# FIRES!

A Joint Publication for U.S. Artillery Professionals March — April 2013 http://sill-www.army.mil/firesbulletin

# Fires 2020

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FIRES

March - April 2013





**PURPOSE:** Founded in 2007, *Fires* serves as a forum for the professional discussions of all Fires professionals, both active and Reserve Component (RC); disseminates professional knowledge about progress, developments and best use in campaigns; cultivates a common understanding of the power, limitations and application of joint Fires, both lethal and nonlethal; fosters joint Fires interdependency among the armed services; and promotes the understanding of and interoperability between the branches, both active and RC, all of which contribute to the good of Army, joint and combined forces, and our nation.

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On the Cover: Lance Cpl. Paul J. Butcher from M Battery, 3rd Battalion, 12th Marine Regiment, 3rd Marine Division, III Marine Expeditionary Force, pulls the lanyard of an M777 howitzer at Pong Nam Ron, Kingdom of Thailand, during the Cobra Gold 2013 field training exercise (FTX). During the FTX, Royal Thai and U.S. Marines participated in bilateral training with the hopes of learning best practices from each force's military occupational specialty counterparts. (Photo courtesy of Lance Cpl. Paul J. Butcher, U.S. Marine Corps)


Regiment and battlefield coordination detachment (BCD) headquarters; 13 per FA/Fires battalion/squadron; 3 per fire support element (FSE), Fires and effects cell (FEC), effects coordination cell (ECC) fire support cell (FSC), and separate battery or detachment; 2 per fire support team (FIST); and 1 per Master Gunner. Free copies to Army ADA units: 7 per air and missile defense command (AAMDC) and ADA brigade headquarters; 13 per ADA battalion; and 3 per air defense airspace management cell (ADAM) and separate battery or detachment. The FA and ADA Schools' departments, directorates and divisions each get 2 copies. Other Army branch and US armed services units/organizations and US government agencies that work with FA or ADA personnel, equipment, doctrine, tactics, training organization or leadership issues may request a free copy—including, but not limited to—ROTCs, recruiting commands, libraries, attaches, liaison officers, state adjutants general, public affairs offices, military academies, laboratories, arsenals, major commands, etc.

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# Fires 2020

**By MG Mark McDonald**
Commanding General of the Fires Center of Excellence and Fort Sill, Okla.

Plans are in full swing here at Fort Sill, Okla., pending budget decisions, for the annual Fires Seminar scheduled for May 7 - 8, 2013. Select Fires professionals from around the world will attend and participate in the seminar, discussing topics which will directly impact the force, our Soldiers, and possibly procedures for the future Fires force of 2020. This year will be somewhat of a departure from past seminars, as the event will be by invitation only. However, everyone will have the option of virtual attendance. We have provided links with instructions on how to attend virtually through Defense Connect Online (DCO) at http://go.usa.gov/2Qy3. The most current information (agenda updates, scheduled guest speakers, topics, etc.) will always be posted as it becomes available on the Fires Knowledge Network (FKN), so use that as your first source of information.

We encourage all of you to carve out time from your busy schedules and use the seminar as a professional development opportunity for your junior leaders and Soldiers. Input from the field is invaluable as we move through the seminar, and your questions or comments are easily transmitted through DCO. We want this seminar to be a two-way source of information, and the only way to do that is to get our Fires force involved at the individual level. Some of the most forward-thinking and relevant questions and/or comments from past seminars have come from young captains who have just returned from theater or noncommissioned officers on the gun lines. Your insights, opinions, and concerns are the foundation of the Fires Seminar and it's imperative senior leaders hear from you.

This year's theme is Fires 2020, and this issue of *Fires* is dedicated to preparing seminar attendees for educated discussions on the topics of weapons systems, joint and combined training, doctrine, and capabilities development for the force of 2020. The Capabilities Development and Integration Directorate (CDID), the Directorate of Training and Doctrine (DOTD), and the Joint and Combined Integration Directorate (JACI) have provided their best subject matter experts (SMEs) to prepare these articles for your benefit.


The article by COL John T. Smith, director of JACI, does an excellent job of discussing the importance of joint and combined training within the branches and the Fires force. Only a few of us have been around long enough to remember an era with little or no interaction among our allied nations. Exercises such as Return of Forces to Europe, or REFORGER, provided only minimal contact with the host country, most of which was reserved for the more senior ranks. The Force of 2020 will definitely be a joint and combined force, training side-by-side, using equipment that is in synch and communicating 24/7, and producing Soldiers who are highly proficient in the skills required of Fires Soldiers around the world. A veteran of 28 years, Smith understands and accurately articulates the mission of JACI, describing the courses offered, and more importantly, the importance they have to our future force.

Airspace is becoming increasingly competitive as more and more demands are being placed upon the same time and space allocations. In Operation Iraqi Freedom, airspace clearance time averaged 45 minutes due to lack of understanding of the mission requirements. LTC Dan Elliot, in coordination with SMEs from the Maneuver and Aviation Centers of Excellence (MCoE and AVNCoE), has researched the past and current AGI requirements and his article “Air Ground Integration (AGI) in Unified Land Operations” will explain the synergies and efficiencies gained through integrating air and ground capabilities.

In its simplest terms, AGI is a function of combined arms and mission command. Knowing that combined arms is an enormous combat power multiplier, the onus lies with mission command to synchronize and integrate leadership, information, and all of our warfighting functions and the supporting systems. The Fires Center of Excellence (FCoE) has formed a working group with both the MCoE and the AVNCoE to establish a shared understanding, improved relationship, interoperability, and mutual support in the effort to resolve the airspace conflict and better coordinate its use. The need still exists to establish doctrine and achieve a common language and understanding of how we must fight, now and in the future. Your input is critical to ensure we get this rapid synchronization right from the beginning and all unified action partners are identified and addressed in the doctrinal process. The Fires seminar will be the conduit for this discussion.

Although some of the topics at the seminar aren’t covered in this magazine, reading and understanding those we’ve provided will definitely give you a decisive edge in participating in discussions. If you don’t get enough copies to distribute to your Soldiers, the online version of the magazine can be found at http://sill-www.army.mil/firesbulletin/ and is readily available from any computer or smart device.

Again, thank you so much for what you do every day to make our Army and the Fires force the best, most professional team in the world. We look forward to hearing from all of you during the 2013 Fires Seminar.

**Fires Strong!**★★

Soldiers stage 155 mm artillery rounds in preparation for an exercise with the 82nd Airborne Division at the Sicily Drop Zone, near Fort Bragg, N.C. The Joint Operational Exercise (JOAX) 13-02 is a combined joint training exercise designed to prepare elements of the 82nd Airborne Division, along with its partners and enablers, to respond as part of the Global Response Force. (Photo by Staff Sgt. Renae Saylock, U.S. Air Force)

# Field Artillery Modernization Strategy

By BG Brian J. McKiernan
Chief of the Field Artillery and Commandant of the U.S. Army Field Artillery School, Fort Sill, Okla.


As we forge ahead into 2013, one objective remains clear for the Field Artillery (FA) branch, we must continue to assess the evolving capability of potential adversaries in order to determine and address gaps in our ability to integrate and deliver Fires in support of unified land operations. The Fires Force Modernization Strategy, that includes the Field Artillery Modernization Strategy, is a result of this assessment process and provides a roadmap to deliver required operational capabilities for the Army of 2020. The following summary provides an update on a few current operational gaps and the methods we're employing to ensure the readiness of tomorrow's Field Artillery force to meet the challenge of the security environment of 2020 and beyond.

**Target Acquisition Radars.** We are moving from eight different 90-degree sensor systems that are aging and costly to maintain, to two, 360-degree systems with state of the art electronics. The High Mobility Multipurpose Wheeled Vehicle (HMMWV)-mounted AN/TPQ-50 Lightweight Counter Mortar Radar (LCMR) and the truck-mounted AN/TPQ-53 Quick Reaction Capability Radar will soon become the primary target acquisition radars within the Field Artillery. These radars are designed to provide 360-degree detection coverage for counterfire and enable warning against incoming enemy rocket, artillery and mortar fire.

The AN/TPQ-53 provides AN/TPQ-37-type performance and reduces operational and support costs. It provides 90-degree and 360-degree capability to detect, classify and track incoming mortar, artillery, and rocket projectiles. The minimum range is 500 meters and the maximum range is 60 kilometers. The radar can be emplaced in five minutes, displaced in two minutes, is equipped with an auto-leveling system, and is manned by a crew of four. The radar is linked by digital tactical radios to Advanced Field Artillery Tactical Data System (AFATDS) for rapid mission processing.

The Q-50 is a short-range radar, engineered to work in tandem with the Q-53 as a complementary system and mitigates the risk of the minimum range of the Q-53. The Q-50 has a minimum range of 500 meters and a maximum range of 10 kilometers, and it is manned by a crew of two.

Fielding for the Q53 is currently planned for the first quarter of FY14 and for the Q50, fielding is currently planned for third quarter of FY13. This plan remains contingent on the successful completion of testing and obtaining full material release for each system.

**Targeting Devices.** Accurate target location continues to be our greatest challenge in meeting the five requirements for accurate predicted fire and fully leveraging the incredible capabilities of our precision munitions. We are making great strides in addressing this challenge and have developed a program that has great potential to resolve this age-old issue. Our Lightweight Laser Designator Rangefinder-Hand-Held (LLDR-2H), scheduled to be fielded in June 2013, and the future Joint Effects Targeting System (JETS) are superior targeting systems that will greatly enhance target location capabilities.

**Update on LLDR-2H.** Today, all of our brigade combat teams (BCTs) are fielded with the Lightweight Laser Designator Rangefinder (LLDR). At a system weight of nearly 32 pounds, the LLDR was first fielded in the late 1990's and remains a capable targeting device. Unfortunately, the LLDR uses a digital magnetic compass which does not provide the target location accuracy required to effectively employ precision munitions without target coordinate mensuration. The LLDR-2H adds the high accuracy azimuth device (HAAD) which uses the Celestial compass interfacing with its selective availability anti-spoofing module (SAASM) compliant global positioning system (GPS) receiver to achieve 10-meter target location error (TLE) out to 2,500 meters and near precision accuracy at ranges greater than 6,000 meters. When the sun or stars are not available, the LLDR-2H can either reference previously stored target reference points or revert to the digital magnetic compass used in legacy systems.

**Update on JETS.** JETS is the umbrella term used for the next generation of hand-held precision targeting devices (HHPTD) specifically designed for forward observers (FO) enabling them to determine accurate target coordinates and effectively employ precision munitions without target coordinate mensuration.

An FO equipped with JETS will be capable of target recognition out to ranges of 3,000 meters during the day and 1,300 meters at night with sufficient accuracy for the employment of precision munitions without mensuration (10 meters TLE at 2.5 kilometers). JETS will have a hand-held weight of no more than 5.5 pounds, and will be capable of day and night observation, target location and designation. JETS, equipped with the Target Location Designation System (TLDS) module, will have the capability to designate stationary targets out to five kilometers and moving targets out to three kilometers. We anticipate select units will be equipped with JETS beginning in 2016.

**A Bridging Strategy.** Until we can field JETS, a quick reaction capability (QRC) hand-held precision targeting device will be fielded to provide the dismounted FO an enhanced ability to accurately locate targets. The QRC device will bridge the gap between the target location capability found in units today and the desired capability programmed in JETS. We expect select units in Afghanistan to be the first to receive QRC hand-held devices beginning in March 2013.

**Delivery Systems.** Our ongoing FA delivery system modernization efforts include the Paladin Integrated Management (PIM) program and the Digitized M119A3 Program.

**Update on Paladin Integrated Management (PIM).** The objective behind PIM is to address obsolescence and sustainment issues of the current M109A6 Paladin and M992A2 Field Artillery Ammunition Supply Vehicle (FAASV), and to mitigate size, weight and power

Soldiers from B Battery, 2nd Battalion, 5th Field Artillery, get ready to conduct a live-fire mission Dec. 4, 2012, with their M109A6 Paladin. The live-fire was part of the Paladin crew's certification at Training Area 22 on Fort Sill, Okla. (Photo by SGT Nathaniel Foster, U.S. Army)

gaps required to support the armor brigade combat teams (ABCT) formations through the year 2037.

