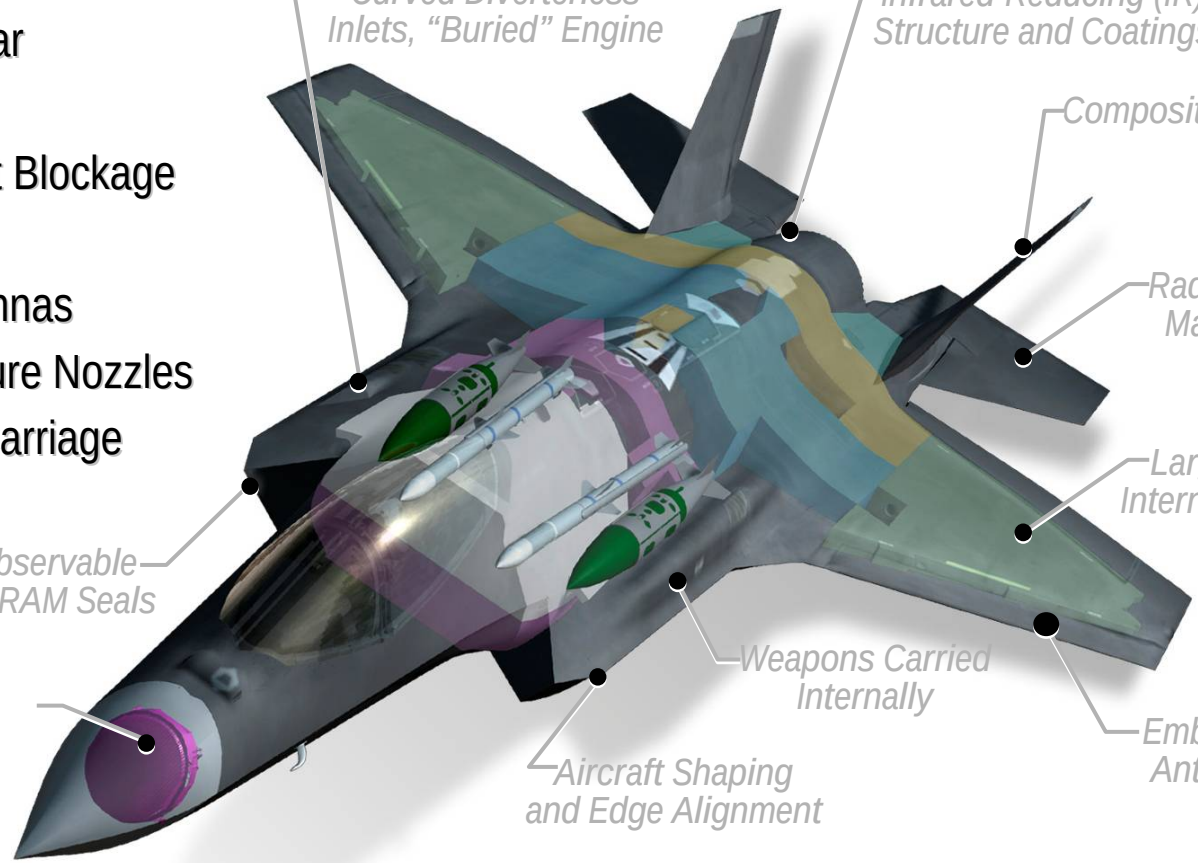
Length	56 ft
Span	37.4 ft
Wing Area	400 ft^2
Internal Fuel	10,800 lb
Spot Factor	1.0

Length	50.8 ft
Span	43 ft
Wing Area	620 ft^2
Internal Fuel	19,145 lb
Spot Factor	1.11

Length	60.38 ft
Span	42 ft
Wing Area	500 ft^2
Internal Fuel	14,708 lb
Spot Factor	1.24

VLO Stealth Design

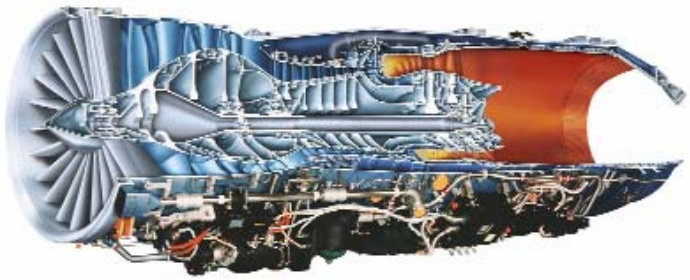
- Internal Fuel Tanks
- Fixed Array Radar
- Engine Inlets
- Full Line-of-Sight Blockage
- Aligned Edges
- Embedded Antennas
- Reduced Signature Nozzles
- Internal Stores Carriage



Fundamental 5TH Design Features Can Not Be Retrofitted

JSF Engine Interchangeability

- **Physically and Functionally Interchangeable**
- **Any Aircraft Able to Use Any Engine**
- **Common JSF Autonomic Logistics System Interfaces**



PRATT & WHITNEY F135

GE AIRCRAFT ENGINES/ ROLLS ROYCE F136

JSF Engines - - Common Core for Aircraft Variants, Competition in Production

F-35 Integrated Avionics

Full Spherical Coverage by RWR & Distributed Aperture System (DAS)

360° Coverage

Electro-Optical Targeting System (EOTS)
- **Saberliner**

RWR Antennae

DAS Apertures

Active Electronically Scanned Array (AESA)

Radar
- **BAC-111**

Electronic Support Measures

Emitter Locating
- **Sphyraena ESM Flight**

All Aspect Stealth – Low Observable

Mission Systems Test
- **CATB 1st Flight Dec 07**
- **BF-4 1st Flight Mar 09**

Network Connectivity
- **Link-16, VMF, MDL**
- **SINCGARS**
- **Wide Band Tactical (TTNT/WNW)**
- **NEW**
- **SATCOM (Voice/Data/IBS)**

Validating Mission Systems in Flight

QF-4

EO DAS

Sabreliner

EOTS

BAC-111

Radar, EO DAS, INS, GPS

Systems in Test	Flight Hrs	Lab Hrs
HMD	97.6 Hrs (AA-1/BF-1)	14456
Radar	227 Hrs (BAC-111) 1 Hr CATB	18000
EO DAS	245 Hrs (F-16, BAC-111, QF-4) (CATB – 1Q ’10)	25282
EOTS	152 Hrs (Sabreliner) (CATB – 4Q ’09)	10680
Integrated CNI	109 Hrs INS/GPS: AA-1/BF-1 126 Hrs INS/GPS: BAC-111 35 Hrs RALT 20 Hrs CATB	12000 (Supplier) 8155 (MSIL)
EW/CM	101 Hrs (CATB –1Q ’09)	28842

F-16

DAS, EW CM

F-35 AA-1

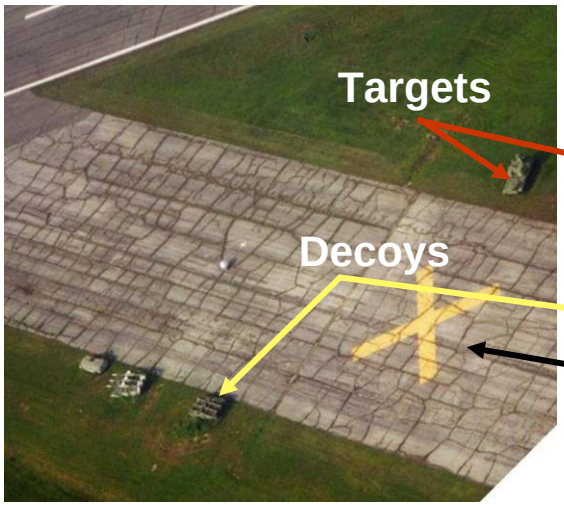
HMD **MFD**

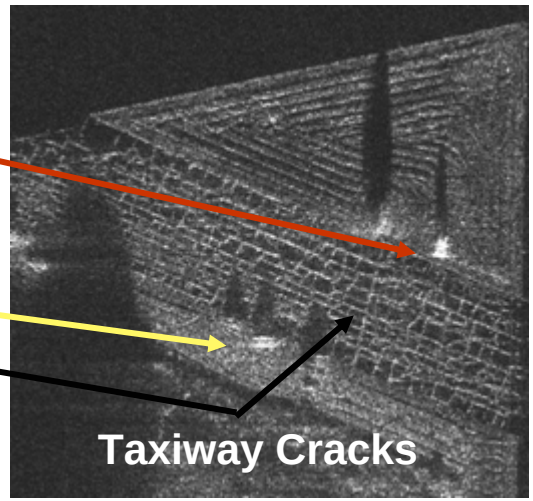
CATB

Fully Integrated MS

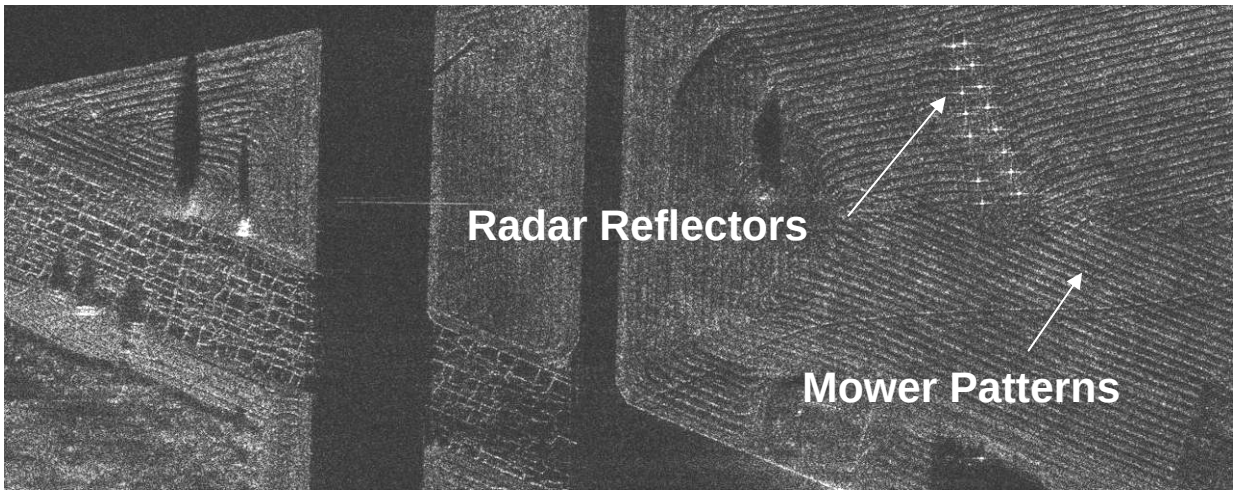

CATB
COOPERATIVE AVIONICS TEST BED
N35LX
LOCKHEED MARTIN
NORTHROP GRUMMAN
BAE SYSTEMS
F-35
AA-1

APG-81 Advanced Electronically Scanned Array (AESA) Radar



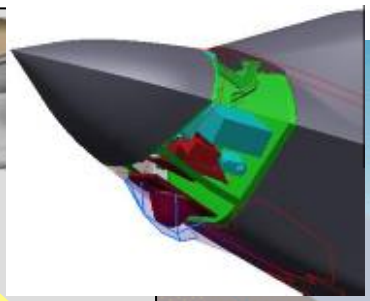


APG-81 Ultra High Resolution SAR Imagery



Electro Optical Targeting System Operational Capabilities

EO Targeting System



- Internally Mounted
- Long Range, High Resolution
- NAVFLIR, Targeting FLIR, IRST Functions
- Digital Continuous Zoom

Long Range A-A IRST

Air-to-Surface Targeting FLIR

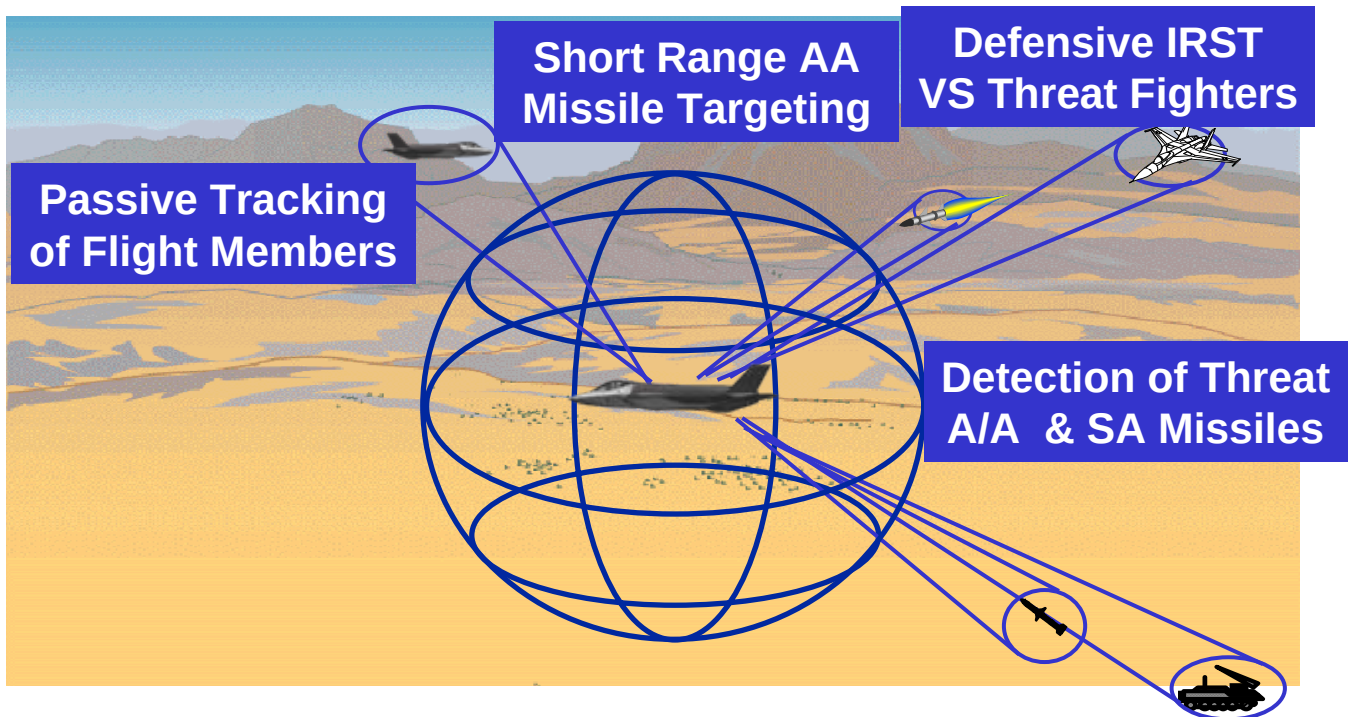
Laser Designation

Laser Spot Tracker

The Advanced EOTS Provides Passive Multi-Spectral A/A and A/G Capabilities As Well as Enhanced A/G Target ID Capability

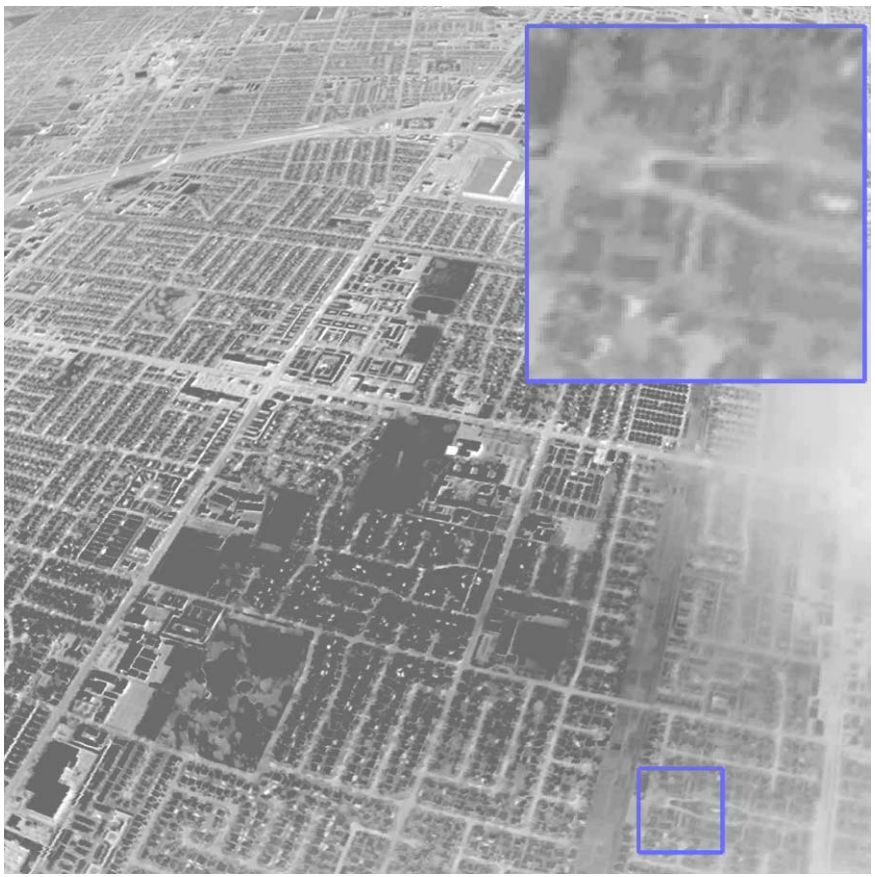
Distributed Aperture System (DAS)

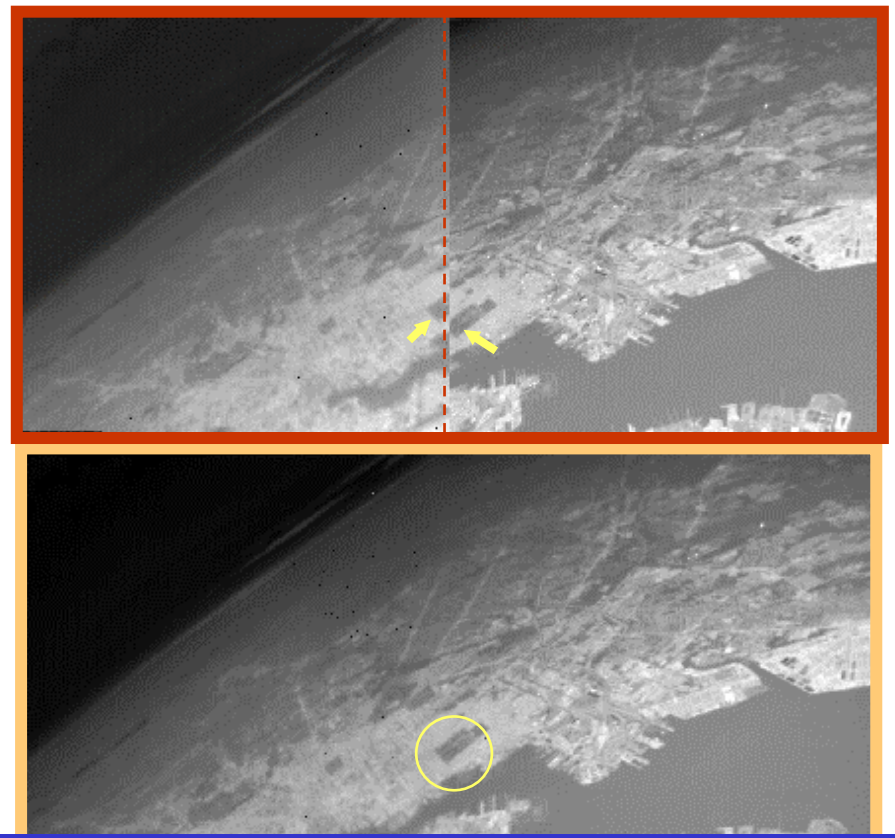
- **Total Situational Awareness Around Aircraft**
- **Track Wingmen & Threat Aircraft**
- **Missile Launch Detection**
- **NAVFLIR Functions**
- **Integrated with HMD**



EO Distributed Apertures Flight Demonstration

JSF Generates 6 Continuous Images….





