

UNCLASSIFIED
PROGRAM EXECUTIVE OFFICE
MISSILES AND SPACE

Counter-Rocket, Artillery, Mortar (C-RAM)



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Program Overview Briefing

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Any Warfighter - Anywhere - All The Time

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C-RAM Program Directorate Mission



- Responsible for the overall life cycle management of automated Air and Missile Defense command and control systems, force protection systems-of-systems, and counterfires/counter target acquisition radars. C-RAM programs include Forward Area Air Defense Command and Control (FAAD C2); Air and Missile Defense Planning and Control System (AMDPCS); Rocket, Artillery, Mortar (RAM) Warn; C-RAM Intercept (Land-based Phalanx Weapon System [LPWS]); Firefinder (AN/TPQ-36/37); AN/TPQ-53, which replaces the Firefinder; Lightweight Counter Mortar Radar (AN/TPQ-50); and the Range Radar Replacement Program (RRRP).
- The C-RAM Program Directorate also manages C-RAM system-of-systems capabilities in theater, providing force protection against the indirect fire threat. This responsibility includes enhancement of the existing C-RAM C2 for netting and integration of systems for a holistic solution, ensuring effective interfaces are developed and maintained between the Air Defense C2 and C-RAM systems and the Mission Command Networks and Systems, other services, and allied nations.





C-RAM Portfolio



Emerging C-RAM Systems/Products are Built on the Foundation of Existing Programs of Record

**Original
Systems
and
Products**

- **Forward Area Air Defense Command and Control (FAAD C2) – Acquisition Category (ACAT) II**
 - FAAD C2 Software
 - FAAD C2 Sheltered Systems
- **Air and Missile Defense Planning and Control System (AMDPCS) – ACAT II**
 - Air Defense Airspace Management (ADAM) Cells
 - Air and Missile Defense Workstation (AMDWS)
 - AMDPCS Sheltered Systems at Air Defense Artillery (ADA) Echelons (BN thru AAMDC)
 - Air Defense System Integrator (ADSI) Workstation

**Additional
Systems
and
Products**

- **C-RAM Warfighter Support – Quick Reaction Capability (QRC)**
 - Sense, Warn, and Intercept Capability
- **Rocket, Artillery, Mortar (RAM) Warn – ACAT III**
- **C-RAM Intercept to IFPC/Avenger Composite BNs – ACAT III**
- **Product Manager (PdM) Radars – Sep 14**
 - AN/TPQ-36/37 Firefinders – ACAT III
 - AN/TPQ-50 Lightweight Counter Mortar Radar (LCMR) – ACAT III
 - AN/TPQ-53 – ACAT II
- **Range Replacement Radar Program (RRRP) – ACAT III**





UNCLASSIFIED FAAD/C-RAM C2 Role in Current Programs and Emerging Requirements



Original PD C-RAM Acquisition Programs

- **FAAD C2** (ORD dated 1995) - fielded force wide as engagement operations (EO) software for SHORAD/Avenger units; links/nets Sentinel Radars until migration to Army Integrated Air and Missile Defense (AIAMD) Integrated Fire Control Network (IFCN)
- **AMDPCS** (CPD dated 2008) - component of all ADAM shelter configurations at all echelons for conduct of SHORAD engagement; provides correlated air picture to AMDWS for force operations (FO) and planning and to Mission Command for air situational awareness/understanding

Homeland Defense of the National Capitol Region

- **Operation Noble Eagle (ONE)** - core component of the C2 architecture; USAF leads effort and funds C2 improvements as required

Theater C-RAM Capabilities (Various JUONs)

- **C-RAM capability** is currently deployed at multiple Forward Operating Bases (FOB) in Afghanistan – it is built off FAAD C2 software with changes to integrate other C-RAM component systems, and enhancements as required to keep pace with the evolving threat and changes in enemy tactics

Transitioned Programs of Record

- **RAM Warn** (CPD dated 2010) – horizontal technology insertion of C-RAM warn components and communications into Maneuver Brigade Combat Teams to provide early, localized warning of indirect fire attacks
- **C-RAM Intercept (LPWS)** (CPD dated 2013) – CONUS fielding to two Indirect Fire Protection Capability (IFPC)/Avenger Composite Battalions

Related Efforts

- **FAAD/C-RAM C2 and AMDWS SW Virtualization in the IBCS** server, incorporating new functions to meet Real-Time Safety Critical Embedded (RTSCE) Common Operating Environment (COE) requirements, and modification of ADAM shelter as a core component providing C2 for Avenger, LPWS, RAM Warn, and IFPC-2 Intercept





FORWARD AREA AIR DEFENSE COMMAND & CONTROL (FAAD C2)





FAAD C2 Program Mission



Mission:

- Rapidly develop, acquire, integrate, test, field, and sustain CONUS or OCONUS FAAD C2 system-of-systems hardware and software to various echelons from ADA Bde to fire unit level, providing them a correlated air picture (Tactical Single Integrated Air Picture) using local and external Army and Joint sensors, linking them to the Mission Command Networks and Systems and the Joint Defense Network (JDN) via various forms of communications to provide timely and accurate correlated operational Air Picture to automate engagement decisions.
- Components include: shelters; communications equipment; and FAAD C2 software, which performs the Engagement Operations, Surveillance, Battle Management, Weapons Coordination & Management functions, as well as interfacing with tactical systems, including Air & Missile Defense Workstation (AMDWS) and Air Defense System Integrator (ADSI).



FAAD C2 gives the Warfighters access to an accurate, correlated, and Real-Time air picture plus weapons control and status facilitating the ADA mission and to Protect the Force





FAAD C2 System Description



FAAD C2 is a system-of-systems that integrates software, hardware, and shelter system components

FAAD C2 Software Provides:

- Engagement Operations functions to Maneuver Air and Missile Defense (AMD) and Composite AMD BNs
- Air battle management and situational awareness to the Maneuver Commander via the ADAM Cell
- Low level air picture to DIV/BDEs through the Sensor C2
- Software basis for C-RAM Intercept and Sense/Warn capability
- Automated integration with the Mission Command system

FAAD C2 Shelter Systems:

- Based on an Army standard Rigid Wall Shelter and Command Post Platform shelter
- Are Type Classified-Standard and Materiel Released
- FAAD C2 (and AMDPCS) shelters are mutually supported and can be operationally interchanged

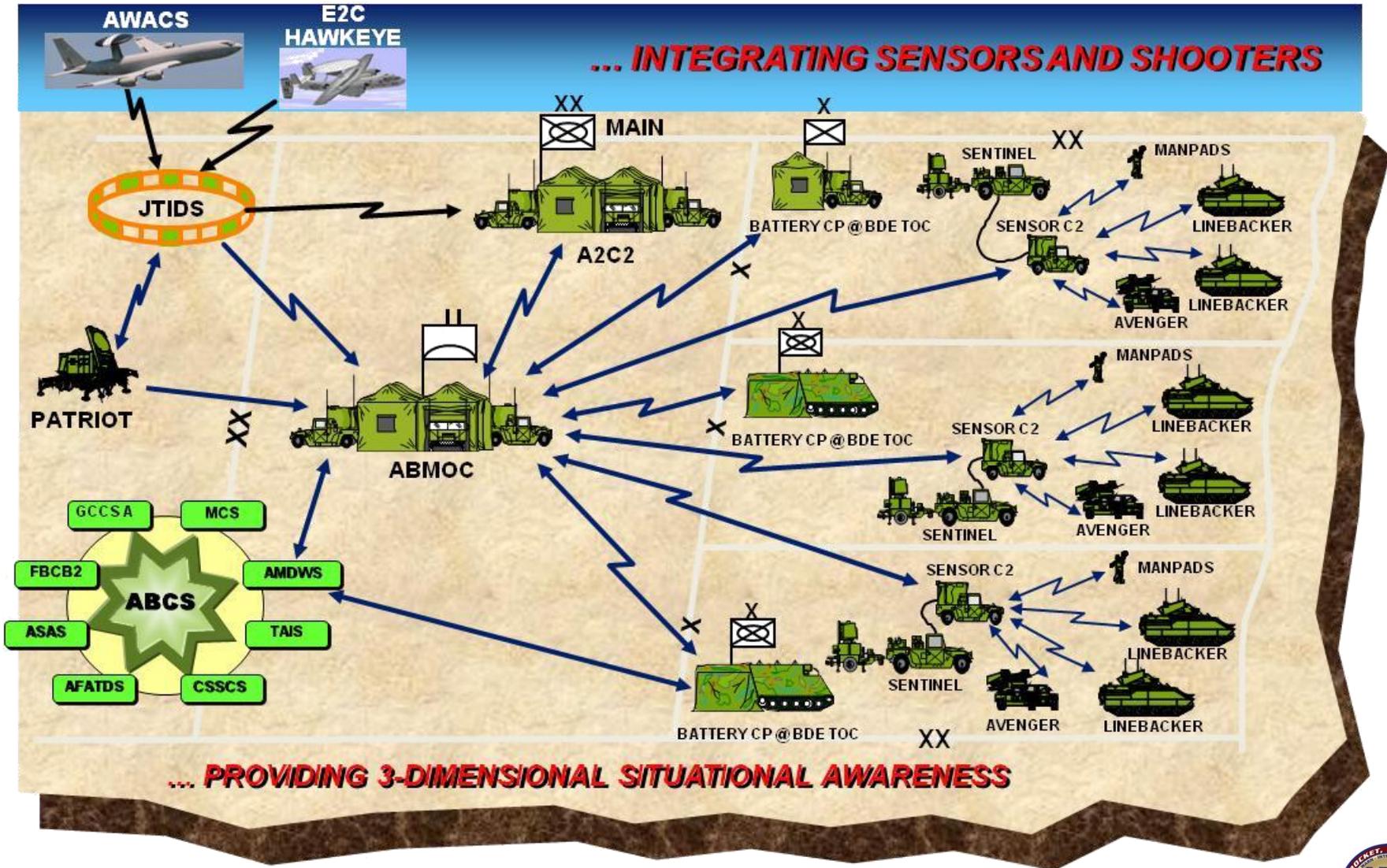
FAAD C2 Fire Unit Hardware Components:

- Forward Area Computer Terminal provides airspace situational data; engagement commands; and weapon coordination, status, and control to Avenger Fire Units
- Critical in preventing fratricide





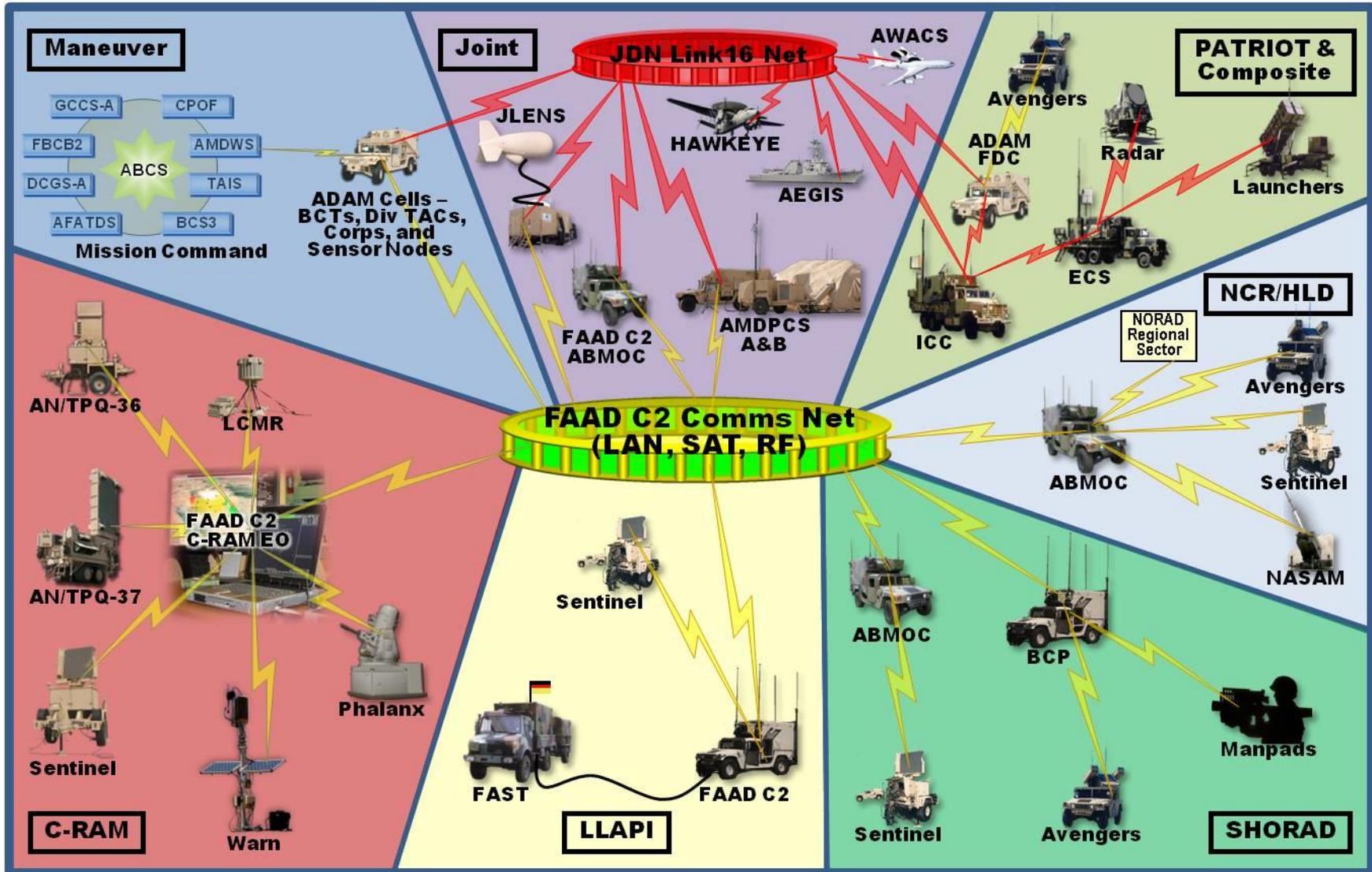
UNCLASSIFIED FAAD C2 SoS Employment (Original OV – Circa 1990)





UNCLASSIFIED FAAD C2

Current Capabilities Architecture





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FAAD C2

Engagement Operations



PROVIDES REAL-TIME AIR SURVEILLANCE & BATTLE MANAGEMENT INFORMATION (in 2-D/3-D)

Provides Real-Time Information for:

- Correlated Common Operating Air Picture
- Positive Position Locating Information (PPLI)
- Air Corridors
- Friendly Aircraft
- Enemy Aircraft
- Unknown Aircraft
- Air Defense Unit Locations, including Joint & Coalition Units
- Battlefield Graphics
- Airspace Battle Management
- Weapon Engagement Status
- Weapons System Target Pairing & TCO Functionality Available**
- Close Air Support/Point of Origin to Cockpit/Call for Fire

0008 SW HOS SNGL FW 135 EG 506 662
MESSAGE NEEDS ACK

FW: TIGHT	RW: TIGHT	ADW: RED
TRK ALRT: 3 ON		27 1930Z
OTH ALRT: 2 ON		AOI-EXT 60
ACK MSG: 1		AOI-ALT 10.0
		THR-FW 60
		THR-RW 60

STD USE ARMY A/C ROUTE

GEOMETRY REF NUM: 511
EFFECTIVE TIME: 2000Z
EFFECTIVE DAY: 100AY----

TODAY TOMORROW

DEACTIVATION TIME: ***Z
DEACTIVATION DAY: INDEF----

TODAY TOMORROW INDEF

COURSE ALLOWANCE (deg): 20
10 20 30 40

MIN VELOCITY (MPS): 100
MAX VELOCITY (MPS): 250

DIRECTION: ONE-WAY TWO-WAY

ONE-WAY TWO-WAY

PREVPG NEXTPG

CANCEL 1/2 PROCESS

TN: 0104 FRIEND SGL RW
HDG: HV
ALT: ****M SPEED: 006M/S
LOCATION: 135 CG 0100 1100
TADIL-B:
A1: A2: ESA: IFB:

TRACK CLEAR F1	OTHER CLEAR F2	SCALE F3	OVRLY F4
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RETURN LAST MENU	USER SYSTEM TOP
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GEN ORDERS F5	CTRL MEAS F6	DISP MSG F7	F8
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EVENT HSTRY	ASSIGN ID	ENTER
DEHOOK	ASSOC TRACKS	





AIR AND MISSILE DEFENSE COMMAND & CONTROL SYSTEM (AMDPCS)





AMDPCS Program Mission



Mission:

- **Develop and field operationally effective and supportable, integrated, digitized Air Defense Systems that satisfy the functional information requirements of commanders and staffs at all echelons of command. This is accomplished through the AMDPCS program.**
- **AMDPCS is the backbone of Army Air Defense through the capability it provides via:**
 - Air Defense Airspace Management (ADAM) Cells to the Corps, Divisions, Brigade Combat Teams (BCT), Combat Aviation Bdes, Fires Bdes, Battlefield Surveillance Bdes, and Maneuver Enhanced Bdes
 - Sheltered Tactical Operations Centers (TOC) (ADAM based) to ADA Bdes, Army Air and Missile Defense Commands (AAMDC), Joint C2 elements, Fire Coordination Cells (FCC), and as Battery CPs and Sensor C2 Nodes
 - Components include: Command Post Platform (CPP) shelters, communications equipment, FAAD/C-RAM C2, AMDWS, ADSI, and TAIS (in some applications)