PIM executed several significant test events in 2012, including a logistics demonstration (LOG Demo) and a limited user test (LUT) utilizing Soldiers from 4th Battalion, 27th Field Artillery, 2nd Brigade Combat Team, 1st Armor Division, stationed at Fort Bliss, Texas. The LOG Demo ran from June to November and Soldiers performed field-level operations and maintenance, including a full demonstration of the preventive maintenance checks and services (PMCS) as recorded in the draft technical manual. The LOG Demo demonstrated PIM's suitability for maintenance in the field and provided information needed to update procedures in the draft technical manuals.

A future Log Demo, prior to full rate production (FRP) in 2017, will be conducted to demonstrate the matured and full support package before fielding to operational units. The LUT from October to November, was the first time Soldiers utilized the vehicle in an operational environment. Following individual and collective training, the record test incorporated two 72-hour scenarios with two self-propelled howitzers with ammunition carriers firing 1,255 rounds and driving 882 miles. Data collected during the LUT is being analyzed to assess the capability of Soldiers to operate PIM and deliver accurate and timely fires in a realistic operational environment. The first unit equipped (FUE) is scheduled for FY17.

**Update on the Digitized M119A3 Program.** Another modernization effort involves the development of a common digital fire system capability for our towed artillery systems. The M777A2 was the first towed howitzer with a Digital Fire Control System (DFCS). A program to integrate a DFCS capability onto the M119A2 towed howitzer was approved in 2008. The Digitized M119A3 Program is on track and will leverage the software for the M777A2 howitzer and will maximize commonality in operations and training while minimizing cost. The application of a digital fire control system to our 105 mm towed systems will enable faster emplacement, more responsive Fires and improve accuracy.

**Munitions.** Supporting combat operations with both precision and area fire munitions remains a requirement for current and future operational environments. The development and fielding of Field Artillery precision munitions within the last decade have proven to be a game changer for the Field Artillery and our supported maneuver commanders. The past 10-plus years of sustained combat has clearly validated the requirement for organic precision munition capabilities, while improving our conventional munitions capabilities.

Excalibur and the XM1156 Precision Guidance Kit (PGK) are critical priorities in our munitions modernization effort. Informed by lessons learned and capability reviews, our munitions modernization efforts include a mix of precision, near precision and area fire munitions.

**Update on Excalibur.** The Excalibur program is divided into three increments which allows for spiral development and fielding of each increment with improved capabilities. Block (Blk) Ia-1 (DA39) was fielded in Iraq in May 2007, in response to an Urgent Needs Statement (UNS) from theater requesting a precision artillery munition. The maximum range for Blk Ia-1 is 24 kilometers. Blk Ia-2 (DA45) was fielded in November 2010, and has a maximum range capability of 35 kilometers. Blk Ib is currently in low rate initial production (LRIP) and is scheduled to be fielded beginning second quarter FY14.

**Update on the XM1156 PGK.** PGK is also being fielded in two parts, first as an urgent fielding in March 2013, and later as formal program of record (POR) in second quarter FY14. While the PGK urgent fielding configuration does have some limitations (83 percent reliability vs. 92 percent POR), PGK has demonstrated 50 meter or less circular error of probability (CEP) during test and evaluation and will provide a tremendous near- precision asset to the commander. PGK will be employed with the M795 155 mm high explosive (HE) projectiles and the M549A1 155 mm HE rocket assisted projectiles (RAP).

We are also pursuing improvements to our conventional munitions capabilities. The M1130 105 mm HE pre-formed fragmentation projectile has been fielded in Operation Enduring Freedom (OEF). It provides greater lethality against personnel and light targets than the M1 HE, M760 HE, M913 HE and M927 HE projectiles. The M483 dual-purpose improved conventional mu-

Soldiers from B Battery, 1st Battalion, 14th Field Artillery, fire a rocket from the High Mobility Artillery Rocket System (HIMARS). (Photo courtesy of the 97th Air Mobility Wing)

nition (DPICM) re-use program utilizes de-militarized DPICM projectile bodies and other parts for use in the M1122, XM1123 and XM1124 projectiles. The M1122 155 mm HE training projectile, with its greater range (equivalent to the M795) and lower cost, will replace the M107 HE projectile. It is in production and available to units now. Additionally, we are developing the XM1123 155 mm extended range infrared illumination and XM1124 155 mm extended range visible illumination projectiles. These will enable illumination out to 22.5 kilometers and are planned to begin fielding in FY15.

**Mission Command.** AFATDS has been the Field Artillery's primary fire support and mission command system for the past 20 years. However, an Army-wide initiative is underway to shift all mission command software into a single common operating environment (COE). In support of this initiative, the Fires Center of Excellence has developed a strategy that will allow for the eventual convergence of all fire support system software/applications onto one AFATDS Increment II software system.

To accomplish this, AFATDS Increment II will be developed for role-based operations. These roles for specific applications will include; fire support from the FO (mounted and dismounted to the corps fire support element, as well as fire direction (both tactical and technical). This will provide a common 'look and feel' for fire supporters from the FO to the battlefield coordination detachment.

Additionally, Effects Management Tool (EMT), Joint Automated Deep Operations Coordination System (JADOCS), Forward Observer System (FOS), pocket-sized forward entry device (PFED), Precision Fires Manager (PFM), Profiler and CENTAUR will eventually be migrated to AFATDS Increment II. This migration of systems will provide ease of training, resource savings, and a more streamlined path to software updates to accommodate future requirements. The end state for this strategy is scheduled for FY18, where one software application, designed to fit numerous roles, will support multiple Fires functions.

**Air-Ground Integration.** Air-ground integration continues to be a challenge as we integrate Fires, aviation and unmanned aircraft systems (UASs) in support of the maneuver commander. The task of integrating all airspace users, Fires, air defense and airspace control in near-real time is complex. As more users compete for the same airspace, we see a clear need for the same users to collaborate to ensure the most efficient use of the airspace.

**Update on Joint Air Ground Integration Cell (JAGIC).** JAGIC is the result of a five-year effort by the Army-Air Force Integration Forum to enhance the integration of air space at the division through improved organizational design and collaboration.

The JAGIC concept is derived from the V Corps operational use of joint Fires during Operation Iraqi Freedom I. The V Corps after action report (AAR) concluded the most effective integration of joint Fires resulted from the Fires cell, the chief of current operations and the air support operations center (ASOC) being physically located with one another in the headquarters. The ASOC, unlike an air support operations center (ASOS), has the ability to provide procedural control for fixed wing aircraft to an altitude assigned by the airspace operations center (AOC). The alignment of an ASOC with an Army division provides the capacity to control a much larger volume of airspace and the ability to influence how it's used.

The JAGIC consists of an ASOC and a tactical air control party from the U.S. Air Force, and the Fires airspace control, air and missile defense, and aviation cells from the Army that reside in the division tactical operations center (TOC).

The significant advantage offered by the organization under this concept is that the ASOC is capable of procedural control of the division airspace, and in concert with all the other cells, has a full appreciation of the utilization of the division air space.

Operating as a single, cohesive cell JAGIC builds Soldier-Airman personal relationships, resulting in improved communication effectiveness leading to more rapid decisions based on better information improving effectiveness and reducing risk.

**The Field Artillery Force 2020.** ADP 3-0, *Unified Land Operations*, states "Army leaders accept that no prefabricated solutions to tactical or operational problems exist. Army leaders must adapt their thinking, their formations, and their employment techniques to the specific situation they face. This requires an adaptable mind, a willingness to accept prudent risk in unfamiliar or rapidly changing situations, and an ability to adjust based on continuous assessment."

I believe this thought accurately represents the nature of the contemporary operating environment. The lessons we've learned and our assessment of our enemies' capabilities, and our own, drive us to continuously adapt and prepare for the future. I'm confident we're developing the right organization and materiel solutions to support unified land operations.★★

## Fires Changes of Command

March 7, 2013

**2nd BN, 17th FA, Joint Base Lewis-McChord, Wash.**
Outgoing: LTC Kolin Bernardoni
Incoming: LTC Tom Gordon

April 17, 2013

**3rd BN, 321st FA, Fort Bragg, N.C.**
Outgoing: LTC Joe Bookard
Incomming: LTC Joe O'Callaghan

April 26, 2013

**2nd BN, 32nd FA, Fort Riley, Kan.**
Outgoing: LTC Jeff Anderson
Incomming: LTC Tim Blackwell

May 2, 2013

**3rd BN, 4th ADA, Fort Bragg, N.C.**
Outgoing: LTC Richard A. Harrison
Incomming: LTC Patrick M. Costello

# Operational Benefits of the Army's Integrated Air and Missile Defense Capability

By COL(P) Don Fryc
Chief of the Air Defense Artillery and Commandant of the U.S. Army Air Defense Artillery School, Fort Sill, Okla.

If you are familiar with the Army's Air and Missile Defense (AMD) Strategy, you know that our efforts to develop the Army's Integrated Air and Missile Defense Capability (AIAMD) are central to achieving our long-term objectives. While we still may be three years away from seeing an initial capability fielded, I believe we are overdue a discussion on how it might change the way we fight. With that in mind, I'd like to begin that discussion by addressing what I see as the primary operational benefits of a fully capable AIAMD (Increment 2) force, spanning the full spectrum of anticipated operations in a given theater.


**Defensive Operations.** Conventional thought is that our success in future defensive operations will hinge upon our ability to overcome our adversaries' attempts at anti-access and area denial (A2AD) in a given theater of operations. To do this, we will need an agile and flexible AMD force, capable of defeating the full range of aerial threats and the tools to make timely and accurate decisions in a fluid, and often ambiguous, operating environment.

- **Agility & Flexibility in the Face of Change.** The establishment of an integrated fire control network (IFCN), which starts with the arrival of the first Integrated Battlefield Control System/Enhanced Operational Capability (IBCS/EOC) node and expands as follow-on nodes arrive in theater, will serve as the backbone for our future AMD defense designs. All available sensors and shooters will be placed on this network and organized and assigned in accordance with mission, enemy, terrain and weather, troops, time available and civil considerations (METT-TC). This construct sets the conditions for one of the primary operational benefits of AIAMD: its ability to keep pace with, and even anticipate, the ever-changing nature of the elements of METT-TC.
  - o **Mission Changes.** Currently, if the joint force commander (JFC) adjusts his defended asset list (DAL), i.e., re-prioritizes asset defense, adds or removes assets, etc., AMD commanders would typically move entire elements, i.e., Patriot batteries, in order to fulfill the requirements of the new defense design. With AIAMD, true mission command is achieved and mission changes can be executed in a matter of minutes. Using the Integrated Defense Design (IDD) planner, critical planning parameters such as communications plan adjustments, terrain impacts, missile inventories/mixes, defended area optimization, joint interdependencies, etc., can be analyzed and shared among commanders and their staffs at all echelons. Multiple designs (courses of action) can be 'war gamed' and employment decisions made rapidly. With the existence of the IFCN, execution of the plan will often occur without the physical movement of AMD assets, requiring only the digital reassignment of sensors and/or shooters to the appropriate IBCS/EOC. If physical re-positioning of sensors and/or shooters is required, no longer will entire 'system' defined elements

have to move, e.g., Patriot battery. Instead, the absolute minimum number of 'components' (as required by METT-TC analysis) can be repositioned, and done so without the need to 'uncover' the assets they previously defended.

- o **Threat Changes.** We see a similar operational benefit when it comes to the AMD force's 'agility and flexibility' in responding to changes in the anticipated threat. The current AMD force is typically employed to defeat a well-defined threat to a specific set of assets. When ambiguity is introduced in terms of threat type or direction of attack, our 'sectored' AMD capabilities can be rendered ineffective, despite our best efforts to mitigate inherent uncertainty by off-setting a number of launchers along secondary target lines (STLs) or using remote launch farms. Particularly problematic are the challenges presented when our limited AMD assets may be required to defeat a simultaneous mixed air breathing threat (ABT) cruise missile (CM), unmanned aerial system (UAS), fixed wing/rotary wing and ballistic missile (BM) attack.

With the fielding of AIAMD capabilities, our ability to mitigate the risks associated with this scenario improves exponentially. If the potential for this type of fight was anticipated going into defensive operations, AMD components, i.e., sensors and shooters, could be task organized via the network so that 'non-organic' sensors could support the organic launchers of multiple elements. For example, if these launchers were positioned close enough to nearby Patriot radar sectors to allow for missile capture, IBCSs/EOCs could 'engage off the network,' exploiting fire control quality data received from all sensors tracking the intended target. Furthermore, if commanders are forced to deal with an unanticipated threat, the dynamic ability to reassign components across a networked defense design would offer numerous possibilities/component configurations for countering that threat.