….Seamlessly Stitched Together For Full 360 Degree Imaging Capability

Aircraft Communications Capability

- Funded
- Planned

Identification/Surveillance

- Mark XII Transponder and Interrogator
  - Modes 1, 2, 3/A, C, 4, 5
- Mode S (transponder only)
- Mode S (interrogator)

Voice Communications

- UHF/VHF Clear/Secure
- HAVEQUICK
- Survival Radio Comm
- Link 16
- MADL
- SATCOM (DAMA/MUOS)

Data Communications

- Link 16 (J-Series)
- VMF (K-Series)
- MADL (intra-flight data link)
- P5 CTS
- IBS (TIBS/TDDS)
- Streaming Video (Rover format)
- Tactical Wide Band IP based DL
- SATCOM (DAMA/MUOS)

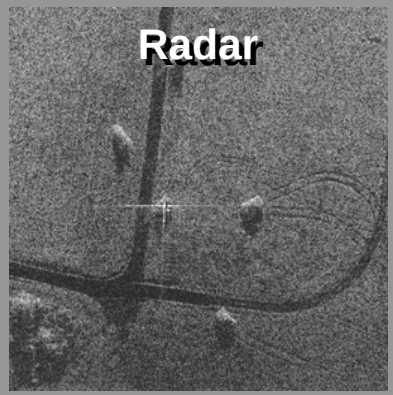
Navigation/Landing Aids

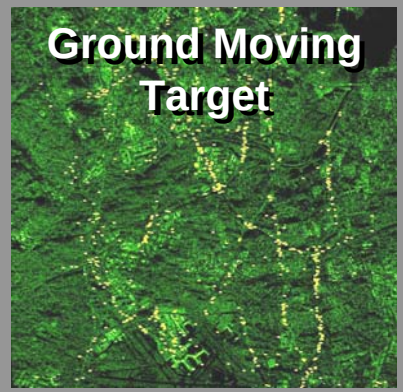
- INS
- GPS
- ILS
- TACAN
- ICLS
- JPALS (partial)
- JPALS (full)

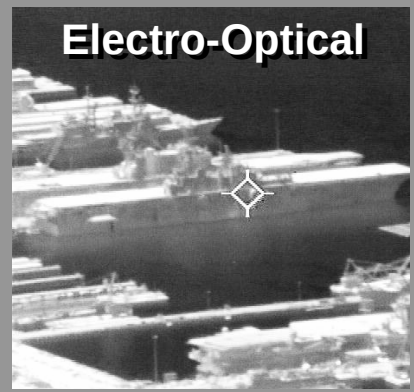
Weapons

- X-band (AIM-120, AIM-9X)
- NEW (Link-16 network enabled weapons: JSOW, SDB-II)

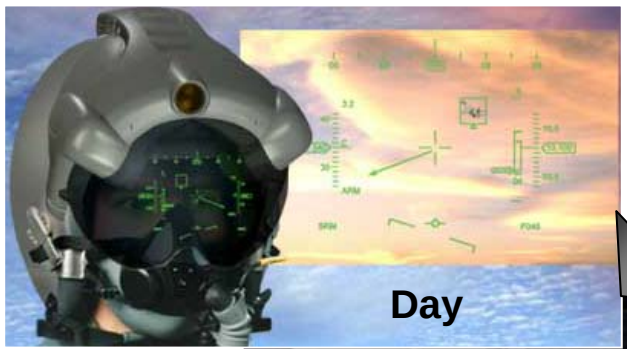
Enhanced Sensor Fusion & Information Displays Total Situational Awareness



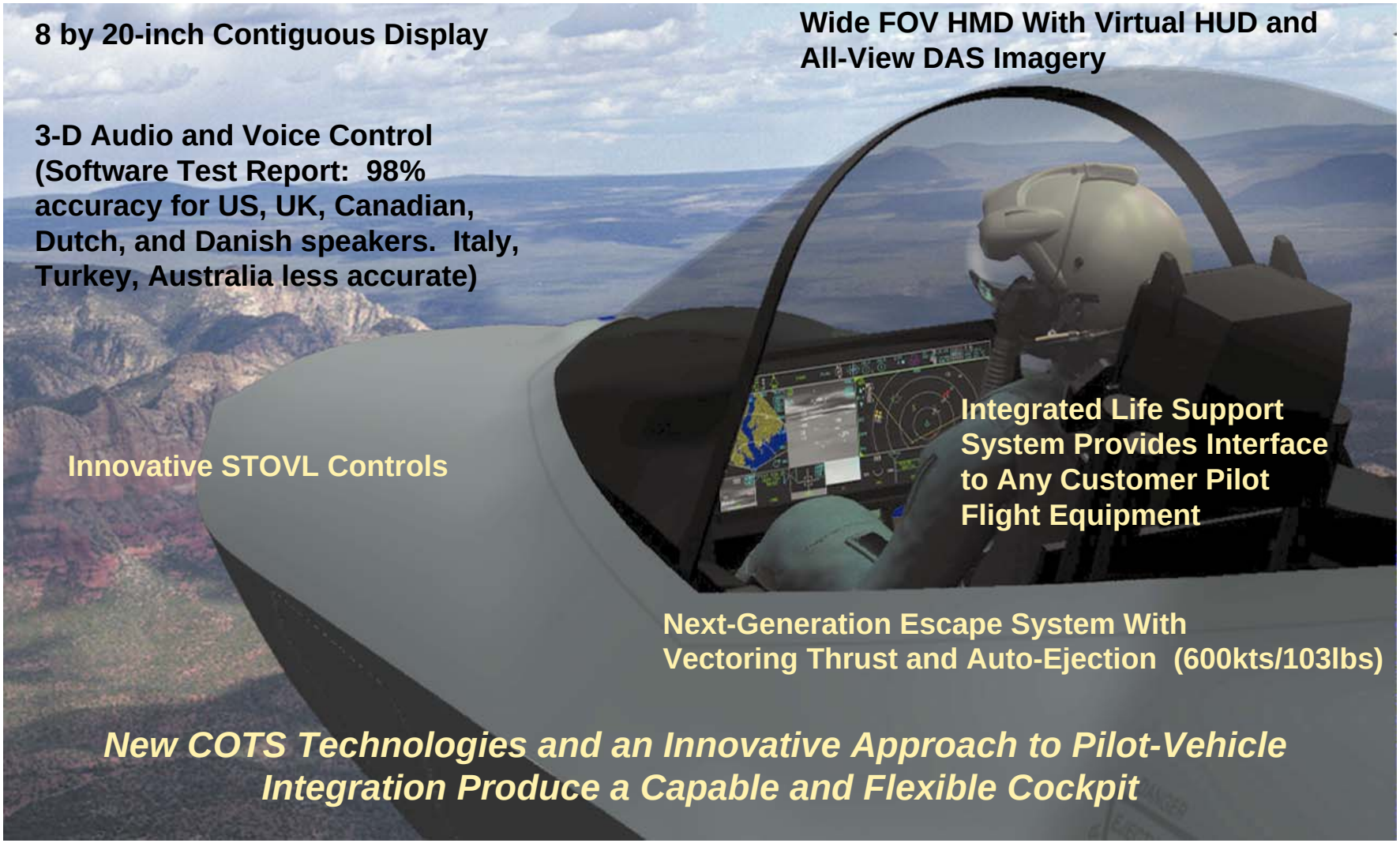




Fused Tactical Information Managed & Displayed To The Pilot



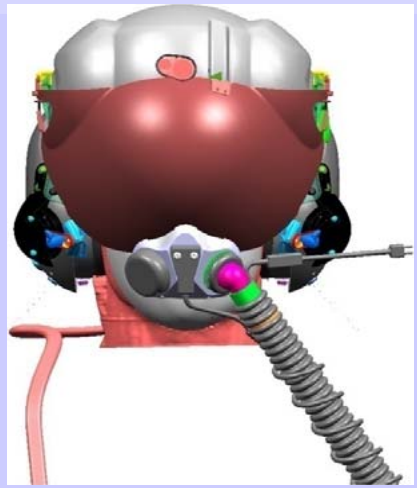
JSF Crew Station

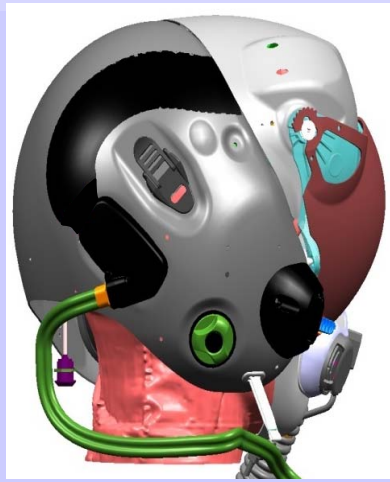


HMDS

DESCRIPTION

- **Provides head protection, virtual HUD, video stream and night camera for F-35 pilots**
- **HMDS components include**
  - **Display Management Computer (DMC/H)**
  - **Head-tracker Transmitter Unit (HTU) – on seat**
  - **Fixed Camera – above glare shield**
  - **Helmet Assembly Unit (HAU) – helmet, ANR ear cups, HVI and modified MBU-23/P**
  - **Helmet Display Unit (HDU) – display source, optics, visors (2), head-tracker receiver unit (HRU)**



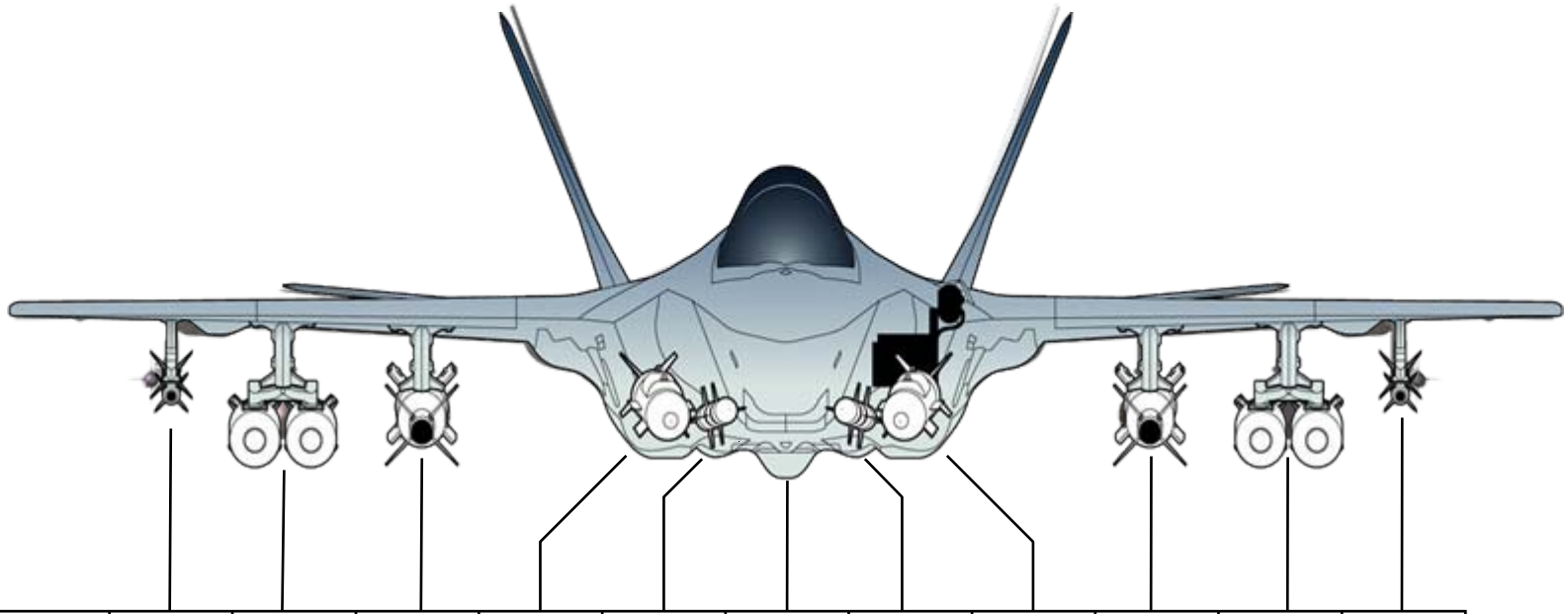


Panoramic Cockpit Display

DESCRIPTION

- 8 x 20 AMLCD Head Down Display
- Single Piece of Glass
- 12 operator selectable portals, or two 7x10 portals
- Touch Screen Interface
- Provides virtual Keypad for system control
- Function Action Bar (FAB) for time critical system controls

Weapons Stations

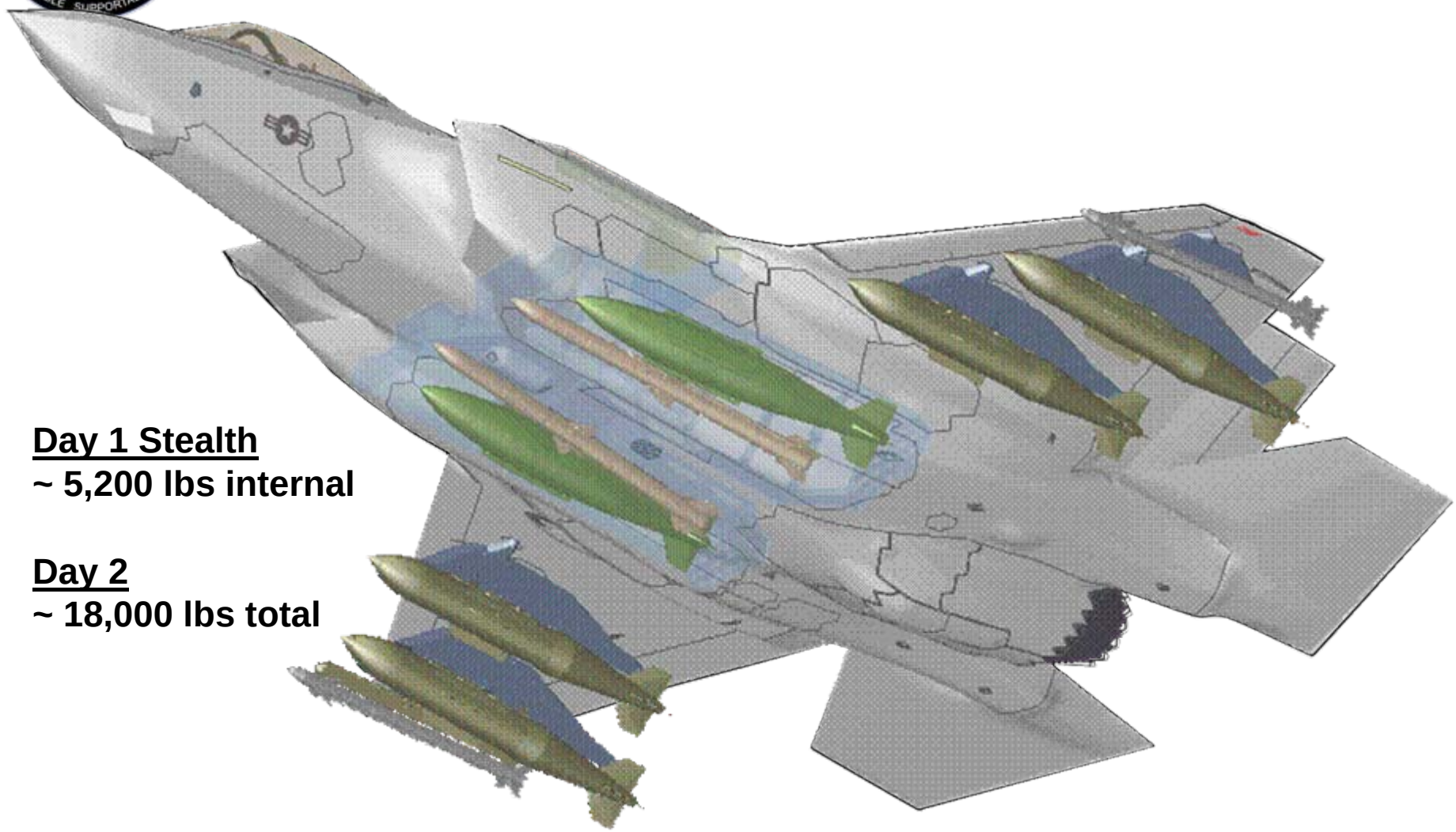


Station	11	10	9	8	7	6	5	4	3	2	1
Store	A/A	A/A, A/S	A/A, A/S	A/A, A/S	A/A	A/S	A/A	A/A, A/S	A/A, A/S	A/A, A/S	A/A
Weight	300	2,500*	5,000	2,500*	350	1,000	350	2,500*	5,000	2,500*	300

- **Over 18,000 Lbs Ordnance Capacity**
- **Non-pyrotechnic Suspension and Release**