AMDPCS System Description



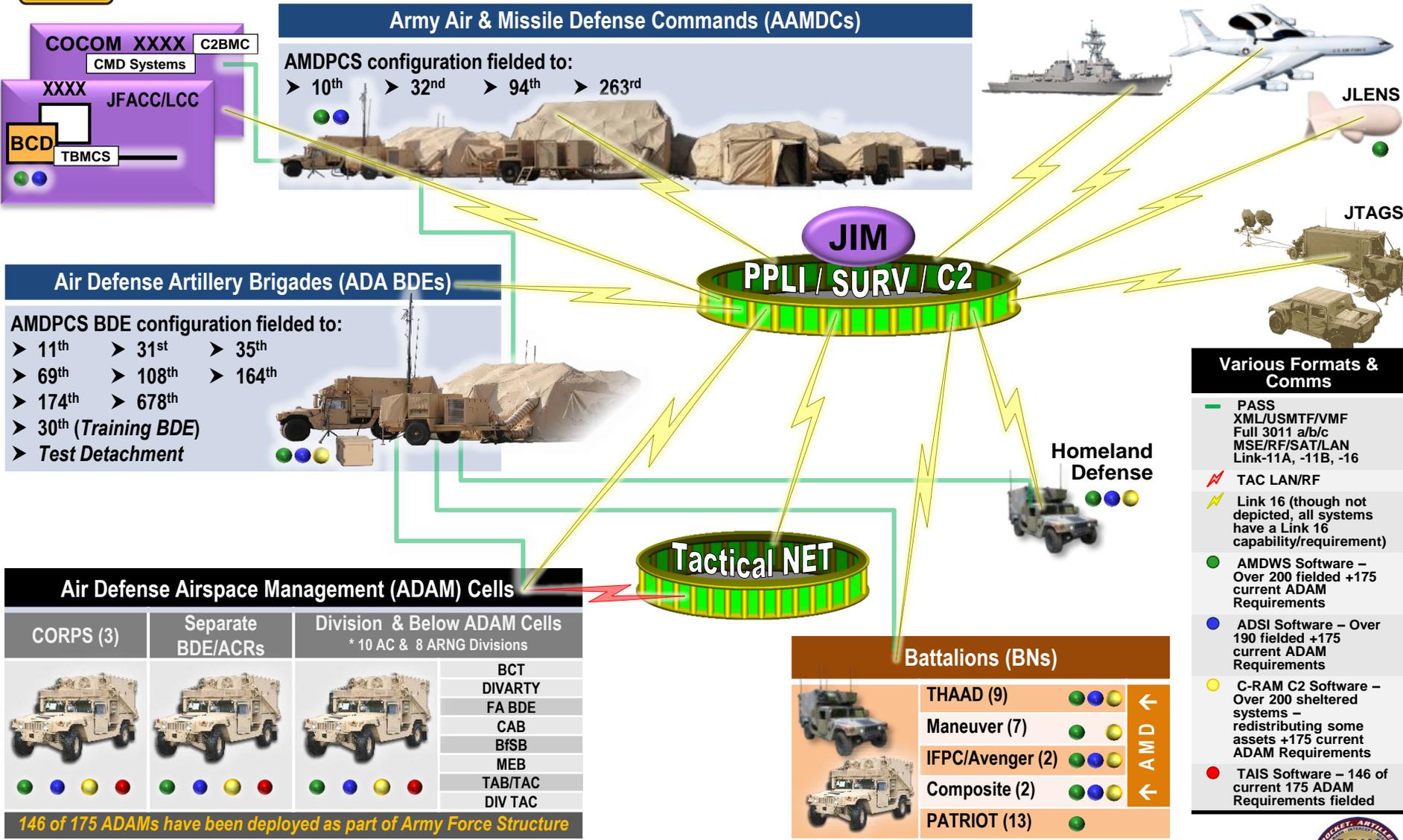
- Army Objective Force system that provides integration of Air and Missile Defense operations at all echelons
- Shelter systems centered around a single type-classified/materiel-released baseline shelter known as the ADAM Cell
- Depending on echelon, ADAMs are fielded in different quantities at Corps, divisions, BCTs, and Multi-functional Support Brigades (MFSB), and provide Commanders at divisions and BCTs with air defense situation awareness and airspace management capabilities
- AMDPCS configurations are also deployed with Air Defense units including AAMDCs, ADA Bdes, and ADA BNs
- AMDPCS provides two major software systems used in air defense force operations and engagement operations - AMDWS and ADSI
- AMDWS operates on a staff laptop and is a staff planning and battle-space situational awareness tool that provides commanders at all echelons with a common tactical and operational air picture
- ADSI provides a multi-TADL/comms processor capability for external links



AMDPCS Across the Force



U.S. ARMY



COCOM XXXX C2BMC

CMD Systems

XXXX JFACC/LCC

BCD TBMCS

Army Air & Missile Defense Commands (AAMDCs)

AMDPCS configuration fielded to:

- > 10th
- > 32nd
- > 94th
- > 263rd



Air Defense Artillery Brigades (ADA BDEs)

AMDPCS BDE configuration fielded to:

- > 11th
- > 31st
- > 35th
- > 69th
- > 108th
- > 164th
- > 174th
- > 678th
- > 30th (Training BDE)
- > Test Detachment



Air Defense Airspace Management (ADAM) Cells

CORPS (3)

Separate BDE/ACRs

Division & Below ADAM Cells
* 10 AC & 8 ARNG Divisions



- BCT
- DIVARTY
- FA BDE
- CAB
- BfSB
- MEB
- TAB/TAC
- DIV TAC

146 of 175 ADAMs have been deployed as part of Army Force Structure

Battalions (BNs)



THAAD (9)



Maneuver (7)



IFPC/Avenger (2)



Composite (2)



PATRIOT (13)



AMD

Various Formats & Comms

- PASS XML/USMTF/VMF Full 3011 a/b/c MSE/RF/SAT/LAN Link-11A, -11B, -16
- TAC LAN/RF
- Link 16 (though not depicted, all systems have a Link 16 capability/requirement)
- AMDWS Software – Over 200 fielded +175 current ADAM Requirements
- ADSI Software – Over 190 fielded +175 current ADAM Requirements
- C-RAM C2 Software – Over 200 sheltered systems – redistributing some assets +175 current ADAM Requirements
- TAIS Software – 146 of current 175 ADAM Requirements fielded



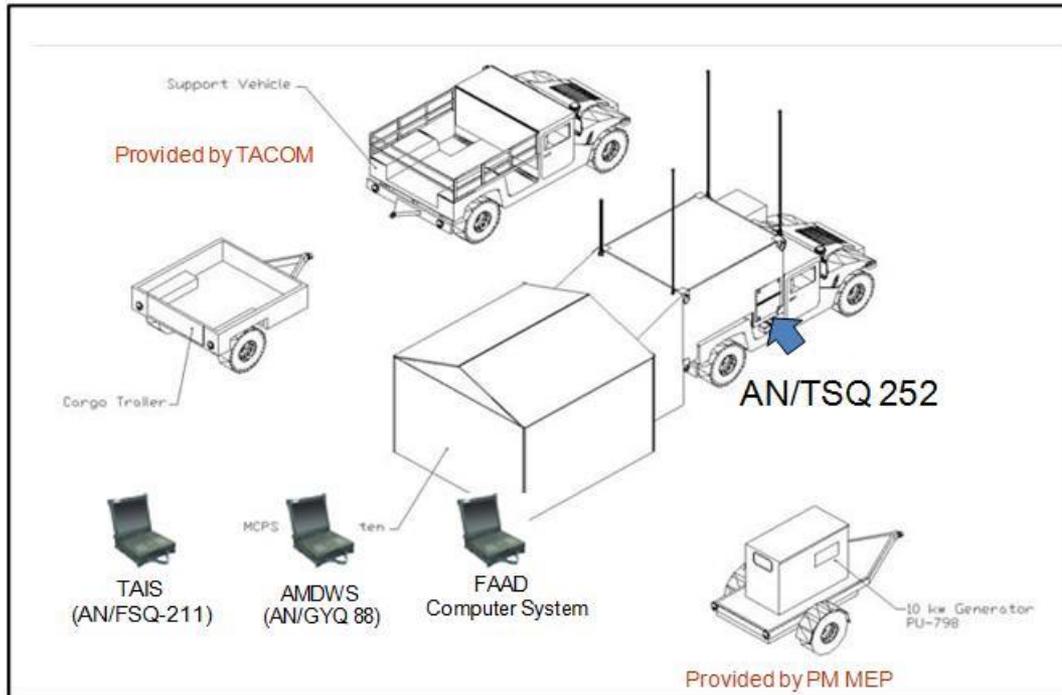


ADAM System Description



The ADAM, AN/TSQ 253 (V1) Provides:

- Three dimensional Air Situational Awareness, early warning, and alerting for Division & BCT CDR (e.g. Air Tracks Visibility & TBMs)
- Radio/chat systems that will allow it to forward TBM launch point, flight of missile, and impact point to subordinate units
- Collaborative Army and Joint AMD Integrated Planning
- Army AMD and AVN Integrated Planning for Current and Future Operations



AN/TSQ 253 (V1)