- **Buying Back 'Decision Space.'** As our operators are forced to deal with airspace that has become increasingly crowded and ambiguous, the challenge of making timely and accurate identification and engagement decisions has grown exponentially. Through its composite track management approach to integrating the air picture and the suite of automated battle management aids (ABMA) that are part of the common mission command capability, AIAMD will give our operators greater confidence in the classification and identity of the objects they are seeing and the tools required to rapidly process the information required in making the best possible engagement decisions.

A Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) aerostat is launched during a joint air defense exercise at White Sands Missile Range, N.M. (Photo by John Hamilton, U.S. Army)

**Offensive Operations.** The transition from defensive to offensive operations has always been a challenge for AMD forces, as we must be able to task organize to optimize protection across a DAL that expands, numerically and geographically during that transition. Historically, AMD forces have been neither sufficient in quantity nor operationally agile enough to cover all the joint force commander's (JFC's) critical assets. Leveraging AIAMD's agility and its ability to more fully exploit Army, joint and coalition AMD capabilities, we will be able to achieve greater economies of force and thereby extend protection to a greater percentage of the JFC's critical assets. Additionally, while full protection of all friendly forces throughout the breadth and depth of the battlefield may not be possible, the ability to improve and extend third dimensional situational awareness and understanding well beyond existing capabilities will provide unprotected forces the information they require to mitigate the risk posed by aerial threats.

- **Economy of Force Through Tailorable and Agile Forces.** AIAMD's ability to rapidly task organize at the component level and leverage organic AMD mission command capabilities at the brigade combat teams (BCTs) and functional brigades will give the JFC far greater ability to exercise economies of force in the AMD fight. Through AIAMD's component-based, net-centric approach, we can achieve the flexibility and agility required to support offensive operations. Further, the ability to collaborate on AMD support requirements across echelons, to include our air defense and airspace management (ADAM) cells, is critical during the transition to offensive operations. It promotes common understanding of the situation, a more holistic assessment of available AMD capabilities (to include joint and coalition) and tighter synchronization/coordination of the multiple mission changes that will take place as AMD elements transition from a defensive to offensive posture. This collaboration gives commanders access to the key elements of information they require to make informed decisions on how best to achieve 'economy of force' in the context of the theater AMD fight. With better access to joint and coalition AMD capabilities and the ability to tailor Army AMD forces down to the component level, the JFC will have more options for mitigating the risk he was previously forced to accept as he transitioned to decisive action in his theatre of operations.

- **Enhanced Ability to See & Understand the Third Dimension Fight.** As maneuver forces look to seize the initiative and execute decisive action against the enemy, the ability to see and understand the area of interest is at a premium. Given the pace of these operations, this information must be timely and unambiguous. While this has proven to be a challenge across all aspects of the environment, the ability to gather and process this information, as it pertains to the third dimension, has been particularly daunting. The lack of a real-time air picture at BCTs and functional brigades forces commanders to accept what amounts to incalculable risk when factoring in the enemy's ability to influence (interdict, delay, disrupt) their scheme of maneuver to achieve decisive action. Even if they don't have the assets to defeat the potential threat, identifying and understanding it allows them to assess the risk and implement measures to mitigate it. AIAMD helps to satisfy the requirement for air SA/SU at the tactical level. Through their organic ADAM cells, commanders and their staffs will have access to the same hi-fidelity, near real-time, integrated air picture that is being used by our AMD formations. The operational impact of this is significant. To begin with, it affords the maneuver commander an unprecedented ability to anticipate/identify the risks posed to his formations from the air. Additionally, he will have a greatly expanded set of options for mitigating that risk, stemming from his access to the same air picture, same force operations (ops) data and same collaborative planning process to which our AMD forces have access. Along with this comes an unprecedented ability to leverage the joint kill chain at the tactical level.

**Stability Operations.** The past decade has served to demonstrate the criticality of AMD forces in conducting stability operations. This constitutes a significant paradigm shift from the days when we considered the defeat of the adversary's aerial forces as our AMD 'end state,' and the trigger for redeployment to home station. With tactical ballistic missiles (TBMs) and cruise missiles (CMs) in the hands of state actors who might look to exploit continued instability in a given region, and the increased use of rocket, artillery and mortar (RAM) and UASs by non-state actors and insurgents who are attempting to achieve their geo-political objectives, the need for AMD forces in support of stability operations is clear.

As with the other forces executing these missions, AMD forces must be scalable and multi-role in order to deal with the decentralized and often 'localized' nature of the operating environment. They must also be tightly integrated with the other forces employed so that they are able to holistically carry out the warfighting functions as they apply to stability operations.

- **Scalable & Multi-role Forces.** The inherent flexibility and agility of the component-based AIAMD and its common mission command capability are well suited for the stability ops environment. Army AMD forces can be task organized based on the threat posed to a particular location, the availability of joint and coalition AMD assets that could be incorporated into the defense design and the physical constraints imposed by that location – essentially, the same METT-TC tailoring discussed earlier. So, for those high value operating bases, infrastructure nodes and geo-political centers that could be targeted by the full range of aerial threats (i.e., BM, CM, UAS and RAM), AIAMD allows the commander to pull together the appropriate 'mix' and quantity of sensor and shooter components to create a multi-role task force controlled by a networked, common mission command architecture. Similarly, for those forward operating bases (FOBs) that might be dealing with a more specific and local threat (i.e., RAM, UAS), theater sensor and shooter assets can be allocated and employed in a more streamlined, expeditionary manner to achieve the minimum engagement capability required for each FOB.
- **Contribute to Enhanced Integration Across Warfighting Functions.** While the Army's capstone and operating concepts make it clear that the integration of warfighting functions is critical to success across the range of military operations, this integration is absolutely vital to stability operations. From an operational standpoint, the ability to fuse sensors and present an integrated air picture will enable greater integration across those warfighting functions that rely on that air picture to execute the critical tasks for which they are responsible. When accompanied by complementary organizational design changes across the various major command (MC) echelons, the ability to see and understand the airspace in the same way, at the same time will allow for more coordinated and effective use of that airspace. Clearance of Fires, selection of ABT defeat options (e.g., lethal vs. non-lethal), selection of response/counter-strike options (e.g., indirect Fires, maneuver, air), and fratricide avoidance (both air and ground) would all benefit from this capability.

**Final Thoughts.** I am convinced that the AIAMD capability we are developing can be a tremendous game-changer when it comes to executing AMD across the full spectrum of future operations. For that to happen, however, we must be willing to take a critical look at long accepted air defense doctrine that was written for the system-centric capabilities we currently employ. While I believe that the ADA employment principles of mass, mix, mobility and integration remain relevant and applicable, do we need to embrace additional characteristics like 'agility and flexibility?' And, what about the other components of the Doctrine, Organization, Training, Manpower, Personnel, Logistics and Facilities (DOTMLPF)? Are we organized in a manner that allows us to fully exploit this capability? Are we training the right skill sets? Are our leaders prepared to embrace the changes it brings? If we are to realize the full potential of this capability, these are the tough issues we, as a community, must be willing to tackle before its fielding.

For ongoing discussions about this topic, go to our ADA MilBook page: http://go.usa.gov/2QyA

**FIRST TO FIRE!**★★

A Guided Multiple Launch Rocket System (GMLRS) from A Battery, 2nd Battalion, 4th Field Artillery, fires a 227 mm rocket. (Photo by Rick Rzepka, U.S. Army)

# Air Ground Integration in Unified Land Operations

By LTC Dan Elliott

Before the surge in Iraq, average airspace clearance time in Operation Iraqi Freedom (OIF) for a Guided Multiple Launch Rocket System (GMLRS) fire mission was 45 minutes. The 'long pole in the tent' was usually getting clearance through fixed wing control readiness center (CRC) or with the air support operations center (ASOC) as they were separately located from the requesting tactical echelon. As a result, they lacked situational understanding of how much or how little airspace was required to clear the mission.

This failure to gain understanding caused delays in clearing vast areas of airspace between the gun target line at all altitudes. Similar delays occurred in brigade combat team (BCT) and division operations centers' clearance of Fires process, when the fire support element (FSE) was not collocated with the air defense air management and brigade aviation element (ADAM/BAE) cell, G3 Air liaison and tactical air control party (TACP) or air liaison officer (ALO).

In March 2007, following the Joint Fires Conference at Multi-National Corps-Iraq (MNC-I), a joint working group developed tactics, techniques and procedures to improve airspace clearance through air ground integration. This effort was centered on collocating rotary wing, fixed wing and Fires liaisons and integrating their systems within current operations under the direction of the G3/S3 at echelons from brigade level to corps.

Additionally, MNC-I mandated bi-weekly battle drill rehearsals involving the functions of fire support, air space control, air maneuver and reconnaissance and surveillance. Consequently, efficiencies developed due to common shared understanding in executing the battle drills, which improved clearance times to average less than six minutes; many times less than two minutes from the call-for-fire (CFF) to the GMLRS shot.

The fundamental characteristic of the Army necessary to provide decisive land power is operational adaptability -- the ability of Army leaders, Soldiers, and civilians to shape conditions and respond effectively to a broad range of missions and changing threats and situations with appropriate, flexible, and responsive capabilities. How rapidly the Army responds is incumbent upon the speed at which knowledge is received and then appropriate action applied. Air ground integration (AGI) is a sustainable best practice that offers a justifiable solution to enhance and increase command post operational agility at echelon.

**Air Ground Integration.** Although there is no current published definition of AGI as a term, one can find it referenced in Army combined arms doctrine, Army mission command doctrine, and joint operations doctrine in multiple publications. Not only that, but it becomes readily apparent to the combined arms leader that no one publication describes AGI techniques at all echelons for the commander. Obviously, Army and joint forces conclude that AGI is doctrinally essential to the successful conduct of operations and minimizing fratricide.

In Army mission command doctrine, it is stated that establishing a shared understanding of AGI and airspace use not only guides further planning, but enables informed, timely decisions during mission accomplishment. In Army combined arms doctrine, AGI is a listed planning consideration for the commander. Airspace control integration and air missile defense integration with joint force air operations is required to enable freedom of movement and action for maneuver. Fires must be integrated with the capabilities of other Army warfighting functions, special operation forces, joint forces and multinational forces. Special operations forces think enough of the importance of AGI to dedicate an entire chapter to it in their newly revised doctrine.

In joint doctrine, close air support (CAS) and close combat attack (CCA) require detailed integration of each air mission with the Fires and movement of ground maneuver forces. With the

SPC Josh Estrello hooks up a M119A2 to an approaching UH-60M Blackhawk helicopter, with assistance from 1SG Federico Despiau and SSG Robert Novak, during an air assault training mission conducted by Soldiers of the 3rd Battalion, 319th Airborne Field Artillery Regiment, 1st Brigade Combat Team, 82nd Airborne Division, on Fort Bragg, N.C. (Photo by SGT Mike MacLeod, U.S. Army)

proliferation of tactical unmanned aerial surveillance (UAS), planners must pay close attention to integration and deconfliction within the objective area and ensure all units are informed of the plan. If present, the forward air controller (airborne) (FAC-A) or joint terminal attack controller (JTAC) must know the location and altitude of unmanned aircraft systems (UAS) within the objective area. Furthermore, when nontraditional strike platforms are re-tasked or transitioned from ISR to strike missions, a clear transfer of command and control must occur.

**So, What is AGI?** To the commander, AGI is a function of combined arms and mission command. Combined arms is the synchronized and simultaneous application of the elements of combat power to achieve an effect greater than if each element of combat power were to be used separately or sequentially. The functional concept of mission command integrates leadership, information, and all of the warfighting functions and their supporting systems.

This integration uses the capabilities of each warfighting function and information in complementary and reinforcing capabilities. Complementary capabilities protect the weaknesses of one system or organization with the capabilities of a different warfighting function. Reinforcing capabilities combine similar systems or capabilities within the same warfighting function to increase the function's overall capabilities. An example of the synergies and efficiencies gained through integrating air and ground complementary and reinforcing capabilities lies with considering the counter-unmanned aircraft systems (C-UAS) scenario.

A recent information paper published by the Aviation Center of Excellence (AVNCoE), Fort Rucker, Ala., concluded that the combat aviation brigade provides one piece of the overall system-of-systems approach to the C-UAS mission. Aviation must remain aligned with the Fires Center of Excellence (FCoE), Fort Sill, Okla., and also be integrated into joint solutions to ensure a coordinated effort.