*** STOVL Stations 2/10 & 4/8 Reduced to 1,500 (SWAT)**

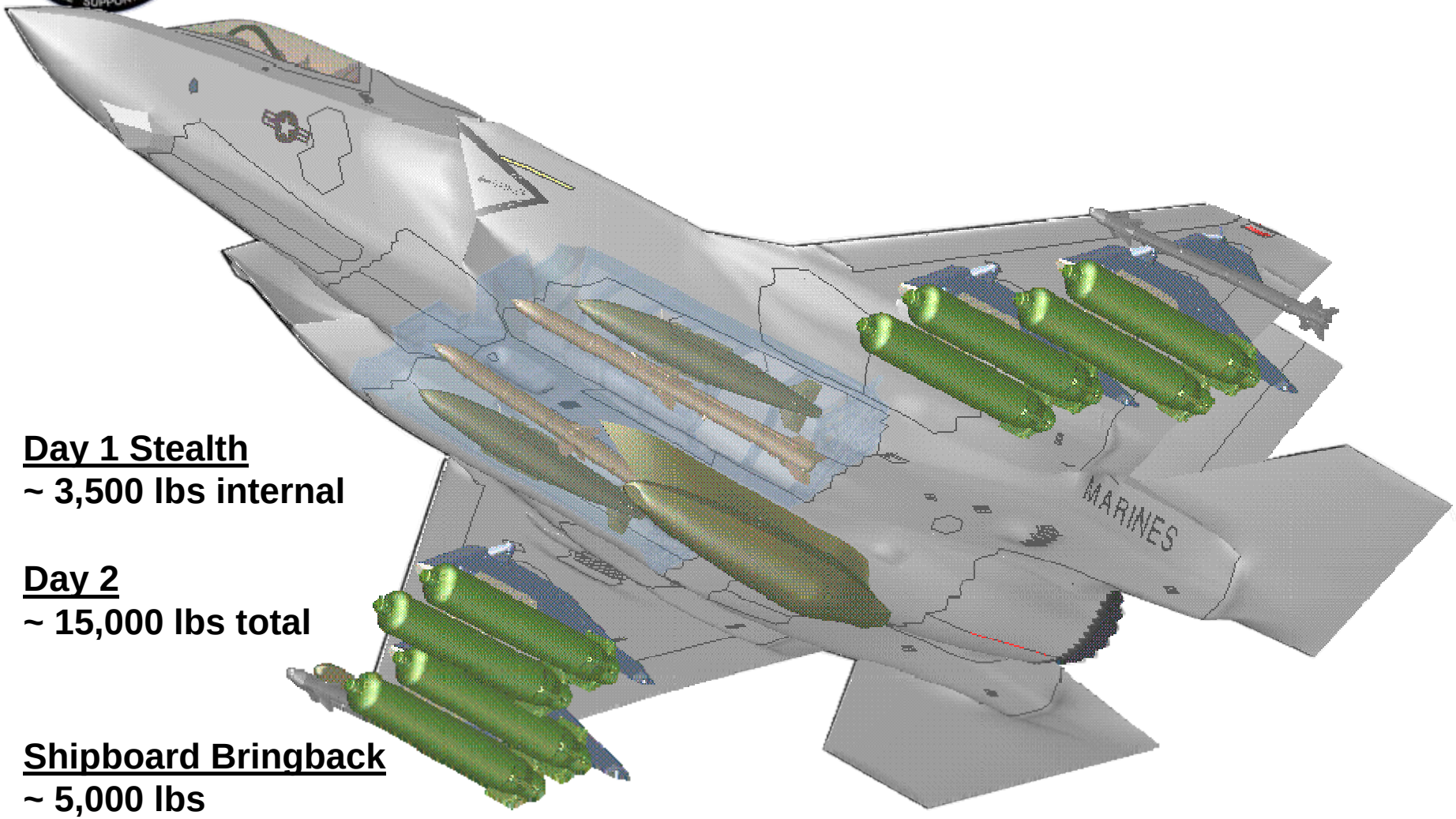
CTOL Loading



Day 1 Stealth
~ 5,200 lbs internal

Day 2
~ 18,000 lbs total

STOVL Loading

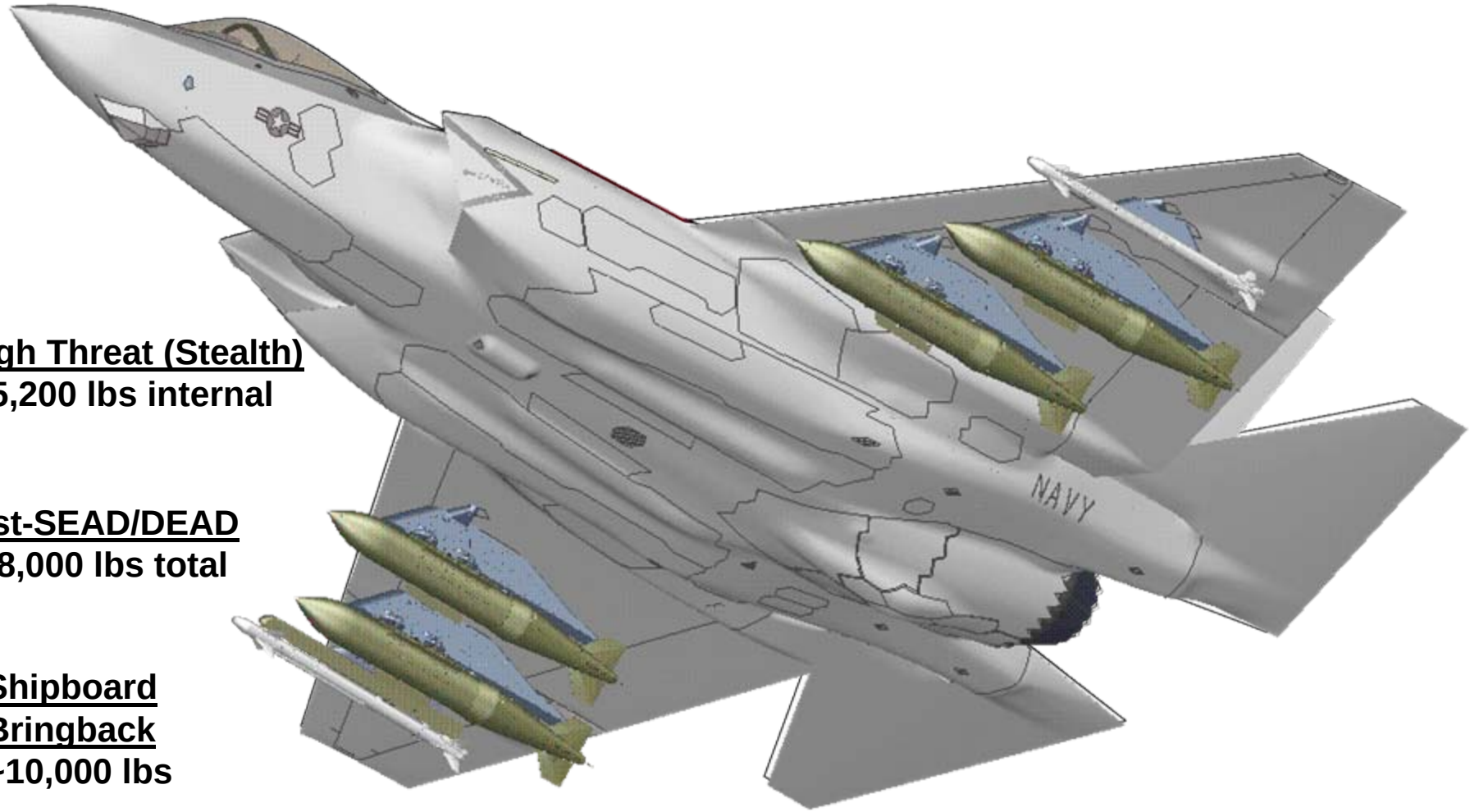


Day 1 Stealth
~ 3,500 lbs internal

Day 2
~ 15,000 lbs total

Shipboard Bringback
~ 5,000 lbs

CV Loading



High Threat (Stealth)
~ 5,200 lbs internal

Post-SEAD/DEAD
~ 18,000 lbs total

Shipboard Bringback
~10,000 lbs

CTOL & CV Weapons Carriage Requirements

Store Fully Certified During SDD

EXTERNAL WEAPONS

426 -Gallon Wing Tank

Stormshadow

GBU-38 JDAM 500-lb (MK-82 Warhead)

AGM-158 JASSM

MXU-648/CNU-88 Baggage Pod

AGM-154A/C JSOW Glide Bomb

AIM-120B/C AMRAAM

GBU-31 JDAM 2,000-lb (MK-84 Warhead)

AIM-9X Sidewinder

GBU-32 JDAM 1,000-lb (MK-83/BLU-110 Warhead)

BDU-57/58/60 Laser-Guided Training Round

GBU-31 JDAM 2,000-lb (BLU-109 Warhead)

Missionized Gun

Brimstone/Joint Common Missile

MK-76/MK-58/BDU-48

INTERNAL

GBU-32 JDAM 1,000-lb (MK-83/BLU-110 Warhead)

GBU-12 Paveway II 500-lb LGB (MK-82 Warhead)

GBU-31 JDAM 2,000-lb (MK-84 Warhead)

AGM-154A/C JSOW Glide Bomb

CBU-103/105 WCMD

GBU-38 JDAM 500-lb (MK-82 Warhead)

Brimstone/Joint Common Missile

GBU-31 JDAM 2,000-lb (BLU-109 Warhead)

AIM-120C AMRAAM

AIM-132 ASRAAM

Weapons Currently Under Development

UK 500# PGB

Phase I SDB

EXTERNAL WEAPONS

GBU-10 Paveway II 2,000-lb LGB (MK-84 Warhead)

GBU-24A/B Paveway III 2,000-lb LGB (MK-84 / BLU-109 Warhead)

GBU-16 Paveway II 1,000-lb LGB (MK-83 Warhead)

MK-83 BLU-110 LDGP 1,000-lb LDGP

MK-83 BSU-85 HDGP

MK-84 2,000-lb LD/HDGP

MK-84 BSU-50 Ballute 2,000-lb HDGP

GBU-12 Paveway II 500-lb LGB (MK-82 Warhead)

MK-82 500-lb LD & HD

CBU-99/100 Rockeye II Cluster Munition

CBU-103/105 WCMD

AIM-132 ASRAAM

STOVL Weapons Carriage Requirements

Store Fully Certified During SDD

EXTERNAL WEAPONS

426 -Gallon Wing Tank

Stormshadow

GBU-38 JDAM 500-lb
(MK-82 Warhead)

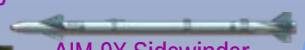
AGM-158 JASSM

MXU-648/CNU-88 Baggage Pod

AGM-154A/C JSOW Glide Bomb

AIM-120B/C AMRAAM

GBU-31 JDAM 2,000-lb
(MK-84 Warhead)

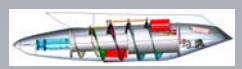


AIM-9X Sidewinder

GBU-32 JDAM 1,000-lb
(MK-83/BLU-110 Warhead)

BDU-57/58/60
Laser-Guided Training Round

GBU-31 JDAM 2,000-lb
(BLU-109 Warhead)



Missionized Gun

Brimstone/Joint
Common Missile

MK-76/MK-58/BDU-48

INTERNAL

GBU-32 JDAM 1,000-lb
(MK-83/BLU-110 Warhead)

GBU-12 Paveway II 500-lb LGB
(MK-82 Warhead)

CBU-103/105 WCMD

GBU-38 JDAM 500-lb
(MK-82 Warhead)

Brimstone/Joint
Common Missile

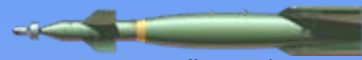
AIM-120C AMRAAM

AIM-132 ASRAAM

EXTERNAL WEAPONS

GBU-10 Paveway II 2,000-lb LGB (MK-84 Warhead)

GBU-24A/B Paveway III 2,000-lb LGB (MK-84 / BLU-109 Warhead)



GBU-16 Paveway II 1,000-lb LGB (MK-83 Warhead)

MK-83 BLU-110 LDGP 1,000-lb LDGP

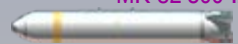
MK-83 BSU-85 HDGP

MK-84 2,000-lb LD/HDGP

MK-84 BSU-50 Ballute 2,000-lb HDGP

GBU-12 Paveway II 500-lb LGB
(MK-82 Warhead)

MK-82 500-lb LD & HD



CBU-99/100 Rockeye II
Cluster Munition

CBU-103/105 WCMD

AIM-132 ASRAAM

Weapons Currently Under Development

UK 500# PGB

Phase I SDB

Weapons Integration Progress

Design Integration

Completed 3200+ Stores WT Testing
AMRAAM, JDAM and JSOW Simulators
Delivered for SW Integration & Testing

CTOL Gun System Testing

Fired 60,000+ Total Rnds on CTOL
36K Qual Test Complete
5000 Rnds fired on STOVL gun pod

S&RES Testing

S&RES Qual Testing Complete
Rack Compatibility Tests Complete
for all SDD Stores

SMS Testing

Fuselage Remote Interface Unit Qual
Testing Complete, Installed on BF-1

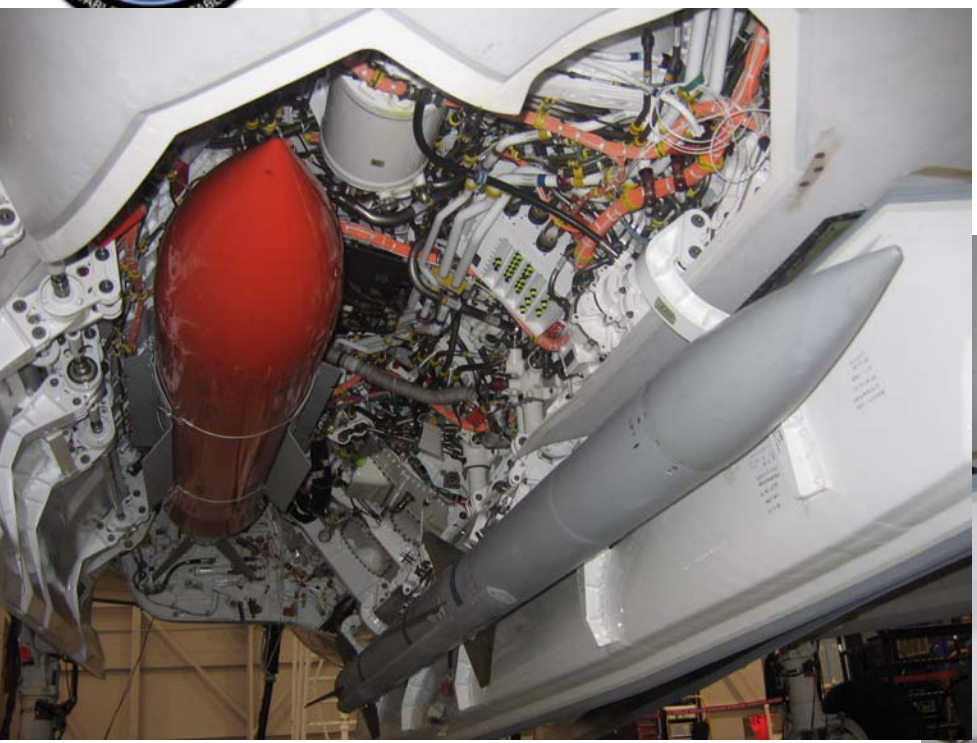
AME Hardware

BF-1 AME Complete - SCT/GVT With
AMRAAM, GBU-32 & Ext AIM-9X Completed

Flight Clearance

AA-1 Cleared for Captive Weapon Carriage

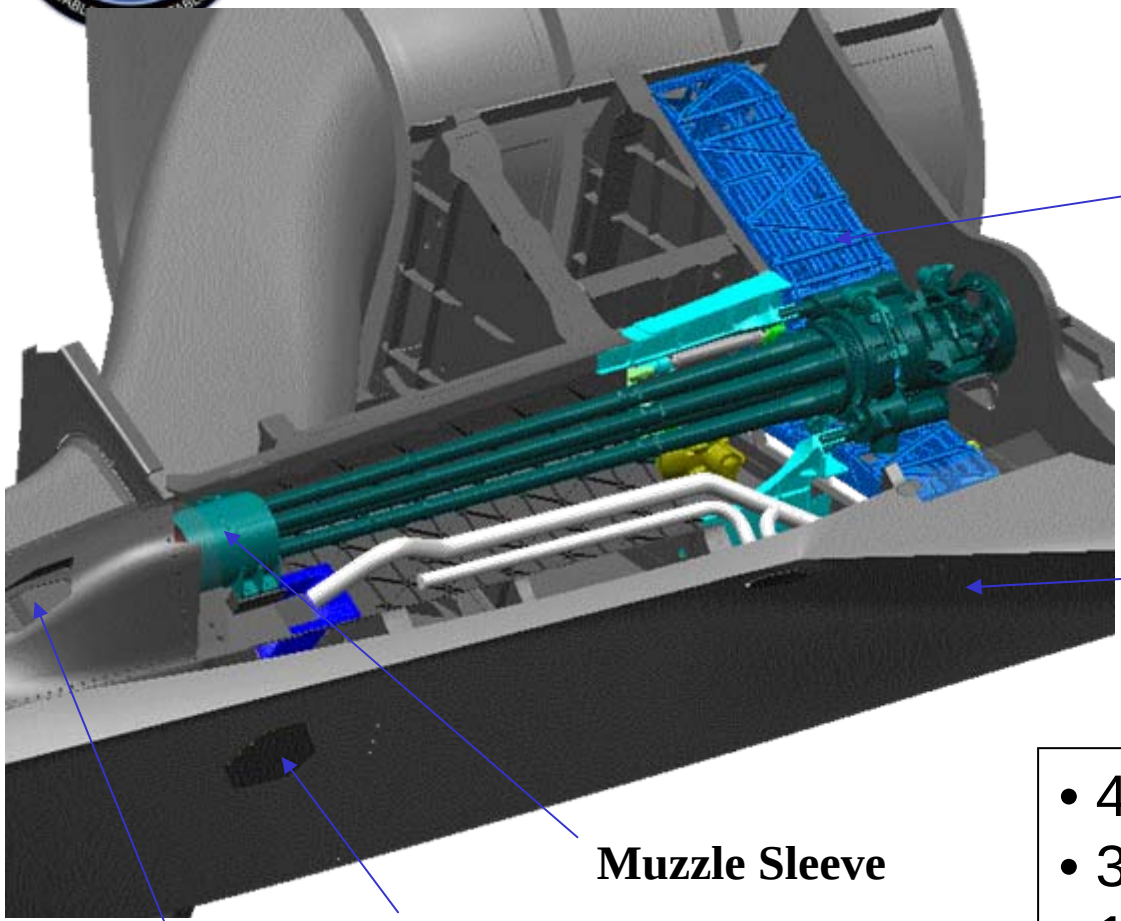
Weapons Installed/Flown on AA-1



Loaded Inert AMRAAM & GBU-31/32

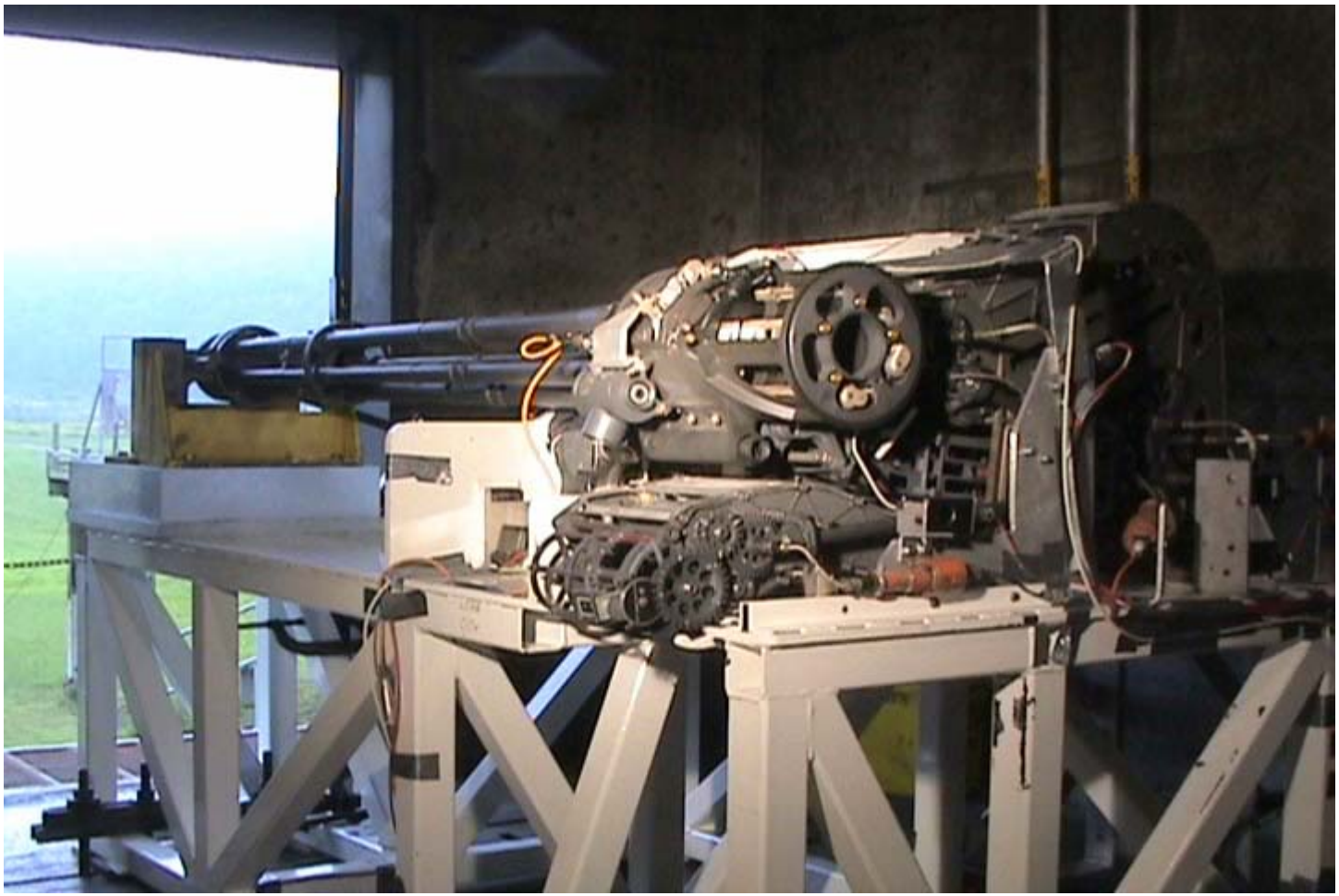
BF-1 Fit Check: 1000lb JDAM, AMRAAM

CTOL Gun System Installation
General Dynamics GAU-22 25mm Gun



- 4 Barrel 25mm Gatling gun
- 3000 SPM firing Rate
- 182 Rounds PGU-20 (DU)
- Hydraulic Drive

GAU-22; 30 Round Burst



Questions?