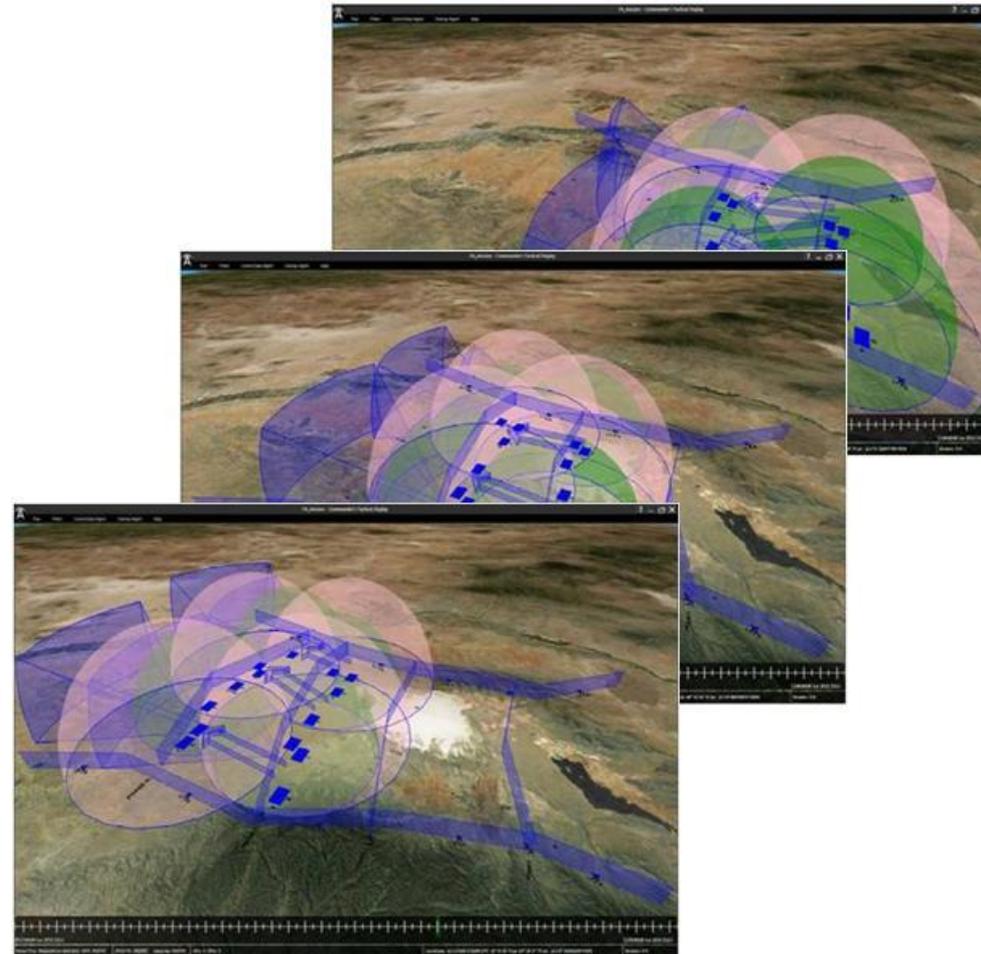
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AMDWS ADA / C-RAM

Force Operations and Planning



- **Sensor/Weapon Placement Optimization**
- **Time Phased Defense Design Planning**
- **Strategic – Tactical Interoperability**
- **Joint and Multi-national Interoperability**
- **Common Operating Picture**
 - Combined Regional / Local Air Picture
 - Sensor / Weapon Coverage and Status
 - Air Combat Order (ACO) / Air Tasking Order (ATO) Parsing and Display
- **RAM Event Management**
 - Fires Coordination (Variable Message Format)
 - Visual Sensor & UAS Tasking
- **Defense Design Exerciser**
 - Air and Force Protection Analysis
 - Rapid Forensic Analysis





C-RAM WARFIGHTER SUPPORT - SENSE, WARN & INTERCEPT -





C-RAM Requirement/Background



■ C-RAM Requirement

- The Army validated a theater Operational Requirement for a system to destroy rockets and mortar rounds in flight in Sep 04

■ C-RAM Capability

- In Sep 04, the Army directed the Air and Missile Defense Command and Control Systems (AMDCC) Product Office to complete a Proof-of-Principle test of their concept for a C-RAM capability
- Proof of Principle test was completed in Nov 04 with US Navy Phalanx destroying > 60 % of mortar rounds
 - **CG CENTCOM said it met theater requirements and requested immediate fielding**

■ Results of C-RAM PoP test briefed to Vice Chief of Staff, Army, Secretary of the Navy, and Deputy Secretary of Defense in Dec 04 / Jan 05

- C-RAM directed to conduct more stressing test – “If successful, Field Immediately”

■ First increment of C-RAM test conducted in Feb 05 – validated Sense, Warn

- ATEC CG said “field immediately” because “it can save lives”
- C-RAM Sense and Warn capability fielded to first Forward Operating Base (FOB), just 4 months after Proof of Principle test

■ Second test increment conducted in Apr 05 – validated Intercept capability

- Two LPWS systems deployed to Initial FOB in May 05

■ Multiple improvements have been incorporated, responding to Lessons Learned by soldiers and to respond to changes in threat tactics

C-RAM Sense, Warn, Respond Capability Currently Deployed in Afghanistan, Iraq, and Egypt, with Intercept at Some Locations in Afghanistan and Iraq – Mission Continues





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C-RAM Functions/Pillars in Countering the IDF Threat



Senses Indirect Fire (IDF) and Air Breathing Targets (ABT)



Warns personnel within hazard area of predicted impact point



Warn 3.0

Intercepts rocket or mortar round in flight, precluding lethal effects on the ground



LPWS



AI3

Provides **Command and Control** by modified versions of standard Army C2 systems



FAAD C2

- Coordinates/enables lethal or non-lethal **Response** through the Mission Command systems
- **Shapes** the battlefield by assessment of threat data collected by C-RAM systems
- **Protect** deals with the consultation and coordination of physical barriers, bunkers, and other measures to provide physical force protection

- Requires a Holistic Approach - No One System/Component can Perform the Mission
- Modular, Scalable, and Tailorable Capability Based on Mission Need and Available Resources

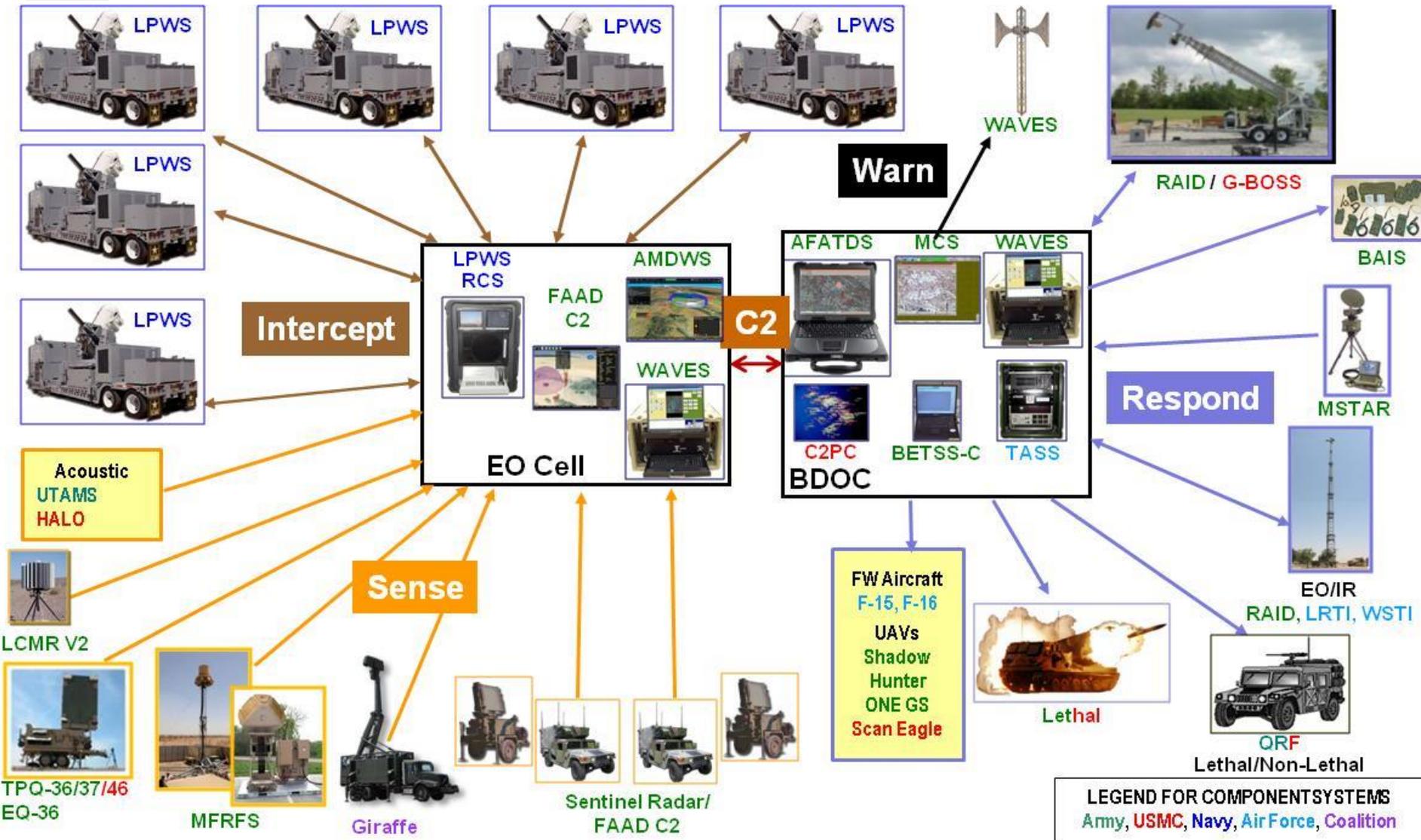




U.S. ARMY

C-RAM Sense, Warn, Intercept & Enhanced Response Validated Architecture

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LEGEND FOR COMPONENTS SYSTEMS
 Army, USMC, Navy, Air Force, Coalition