The alignment and integration of AMD capabilities, aviation capabilities, airspace control capabilities and targeting capabilities creates increased command post agility and responsiveness for the maneuver commander to make decisions and apply appropriate action to defeat the C-UAS threat. The integration of these reinforcing and complementary capabilities provides a more complete solution to the C-UAS problem set.

AGI is one of the outputs of the mission command warfighting function and a continuing activity of the operations process. Additionally, AGI offers a technique of how to integrate, organize and configure the force to rapidly develop and communicate shared understanding, increase collaboration and interaction between staff liaisons, and enable commanders' decisions.

In collaborative efforts, the Maneuver Center of Excellence (MCoE), Fort Benning, Ga., the AVNCoE and the FCoE formed a working group to bring about shared understanding, improved relationships, interoperability, and mutually supporting exchange. The outcomes of this collaboration developed five lines of effort to improve professional military education, including driving a doctrinal common language based on an understanding of how we must fight. During this collaboration, liaisons from the collective CoEs identified the need to define and describe AGI doctrinally in order to achieve this common language and understanding of how we must fight.

The proposed definition of air ground integration (AGI) is the planning, synchronization and coordination during the employment of ground and air maneuver and Fires in order to achieve the commander's objectives, seize and retain the initiative, and sustain freedom of movement and action.

Fundamental to successful AGI is understanding the ground scheme of maneuver, providing proper liaison, task integration, deconfliction, and systems integration. The Army's overarching framework for exercising AGI is the operations process. AGI requires the direct coordination at all stages of the operations process under the direction of the G3/S3 with the Fires cell, the aviation cell, the targeting cell, and any additional joint, multi-national or inter-agency cell that enhances AGI.

This coordination requires rapid synchronization in the employment of ground and air maneuver with Fires in plans, future and current operations integration cells. AGI synchronization results in efficiencies in unit battle drills include: dynamic targeting, interdiction, clearance of Fires, medical evacuation (MEDEVAC), air assault (AASLT), C-UAS/counter-air (CA), intelligence surveillance and reconnaissance (ISR), UAS attack, downed aircraft, CCA, CAS and personnel recovery (PR).

Army forces do not operate independently but as a part of a larger unified action. Army leaders integrate Army operations within this larger effort. Commanders extend the depth of operations through joint integration. Effective integration requires creating shared understanding and purpose through collaboration with unified action partners. As a continued and collaborative activity throughout the operations process, AGI enhances the higher commander's ability to decisively employ his maneuver forces and joint Fires at a time and place of his choosing.

In the planning phase, Army AGI begins with the conceptual plan in Army design methodology and the operational approach from the commander in developing the scheme of maneuver. Fundamental to complementing the scheme of maneuver through AGI is correctly framing the problem and visual modeling to highlight relationships that were not considered through conversation alone. This may point to new ways of thinking and possible areas of further examination considering ground and air maneuver, Fires, reconnaissance and security. Functionally, the targeting working group synthesizes AGI requirements in planning objectives, effects, tasks and actions and coordinates these requirements with higher, lower and adjacent units.

As the planning process becomes more iterative and detailed through military decision making process (MDMP) and troop leading procedures, AGI considerations offer specific insight in coordinating and synchronizing the maximum participation of air, ground and Fires and minimizing their limitations and constraints. AGI increases the flexibility of the commander to seize and maintain the initiative. Staffers must understand AGI coordination requirements and measures necessary to acquire and attack targets safely and efficiently in an operational environment at all echelons.

SGT Aaron Sweeny and SSG Robert Novak, both with 3rd Platoon, A Battery, 2nd Battalion, 377th Field Artillery, Task Force Spartan, watch explosions from a mountain top near Forward Operating Base Salerno during a call-for-fire exercise. (Photo by SPC Ken Scar, U.S. Army)

AGI control measures permit the complementary and simultaneous attack of targets by air and ground weapons system. Call signs, radio frequencies, fire support and airspace coordination measures, targeting guidance, reconnaissance priorities, mission command handover, and specific activities that complement and reinforce other warfighting functions are synchronized within the overall operation to support the scheme of maneuver.

In the prepare phase, the commander continues coordination with higher, lower, supporting and supported units. Operations that include AASLT, air movement, CCA and CAS require detailed AGI. AGI preparation activities include: establishing proper liaison, integrating systems, synchronizing standard operating procedures (SOPs) and battle drills, integrating security operations with reconnaissance and surveillance plans, refining planning based on current operations, and configuring, organizing and integrating the force to best accomplish the commander's objectives.

AGI offers a technique to organize and integrate specific liaisons and systems collocated in the operations center as a best practice to enhance the operational agility of the command post. By collocating fire support, rotary air, fixed wing air, air missile defense, reconnaissance, and targeting functions under the direction of the chief of operations or battle captain, and integrating their systems, commanders best influence their ability to plan, synchronize and employ ground, air and Fires capabilities to achieve AGI. Even if the joint liaison, systems, or digital linkages are not available in the operations center, Army AGI is achieved using this technique.

Commanders often use the combined arms rehearsal, the fire support rehearsal and the targeting working group to refine and synchronize AGI inputs to the plan under the direction of the G3/S3 in the transition from the preparation phase to the execution phase. The Army targeting methodology of decide, detect, deliver and assess (D3A) lends well to the commander as one of the Army's integration processes to synchronize ground and air operations with Fires.

During the execution phase, commanders and staff apply combat power to seize, retain and exploit the initiative to gain and maintain a position of relative advantage. During execution the situation may change rapidly. With respect to AGI organizing techniques, dynamic targeting becomes a suitable process to rapidly synchronize and coordinate staff actions in response to the current situation.

Using the distinct steps of dynamic targeting, staffs readily coordinate complementary and reinforcing activities within their warfighting functions to best enable decisive action. A rehearsed dynamic targeting battle drill in current operations that involves collocated and integrated functional liaisons between joint Fires, aviation, and the chief of operations or battle captain will increase the speed and effectiveness of command decisions, and allow for greater flexibility. In this process, the JTAC, joint Fires observer (JFO), fire support officer (FSO) and TACP liaisons coordinate AGI requirements through liaisons at the highest echelon to enhance shared understanding.

Assessment is continuous throughout the operations process and AGI continued activities. AGI assessments occur at every echelon and are acted upon to enable commander's decisions and achieve commander's objectives. Battle damage assessment, munitions effectiveness assessment, and re-attack recommendations are pertinent to all components of AGI. These functions are crucial to the synchronization of combat power and provide the commander with vital feedback on the progress toward reaching the desired end state.

The current informal proposal for an AGI ATP includes the proposed definition for AGI, AGI imperatives, roles and responsibilities, AGI as part of mission command and the operations process, and techniques for achieving AGI through understanding the scheme of maneuver, proper liaison, battle drills and systems integration at echelons to include:

- **AGI at Corps/Theater Level.** ASOC, joint air component coordination element (JACCE), AMD, J/G3 aviation, Fires cell (FC) and joint Fires element (JFE)
- **AGI at Division Level.** Joint Air Ground Integration - JAGIC
- **AGI at Brigade Level.** ADAM/BAE, ALO/TACP, FSO, fire support coordinator (FSCOORD)
- **AGI at Battalion and Below.** TACP, JTAC, JFO, FSO, ALO, S3 Air

AGI as a term implies much more than just coordinated and integrated airspace deconfliction. It is a continuous activity of the operations process providing the synchronized planning and coordination of the employment of ground and air maneuver operations and Fires to accomplish the commander's objectives. All artillery calls-for-fire (CFF), counterfire (CF), CAS, UAS attack and ISR, MEDEVAC, CCA and C-UAS requests received in the tactical operations center (TOC) are functions of AGI.

AGI aligns the Fires warfighting function within the operations process for the maneuver commander, and complements the mission command warfighting function. Additionally, AGI techniques arrange personnel, networks, information systems, processes and procedures to best enable commanders to conduct operations, seize and exploit the initiative, and sustain freedom of movement and action. A combined arms publication that offers both the definition of AGI and techniques for achieving AGI at all echelons to support unified land operations would enhance the commander's ability to synchronize complementary and reinforcing war-fighting functions, enable decisions, and achieve the desired end state.★★

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*Lieutenant Colonel Dan Elliott consulted with doctrine representative Mr. Curtis Archuleta from the MCoE and LTC Charles Bowery from the AVNCoE for input and concurrence on the release of this article. Elliott is currently a doctrine writer for the Fires Center of Excellence (FCoE), Fort Sill, Okla., and lead action officer for CoE collaboration with the MCoE and AVNCoE. In OIF 06-08, Elliott served as task force (TF) commander for TF Terminator during the surge in Iraq, firing more than 420 GMLRS missions and contributed to developing clearance of Fires and airspace clearance TTPs for MNC-I. He served as a plans officer liaison to 7th Air Force Group and 607th Combined Air Operations Center Strategy, Plans and Operations directorates in 2011. Additionally, Elliott served as the ARFOR S3 in JTF-Bravo in 2010, providing operations command and control for disaster relief, humanitarian assistance, counter-drug interdiction and personnel recovery missions. He has served on various joint and combined working groups in the effort toward coordinating air ground integration techniques.*

# Training for Joint Operations

By COL John T. Smith

Joint operations are an inescapable way of life for our Army at nearly every echelon. Twenty years of operations has driven 'jointness' deeper into our formations. Working closely across all branches of the U.S. military adds significant operational capability to our Soldiers in the field. Consequently, today's formations are significantly more capable. This trend is likely to continue as our military continues to see efficiencies through sister-service capabilities.

The Fires community benefits from joint operations at every level. At the platoon level, Army joint Fires observer (JFO) teams work closely with an Air Force joint terminal attack controller (JTAC). At echelons above division (EAD), the battlefield coordination detachments (BCD) enable the work of the air and space operations center (ASOC). The area air defense commander (AADC) and Army Air and Missile Defense Command (AAMDC) is another example of how today's formations are becoming more joint. At every echelon, we work with our joint partners to deliver lethal and non-lethal Fires on the enemy and to protect critical assets. In exercises such as Talisman Saber, Cobra Gold, Balikatan, Keen Sword, Jackal Stone and Daring Warrior, we hone our skills,

Marines drive an assault amphibious vehicle during Exercise Keen Sword 2013. U.S. military and Japan Ground Self-Defense Force personnel are training alongside each other at locations throughout Japan during Keen Sword, a regularly-scheduled, joint, bilateral exercise. The Marines are with Combat Assault Battalion, 3rd Marine Division, III Marine Expeditionary Force. (Photo by Lance Cpl. Adam B. Miller, U.S. Marine Corps)

and the demand for effective joint operations becomes increasingly evident. As we seek to be the security partner of choice across the globe, exercises such as these, and our contribution to them, become ever more important to our overall defense strategy.

Contemporary and ongoing operations share this characteristic as well. Very rarely do we act without the inclusion of the military forces of allied and partner nations. Just as lessons learned following actions in Panama and Grenada encouraged the United States to establish more integration and interoperability between its services, nations that routinely work together naturally see advantages in establishing common ways and means of fostering cooperation across their military forces.

The Joint and Combined Integration (JACI) directorate at the Fires Center of Excellence (FCoE), Fort Sill, Okla., exists for these very reasons. JACI serves as the commanding general's primary staff proponent for all lethal and non-lethal joint and combined Fires and effects issues, including development, integration and execution of joint instruction, training and doctrine development in the FCoE, as well as to support the integration of joint, coalition, and other agencies into exercises and training.

From the 18th Chairman's Strategic Direction to the Joint Force: "Our aim should be a versatile, responsive, and decisive joint force… not just by adding and subtracting, but by leaders combining capabilities in innovative ways. It means interdependence—Services that rely on each other to achieve objectives and create capabilities that do not exist except when combined."

The Fires officer is crucial to bringing these capabilities together in our formations. This is precisely the function of the JACI as it spearheads joint efforts for the FCoE.

The functional and military occupational specialties (MOS) producing courses that JACI manages are essential to joint and combined integration. Whether it's the joint Fires observer delivering responsive Fires at the tactical level or Fires staffs and leaders at the operational level integrating Fires in support of theater level operations, today's Fires community is increasingly joint. JACI provides oversight and support to several courses, the Joint Operational Fires and Effects Course, the Joint Fires Observer Course, the Precision Fires Program Courses and four Electronic Warfare courses. Each of these courses enables more effective joint operations.