CAPT John “Snooze” Martins
Director, Air Vehicle
F-35 Lightning II Program Office
John.martins@jsf.mil

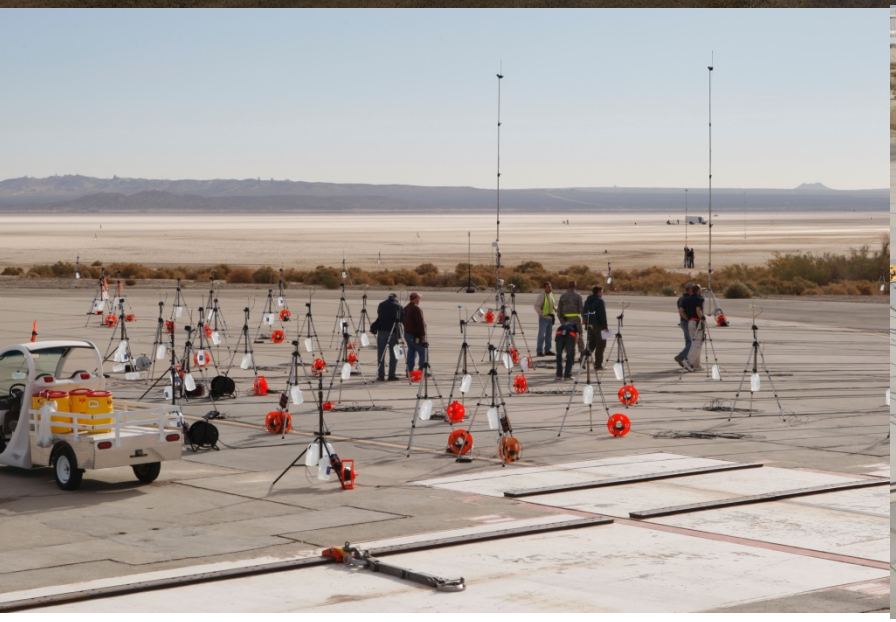
JSF Flight Test Video

JSF Program Video


STOVL
F-35


BF-02

Edwards Noise Testing
Ground Run-Up Photos



Edwards Noise Testing
Flyover Photos

Precision Fires Rocket and Missile Systems

Presentation to Precision Strike Association Annual Review

Fort Walton Beach, FL 11 March 2009

Recipients of the 2008 William J. Perry Award

COL David J. Rice
Project Manager
Precision Fires Rocket and Missile Systems
Phone (256) 876-1196 (DSN 746)
Email: david.rice@msl.army.mil

Any Warfighter - Anywhere - All The Time

PFRMS Systems at War

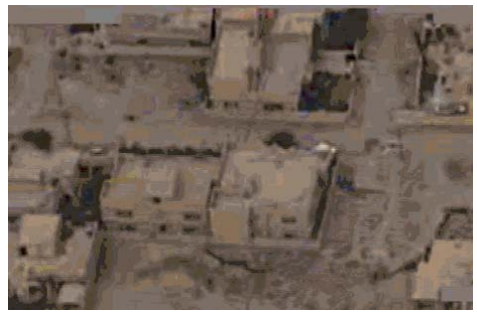
- All systems are supporting the Global War on Terrorism
- Currently supporting Operation Iraqi Freedom and Operation Enduring Freedom
- Performance is above Army Standards
- Launchers returning in excellent condition requiring only routine and minimal maintenance

M270A1
98% Readiness Rate

HIMARS
99% Readiness Rate

GMLRS Unitary
1,124 Rockets Fired
As of 5 Mar 09
98% Reliability

ATACMS
543 Missiles Fired
As of 10 Dec 09
98% Reliability



GMLRS-Unitary Rocket Usage in Theater

1,124 Total Rockets Fired As Of 5 Mar 2009

Who Shoots GMLRS-U:		
US Army	*648*	*57.65%*
USMC	*27*	*2.4%*
UK	*449*	*39.95%*
M270A1		*51%*
M142		*12%*
M270B1		*37%*

US Army Missions

Who Requests GMLRS-U:		
Army	*421*	*65%*
USMC	*121*	*19%*
Other	*106*	*16%*
How GMLRS-U is employed:		
Troops in Contact	*183*	*28%*
Pre-Planned	*465*	*72%*
Environments employed:		
Urban/COIN	*619*	*96%*
Other (TD/Test)	*29*	*4%*

Operationally Effective: 98.3%

Capability Gap: Persistent, responsive, all-weather, rapidly-deployable, long-range, surface-to-surface, precision-strike capability.

Description

- GPS-Augmented Inertial Guidance
- 200lb-Class HE IM-Compliant Warhead
- Multi-Fuze Selection (Point Detonating, Delay, Proximity)
- 15-70km Range

Current Targets

- Precisely Located/Mensurated Point targets
- Congested/Complex Urban Targets
- Targets in Areas Where Collateral Damage is of Concern

Effectiveness/Reliability

- BDA Shows High Level of Effectiveness
- Rare Reports of Minor Collateral Damage
- Reliability of US Army Missions: 98.68%

ATACMS QRU Usage In Theater

543 Total Missiles Fired as of 10 Dec 2008

OIF/OEF MISSIONS

Who uses ATACMS?

Army	Joint Operations	145	28%
Marines		77	15%
USAF		290	57%

How ATACMS is Employed:

Time-Sensitive Targets	205	40%
Pre-Planned	307	60%

Employment Environments:

Initial OIF Conflict	460	90%
COIN	52*	10%

*QRU & T2K Unitary

Mission Process

- Target located by Multiple Sensors
- Target refined using Precision Strike Suite - Special Operation Forces or Mensuration via Rainstorm / Raindrop, etc.
- Passed to AFATDS for tactical fire control
- Launcher receives and executes mission

Launcher Theater Accomplishments

- All FAL variants (M270, M270A1, M270B1 and M142) have supported GWOT operations
- Launchers variants currently support both OIF and OEF operations
  - 13 Army M142s support OIF / OEF
  - 4 UK M270B1s support OEF
  - 16 Army M270A1s support OIF
  - 6 USMC M142s support OIF

- Launchers deployed in Theatre continue to perform above Army Standards
  - Operational readiness exceeds 97%
  - Reliability is over 350 hours between System Abort Failures
  - No maintenance issues
- M142 and M270A1 launchers returning from both Theaters are in excellent condition requiring minimal Reset

MLRS Worldwide Third Party Sales

MOU PARTNERS

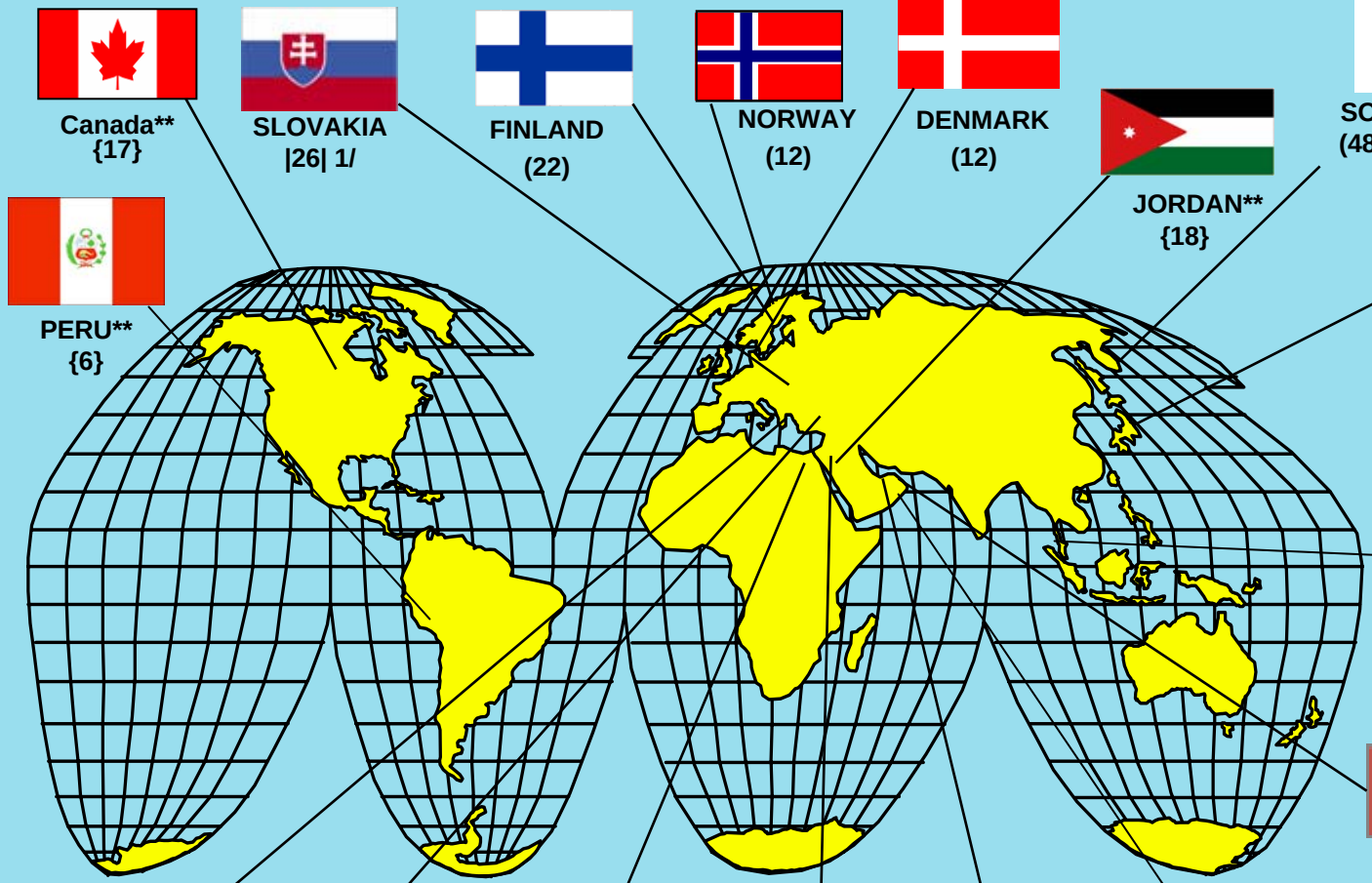
US

UK

FRANCE

GERMANY

ITALY



Canada** {17}

SLOVAKIA |26| 1/

FINLAND (22)

NORWAY (12)

DENMARK (12)

JORDAN** {18}

SOUTH KOREA (48) [10] (A-220)

PERU** {6}

JAPAN (77) + [22] *

SINGAPORE {18}

UAE {20} (A-101)

GREECE (36) (A-100)

TURKEY (12) (A-71)

EGYPT (26)

ISRAEL (48)

BAHRAIN (9) + [6]

(A-30)

OMAN** {20}

(A) ATACMS
{ } HIMARS
( ) M270
[ ] M270A1
* Co-Production

** Potential

1/ ❙❙ RM-70 Modular Launchers / 810 M26 Rockets

The Future for Cluster Munitions

Requirement: Suppress, neutralize, destroy various armored or soft, mobile or fixed, active or passive, precisely or imprecisely located, high-payoff area and point targets

Cluster Munitions Policy Memo (19 Jun 08)

- After 2018, cluster munitions must not produce >1% UXO; limit will not be waived
- No differentiation between types of UXO (hazardous or non-hazardous duds)
- All cluster munition stocks that exceed operational planning requirements will be removed from the inventory as soon as possible, but not later than Jun '09

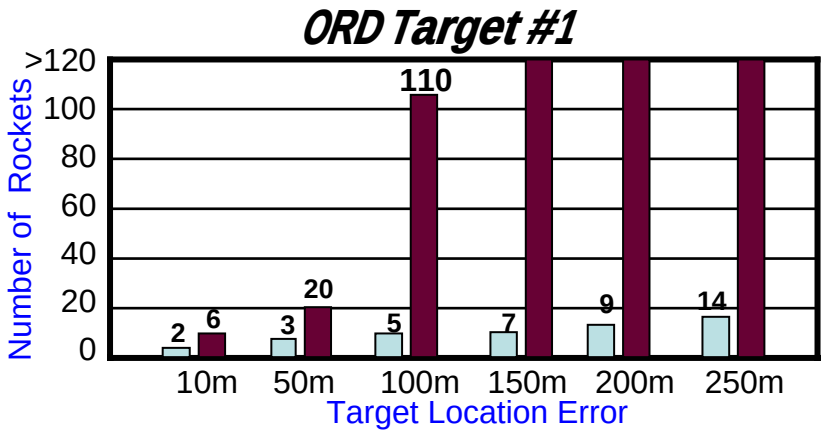
Self Destruct Fuze (SDF) Development and Performance

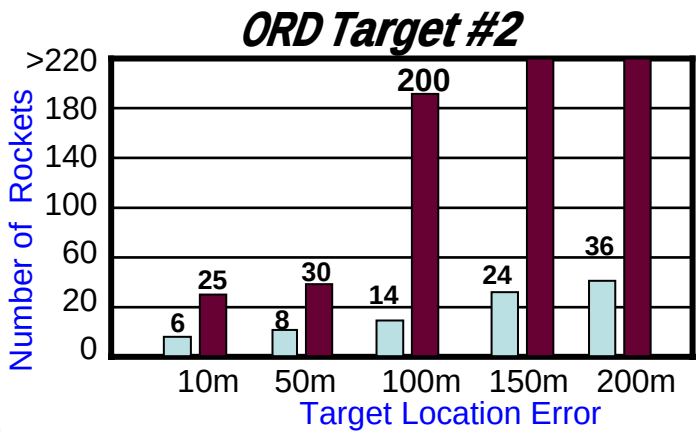
- Previous UXO Requirement: <2% 20-60km; <4% <20km and >60km
  Does not Comply with the new DOD Policy
- GMLRS DPICM w/pSDF demonstrated "hazardous" dud rate of only 0.15%, overall UXO 3.7%:
  Does not comply with the new DOD Policy

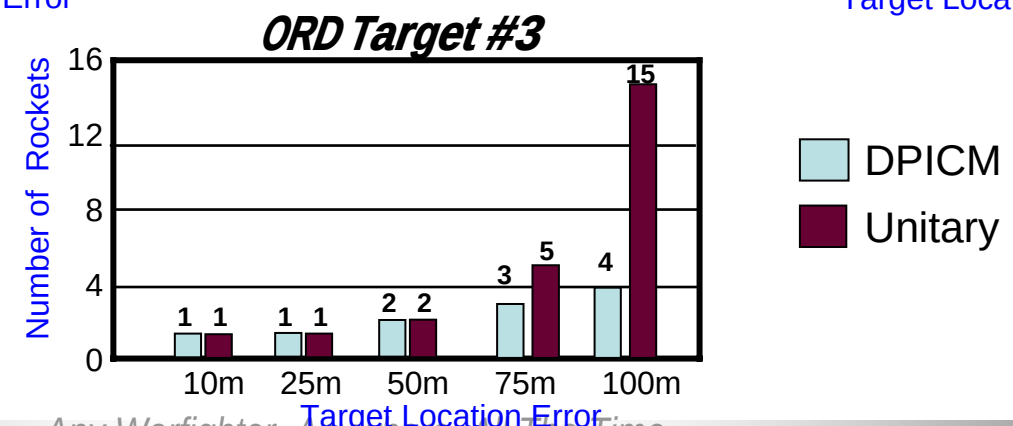
In 2019, the Army will no longer have the ability to efficiently engage inaccurately located and area targets!

GMLRS DPICM ORD Target Engagements

- GMLRS DPICM in Full Rate Production, yet no longer deemed politically suitable
- Unacceptable rate of unexploded ordnance
- Long range radar accuracy is not adequate for efficient GMLRS unitary target engagements beyond cannon artillery ranges







Inventory and Operational Risks

Serviceable Rocket Inventory 2008-2019

2008			2019
Munition	Available munitions	Range	Available munitions
M26 (DPICM)	360,192	32.5km	0
M26A2 (DPICM)	3,924	45.0km	0
M30 (DPICM)	1,914	70.0km	0
M31A1 (Unitary)	204	70.0km	33,006

ZERO

Operational Risks

- GMLRS AWP production schedule may not provide sufficient numbers by 2019 to support COCOM operational plans
- AMSAA/ARL approved models for AWP technologies

Program Overview

- Program composition
  - ACAT 1C with two variants
    - DPICM in Full Rate Production (FRP)
    - Unitary Completing LRIP headed to FRP Decision
  - Variants share documentation
    - APB
    - Common Funding (RDTE and Procurement) Lines

Second Order Effects

- Impact to APB
- Item C of Nunn-McCurdy ADM (April 2007)
- Future of DPICM Production
- Elimination of DPICM, impact on the USMC and FMS Customers

AWP Performance Parameters

- Meets DPICM ORD requirements in servicing targets
- Produce no residual cluster munition UXO
- Achieve required warhead IM rating
- Compatible with the M270A1 and HIMARS Launchers

GMLRS System Description

Unitary Unique Components

Electronic Safe & Arm Fuze (ESAF)

Warhead

Prox Sensor

Radome

GMLRS Common Components

Spring Fins

Roll Joint Motor

Control Actuation System

Guidance Processor Electronics

Canards

Battery

Nose Cap

DPICM Unique Components

Payload Dispensing Core Assembly

Sub-munitions

Electronic Safe & Arm Device (ESAD)

Alternative Warhead Unique Components

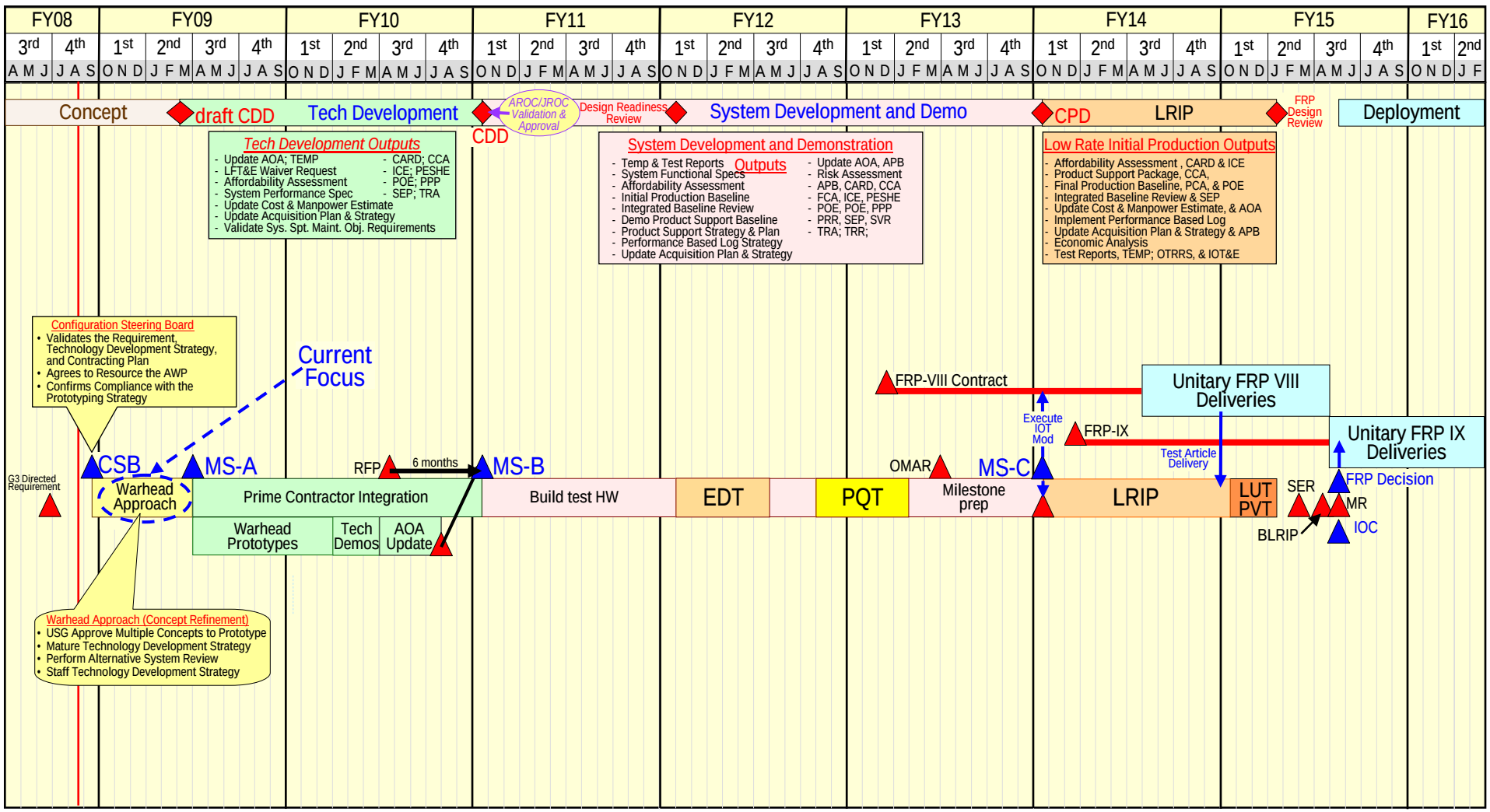
Warhead

Fuze TBD

Nose Cap TBD

Prox Sensor TBD

AWP Schedule Overview



Review of Eliminating DPICM

- Current pSDF (nor DPICM) is not compliant with DoD cluster munition policy
- Must demilitarize all non-compliant DPICMs after 2018; cost TBD
- UAE DPICM Procurement in FRP 4
- USMC Unexercised DPICM Option in FRP 4

Recommend Build Unitary in Lieu of DPICM FY09-FY13

Questions?