C-RAM Performance in Combat



- LPWS systems have achieved **more than 300 successful intercepts** of a rocket or mortar round fired at high value assets
- C-RAM Sense, Warn, and Respond performance has also been extremely successful, **providing timely Warning for more than 5,600 rocket or mortar attacks against C-RAM FOBs, with a minimum of False Warnings**
 - This enables troops in the hazard area to lie prone or seek protection prior to impact
 - C-RAM has also supported successful Response resulting in capture/destruction of IDF crews and caches
- C-RAM operational performance exceeds its initial performance in testing at Yuma
- C-RAM Sense, Warn, Intercept, and Respond performance is enhanced by the creation of “Super FOBs” ...linking FOBs together

**C-RAM Systems Operational Readiness Rate Currently Exceeds 95%,
Operating 24/7 in an Extreme Heat and Dust Environment!**





RAM WARN





RAM Warn Requirement



■ Why is RAM Warn needed?

- Due to an increased number of Indirect Fire (IDF) attacks against US forces

■ What it provides to the Warfighter?

- Provides the Soldier early warning of an IDF attack via localized audio/visual warning, thus reducing personnel casualties

■ Requirements Document

- IFPC Increment 1 Capability Production Document (CPD), 6 August 2010, CARD # 0782
- RAM Warn CPD, 1 May 2012, CARD #0782 retained; update reflects program name change
- ACAT III, Joint Staffing Designator: Independent (not a joint program)
- Representative Warn capability at the Maneuver BCTs, with operational expansion via access to Army Prepositioned Stock (APS) as required based on mission needs
 - APS suites consist of two (2) outdoor Warn systems and seven (7) indoor Warn systems

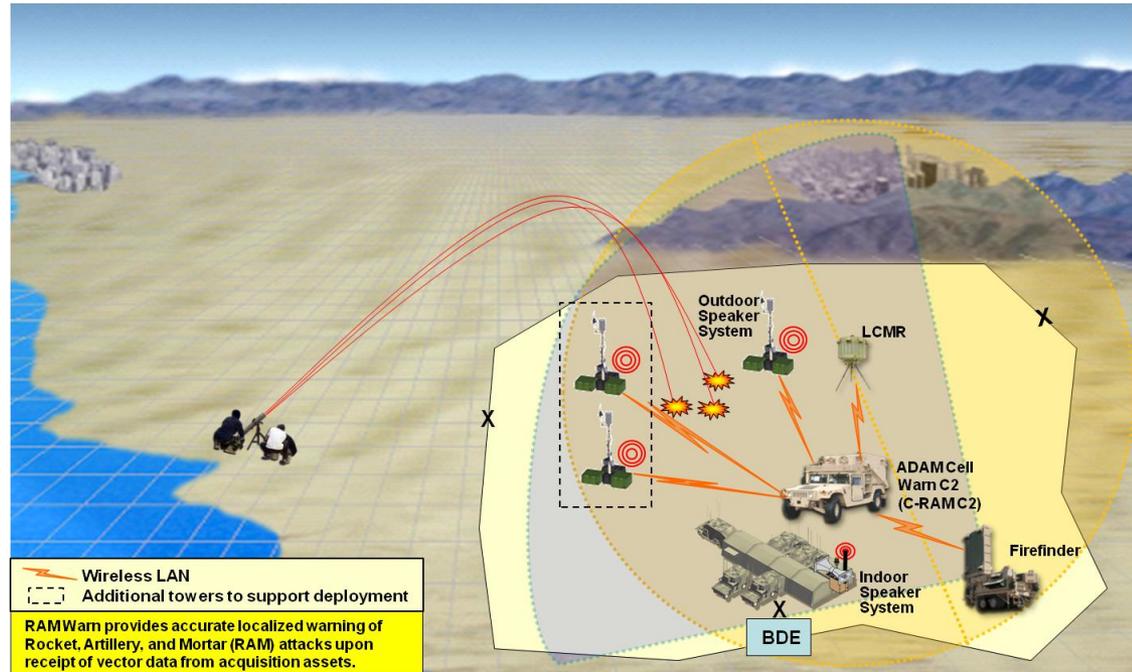




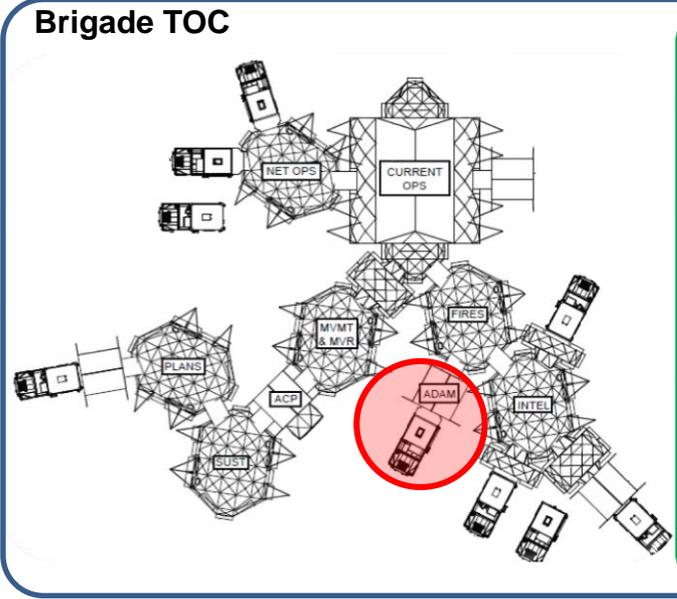
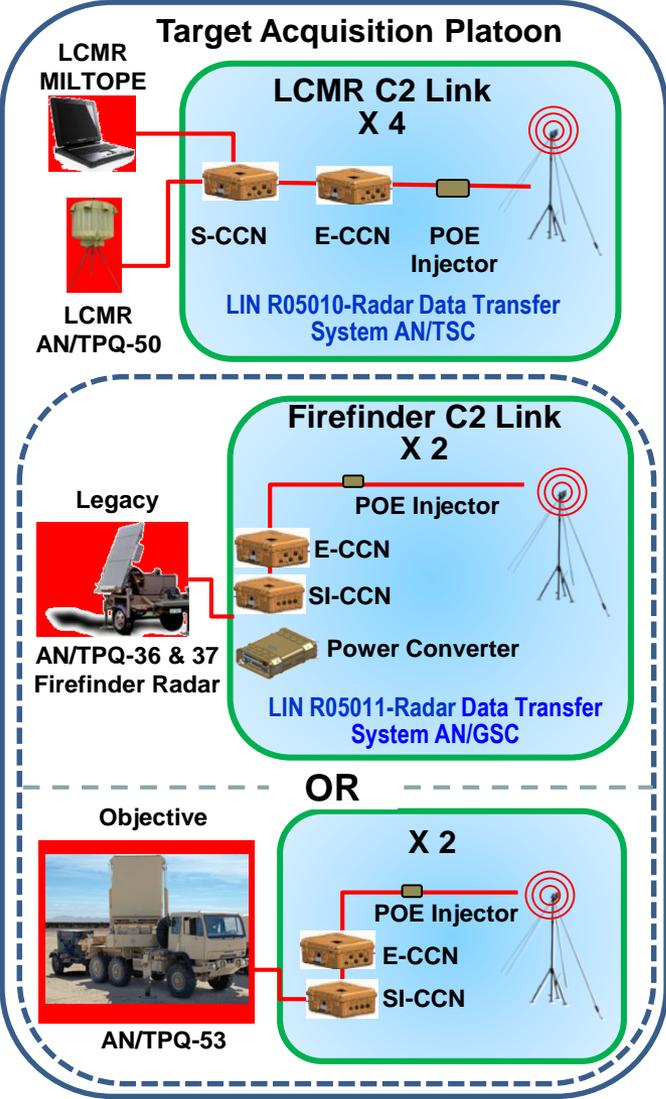
RAM Warn Operational Concept



- RAM Warn primary mission is to warn U.S. forces of incoming Indirect Fire (IDF) attacks
- IDF attacks comprise a significant portion of all Soldier casualties
- Overview of the RAM Warn capability
 - Begins with the acquisition of an IDF launch by two or more independent sensors (radars) acquiring the same event within a given time frame
 - FAAD C2 confirms that detection event is an actual IDF launch, determines Point of Impact (POI) and Time of Impact of IDF rounds
 - Based on the POI, FAAD C2 then determines which warn nodes should send “Incoming” warning alarms and transmits this information to the appropriate warning nodes



RAM Warn System Overview



Blue are PM Provided

Red Unit Property – unit provides power

Additional RAM Warn equipment will be made available as Army Prepositioned Stock (APS) for deploying units based on mission needs





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What is Required to Field RAM Warn to a BCT?