**Joint Operational Fires and Effects Course (JOFEC).** JOFEC trains and educates personnel from all U.S. military services, other U.S. government agencies, and some coalition nations on the skills and processes necessary to apply and integrate joint Fires at EAD. Each student gains baseline knowledge of joint and service Fires capabilities, operational environment, doctrine, the joint targeting process and how the joint Fires system works. In doing so, students gain the necessary knowledge to work in a joint Fires element on a joint task force (JTF) staff and understand how to influence the joint targeting cycle in support of division or brigade operations. This knowledge enables the Fires community with a significant capability at the operational level.

JOFEC creates a unique capability for the joint force commander. Officers in the grade of 0-4 through 0-6, noncommissioned officers E-6 through E-8, and warrant officers CW2 through CW5, who serve in Fires cells from Fires and aviation brigades up to the joint task force and combatant command (COCOM) level, are enabled with plans and operational capabilities allowing today's joint force to responsively influence operations. Through a combination of resident classes and mobile training teams, the JOFEC team annually trains Army brigade, division, and corps headquarters; Strategic Communication Command (STRATCOM), Cyber Command (CYBERCOM), Pacific Command (PACOM), and other unified commands, as well as numerous U.S. Air Force, Navy, and Marine Corps commands and cells.

**Precision Fires Program.** As precision capabilities have grown across the joint force, so has the requirement for Soldiers with the skill set necessary to precisely employ those munitions. As all field artillerymen learn, once they first step foot onto Fort Sill, accurate target location is the first and most important of the five requirements for accurate predicted fire. In the past, the use of a map and compass was 'good enough.' An observer could have been 'close' and still have effects on a target, but this was planned in an environment without collateral concerns. Advancement of precision munitions and the reduction in the number of howitzers and rocket launchers in service, coupled with operating in collateral environments, make it necessary to reduce our target location error (TLE) and account for all our effects. With respect to precision munitions, 'close' is not good enough in the joint environment.

The effective employment of precision munitions requires a process called target coordinate mensuration (TCM). As stipulated in chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3505.01A, "personnel who conduct target coordinate mensuration must be certified to do so by an accredited institution." The United States Army Fires Center of Excellence (USAFCoE) is the designated functional manager for TCM and collateral damage estimation (CDE). The Precision Fires Program is a jointly recognized and accredited training and certification program to address this requirement. The USAFCoE has a clear understanding of the requirements associated with precision Fires and has collaborated with the joint staff, sister services, and COCOMs to develop joint recognized training for TCM, weaponeering (WPN) and CDE.

For the past two years, the JACI, has been the USAFCoE's lead agent for the development of a Precision Fires Program (PFP). The PFP encompasses institutional training for target TCM, WPN and CDE. Each course certifies students on specific technical skill sets within the targeting process. The program is set-up to conduct all three courses in sequence but each course is stand-alone and students can attend one, two or all three.

The PFP training provided by JACI is oriented to 13F forward observers, 131A targeting technicians and 13A fire support officers. Having trained operators enables commanders, at all levels, to employ indirect Fires accurately and effectively, achieving first-round target effects while mitigating damage to collateral concerns. This is crucial, to both our current and future operational environment, where the military necessity to engage a target must be balanced with the implications of potential collateral damage.

The JACI PFP provides three venues for instruction. The first is through primary military education (PME) for 13F Advanced Leader Course (ALC) and Senior Leader Course (SLC), 131A Basic and Advance courses. The second method is the resident functional course open to 13F forward observers and 131A targeting technicians who did not receive this training during PME. It is also open to sister services, and individuals in targeting billets who require this training. The third venue is the Mobile Training Team (MTT) for Army Force Generation (ARFORGEN) support, unit-level training program development, and current COCOM training activities when requested. All venues provide training to joint standards and will lead to certification for TCM, CDE or both.

**Joint Fires Observer.** The joint Fires observer (JFO) is a key member of the joint fire support team and resides at the brigade combat team (BCT) level and below. JFOs are specially trained forward observers who work closely with, and are the 'eyes and ears' for joint terminal attack controllers (JTACs). A JFO can request, control and adjust surface-to-surface Fires; provide timely and accurate close air support (CAS) targeting information to a JTAC/FAC (A) or directly to aircraft when authorized by the controlling JTAC/FAC (A); and perform autonomous terminal guidance operations (TGO). TGOs are those actions that provide electronic, mechanical, voice or visual communications to provide approaching aircraft and/or weapons additional information regarding a specific target location. TGO does not include the authority to clear aircraft to release ordnance and should not be confused with terminal attack control.

JTACs can cover only limited areas of the operating environment (OE) and depend on JFOs at maneuver-company level and below for the necessary targeting information for joint Fires. Throughout 2012, the JFO schoolhouse has seen an increasing demand from the force for additional JFOs in order to fill not only the typical Modified Table of Organizational and Equipment (MTOE) JFO positions within maneuver platoons, but also additional JFO capabilities within the maneuver BCT commander's formation and in security force assistance teams (SFAT).

The course runs 10 days, which includes 38 hours of simulation training, 36 hours of academics and four hours of Precision Strike Software-Special Operations Forces (PSS-SOF) familiarization. As per the JFO memorandum of agreement (MOA), the following tasks are required for initial certification, as well as semi-annual currencies. These certification requirements are included in simulation training (six certification simulations) and the final evaluation 'final check ride,' which consists of: performing two terminal guidance operations (TGO) events; performing as JFO in support of two CAS events; performing as a non-JTAC qualified individual, in support of one CAS event utilizing multiservice procedures, for the joint application of firepower; performing one laser event where laser is used for target designation or terminal guidance; performing one night target marking event using device; performing one abort; performing six special operations forces training system call-for-fire events (STS CFF) events; and performing one AC-130 CFF event.

The JFO course is taught in cooperation with U.S. Army personnel from JACI, active Air Force personnel from Detachment 1, 6th Combat Training Squadron (Nellis Air Force Base, Nev.), Army and Air Force guest instructors (JTACs and CAS subject matter experts), and contractors from FSCX, which are composed of former JTACs and 13F personnel. The primary JFO training facility is Domeij Hall, Building 2895 on Fort Sill, with additional facilities in Gunnell Hall and the Jared Monti Hall Simulation Facility.

**Electronic Warfare (EW) Courses.** Lessons learned from theater continue to highlight the benefit of having Army EW personnel at all echelons. The Army answered that need by establishing the 29-series MOS (29E enlisted and 290A warrant officer) and the Functional Area 29 Officer Career Field in 2009. The U.S. Army Electronic Warfare School located at Fort Sill, trains EW professionals through the attendance of six different EW courses. The 29-series courses are: FA29 Electronic Warfare Officer Qualification Course; 290A Electronic Warfare Technician Warrant Officer Basic Course (WOBC) and Warrant Officer Advanced Course (WOAC); 29E Electronic Warfare Specialist transition course; and the Electronic Warfare Specialist Senior Leader Course (SLC).

Additionally, the Army developed the Army Operational Electronic Warfare Course (AOEWC), which was established as a bridging strategy to provide deploying units with trained EW personnel while the 29-series courses were being established and is now transitioning to an enduring training capability that will enable commanders to get additional personnel trained in EW operations and enhance the capability of the unit's EW cell. The Department of the Army has mandated deploying battalions and higher must have school-trained EW functional area MOS and/or additional skill identifier (ASI) 1J personnel on staff.

The Electronic Warfare Officer's Qualification Course is a 13-week resident course at the USAFCoE. The course provides active U.S. Army, Army Reserve, and the National Guard components, commissioned officers CPT through LTC, accessed into FA 29 (EW), the education and training in the essential core skills necessary to successfully plan, synchronize, and deconflict EW and cyberspace operation functions in support of the commander's concept of the operation. Emphasis is on Army and joint doctrine, as well as current tactics, techniques and procedures (TTP) to prepare electronic warfare officers (EWOs) to participate in EW operations, at the tactical, operational and strategic levels, in a variety of Army and joint organizations.

The Electronic Warfare (EW) Technician Basic Course is a 16-week resident course at the USAFCoE. The course provides active U.S. Army, Army Reserve and Army National Guard warrant officers, WO1 through WO4, accessed into (MOS) 290A, EW technician, the education and training in the skills necessary to successfully organize, implement, monitor, and evaluate EW operations, threat environments, unit maintenance, intermediate-level support maintenance of EW systems and advise on technical and tactical employment of EW systems. Additionally, graduates will learn how to: supervise maintenance of EW system equipment and components; monitor development of the enemy EW order of battle (OB); process targeting information and intelligence generated by the OB section; assist in the production and application of target selection standards for execution of electronic attack capabilities in support of the land

U.S., Slovakian and Croatian special operations forces learn basic combat maneuvering techniques in Delnice, Croatia, Sept. 14, 2012, during exercise Jackal Stone 2012. Jackal Stone is an annual joint special operations exercise designed to enhance capabilities and interoperability amongst the participating special operations forces as well as to build mutual respect while sharing doctrinal concepts, training concepts and various tactics, techniques and procedures. (Photo by Senior Airman Jodi Martinez, U.S. Air Force)

component commander. Emphasis is on Army doctrine, as well as current TTP's to prepare EWOs to participate in EW operations, at the tactical and operational levels, in a variety of Army organizations.

The EW Technician Advanced Course is undergoing validation through the execution of two pilot courses conducted in the 1st quarter and 3rd quarter of fiscal year 2013, at the USAFCoE. The course will provide active U.S. Army, Army Reserve and Army National Guard warrant officers, WO3 through WO4 the education and training in the skills necessary to successfully organize, implement, monitor, and evaluate EW and cyberspace operations in the Army and joint environment. Emphasis is on Army and joint doctrine, as well as current TTP's to prepare EWOs to participate in EW operations, at the operational and strategic levels, in a variety of Army and joint organizations.

The Electronic Warfare Specialist Course is a nine-week resident course at the USAFCoE, using a combination of 35 percent discussion and 65 percent hands-on/practical exercise. The course provides active U.S. Army, Army Reserve and Army National Guard noncommissioned officers (NCOs) accessed into MOS 29E20/30, Electronic Warfare Specialist, the education and training necessary to perform in EW positions, at the tactical and operational level, in a variety of Army organizations. Emphasis is on army doctrine, EW fundamentals, EW systems, counter remote control improvised explosive devise electronic warfare (CREW) operations, maintenance, troubleshooting procedures, and how to integrate, coordinate, execute and assess EW capabilities in support of ground operations across the full spectrum of military operations.

The EW Specialist Course Senior Leader Course (SLC) is undergoing validation through the execution of two pilot courses conducted in 1st quarter and 3rd quarter of fiscal year 2013 at the USAFCoE. The course provides active U.S. Army, Army Reserve and Army National Guard noncommissioned officers (NCOs), in MOS 29E30/40, EW specialist, the education and training necessary to perform in EW positions, at the operational and strategic level, in a variety of Army and joint organizations. Emphasis is on joint doctrine, EW systems, CREW operations, and how to plan, coordinate, execute and assess EW capabilities in support of ground operations across the full spectrum of military operations.

SPC Jorge Zelaya from B Company, 2nd Battalion, 9th Infantry Regiment, 1st Armored Brigade Combat Team, 2nd Infantry Division, assists a Royal Thai army soldier adjust his M4 sight aperture during the company's combined known distance and explosive urban breaching range in the Kingdom of Thailand. The training will help improve joint interoperability between members of the U.S. military and the Royal Thai army during the annual Cobra Gold exercise. (Photo by CPT Lindsey Elder, U.S. Army)

The Army Operational Electronic Warfare Course is a six-week resident course at the USAFCoE, designed to give an individual a working EW planning and execution foundation in EW for brigade, and above, operations. It teaches Soldiers, Marines, Sailors and Airmen to integrate and operate as a member of the EW team. Each student gains a working knowledge of electronic fundamentals, the integration of EW into the military decision making and targeting processes, how to analyze the electronic order of battle, EW targeting, and assessment of results. Students' knowledge is validated during scenario-based exercises, where they apply their knowledge of integrating EW across the full spectrum of military operations. Attendance at the Army Operational EW Course is open to all services, branches and grades. Graduates of the AOEWC earn the 1J additional skill identifier (ASI).