Strike – from an OSD Perspective

Keith Sanders

Precision Strike Annual Review 2009
March 10, 2009

Outline

- Department's Precision Engagement Vector
  - Guidance from the Secretary of Defense
  - Operational emphasis and CONOPS
  - What does it all mean?
- Business Practice Changes
  - Acquisition policies
  - Cost and schedule control
  - Program governance and Legislative initiatives
- Implications

The Department's Strike Vector

SecDef's Perspectives & Priorities

"When we are at war, I believe the overriding priority of the Defense Department and military services should be to do everything possible to provide troops in the field everything they need to be successful."

"The question I keep coming back to is, why did I have to go outside the regular Pentagon bureaucracy in order to build MRAPs and to get additional ISR?"

"The problem is there are two different mentalities involved. The one is the typical culture in the Defense Department, which is 99-percent, exquisite solutions over a five- or six- or 10-year period, and the other is a 75-percent solution in weeks or months. And people approach problem-solving in very different ways when they have that different kind of experience. We've got to figure out how to be able to walk and chew gum at the same time."

The Department's Strike Vector
SecDef's Perspectives & Priorities (cont'd)

"Chief among institutional challenges facing the Department is acquisitions."

The current situation is "one of those rare chances … to critically and ruthlessly separate appetites from real requirements, those things that are desirable in a perfect world from those things that are truly needed in light of the threats America faces and the missions we are likely to undertake in the years"

"Our procurement and preparation for conventional scenarios must, in turn, be driven more by the actual capabilities of potential adversaries, and less by what is technologically feasible given unlimited time and resources."

"I will pursue greater quantities of systems that represent the '75 percent' solution instead of smaller quantities of '99 percent' exquisite systems."

The Department's Strike Vector
SecDef's Perspectives & Priorities (cont'd)

"I feel that many programs that cost more than anticipated are built on an inadequate initial foundation. I believe the department should seek increased competition, use of prototypes – including competitive prototyping – and ensure technology maturity so that our programs are ready for the next phases of development."

"We must freeze requirements on programs at contract award and write contracts that incentivize proper behavior."

The Department's Strike Vector
Operational Emphasis

- Increased emphasis on ISR
  - New sensors
    - MP-RTIP
    - LSRS
    - ESM
- Increased emphasis on Irregular Warfare
  - Armed UAVs
  - Hostile Fire Indication – and responses
  - New, more versatile gunship
- Increased emphasis on persistence
  - Reaper / Sky Warrior
  - C-12s

The Department's Strike Vector
ISR and Intel Focused CONOPS

- Signals intercepts via high demand, low density platforms
- Airborne ISR to establish long term tracks
- Targeting at remote site(s)
- Authority to engage established during lengthy track periods
- Engage from
  - onboard sensor aircraft
  - third party shooter with targeting data transferred from CAOC or Forward Air Controller

The Department's Strike Vector
ISR and Intel Focused CONOPS (Cont'd)

- Prior rush to establish broad net-centric warfare capabilities has been refocused toward penetrating aircraft

- Deliberate, Selective, Time-of-our-choosing CONOPS are the order of the day
  - Time sensitive engagements but with all the 'a priori' checks and approvals
  - Little delegation of responsibilities
  - Lots more watching; Lots fewer lethal engagements

Business Practice Changes

- Acquisition Policy
  - New DoDD 5000.02
    - Mature designs prior to Milestone B
    - Competitive Prototyping
    - Business Case Certifications prior to Milestones A & B
  - Peer Reviews for major source selections

- Cost and schedule control
  - Renewed emphasis on Fixed Price Type contracts
  - Configuration Steering Boards to scrub requirements
  - Invigorated emphasis on Earned Value Management

Business Practice Changes (Continued)

- Program governance
  - Increased emphasis on technical maturity within a program phase
    - Minimal risk in proceeding to next phase
    - Frequent ‘In Process Reviews’
      - At least annually with Milestone Decision Authority (MDA)
      - Additional event-based reviews
  - Independent assessments to advise MDA
    - Third-party teams for Operational Test Readiness Reviews
    - Joint Analysis Teams, Defense Support Teams & Ad hoc specialty teams

Business Practice Changes (Continued)

- Legislative initiatives
  - SASC: Weapon System Acquisition Reform Act of 2009 (S.454)
    - To address unreasonable cost and schedule estimates, performance expectations, immature technologies and repeated program changes that have led to explosive cost growth and costly schedule delays
  - HASC: The Panel on Defense Acquisition Reform
    - To address fundamental issues that lie behind the Pentagon's continuing problems in acquiring goods and services on time and on budget
    - Targeting NDAA of FY10 / FY11

Implications to Precision Strike

- Fewer New Starts of major programs
- Renewed interest in upgrade/modification efforts
  - Expand number and variety of sensor platforms
  - Expand capture and analysis of existing sensor data
- Renewed interest in growing system reliability, system persistence and endurance
- Possible interest in better matching sensors, comms and weapons to ‘needs’ of ISR platforms
  - Small size, weight, power
  - “Agile” with short engagement times
  - Low collateral damage

Implications to Precision Strike (Continued)

- For the few major acquisition programs
  - Competitive prototyping
  - Down-selects based on test results, EVM performance and management proficiency
  - Go slow in the early program phases
    - Design maturity before Milestone B
  - Go fast through formal Test & Evaluation and initial production
  - Expect lots of outside scrutiny, schedule risk analyses, second-guessing by well-informed third parties
  - Expect careful decision-making by MDA

JDAM / Laser JDAM

Questions?

Comments?

Rebuttals?

Air Armament Center

Flexibility Precision Weapons Bring to the Fight

Dr Bruce Simpson, SES
Director 308 ARSW
11 Mar 2009

308 ARSW Mission/Vision

Mission Statement

Equip Our Warfighters with Air Dominance, Strike, and Combat Support Capabilities to Fight and Win Decisively

Vision Statement

War Winning Capabilities…On Time, On Cost

Capabilities Evolving and Integrating into the Battlespace

Networked Weapons and Platforms

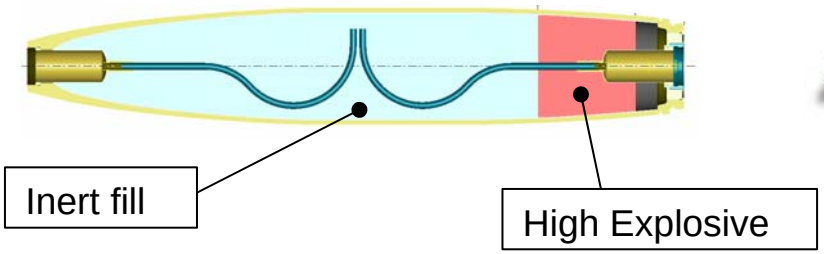
Capabilities
- Precision
- Moving targets
- Low collateral damage

Integration Capabilities
- Find/fix/target
- Decoy
- Suppress/deny

Joint Direct Attack Munition (JDAM)

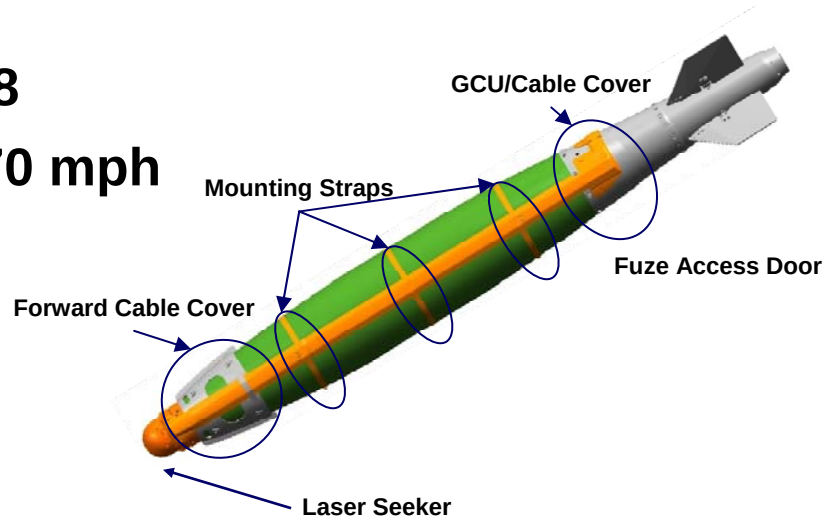
- **Low cost, guidance *tail kits***
- **GPS, Inertial Navigation System**
- **Mk 80 Series/BLU-109 compatibility**
- **Accurate <5 meters, in-flight retargeting**
- **Autonomous & adverse weather capability**
- **F-15E, F-16, F/A-18, F-22A, AV-8B, B-1B, B-2 B-52H**

Navy BLU-126 - Low Collateral Damage



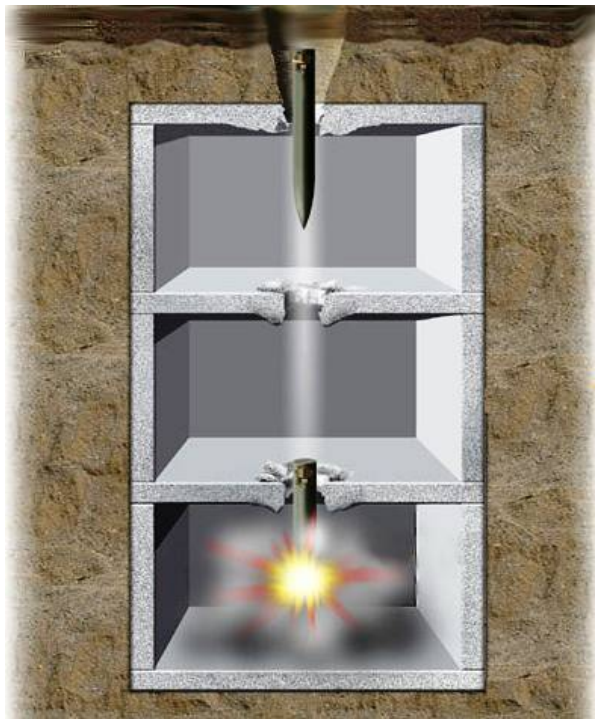
Laser JDAM

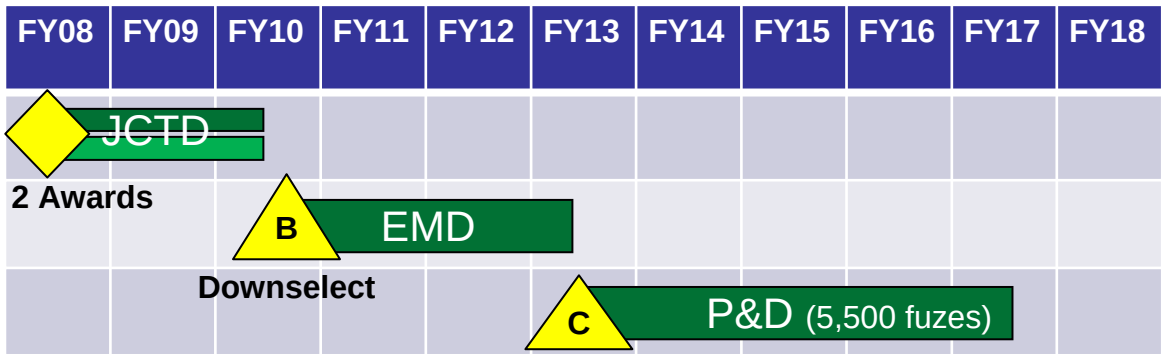
- Response to Urgent Operational Need
- Precision Laser Guidance Kit on GBU-38
- Ability to engage moving targets up to 70 mph
- Accuracy: 3m Stationary, 6m at 70 mph
- Field installable
- Mk-82, BLU-111, BLU-126 compatibility
- F-15E, F-16 Block 40/50, F/A-18A+/C/D
- Production: 400 Air Force, 400 Navy



Hard Target Void Sensing Fuze

- Capable of defeating hardened and deeply buried targets
- Capable of sensing multiple voids
- Capable of operating in hardened concrete
- Reprogrammable from aircraft cockpit





Small Diameter Bomb (SDB I)

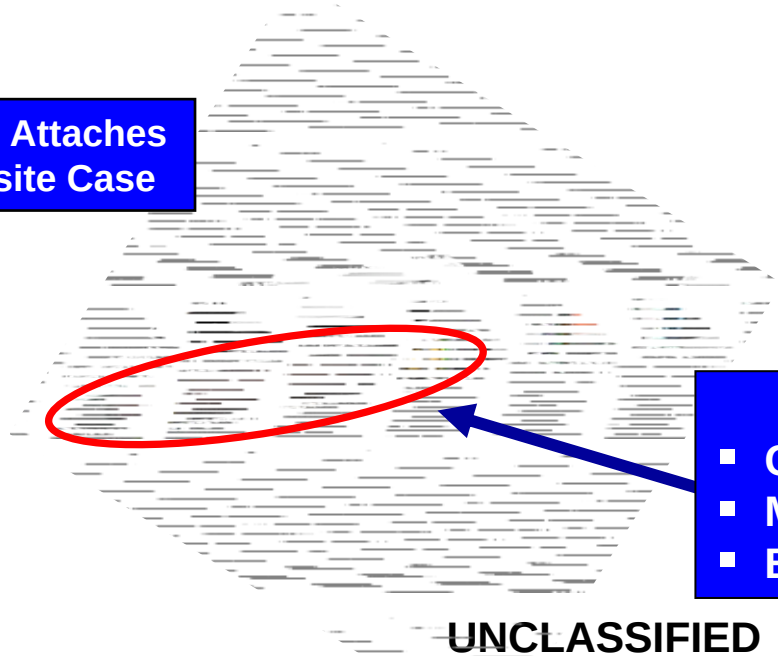
- All-weather, autonomous, precision
- 250 lb class GPS/INS weapon
- Reduced collateral damage
- Flexible attacks with standoff ranges >50nm
- Increased loadout--multiple strikes per sortie
- Cockpit-selectable electronic fuze
- F-15E can receive or self generate coordinates

BRU-61

SDB Focused Lethality Munition (FLM)

- FY06 Out-of-Cycle JCTD
- CENTAF urgent need
- Low collateral damage variant of SDB
- Precisely delivers lethal blast
- Soft targets at risk w/ reduced collateral damage

SDB I Hardware Attaches to FLM Composite Case



New Technology

- Composite Case Warhead
- Multi-Phase Blast Explosive
- Blast Only

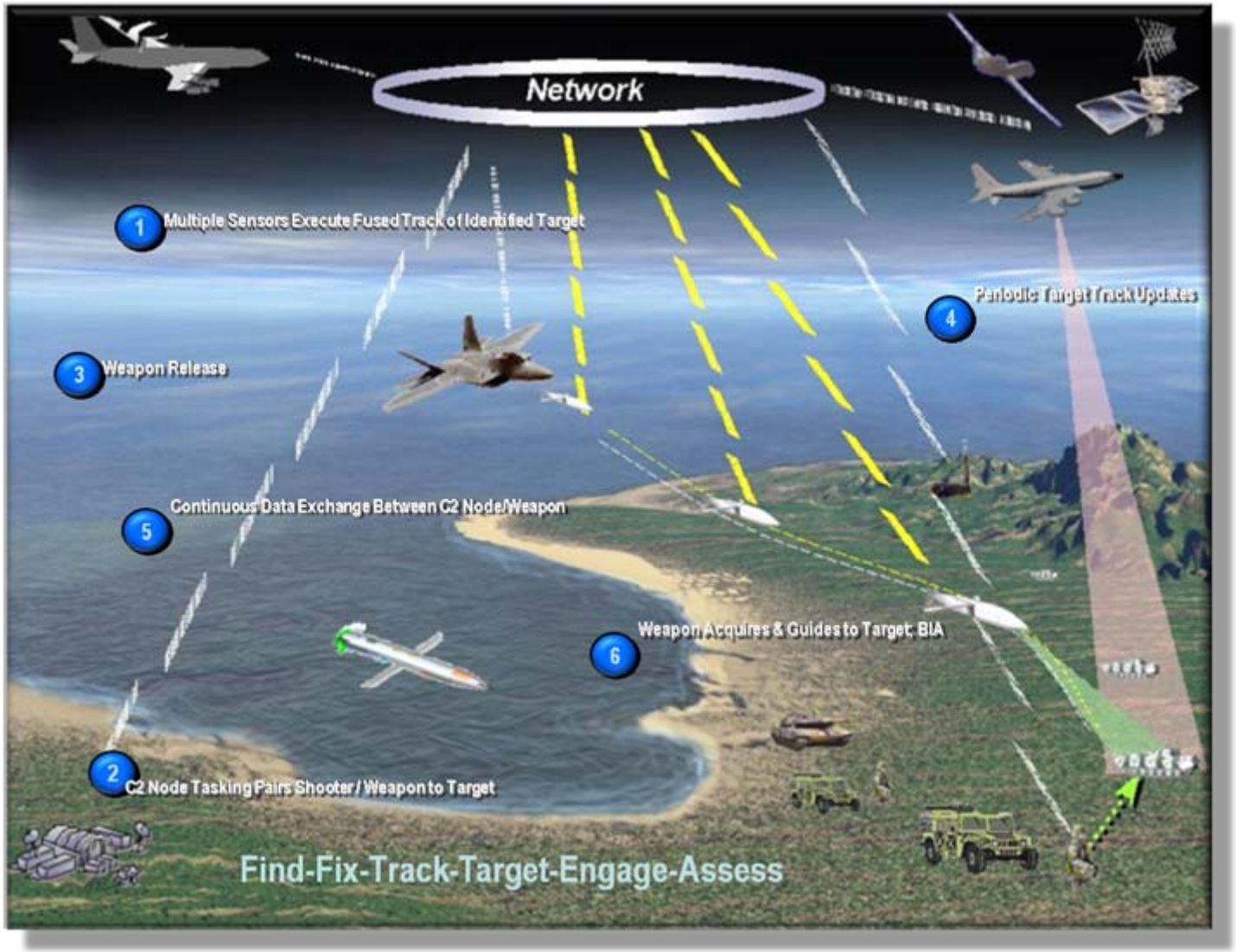
Directed Energy

- **Speed of light weapon**
- **Scalable effects**
- **Reduced collateral damage**

Advanced Tactical Laser

Active Denial System

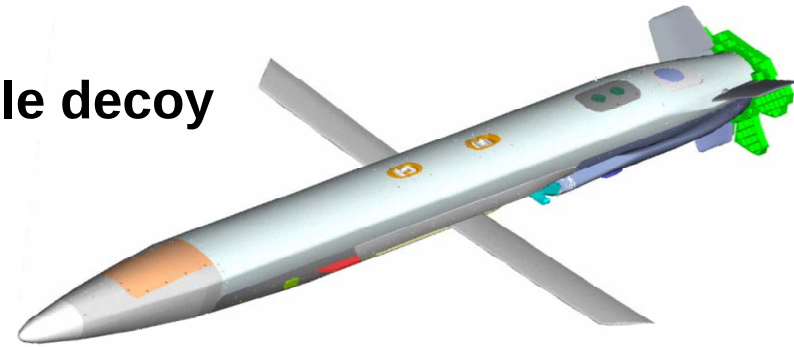
Integration Capabilities



Miniature Air Launched Decoy (MALD)
MALD Jammer (MALD-J)