- **Minimal additional equipment / training is required for the current ADAM Cell crew and shelter to operate the RAM Warn capability**
 - **Training requires only 3 weeks**
 - **Additional equipment is required to provide the Warning capability**
 - Warning devices, both external and internal
 - Communications to link Warning devices to FAAD C2 workstation
- **Army fielding concept for RAM Warn**
 - **Each BCT is provided a “slice” of the equipment required to provide BCT Warning, with the remaining equipment maintained in APS**
 - **The “slice” of equipment at each BCT is sufficient to conduct training, maintain operator skills, and support exercises**
 - **In a deployment the required RAM Warn equipment is provided to the BCT via access to APS**





C-RAM INTERCEPT TO IFPC/AVENGER COMPOSITE BATTALIONS





C-RAM Intercept Requirement



- In DEC 2011, the G-3/5/7 approved a Directed Requirement, stating:
 - LPWS would be fielded to 2 ADA battalions without modifications, to provide an interim capability until IFPC Increment 2-Intercept is fielded
 - 5-5 ADA Effective Date of 1QFY14 and 2-44 ADA Effective Date of 1QFY15
 - TRADOC tasked to develop the C-RAM Intercept (LPWS) Capability Production Document (CPD)
- Force Design Update (FDU) for IFPC/Avenger composite battalion approved in JAN 12
- 5-5 ADA MTOE approved in DEC 12
- CPD and Acquisition Decision Memorandum (ADM) approved in AUG 13





C-RAM Intercept Concept of Operations



Continuous: Sentinel → C-RAM C2 → AMDWS and LPWS (Do Not Engage Sector (DNES)) based on Track Quality (TQ)

1 Rocket/Mortar:

Terrorist launch → **LCMRs** detect, or track is told in by supported units CTA Radars and reports to **C-RAM C2**

2 C-RAM C2 Does 3 Things Near Simultaneously:

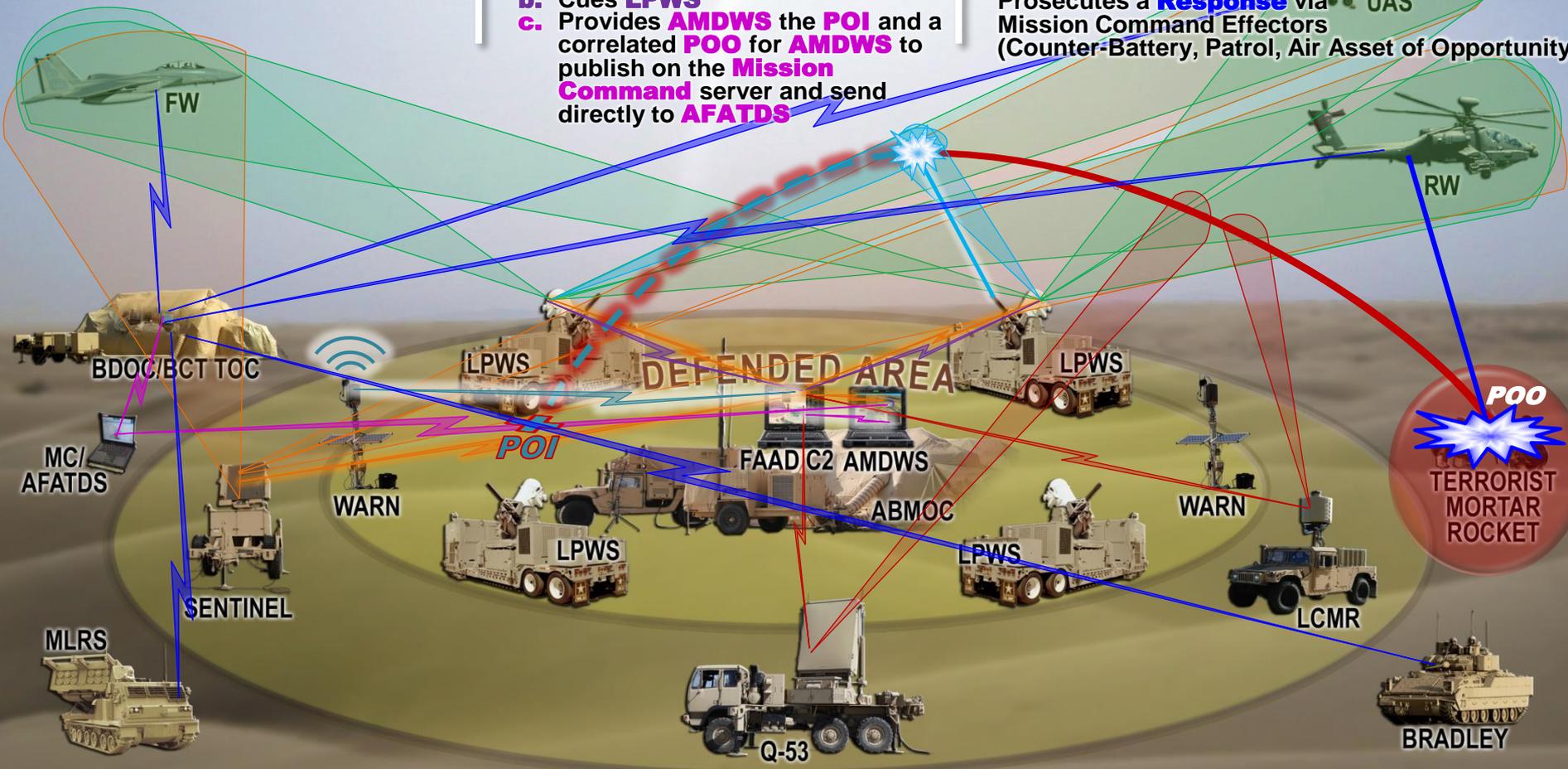
- a. **C-RAM C2** determines **POI** and tells which towers to **Warn**
- b. Cues **LPWS**
- c. Provides **AMDWS** the **POI** and a correlated **POO** for **AMDWS** to publish on the **Mission Command** server and send directly to **AFATDS**

3 LPWS:

LPWS acquires, tracks, engages the RAM target

4 Brigade TOC:

Prosecutes a **Response** via **UAS** Mission Command Effectors (Counter-Battery, Patrol, Air Asset of Opportunity)





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LPWS Transition

Fielding LPWS to IFPC/Avenger Composite BNs



SHORAD BN

C-RAM LPWS
Intercept
Composite BN

IFPC Inc 2-I Blk 1
Potential
Composite BN
(Notional)

IFPC Inc 2-I Blk 2
(Notional)

Current Design

Near Term Design

Mid Term Design

Long Term Design

Avenger BN

IFPC/
Avenger BN

IFPC/
MML BN

MML BN

Avenger
BTY

Avenger
BTY

LPWS
BTY

MML
BTY

LPWS
BTY

MML
BTY



4x3x3=36

4x3x1=12

4x3x2=24

4x3x1=12

4x3x2=24

4x3x3=36



x8



x2



x6



x2



x6



x6





AN/TPQ-50 LCMR





AN/TPQ-50 Mission



Mission:
Short range detection and location of enemy rockets, artillery, and mortars; provide the Warfighter with sense & warn capability against indirect fire threats





AN/TPQ-50 System Overview



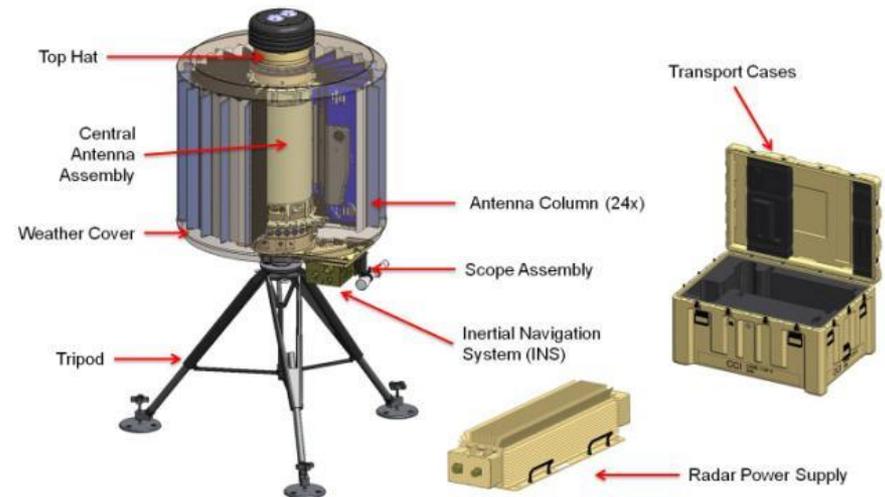
Characteristics / Description:

- Identifies position of indirect fire weapon systems (Rockets, Mortars, and Artillery)
- Continuous 360° degree surveillance capability using an electronically scanned antenna
- Quickly assembled by two soldiers
- Sends weapon point of origin and point of impact to C2 systems



Key Capabilities:

- Vehicle Mounted and Stand-Alone Configurable
- Continuous 360° degree surveillance
- Rapidly deployed by two soldiers





AN/TPQ-50 Capability Summary



Attribute	Capability
Point of Impact	Provides weapon Point of Impact coordinates
Probability of Location	Meets Army requirements for Mortars, Rockets, and Artillery
False Location Rate	Advanced Classification algorithms reduce false location rate
Emplacement Options	Expeditionary, Vehicle Mount, Fixed Site
Clutter Performance	Outstanding performance even in mountainous and urban environments retains full radar performance in presence of severe weather
Weapon Classification	Type (Mortar, Rocket, Artillery) Subtype (Light, Medium, Heavy)
Built-In Test	Online fault detection; fault location to a single LRU
Environmental	MIL-STD-810G compliant
EMI	MIL-STD-461E and MIL-STD-464A compliant



Expeditionary Configuration



Vehicle Mount Configuration



Fixed Site Configuration





AN/TPQ-50 Summary



- Demonstrated success in theater under operational conditions.
- Radar comprised of solid state system components (no moving part). Theater reliability data demonstrates high reliability under continuous 24/7 operation.
- Determines indirect fire weapons Points of Projectile Origin and Point of Impact using a continuous 360° search pattern.
- Remotely operated via encrypted wireless link up to 1 km away with communications links to Counterfire C2 systems (AFATDS) and IFPC / C-RAM (FAAD C2).
- Provides tactical flexibility, mobile operations (vehicle mounted and operates on vehicle power) and fixed emplacement depending on tactical situation.
- 2-person crew (13R MOS) for tactical and mobile environments; reduced personnel requirements for fixed, long term emplacements.
- Currently in Full Rate Production.





AN/TPQ-53





AN/TPQ-53 Mission



Mission:

Provides the next generation, long range target acquisition, counterfire, sense and warn capabilities against direct and indirect fire from rockets, artillery and mortar threats.





AN/TPQ-53 System Overview



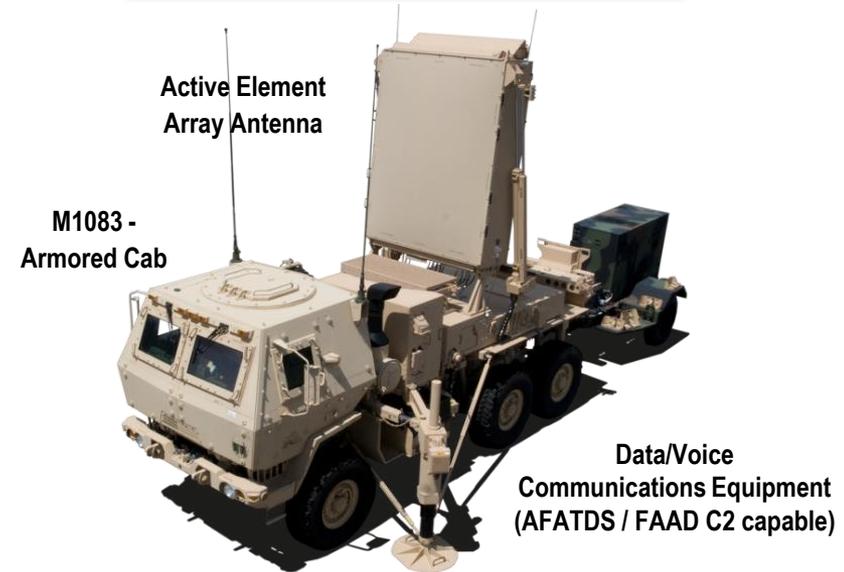
Characteristics / Description:

The AN/TPQ-53 is a replacement for the legacy AN/TPQ-36 and AN/TPQ-37 target acquisition counterfire radar systems. AN/TPQ-53 provides improved operational capability over the legacy radar systems. The AN/TPQ-53 provides Warfighters 360° continuous and responsive counter-battery target acquisition capabilities for all types of military operations. The AN/TPQ-53 detects in-flight projectiles and determines and communicates firing point locations of mortars, artillery, and rockets with a high degree of accuracy and low false alarm rates.

Key Capabilities:

- Determines Points of Projectile Origin and Impact
- 90° and 360° Capable: Detects Mortars, Cannons and Rockets
 - 90° Search
 - 360° Search
- Wireless or Fiber Optic Cable Control (1 km)
- Links to Counterfire Shooters (AFATDS)
- Links to IFPC / C-RAM (FAAD C2)
- Emplace – 5 Min; Displace – 2 Min; Auto-Levels