Our Army is growing more dependent on joint and combined capabilities and is not likely to fight without them in the future. As joint capabilities are pushed deeper into our formations it becomes even more critical that our Soldiers are trained to maximize their effects across a broad range of operations. Understanding capability and tactics of our sister services only serves to increase our ability to apply lethal and non lethal Fires across a wide range of potential conflicts.★★

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Soldiers from B Battery, 1st Battalion, 143rd Field Artillery, California Army National Guard, conduct a live-fire exercise at the 426th Regional Training Institute at Fort McCoy, Wis. (Photo by 1LT Joe Trovato, U.S. Army)

# King of Battle Once Again:

## An Organizational Design to Effectively Integrate Fires in Support of the Tactical, Operational and Strategic Force

**By LTC Sean Bateman and MAJ Steven Hady**

As the Army returns to a force fully prepared to conduct combined arms maneuver and wide area security in unified land operations, it is essential that those forces can effectively integrate and deliver Fires. Joint and U.S. Army strategic guidance documents prescribe that the Army must be responsive to combatant commanders' needs by integrating and synchronizing joint and coalition capabilities in support of globally integrated operations during all phases at the tactical, operational, and strategic echelons.

The modular brigade combat team (BCT) and functional brigade concept was intended to provide the capability to deliver responsive Fires to maneuver commanders by placing Fires battalions within BCTs and providing Fires brigades to support BCTs, divisions, corps, or joint task forces (JTF). This concept eliminated the senior Field Artillery (FA) headquarters' (HQ) relationship and responsibility at the division and corps level. It was assumed BCTs could provide sufficient training, readiness, and administrative oversight for their organic Fires battalions and that a small number of Fires brigades could function as a force Field Artillery headquarters for a greater number of divisions, corps and joint task forces. Operational experience revealed that these assumptions are not valid.

**Why Change?** As Army forces return to training in combined arms operations and execute regionally aligned forc-

## The Fires brigade will train with and achieve the same regional focus as its partnered corps.

es missions, significant capability gaps have emerged in the areas of effective integration of Fires, training oversight of Fires battalions in the BCTs, leader development, and unified action partner integration. While many of these gaps were identified years ago and some solutions to fix the gaps have been implemented, a critical organizational gap remains. Current echelons above brigade organizational design of FA HQ do not sufficiently meet the required capabilities to support combatant commanders and the joint force. In response to this critical organizational gap the Fires Center of Excellence, Fort Sill, Okla., submitted a force design update (FDU) in early 2013, for consideration in the Total Army Analysis process for fiscal years (FY) 2016-2020.

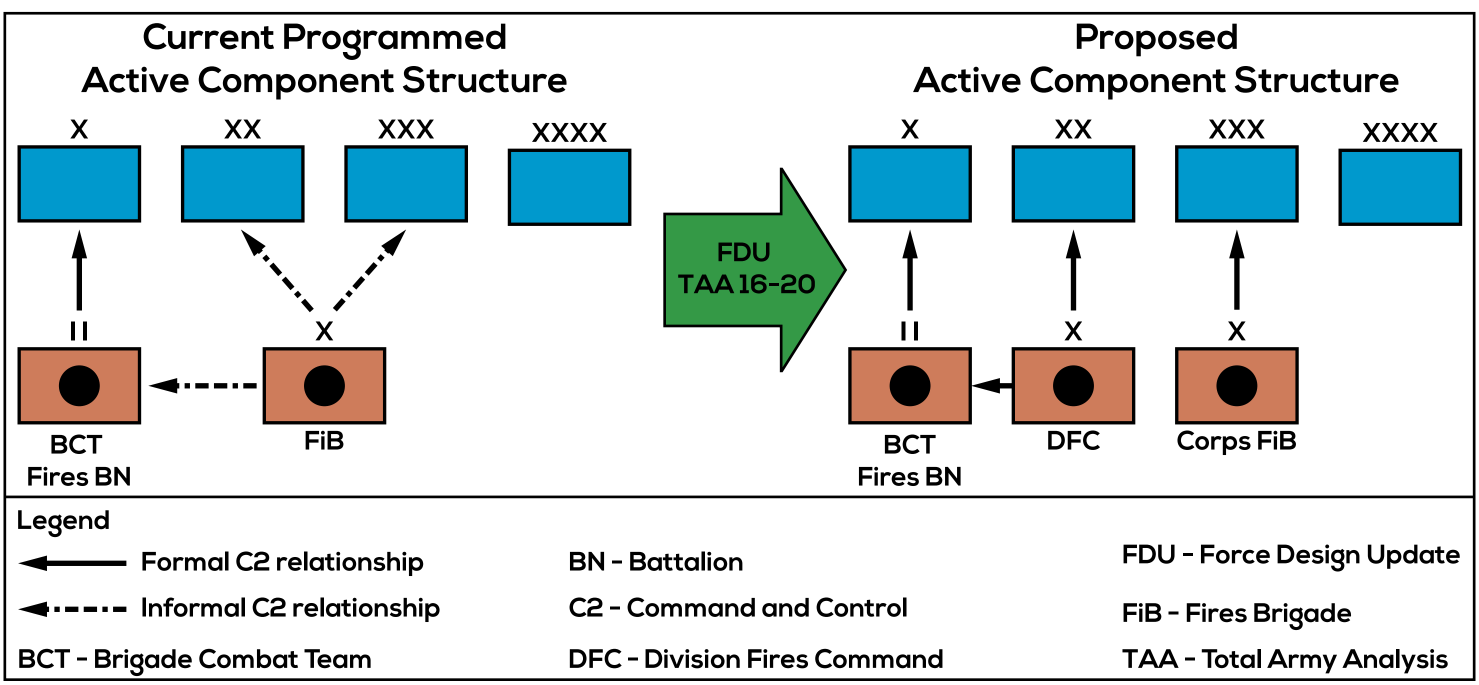
**Overview of the FDU.** The FDU, see the figure below, creates a division Fires command (DFC) for each active component division and aligns an active component Fires brigade to each corps. This requires transforming four of the seven existing Fires brigades and three programmed Fires brigades to the DFC structure while resourcing four additional DFCs. The remaining three existing Fires brigades will be aligned to each of the active corps. The FDU does not alter the organization of the Army National Guard (ARNG) Fires brigades; however, ARNG Fires brigades will be aligned with ARNG divisions for training affiliation and will be capable of serving as a DFC to support ARNG divisions during deployment and provide reinforcing and counterfire capability to a corps or JTF. The FDU will be experimented with as part of the 2013 Campaign of Learning and compete for approval during Total Army Analysis 2016-2020 by the Army leadership. If approved implementation of the organizational change could begin as early as 2016.

**Division Fires Command.** The division Fires commands will integrate and deliver tactical Fires to achieve division and below objectives. The DFC consists of a headquarters and headquarters battery (HHB), target acquisition platoon and a signal platoon. A DFC will be assigned to each active component division and is ideally stationed with the division HQ. The DFC can be tailored with a variety of Fires battalions (rocket and cannon); unmanned aerial systems (UAS); and counter-rocket, artillery, and mortar (C-RAM)/indirect fire protection capability (IFPC) units to support division operations based on the mission. The DFC will not have a support battalion and will rely on the concept of area support for logistics. The DFC does not replace the division fire support element (FSE), which will remain in the division headquarters and headquarters company (HHC).

Specific responsibilities of the DFC will include: integration and delivery of Fires in support of the division commander's concept of operations; serve as the division force FA HQs; synchronization of counterfire and radar employment operations in the division area of operations; detailed targeting; training and professional development of Fires personnel across the division; oversight of the training and certification of BCT Fires battalions in close coordination and cooperation with the BCT commanders.

**Fires Training and Readiness.** The complexities of the operational environment, the requirement for precise and discriminating Fires, and restrictions on employment of Fires, demand Fires organizations and fire supporters be thoroughly trained and certified. A Fires headquarters with command authority facilitates standardized core Fires training throughout the Fires chain by ensuring routine training as a complete Fires

A graphic representation of the changes from a Force Design Update (FDU) would have on active component structure. (Illustration by Rick Paape, U.S. Army)



system, significantly enhancing the maneuver commander's ability to plan, integrate, task organize, and execute Fires in support of unified land operations. The DFCs will provide mission command for training management and certification of the BCT Fires battalions and Fires cells. The DFC commander will work closely with the BCT commander in order to effectively manage the training and certifications of the BCT Fires battalion within the Army Force Generation cycle.

**Fires Brigade.** One active component Fires brigade will align to each of the corps and provide operational Fires to achieve corps or JTF objectives. The Fires brigade consists of an HHB, one or more organic rocket/missile battalions, a target acquisition platoon, a signal company, and a reduced brigade support battalion. The unit will be aligned to a specific corps, but may not be stationed with the corps HQs. The Fires brigade does not replace the corps Fire support element which will remain in the corps HHC. The Fires brigade's subordinate Fires battalions may be allocated/task organized to DFCs or other Fires brigades using command and support relationships, as the mission requires to provide reinforcing Fires. The FDU will not relocate any current Fires brigade Fires battalions. Fires battalions not stationed with their Fires brigade may be attached to a DFC for garrison administration. The Fires brigade will train with and achieve the same regional focus as its partnered corps.

Specific responsibilities for the Fires brigades include: planning, coordinating and synchronizing Fires in support of the corps commander's concept of operations; serve as a force Field Artillery headquarters; coordination of joint, unified action partner, and combined arms Fires; synchronization of counterfire and radar employment operations in the corps or JTF area of operations. When the corps is employed as a JTF, its responsibilities include: integration and development of unified action partner Fires capabilities, as well as planning, coordination, and execution of Fires training events with partner Fires forces; training and certification of its subordinate Fires battalions.

**Current echelons above brigade organizational design of Field Artillery headquarters do not sufficiently meet the required capabilities.**

**Leader Development.** A key component of the FDU is establishing the ability to enhance development of Fires leaders, especially in the BCTs, while providing senior FA commanders as mentors. By aligning DFCs to each division and a Fires brigade to each corps there will be an FA commander to oversee leader development at each echelon. This leader development can be tailored to the needs of Fires leader as they progress through a career in the Army. In the BCT Fires battalions this will supplement the leader development they receive from the BCT commander.

**Bill Payer Strategy.** The cost to implement this organizational change includes reallocating 3,300 spaces in Fires units. The largest numbers of spaces are gained by eliminating support battalions from the DFCs and reducing the signal companies to platoons. The DFC will rely on area support from the division's combat service support battalion. The Fires brigades at corps would retain their support battalions and the signal company. However, a recent sustainment organizational change has reduced the Fires brigade support battalion in size and capability. The target acquisition battery would be reduced to a platoon in both the DFCs and Fires brigades but would retain the same number of radars. Additional proposals for gaining the spaces required to implement the FDU include reducing howitzer section manning from 10 to nine in all active component M777 battalions, and eliminating the meteorological section from all Fires battalions. Meteorological data will continue to be provided by the use of advanced technology integrated into the fire direction center (FDC).

The requirements to support globally integrated operations require the Fires community to adapt and change its organizational structure to mitigate the unintended consequences of modularity. The creation of division Fires commands and alignment of a Fires brigades to each corps will provide the capabilities required by maneuver commanders. The FDU also addresses the challenges of providing adequate training and readiness oversight of Fires battalions, fostering an improved capability for leader development.

This organizational change supports the ultimate objective of the Fires community of providing commanders the capability to effectively integrate and deliver Fires at the tactical, operational echelons in support of unified land operations.★★

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# "GET A GRID"

## Excellence in Precision Targeting

By Mr. Scott McClellan

Legendary football coach Vince Lombardi once said, "Perfection is not attainable, but if we chase perfection, we can catch excellence." The Training and Doctrine Command (TRADOC) Capabilities Manager (TCM) Fires Cell strives for excellence in precision targeting and is addressing a long-standing capability gap in the employment of precision munitions for the dismounted forward observer (FO).