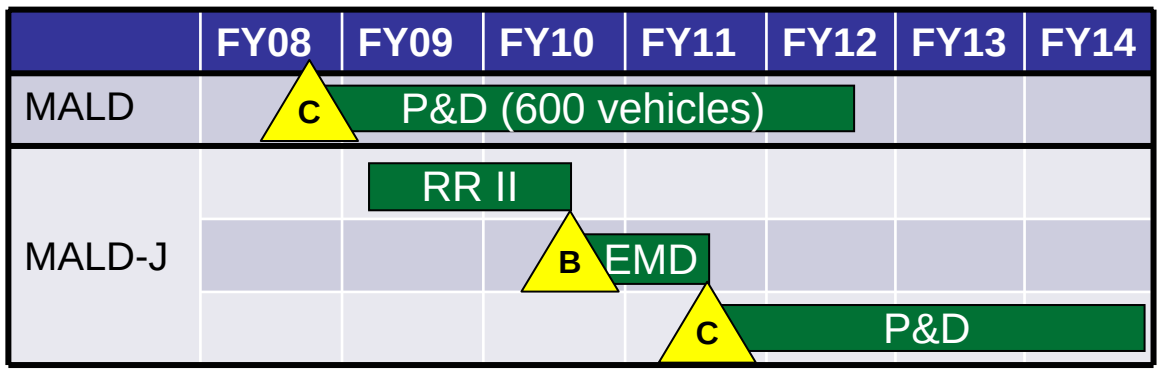
MALD

- Small, low-cost, air-launched, expendable decoy
- Stimulates integrated air defenses
- Emulates fighter/attack/bomber
- Increases enemy's "Fog of War"



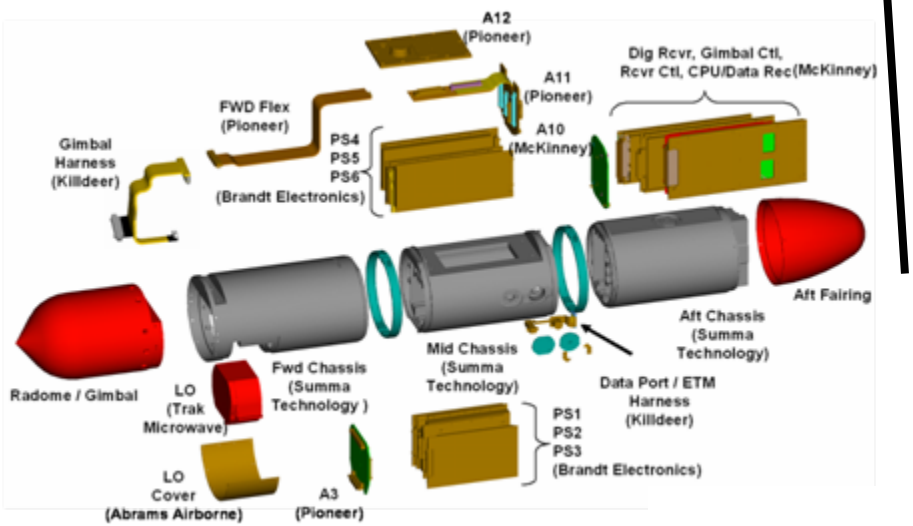
MALD-J

- Adds jammer and retains decoy capability
- Degrades EW/GCI/ACQ radar tracks



HARM Targeting System (HTS)

- Single Ship HARM Targeting
- Multi-ship PGM Targeting
- Time Critical Targeting
  - Targeting mobile SAMs
  - Protecting strike packages
- Increased Detection Range



Network Enabled Weapons

Common Network Interface/Messages

Messages, basic CONOP

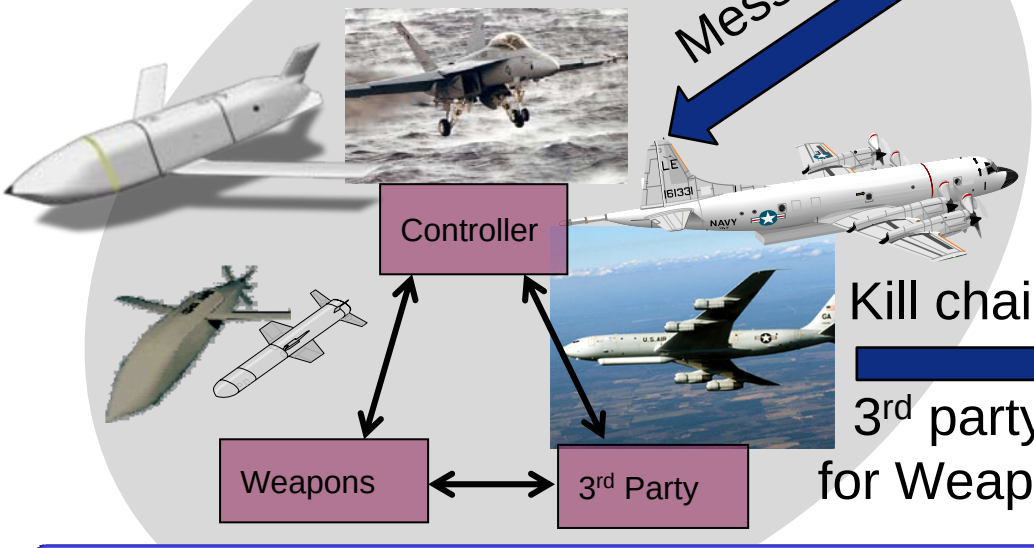
Promoting Interoperability among Weapons and networked systems

WDLN ACTD

NEWIWG

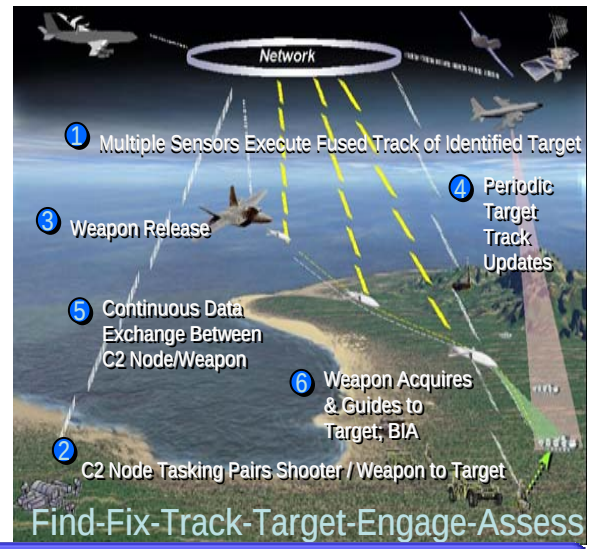
Enterprise

JSuW JCTD



Kill chain complete

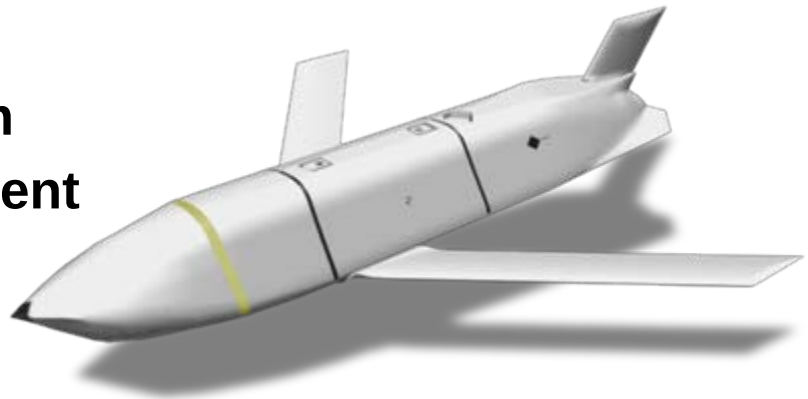
3rd party targeting for Weapons, JTTPs

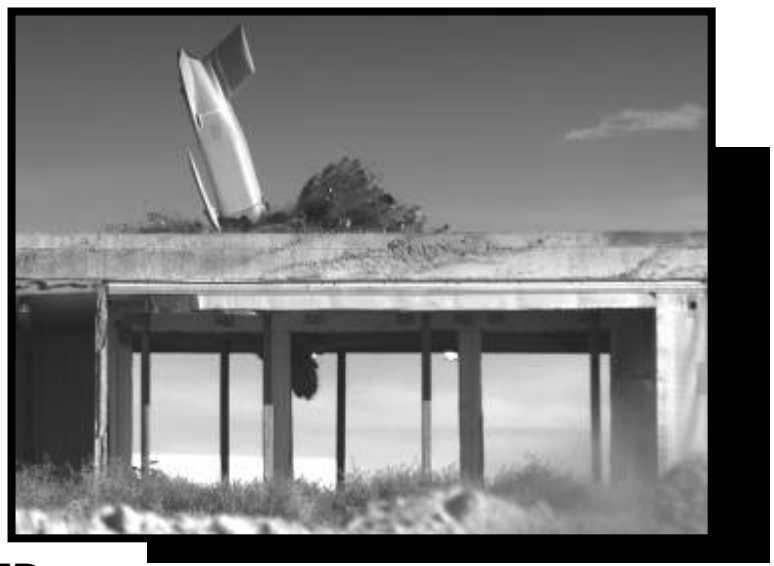


Goal: Any Targeting Asset, Any Weapon

Joint Air to Surface Stand-off Missile (JASSM)

- Stealthy cruise missile
- Precision guided vs. high value targets
- Autonomous Launch and Leave >200nm
- Survivable in advanced threat environment
- Guidance: Inertial Navigation / GPS
- F-16C/D, B-1B, B-2A, B-52H



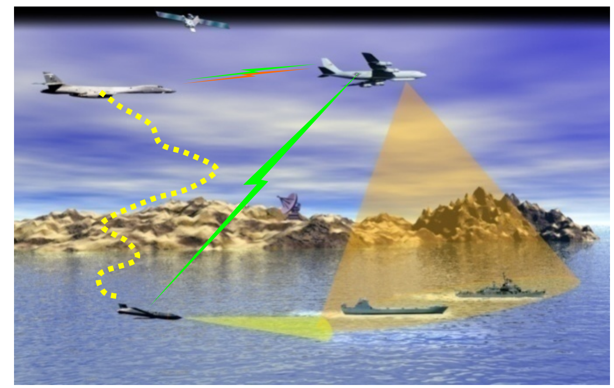


JASSM Extended Range (JASSM ER)
JASSM Anti-Surface Warfare (JASSM ASuW)

AGM-158B

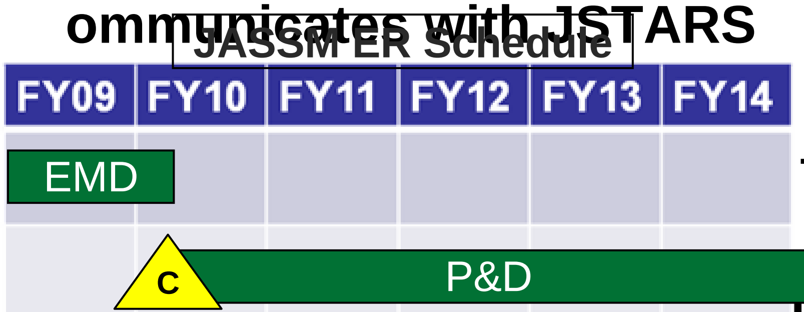
ASSM ER

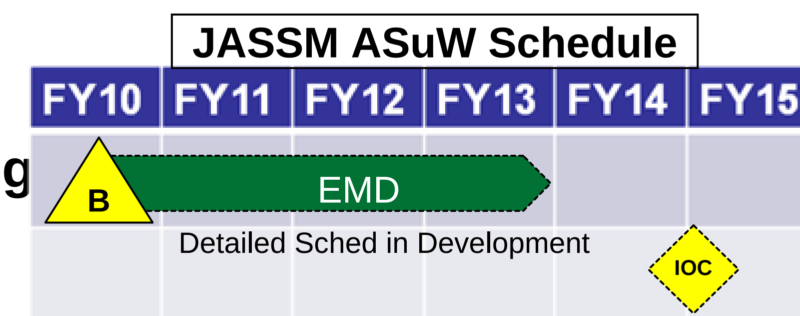
- xtends range to > 500 nm



ASSM ASuW

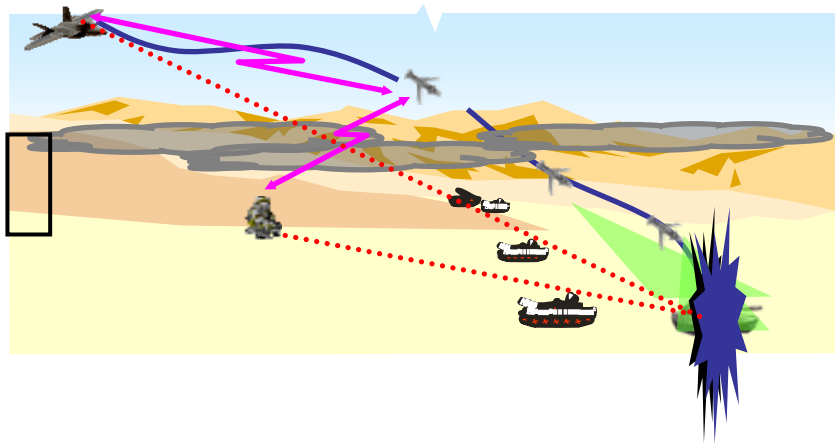
- bility to engage moving ships
- ommunicates with JSTARS tracking

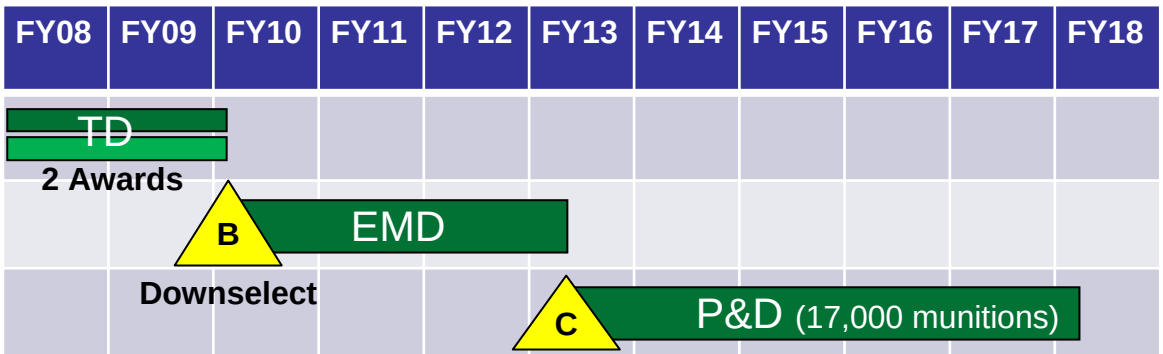




Small Diameter Bomb II (SDB II)

- Capable against moving targets
- Compact, all weather, standoff weapon
- INS/GPS guided, precision weapon
- Multi-mode seeker





War-winning Capabilities …

… On Time, On Cost

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New Administration & Technologies

Industry's Perspective on Changes for Precision Strike

March 2009

Doug Young

Vice President, Business Development, Strike and Surveillance Division
Northrop Grumman Corporation

Introduction

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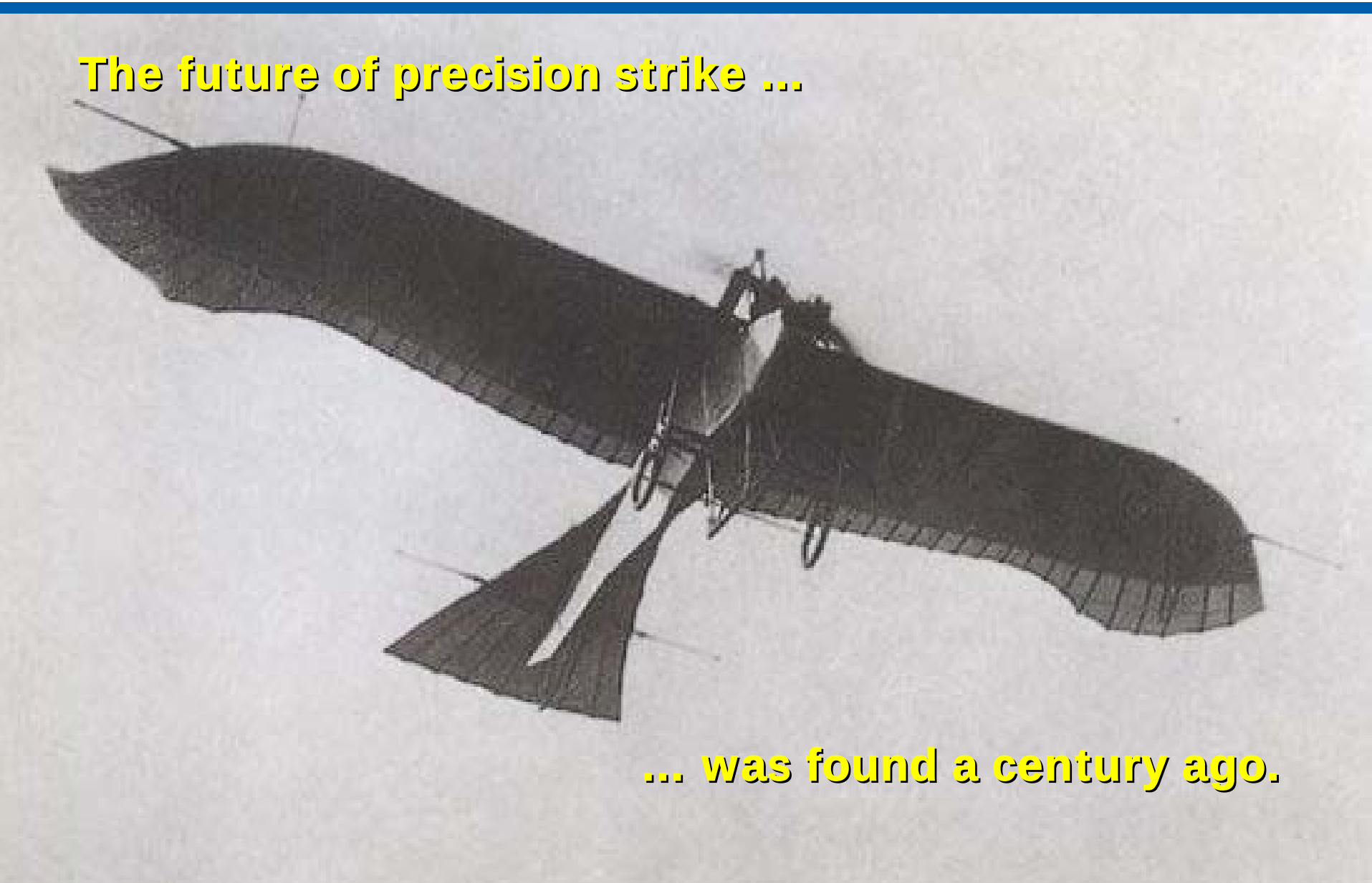

The Obama Administration - Declared Defense Policy Objectives

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- End War in Iraq
  - Increase commitment in Afghanistan
- Place “people first”
  - Increase size of Army / USMC
  - Take care of Service Men / Women & Families
    - Note: already occurring with the Economic Stimulus to include health care, child care services, barracks repair / construction, etc
- Restore global partnerships and build a Civilian Assistance Corps to promote stability
- Focus on adapting and building US military capabilities for current needs and missions of the future

...a more efficient and adaptive military well suited to irregular challenges that preserves nuclear deterrence and sufficient conventional warfighting capabilities
– Administration transition team

Conflict in Early 21st Century

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Hybrid Warfare

Conventional Warfare

Irregular Warfare

Hybrid Warfare – the convergence of disparate types of conflict
- **Civilian-warrior – disciplined, coordinated, autonomous and determined**
- **Weapons – AK-47 to cruise missiles and cyber technology**
- **Tactics – simple to complex, coordinated with high Situational Awareness**
- **Environment – congested urban settings to isolated, inhabitable terrain**
- **Nation-states to non-state actors will embrace and exploit**

Military Capabilities Needed Today

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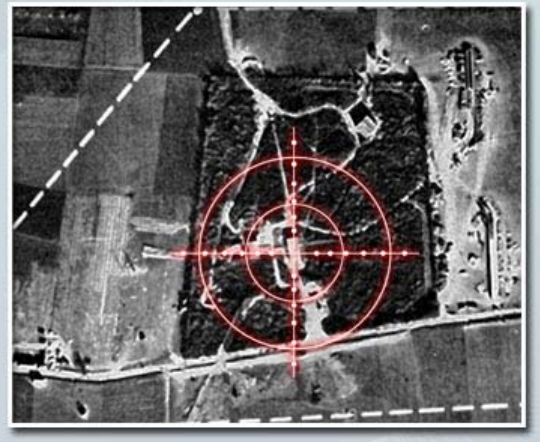
- ISR – to discriminate, detect and track hostile personnel, operations and capabilities
  - Imbedded in complex, congested urban terrain
  - Scattered in austere mountains to dense jungles
- Strike – to damage or destroy
  - With precise, low collateral damage
  - Lethal and non-lethal effects
  - Against a discrete target
  - Against a deeply buried target
  - Must be survivable and persistent



Previous Targeting Photo

Targeting Challenge Today

Challenge of Precision Strike demands extremely high fidelity information

Layering ISR
- Maximizing Awareness of the Battlespace

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Requirements	Who	What	Where	When	Why
SIGINT	X	X	X	Now & Future	X
IMINT		X	X	Now	
MASINT		X	X	Now	
MTI		X	X	Now	
HUMINT	X	X	X	Now & Future	X

Layering ISR assets provides precise data:
- Where (geo-location)
- When (timing)
- Accuracy (speed, signal type, characterization, picture, etc.)