Target Acquisition Subsystem



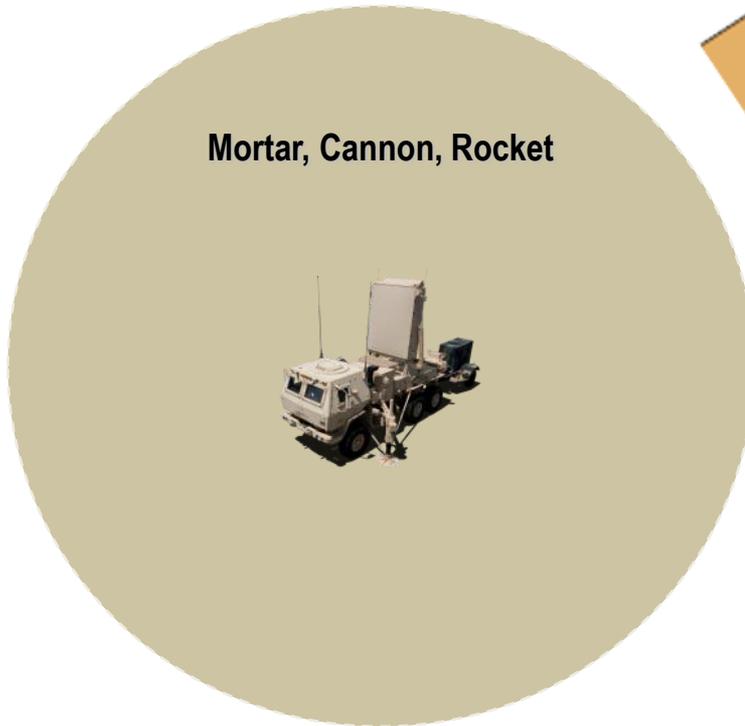
Communication Subsystem





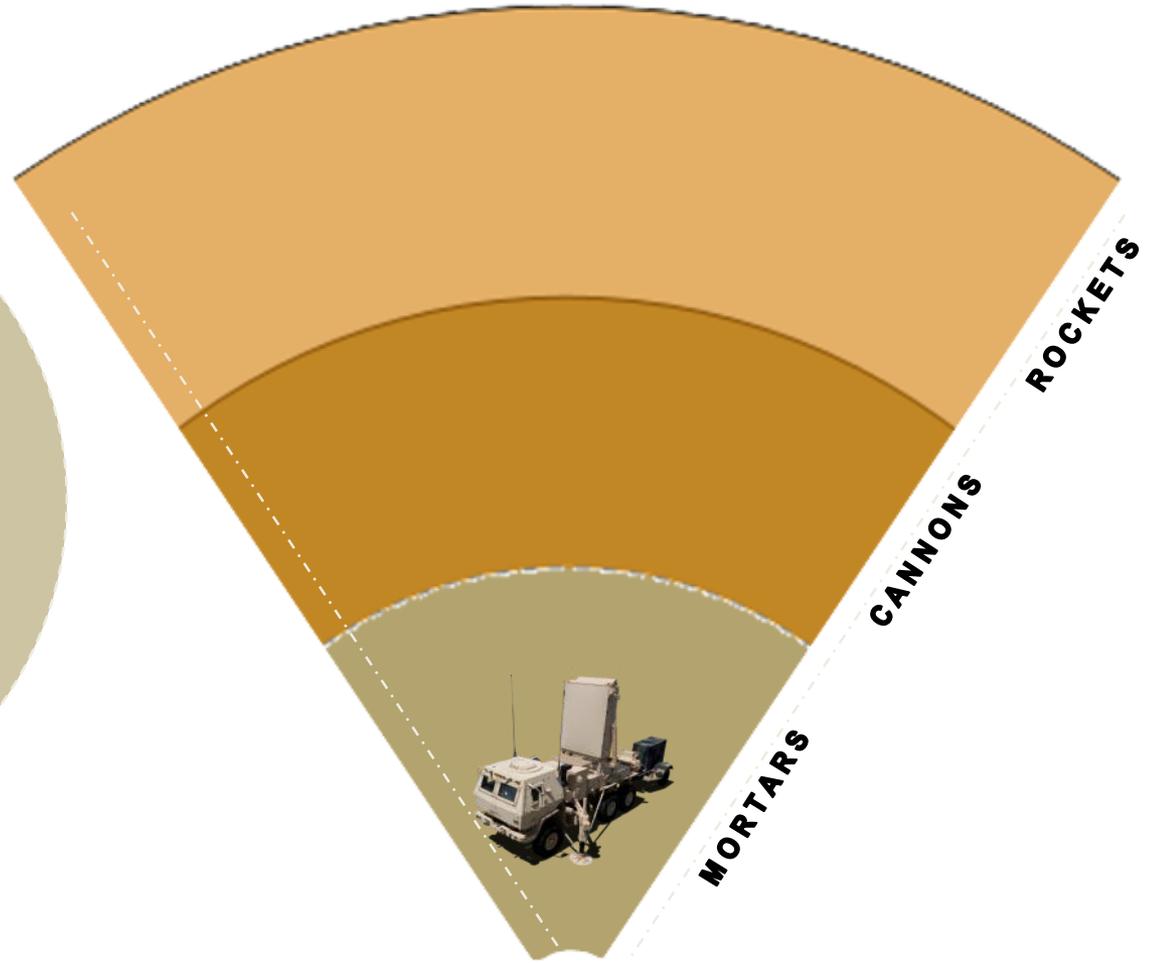
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AN/TPQ-53 Required Performance in 90° & 360° Modes



Mortar, Cannon, Rocket

360° Mode



90° Mode

MORTARS

CANNONS

ROCKETS





AN/TPQ-53 Summary



- Provides improved operational capability over the legacy AN/TPQ-36 and AN/TPQ-37 counterfire radar systems
- Active Electronically Scanned Array radar system
- Determines Points of Projectile Origin and Point of Impact of indirect fire weapons using either a 90° search area or a 360° search area
- Wireless or Fiber Optic Cable Remote Control up to 1 km away, with communications links to Counterfire Shooters (AFATDS) and/or IFPC/C-RAM (FAAD C2)
- Tactically mobile; emplaces in 5 Min, and displaces in 2 Min; Auto-Levels
- 5-person crew; reduced logistics footprint





AN/TPQ-36 FIREFINDER





AN/TPQ-36 Mission



Mission:

Detect and locate enemy rockets, artillery, and mortars with sufficient accuracy to permit rapid engagement with counterfire.





AN/TPQ-36 System Overview

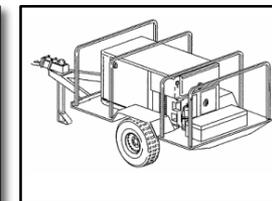
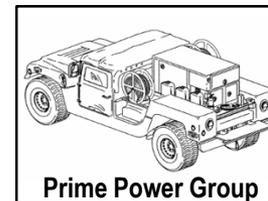


Characteristics / Description:

- Mobile mortar locating radar system; ground and air transportable
- Ability to track, correct and improve the fire of friendly weapons with registration and adjustment data
- Provides sense and warn capability to C-RAM

Key Capabilities:

- Detects, tracks, and classifies enemy indirect fire systems
- Locates mortars, artillery, rocket launchers, and missiles
- Performs high burst, datum-plane, and impact registrations

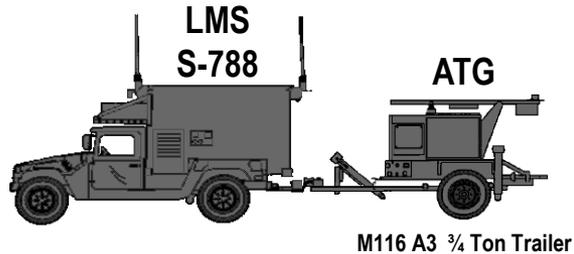




AN/TPQ-36 Configuration



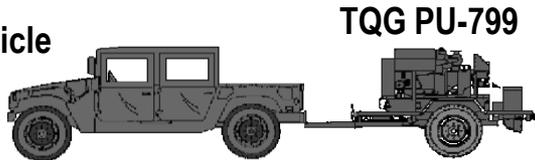
OC
Shelter



M116 A3 3/4 Ton Trailer

- Operations Central (OC) Lightweight Multi-Purpose Shelter (LMS) on M1097A2 Heavy HMMWV tows Antenna Transceiver Group (ATG)

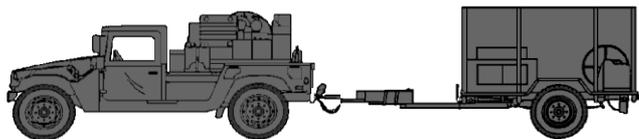
Recon Vehicle



TQG PU-799

- The Recon Vehicle on a M1097A2 Heavy HMMWV tows Tactically Quiet Generator (TQG) PU-799 (10KW, 400HZ, 120/208 volts AC)

Backup TQG
MEP813A
Vehicle



M1102 3/4 Ton Cargo Trailer

- M1097A2 Heavy HMMWV with a TQG tows the Equipment Trailer with all the spare parts



13R30



13R20



13R10



94M10
(Maintainer)

- System is operated and maintained by five (5) Radar Operators; and one (1) Radar Repairer





AN/TPQ-36 Summary



- **Primary mobile target acquisition and counterfire radars system for Field Artillery. Ground and air transportable.**
- **Capable of detecting and locating enemy mortar, artillery, rockets and missiles with sufficient accuracy to permit rapid engagement with counterfire.**
- **Firefinder (AN/TPQ-36 and AN/TPQ-37) is being replaced by the AN/TPQ-53.**
- **Stable, well defined requirements baseline; mature technologies.**
- **Combat proven.**





AN/TPQ-37 FIREFINDER





AN/TPQ-37 Mission



Mission:

Detect and locate enemy rockets, artillery, and mortars with sufficient accuracy to permit rapid engagement with counterfire.





AN/TPQ-37 System Overview



Characteristics / Description:

- Mobile mortar locating radar system; Ground and air transportable
- Ability to track, correct and improve the fire of friendly weapons with registration and adjustment data
- Provides sense and warn capability to C-RAM



ATG
(Antenna Transceiver Group)

Key Capabilities:

- Detects, tracks, and classifies enemy indirect fire systems
- Locates mortars, artillery, rocket launchers, and missiles
- Performs high burst, datum-plane, and impact registrations



OCG
(Operations Control Group)



ATG and Prime Mover



Cargo FMTV



AN/TPQ-37 Configuration



OY-72(V)6/TPQ-37(V)
Antenna Transceiver Group (ATG)
 1430-01-562-7957
 M1048A1 trailer
 2330-01-406-2090



OA-9018(V)1/TPQ-37(V)
Generator Power Distribution Group
 6115-01-400-3217
 M1083A1 FMTV truck
 2320-01-447-3884



OK-398(V)9/TPQ
Operations Central (OC)
 5895-01-567-9005
 M1113 HMMWV
 2320-01-412-0143



Generator Trailer
 6115-01-471-1506



M1083A1 FMTV truck
 2320-01-447-3884



ON-732(V)/TPQ Interconnecting Group
 5895-01-577-7321 [(V)1 is CARC Tan]
 5895-01-578-4332 [(V)2 is CARC Olive Drab]





AN/TPQ-37 Summary



- **Primary mobile target acquisition and counterfire radars system for Field Artillery. Ground and air transportable.**
- **Capable of detecting and locating enemy mortar, artillery, rockets and missiles with sufficient accuracy to permit rapid engagement with counterfire.**
- **Firefinder (AN/TPQ-36 and AN/TPQ-37) is being replaced by the AN/TPQ-53.**
- **Stable, well defined requirements baseline; mature technologies.**
- **Combat proven.**





Summary



- **Transition of deployed C-RAM SoS capability to the Institutional Army as an Enduring Capability is underway (e.g., RAM Warn, C-RAM Intercept)**
 - C-RAM functions/pillars (C2, Sense, Warn, Intercept, etc) are agile, evolutionary, block vs. incremental efforts
 - Each function/pillar is or can be independent of the others with the exception of C2, which is common to all
- **C-RAM C2 software plays a vital role in FAAD C2, AMDPCS, and all C-RAM efforts, as well as other emerging efforts including Integrated Air and Missile Defense (IAMD)**
- **Recent transition of PdM Radars organization/systems under PD C-RAM management offers synergistic approach for IDF detect and defeat**
- **PD C-RAM is working with ASA(ALT) and HQDA Staff to establish appropriate funding lines for mod efforts**