**An Appetite for Increased Accuracy.** The advent of global positioning system (GPS)-aided munitions with better than 10-meter accuracy, such as the 155 mm Excalibur, the 120 mm precision guided mortar and Multiple Launch Rocket System (MLRS)-fired guided unitary rocket have, to date, outpaced the dismounted FO's organic capability to accurately locate targets in a timely manner. Unfortunately, for reasons such as weight, power consumption rates, cabling difficulties, and the lack of a simultaneous voice and digital transmission means, a precision targeting capability has simply not been a viable alternative for the dismounted FO at company levels and below. Tools such as the Precision Strike Suite-Special Operations Forces (PSS-SOF) can refine grid coordinates to the necessary precision, but that function is generally accomplished at levels above the dismounted platoon FO. Target location refinement necessary

PVT Andy Amezcua, an artilleryman from B Battery, 4th Battalion, 27th Field Artillery, 2nd Brigade Combat Team, 1st Armored Division, sits beside an M777 howitzer as the unit prepares for a fire mission using the M982 Excalibur, a long-range artillery shell that uses global positioning satellites to more precisely hit the target. (Photo by SGT Sean Harriman, U.S. Army)

for precision munitions comes at a cost to timeliness, and as the amount of time increases, effectiveness decreases on a fleeting target.

**Capability Gap Identified and Addressed.** In spite of the increased accuracy of GPS munitions, dismounted FOs have been unable to employ those munitions because they lack the ability to provide a precise target location. Specifically, dismounted observers lack the ability to rapidly locate ground targets with better than 10-meter accuracy in all conditions without target mensuration, preventing engagement with precision attack indirect fire systems. Munitions may go precisely to the assigned coordinates, but those coordinates may be precisely incorrect. Additionally, the focused effects generated by today's unitary warheads compound the issue of yielding no effects on an inaccurately located target. For reasons including limits on collateral damage, the age of ubiquitous 'cargo' rounds filled with hundreds of bursting submunitions is over! However, with the advent of technological advances in targeting that compliment the increased accuracy in munitions, the Army has recently established requirements in an effort to increase target location accuracy for the dismounted FO.

**Elements of Target Location Accuracy.** There are four basic requirements for an accurate target location: source location (self-position), computational procedures, direction and range to the intended target. The focus for a dismounted FO is driving the error of the three compounding items of self-position, direction, and range to as close to zero as possible. These elements generally make up what is referred to as target location error and are measured on X (deviation), Y (vertical), and Z (range) axes. Computational procedures are performed through automated means, assumed correct and are not further discussed.

**Self Position.** GPS is the most commonly used instrument for self-position with manufacturer's accuracy claims of approximately six meters (Y axis) when used with the military crypto. GPS accuracy is dependent upon the number of satellites in view, their signal strength, and the actual satellites. Self-location error includes all three axes.

**Direction Finding.**

1. **Digital Magnetic Compass (DMC).** This device is common in most, if not all systems. While it is good for general reference, it is not a reliable way to achieve direction to the intended target. These systems should not be used for actual precision targeting without further refinement.
2. **Terrestrial objects used for reference.** This system is known and has been taught as intersection/resection. Compounding issues with terrestrial direction finding is the error associated with the reference point (RP); both in imagery quality (if used) and the exact point. If the RP is located with high fidelity, then the inputs to the system and subsequent output of target location are highly accurate in direction.
3. **Celestial objects used for reference.** Celestial directions are highly accurate (.05 mils), yet there are issues that affect this high-quality capability. The largest contributing factor is line of sight (LOS). If the sensor systems cannot see the celestial objects then achieving a direction without any other aid is impossible. When sun or stars are not available, some systems can reference previously stored target reference points to maintain precision accuracy; however, most current and planned systems require a completely unobstructed field of view (FOV) up to 30 degrees. Clouds, small wires, tree branches, buildings, etc., inside the FOV may result in either a no solution or a false reading.
4. **Gyros, inertial navigation systems (INS), inertial measurement units (IMU).** These systems aid in navigation and are required to be placed on the ground with a general knowledge of location and sense the rotation of the earth to compute true north. Once true north has been determined, these systems can then convert to any other format required within a relatively accurate manner (3 mils). However, there can be significant inherent 'drift' in these systems.

**Range.** Laser range finders (LRF) add, or could add, errors in two ways: (1) the inherent error in atmospheric conditions and computation times leaves all systems with a +/- error up to five meters and (2) divergence. Lasers are like flashlights and have a certain amount of dispersion out of the aperture. This divergence error, depending on amount and target, can cause false readings from objects located relatively close to the intended target.

**Precision Fires Warrior (PFW).** Precision Fires Warrior is a fully integrated, Soldier-worn, targeting ensemble consisting of both fielded and new technologies. The heart of the PFW ensemble is the Forward Observer Software (FOS) application located on a ruggedized commercial-off-the-shelf (COTS) smart phone called an end user device (EUD). While running the FOS application, the EUD is capable of displaying a digital map depicting selected situational awareness and fire support coordination measures on its five-inch (approximate) screen. Previously, FOS software was only available on hardware far too heavy and cumbersome to carry in a dismounted configuration. The FOS software suite includes digital imagery called precision Fires imagery (PFI,) which is necessary for precision engagements. PFI enables the dismounted observer with a laser range finder the ability to locate targets within 10 meters or less and take advantage of today's precision munitions for first-round effects.

If FOS on an EUD is the heart of PFW ensemble, the incorporation of a power/data hub and a 150-watt conformal battery, which are both fully integrated into the integrated outer tactical vest (IOTV), is the backbone. The hub allows connectivity of peripherals [laser range finder, radios, defense advanced GPS receiver (DAGR) and EUD] for both data transmission and power, and provides the FO an integrated system-of-systems specifically designed for precision targeting. The PFW conformal battery/hub configuration extends the mission profile for the dismounted FO by providing longer battery life and reduces the percentage of carried battery weight per operational hour--extremely important to the dismounted FO. The conformal battery is able to continuously power the smart phone and all of the peripherals for up to 24 hours before recharging.

Also resident on the EUD is a program called Nett Warrior, which is the Army's first Soldier-worn network capability using COTS smart phone technology. Nett Warrior puts the individual dismounted Soldier in the network

A target explodes as a guided missile fired from a Guided Multiple Launch Rocket System (GMLRS) impacts during a combined-arms exercise hosted by the 1st Brigade Combat Team, 1st Cavalry Division. (Photo by SGT John Couffer, U.S. Army)

and provides horizontal and vertical situational awareness to friendly forces. Using Internet Protocol (IP) based radios, such as the Harris 152 or 117G radio, Nett Warrior is designed to give the dismounted Soldier a more complete digital view of the battlefield during operations.

**Joint Effects Targeting System (JETS).** Currently fielded hand-held targeting devices (Vector 21, Mark VIIE, LLDR, TriGR, etc.) use an integral digital magnetic compass (DMC). Unfortunately, devices using a DMC provide unpredictable azimuth errors far greater than required to leverage the focused effects of precision munitions. JETS is the umbrella name used for the next generation of hand-held precision targeting devices (HHPTD) specifically designed to give company and below FO's the necessary tools to employ precision munitions of today and tomorrow. Although a specific materiel solution has not yet been selected for fielding, JETS is designed to address the current company and below dismounted FO precision targeting capability gap and much more! At a hand-held weight of no more than 5.5 pounds, JETS will be capable of day and night observation, target location and designation. Its internal high-accuracy azimuth device (HAAD) will use a celestial compass in conjunction with an external precision azimuth and vertical angle measurement (PAVAM) to achieve the pointing and positioning accuracy (10 meters at greater than 2,500 meters) necessary to employ precision munitions. By the spring of 2013, improvements in hand-held precision targeting devices will achieve a better than 10-meter target location error (TLE) out to 2,500 meters. JETS equipped with the Target Location Designation System (TLDS) module will have the capability to designate stationary and moving targets out to five and three kilometers respectively. Finally, an FO equipped with JETS will be capable of target recognition out to ranges of 3,000 meters during the day and 1,300 meters at night. The first unit fully equipped with JETS is scheduled for 2016. In the interim, a quick reaction capability (QRC) hand-held, precision targeting device will be fielded in 2013, and will provide the dismounted FO the ability to accurately locate targets in a timely manner and within the standards necessary for the employment of precision munitions. The QRC device will bridge the gap between the target location capability found in units today and the objective capability found in JETS. We can expect units in Afghanistan to be the first to receive QRC hand-held devices.

**Lightweight Laser Designator Rangefinder Hand-Held (LLDR2H).** Today, units are also fielded with the Lightweight Laser Designator Rangefinder (LLDR). At a system weight of nearly 32 pounds, the LLDR was first fielded in the late 1990's and remains a very good piece of equipment. However, it also uses a digital magnetic compass and like legacy hand-held targeting devices, is simply not accurate enough to employ precision guided munitions. The LLDR2H adds the high accuracy azimuth device (HAAD), which uses the Celestial compass interfacing with its selective availability anti-spoofing module (SAASM) compliant GPS receiver to achieve the required precision: 10-meter target location error out to 2,500 meters and near precision accuracy at ranges greater than 6,000 meters. When sun or stars are not available, the LLDR2H can either reference previously stored target reference points, maintaining precision accuracy, or revert to the digital magnetic compass used in legacy systems. A limited number of hardened LLDR2H prototypes have been produced.

Whether utilizing PFW, JETS or the LLDR2H, in the very near future the dismounted FOs at company level and below will be equipped with the necessary tools to efficiently employ the full menu of available precision munitions. Coach Lombardi may have been correct when he said that perfection is unattainable; however, excellence has been caught with the new precision targeting tools for the dismounted FO.★★

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Soldiers from C Battery, 2nd Battalion, 43rd Air Defense Artillery, set up the Sentinel radar during an exercise. (Photo courtesy of COL Edward 'Dusty' O'Neill)

# Joint Tactical Air Picture:

## A Technical Approach to Gaining Clarity in the Air Domain

**By COL Edward 'Dusty' O'Neill, Mr. Michael Cochrane, and Mr. Doug Blanchette**

With the development of airplanes, wireless communications and radar, military forces have sought a common tactical picture for the third dimension to enable decisive effects upon an adversary. Radar, developed in the 1940s, provided the first glimpse of an air picture but required communications to understand what was being viewed and interpreted by an operator. Communications, mainly high frequency (HF), provided a means to gain situational awareness of aerial objects by direct dialogue between the pilot and ground operator. Wireless communications of the 1950s enabled ground controllers to vector fire support of maneuvering forces but did very little in ways to clearly understand all the elements required to completely visualize what transected the airspace. Over the years, the services have sought situational understanding to develop a single integrated air picture (SIAP) through a myriad of programs. As recently as the late 1990s/early 2000s, the Joint Program Executive Office (JPEO) for SIAP attempted to integrate the various ground, aerial, and sea-borne sensors and weapon platforms to create

The tactical operations center (TOC) for C Battery, 2nd Battalion, 43rd Air Defense Artillery during an exercise at Nellis Air Force Base, Nev. (Photo courtesy of COL Edward 'Dusty' O'Neill)

the elusive SIAP. Every attempt to date has failed to meet its objective, but each subsequent endeavor has inculcated lessons learned to step closer to attaining SIAP. With the dissolution of JPEO SIAP, the services have been left to their own devices to achieve the desired SIAP capabilities. This article's intent is to inform the air and missile defense (AMD) community about a joint collaborative effort by the services to examine and demonstrate near SIAP capabilities, along with integrated fire control, in a set of technical and tactical procedures using existing technologies. The Air Force Command and Control Integration Center (AFC2IC) at Langley Air Force Base, Va., Navy Air and Missile Defense Command (NAMDC) at Dahlgren, Va., and the Army's Fire Center of Excellence at Fort Sill, Okla., have partnered to demonstrate these capabilities with codified procedures that can be applied to today's warfighters.

**Operational Problem.** The Department of Defense has shortcomings in the production of a tactical air picture, which limits integrated air and missile defense (IAMD) effectiveness. Many theater platforms, e.g., unmanned aerial systems and fifth generation fighters, such as the F-22 and F35, operate on stand-alone networks and do not self-report, nor does their sensor information contribute to the tactical air picture. The current line of sight Link 16 radio frequency (RF) networks have latency issues and inefficient timeslot usage, creating an air picture with situational awareness discrepancies and weapon target pairing difficulties leading to operational inefficiencies. The lack of these systems not being integrated in a network-centric architecture with an improved data update rate continues to effect the development of an accurate and timely tactical air picture, creating inefficiencies in counter-air operations, especially in the contested and anti-access regions.

The shortcomings of a tactical air picture have been around for many years. The services have developed and fielded multiple AMD systems that support their particular mission needs. The necessity to integrate these service systems into a single Joint Integrated Air and Missile Defense (JIAMD) capability has been identified, well documented and mandated to occur. Joint agencies, such as JPEO and SIAP, were established, studies performed, and joint requirements identified; however, the process for meeting these joint requirements takes time to implement. The problems with the tactical picture exist in every combatant command (COCOM) operation today, which reduces the current force effectiveness in counter-air operations.