Improving Persistent Awareness - Enhancing Fidelity of Ground Surveillance

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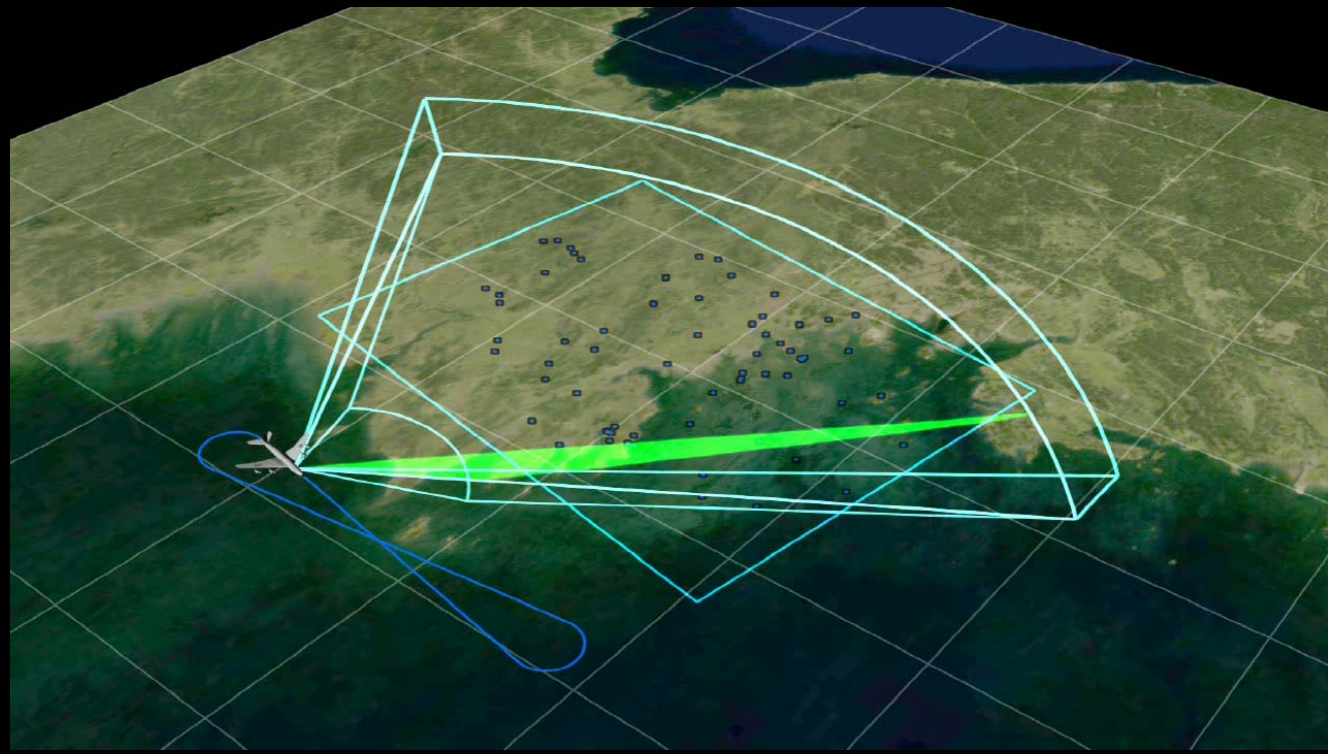
- Current E-8C provides good surveillance and tracking of ground maneuver forces
- Flown over 50,000 hours supporting operations in Iraq and Afghanistan



- Future E-8 (with MP-RTIP Actively Electronically Scanned Antenna) will dramatically improve Ground and Air Commanders' awareness
  - Dismounted Forces
  - Cruise Missile and low flying aircraft

MP-RTIP on Joint Stars – Expanding Precise Awareness of Surface Action

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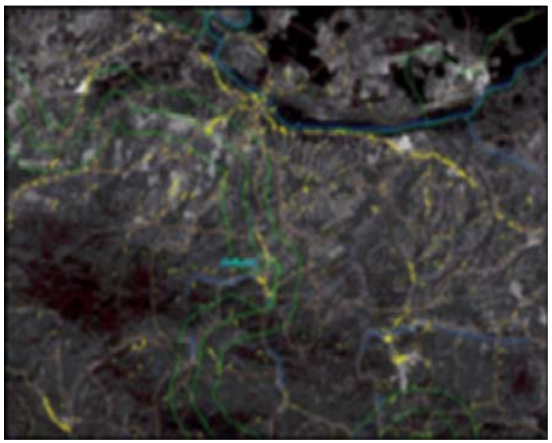
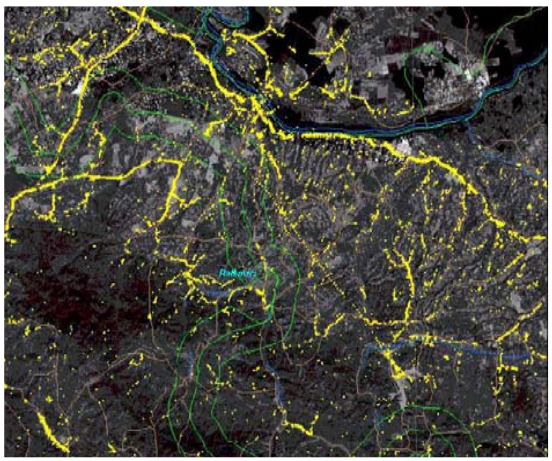
Current E-8



E-8 w/MP-RTIP



Improved Resolution & Track Quantities / Continuity

Operational Benefit	E-8 W/APY-7	E-8 w/MP-RTIP
Wide Area Continuous Tracking		
Small Area Tracking		
Precision Engagement of Moving Targets		
Moving Target ID		
SAR Image Resolution		
Concurrent SAR/GMTI		

1991 – Move and Die
Stationary and Survive
2015 – Move and Die
Stationary and Die

Expanding the ISR coverage – Global Hawk

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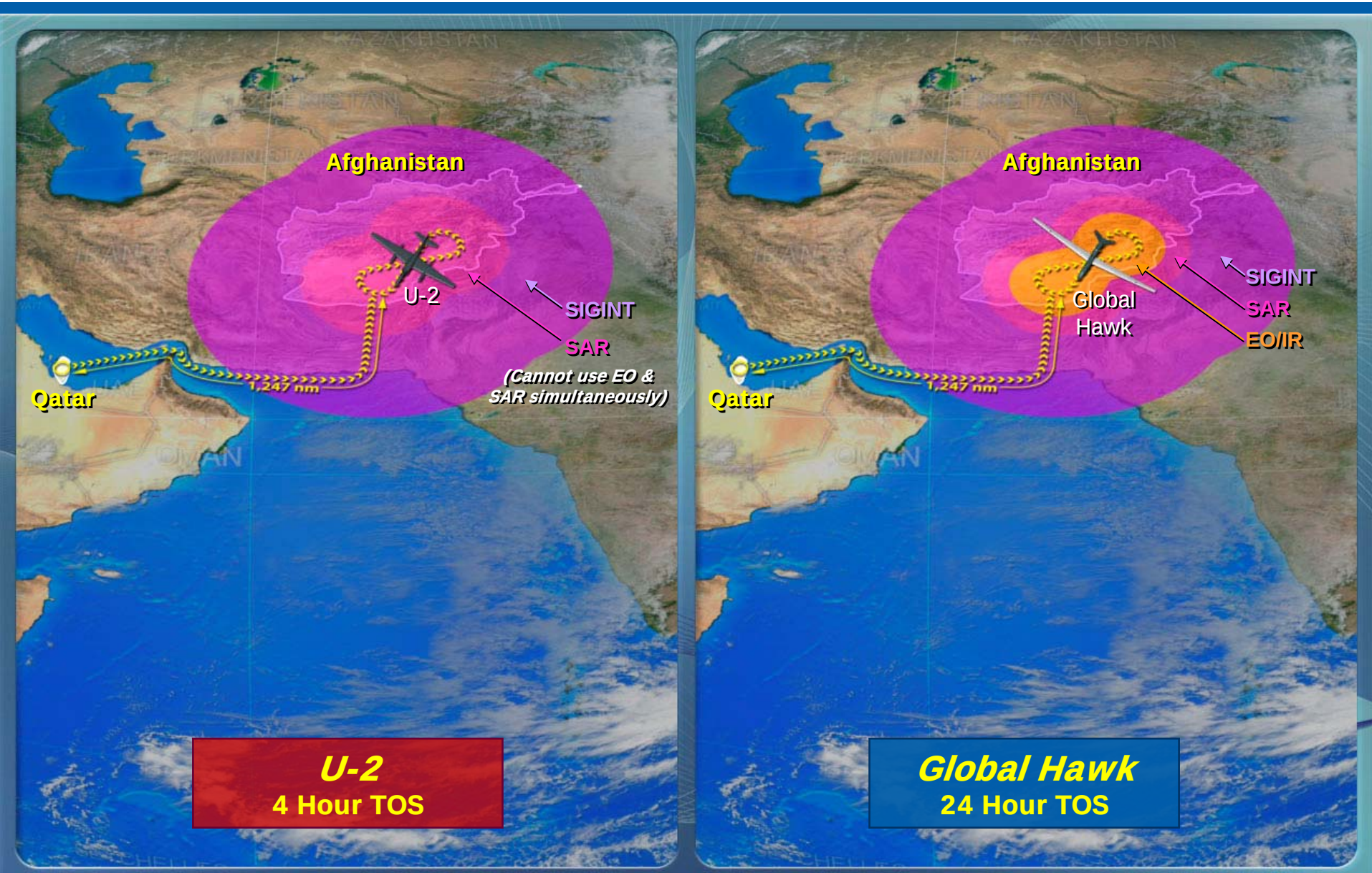

System Comparison – GH vs U-2

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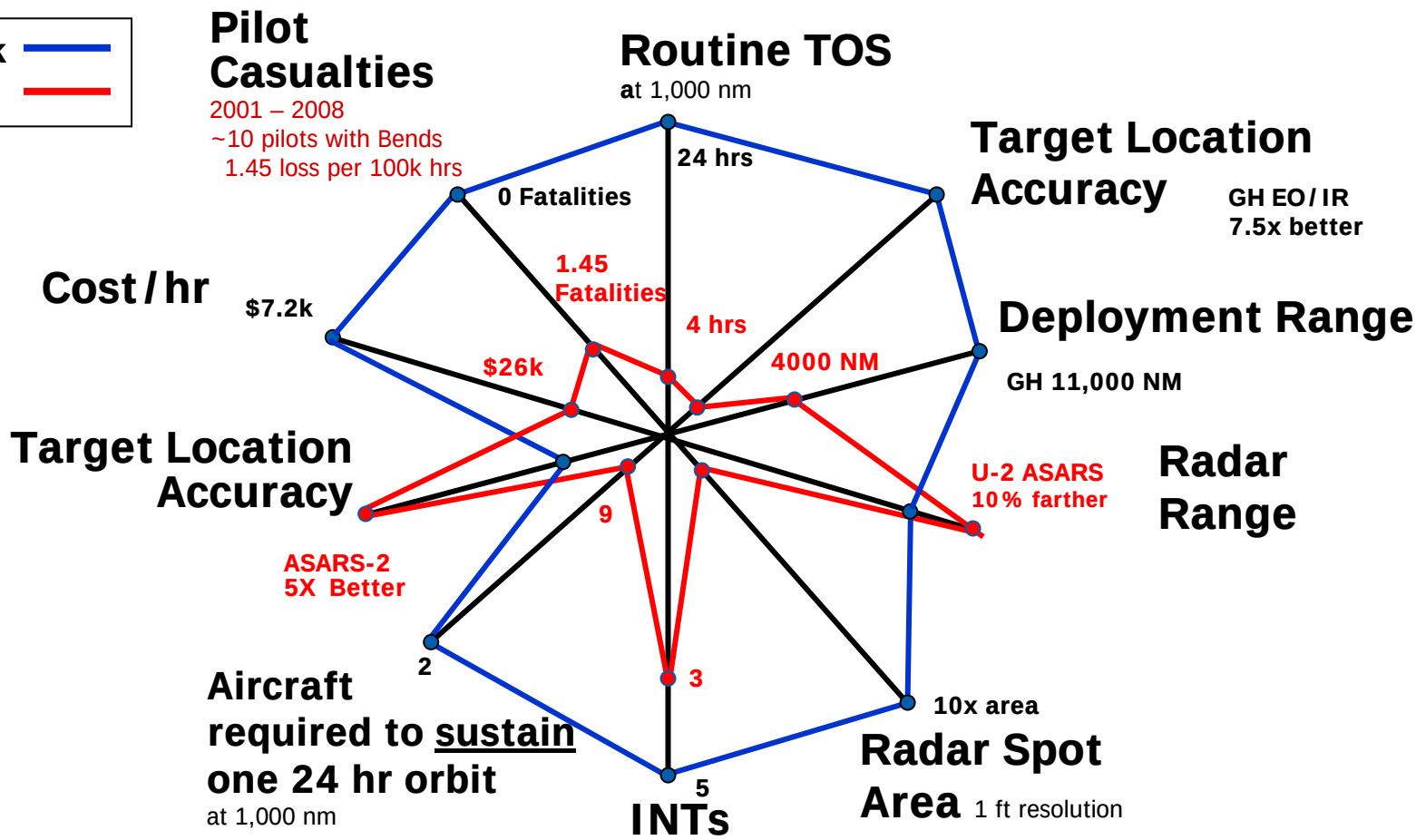

Challenge of Precision Strike demands expanded information collection

Unmanned Combat Air System (UCAS) – Next Generation Combat System

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- Carrier based stealth UAS supported by autonomous air-to-air refueling (AAR) capability
  - Return of true global strike / ISR capability to the US Navy Carrier force
- Long unrefueled range / endurance for deep persistent operations
  - ~1,700-4,000NM max unrefueled range with current engines
  - ~3,300-5,600NM max unrefueled range with advanced commercial derivative engines
- Ultra-long refueled endurance for global responsiveness, extended CV standoff with AAR
  - >100 hours, limited primarily by actuators, lube oil
  - Probe-drogue and boom-receptacle refueling
- Balanced survivability
  - Broad-band / all-aspect stealth
  - On- and off-board threat awareness
  - Dynamic mission management / auto-routing
  - LPI/LPD communications
  - Electronic and lethal countermeasures
  - Collaborative defensive operations

- Advanced, networked targeting capability
  - Automated sensor fusion
  - Automated target recognition
  - Automated precision imagery geo-registration
  - GIG connectivity for ISR data distribution / receipt

UCAS in Action
– Survivable, Sustained ISR and Attack

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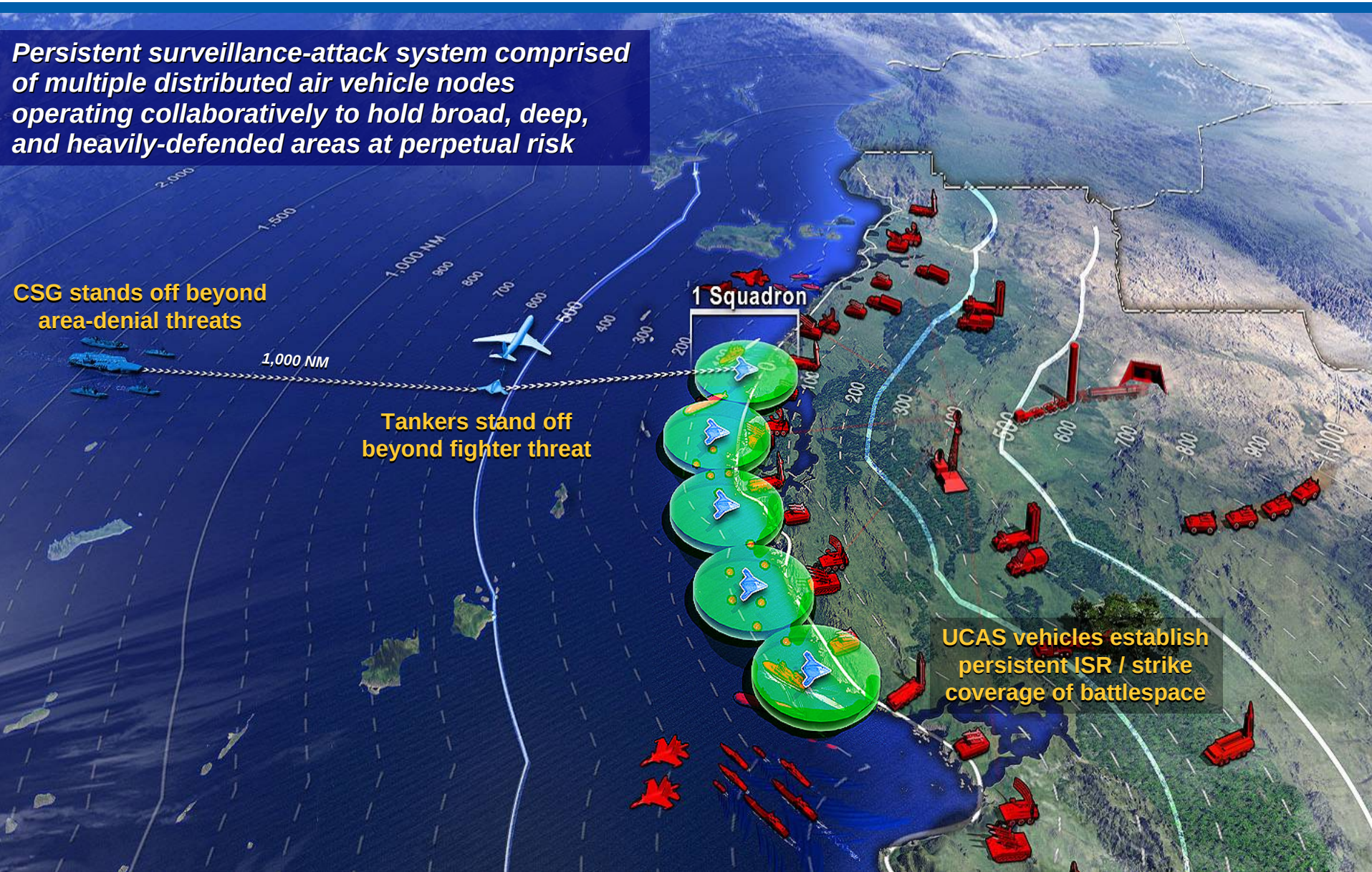
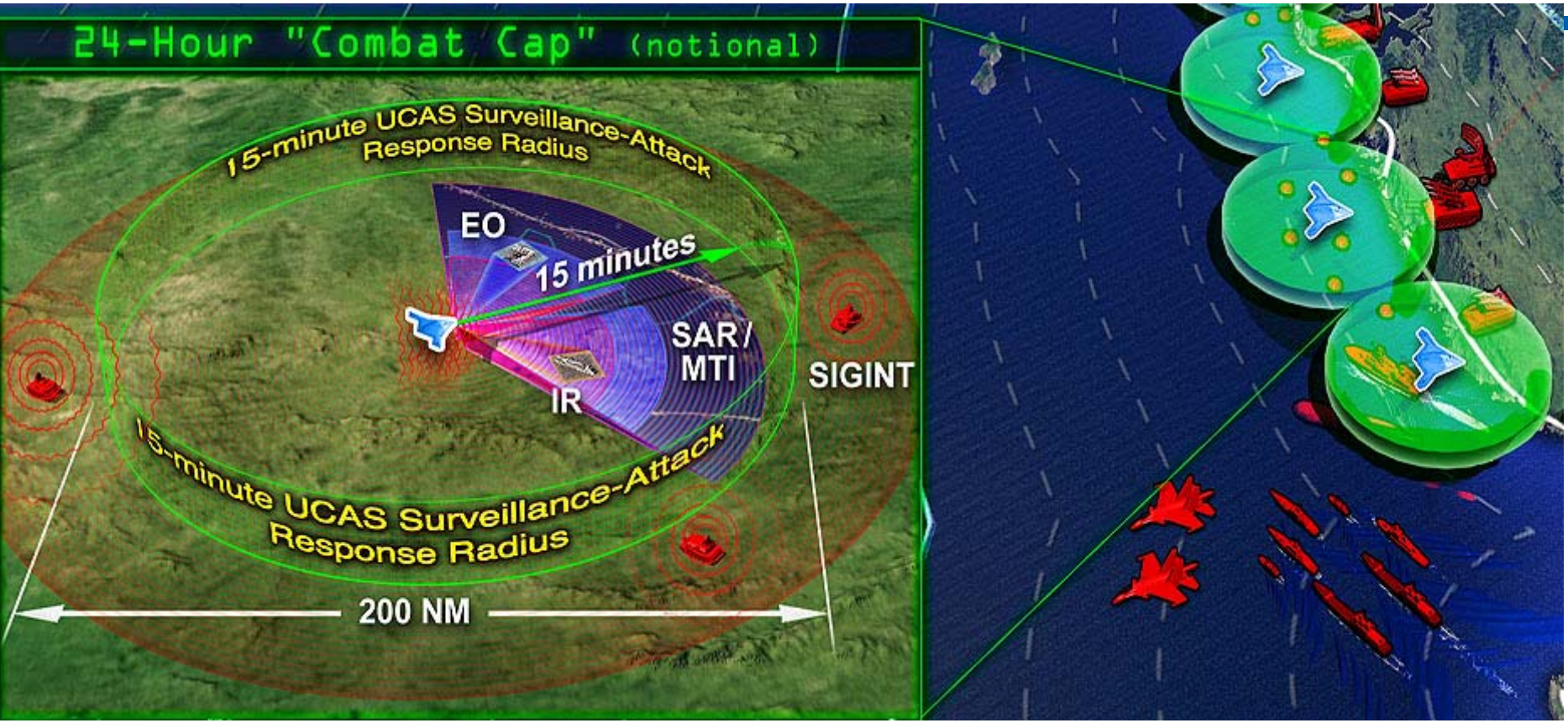


Surveillance and Attack Response – Any Threat Environment



- **Multi-sensor ISR capability**
  - EO/IR, IRST
  - SAR, Ground / Air / Maritime MTI, ISAR
  - ESM

- **Advanced lethality**
  - Two internal weapons bays each carry up to 2,250 lbs of ordnance or advanced mission loads
  - Up to 18 250-lb GPS-guided Small Diameter Bomb, or 2 2000 lbs JDAM)
  - Miniaturized precision kinetic weapons (free-fall, glide and powered) to deepen strike magazine
  - DE weapons for counter-air / missile ops

Potential N-UCAS Concepts of Employment – Core Applications Offer True Multi-mission Capability

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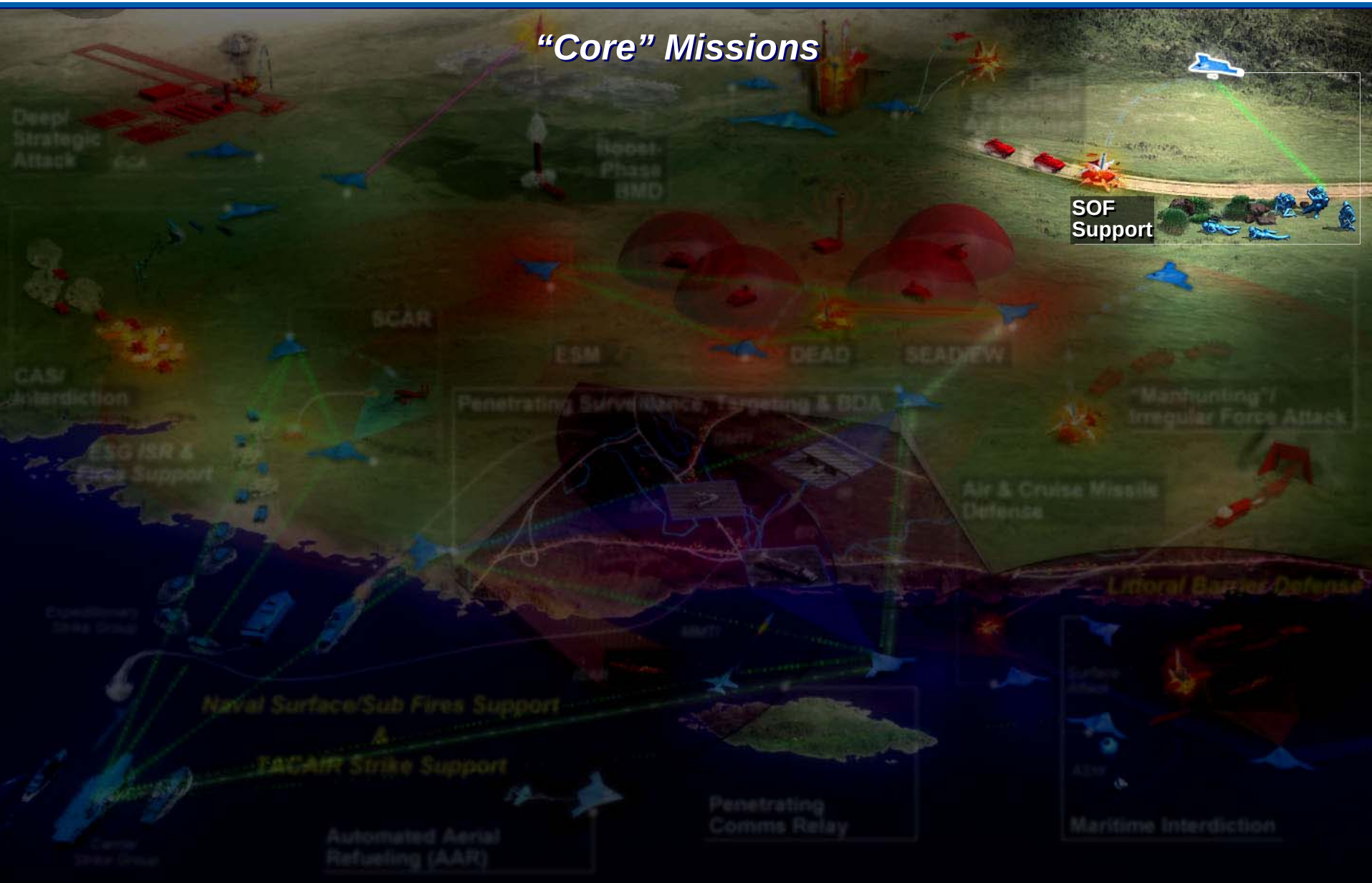

Potential N-UCAS Concepts of Employment – Core Applications Offer True Multi-mission Capability

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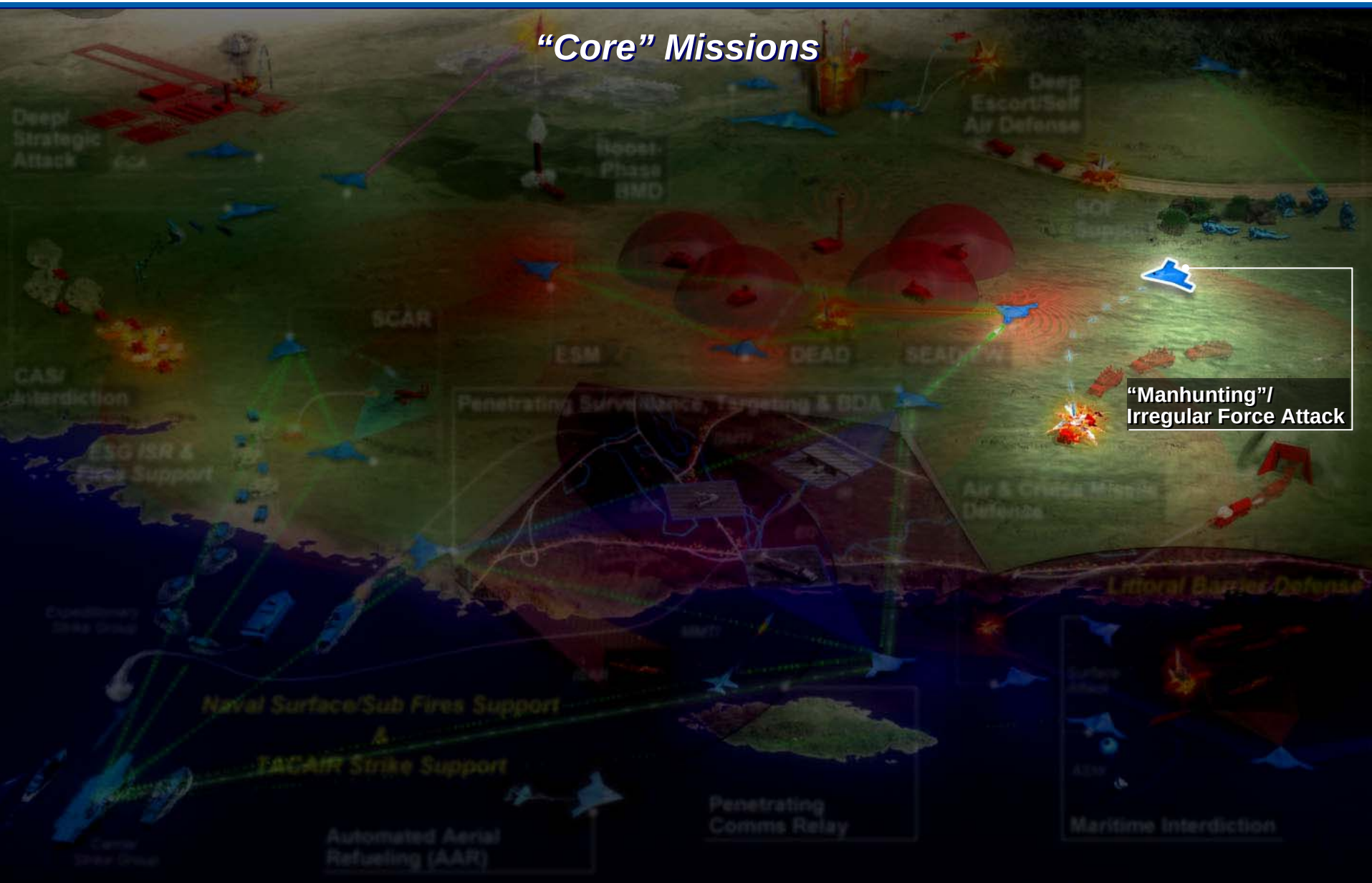

Potential N-UCAS Concepts of Employment – Core Applications Offer True Multi-mission Capability

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Precision Intelligence and Strike – Integrating Systems, 2015

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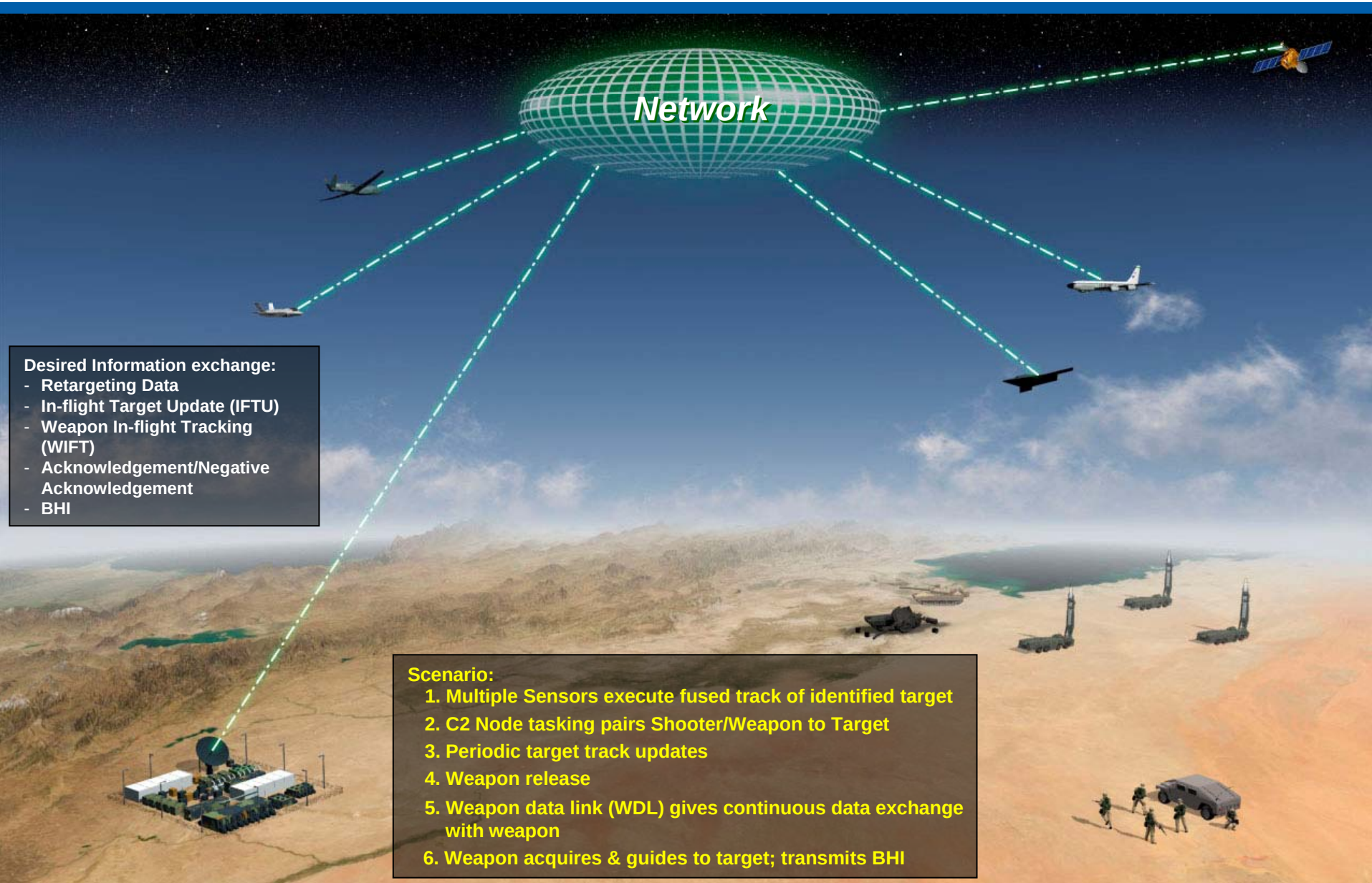
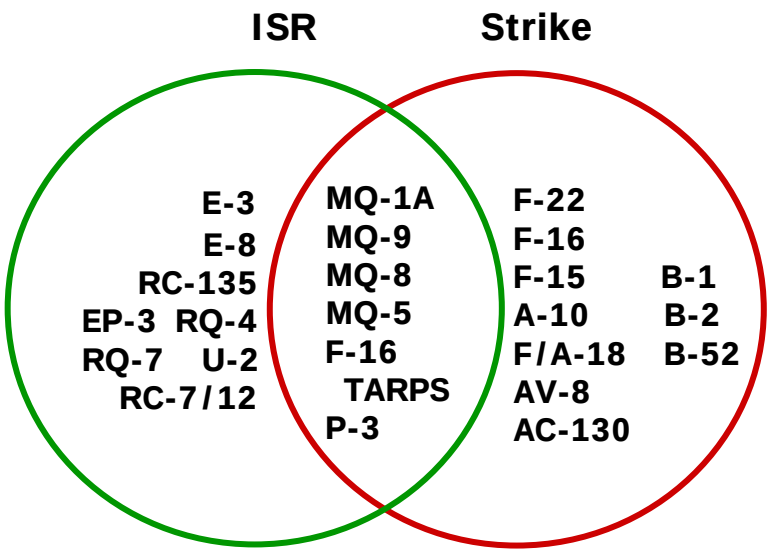
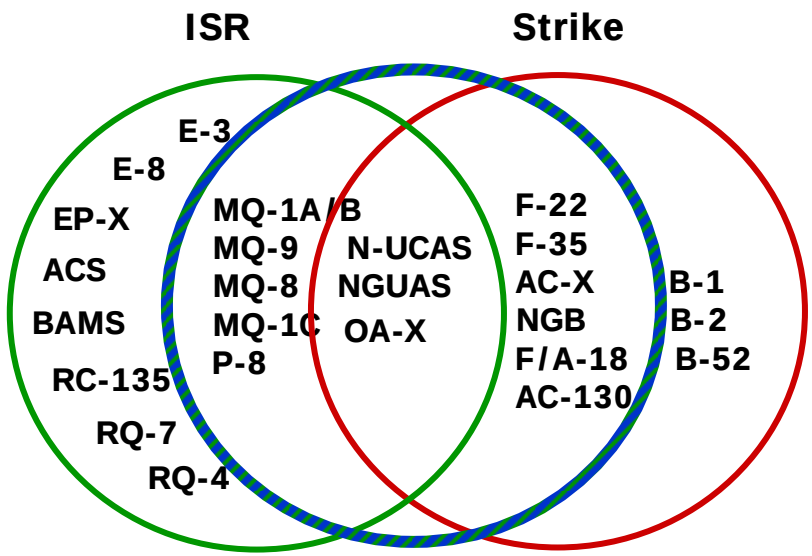


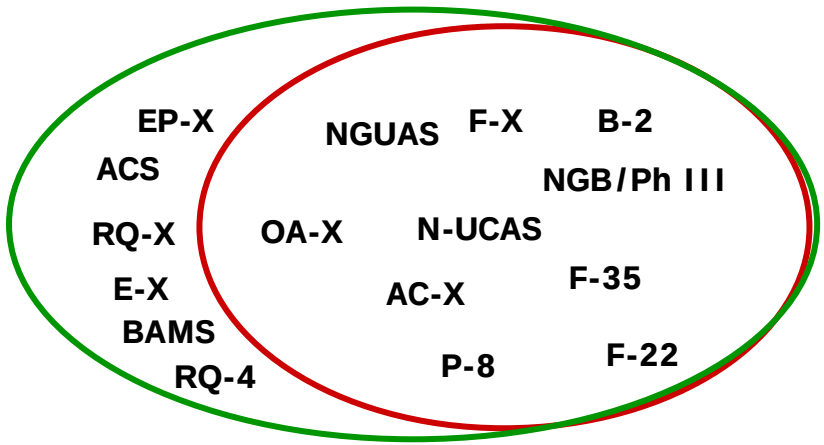
The Evolution of ISR and Strike



2010



2020



2035 Blend

Summary

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- New Administration dedicated to prevailing in current fight by adapting capabilities for this mission ...
- ... while preparing for future challenges by building new capabilities
- Precision Strike in current and future scenarios demands a higher fidelity of Precision Intelligence
- Near-term and developmental systems offer significant improvements of the quality and quantity of data provided ...
- ... and will offers weapon systems that merge collection and engagement capabilities

Industry can no longer think of Precision Strike and ISR as distinct ... as the Joint Warfighter does not


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