Joint AMD capabilities continually evolve and field improved capabilities. This evolutionary process continually comprises legacy and emerging systems that must operate together using current and advanced communications and network technologies as they evolve towards objective IAMD architectures. Many of these AMD systems employ unique, system-centric, interface languages and protocols, as well as joint standards such as Link 16. These can be integrated using the existing standards over operationally available networks and communications, which will enhance and improve current operations and facilitate blending current AMD systems with emerging technologies. This can be accomplished by developing a set of procedures for COCOM joint interoperability control officers (JICOs) and others for establishing a network that uses existing systems, protocols, and standards to develop an improved tactical air picture.

Although Link 16 (MIL-STD-6016) is the common interface format/protocol between AMD systems, its current implementation supports neither fire control quality data transmissions nor development of a integrated tactical air picture for all IAMD systems. Further, next-generation data links like Intra-Flight Data Link (IFDL) are not interoperable with Link 16 at both RF and baseband levels, requiring a translation interface to move data securely from specific platforms to IAMD data users. Advances in internet protocol (IP) routing technology and the expansion of military employment of wide area networks (WANs) have created opportunities to moving tactical level information using these communication modes and methods. However, there are currently no established procedures for establishing and employing such a network. Likewise, there are no tactics and techniques for weapon system operators (WSO) to leverage and use this information to enhance their ability to fight. A Joint Tactical Air Picture (JTAP) enabled tactical data network will allow weapon operators to employ advanced engagement concepts such as engage on remote (EoR) and integrated fire control (IFC).

Currently, service-based AMD sensors are most often integrated into a joint operational area (JOA) tactical air picture via standard RF Link 16, with standard update rates. Further, next-generation data links, such as intra-flight data link (IFDL), are not interoperable with Link 16, requiring a translation interface to move data securely from one to the other, which becomes an opportunity for induced latency and error. Current link systems, such as Link 16, operate on a 12-second update rate, and do not allow for effective use of the current radar reporting (R2) rules. This induces error in track reporting into the network, which often results in multiple sensors reporting the same target as different targets with different track numbers. This leads to ambiguity and potential fratricide.

Advances in IP routing technology and the expansion of military employment of WANs have created the opportunity to move tactical-level information with enhanced update rates (EUR) using new nodes and methods. These new methods and nodes will improve the update rates from 12 seconds to just a few seconds/sub-seconds allowing for the current R2 rules to work, resulting in a significant reduction in dual track reporting and changing track numbers, etc.

Additionally, a set of defined JICO procedures to develop a JTAP and a set of operational techniques, tactics and procedures (TTPs) for the weapons officers that enable the use of existing enhanced sensor and information update-rate capabilities inherent in many data link and sensor systems do not exist. This results in joint force use of substandard air pictures when contrasted with the air picture that can be achieved if JTAP's TTP are established and validated. However, there is a way to attain capabilities that address the concerns raised…through the technical and tactical procedures developed for the FY12 JTAP capability demonstration.

**JTAP Selected as a Capability Demonstration.** JTAP was selected as the FY12 Joint Integrated Air and Missile Defense Organization (JIAMDO)'s Joint Distributed Engineering Plant (JDEP) proposal as a capability demonstration. Co-sponsored by the U.S. Army Fires Center of Excellence, U.S. Navy Air and Missile Defense Command (NAMDC), and Air Combat Command (ACC), this demonstration was selected to examine many codified IAMD gaps. So what is JTAP? JTAP is a capability that supports the creation of a common tactical air picture to enhance mission areas, such as airspace management, joint counter-air/integrated-air and missile defense (IAMD), air interdiction and a variety of advanced engagement concepts mission. JTAP's goal is to demonstrate a capability for using current systems and standards in developing an air picture using track reporting. It will enhance the timeliness and joint interoperable data sharing of all air and missile tracks. This is accomplished using existing military standards (6016 and 3011C) to transmit J-series messages over tactical IP networks at EUR. IP network congestion and latency is reduced by the use of bi-directional protocol independent multi-cast (Bi-Dir PIM) routing rules. JTAP will demonstrate the potential for improving track reporting, timeliness and interoperable data sharing to achieve an integrated air picture (improving the air picture), the capability for cueing, early engagement, and advanced engagement concepts by providing fire control quality data to AMD interceptors (fire control contribution). It will also demonstrate the capability of JTAP procedures and an IP-enabled aerial gateway to exchange data with fifth generation aircraft in the contested and anti-access regions to support AMD (expanding the battle space). JTAP will investigate and assess the potential contribution that this common tactical air picture makes to 32 of 66 warfighting gaps identified in the Integrated Air and Missile Defense Initial Capabilities Document (ICD). Specifically, as a capability demonstration, JTAP will:

- Assess the interoperability of JTAP procedures
- Assess the contribution of JTAP procedures to a common air picture
- Investigate the effectiveness of JTAP procedures and an IP network to exchange data with fifth generation fighters
- Investigate the contribution of JTAP procedures to cueing, early engagement, and advanced engagement concepts through improved sharing of fire control quality data
- Assess the contribution of JTAP towards mitigation of selected gaps identified in the IAMD ICD

JTAP helps to create a more accurate, timely air picture by transmitting track data over an aerial IP network using smart routing technologies. It possesses the following characteristics:

- JTAP is not a single piece of equipment. It is an alternative approach to capturing critical track data that leverages existing and pending technologies and capabilities.
- J-Series messages are transmitted over IP networks via the MIL-STD 3011, aka joint range extension application protocol (JREAP), complementing the Link16 network.
- IP network technologies ensure low latency.
- Smart network routing ensures predicable, high throughput. It is enabled through the use of bi-directional protocol independent multi-cast rule sets.

For the past 18 months, this joint services' effort, along with the Joint Deployable Analysis Team (JDAT), Missile Defense Agency, and the various support services' program managers, developed a demonstration to achieve the stated objectives of JTAP.

**Execution.** JTAP was executed in two parts from Dec. 03-12, 2012, using United States Air Force (USAF) Weapons School's Mission Employment 12-B venue at Nellis AFB, Nev., (live) and a models and simulation event at the Fires Battle Lab at Fort Sill, Okla. The live event incorporated significant live aerial platforms, ground-based air defense systems (Patriot and Sentinel), next generation self-reporting technologies, fifth-to-fourth generation aircraft gateways, and high speed aerial IP, as well as standard Link-16 networks to pass command and control (C2) data. The model and simulation event examined the ballistic missile tracking benefits of JTAP within a congested air-breathing aircraft environment. The Missile Defense Agency's Ballistic Missile Defense (BMD) Exercises Branch participated with models and simulations representing the AEGIS Combat Systems, THAAD and other BMD sys-

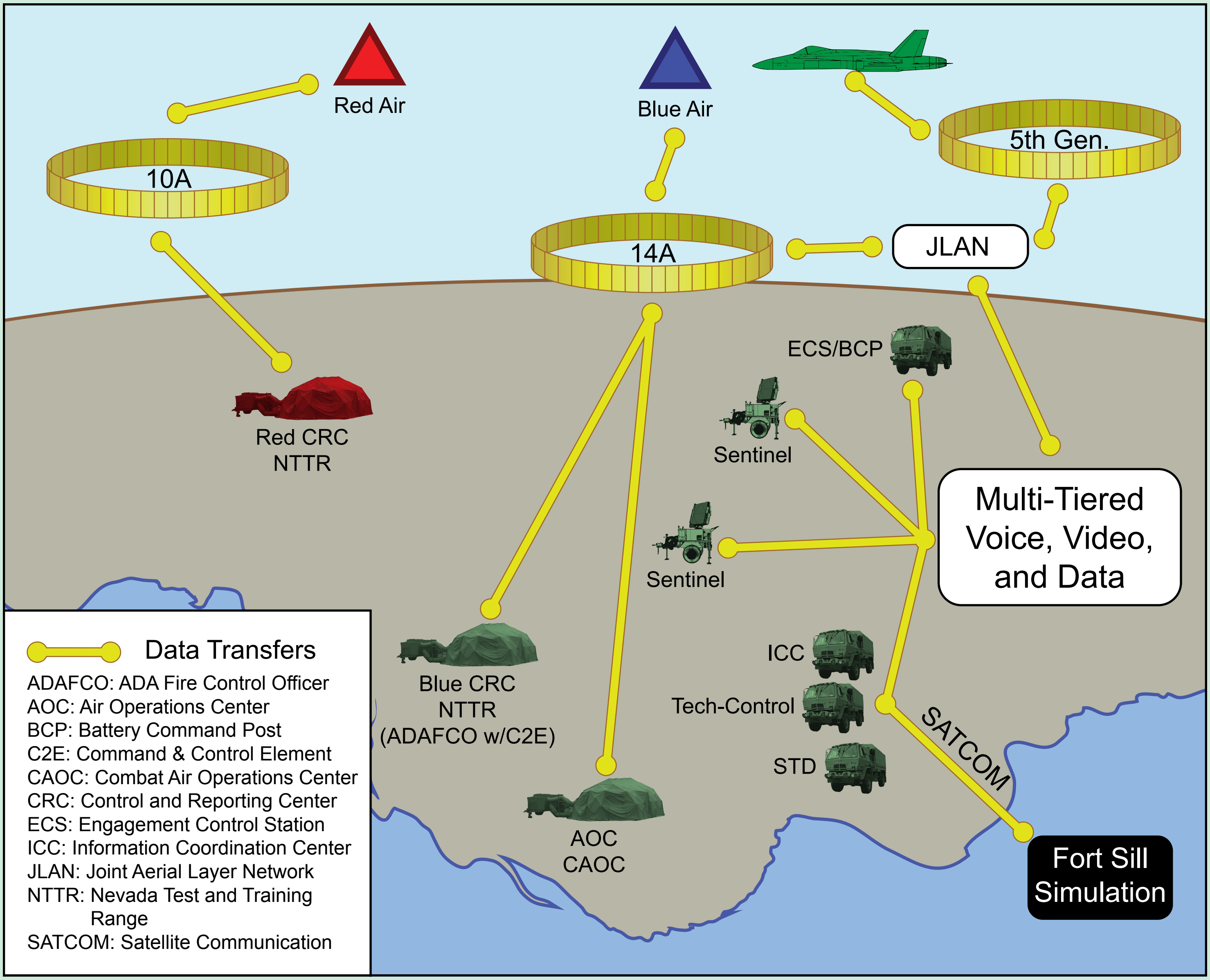



Figure 1: Joint Tactical Air Picture (JTAP) Live Event Operational View. (Illustration by Rick Paape, Jr., information provided by COL Edward 'Dusty' O'Neill)

tems to support the overall JTAP assessment and the U.S. Navy's objectives.

C Battery, 2nd Battalion, 43rd Air Defense Artillery (+) deployed to three locations across the Nevada Training and Test Range (NTTR). The battery established its position near Caliente, Nev., a Sentinel team at Rachel, Nev., and a second Sentinel on Angel's Peak, Las Vegas, Nev. Using standard communications capabilities with enhanced update rate for Post-Deployment Build 7 software, the units established the backbone of the JTAP architecture. During the integration phase of 'air battles,' C Battery, 2-43 and the 422nd Fighter Squadron conducted a series of capability demonstrations for integrated fire control and evaluated the network. The USAF provided an aerial gateway that was integrated into the architecture enabling the fifth-to-fourth generation sensor sharing.

During the ME12B live event 'air battles,' U.S. Air Force Weapon School candidates and their aerial arsenal along with the 422nd Fighter Squadron (F-22) and C Battery, 2-43 ADA conducted a series of integrated fire control (IFC) runs to validate techniques using an aerial gateway to disseminate fire control quality data across the network. This was technically achieved using a simulation driver due to integration challenges of the Battlefield Airborne Communications Node Information System (BIS) aerial gateway. Additional evaluation is required to confirm this capability can be repetitively executed. An unexpected success was the relaying of high-fidelity, targetable J12.6 messages from Patriot to the fighters demonstrating the promise of IFC for air-to-air engagements without using the F-22 sensor. During the defensive counter-air evolution, the last ME12B event, Patriot provided these messages to fifth and fourth generation fighters; with the development of future TTPs designed to leverage this capability, Army ground sensors would facilitate air-air engagements without the need for fighters to turn on their own radars, mitigating their exposure to enemy fighters.

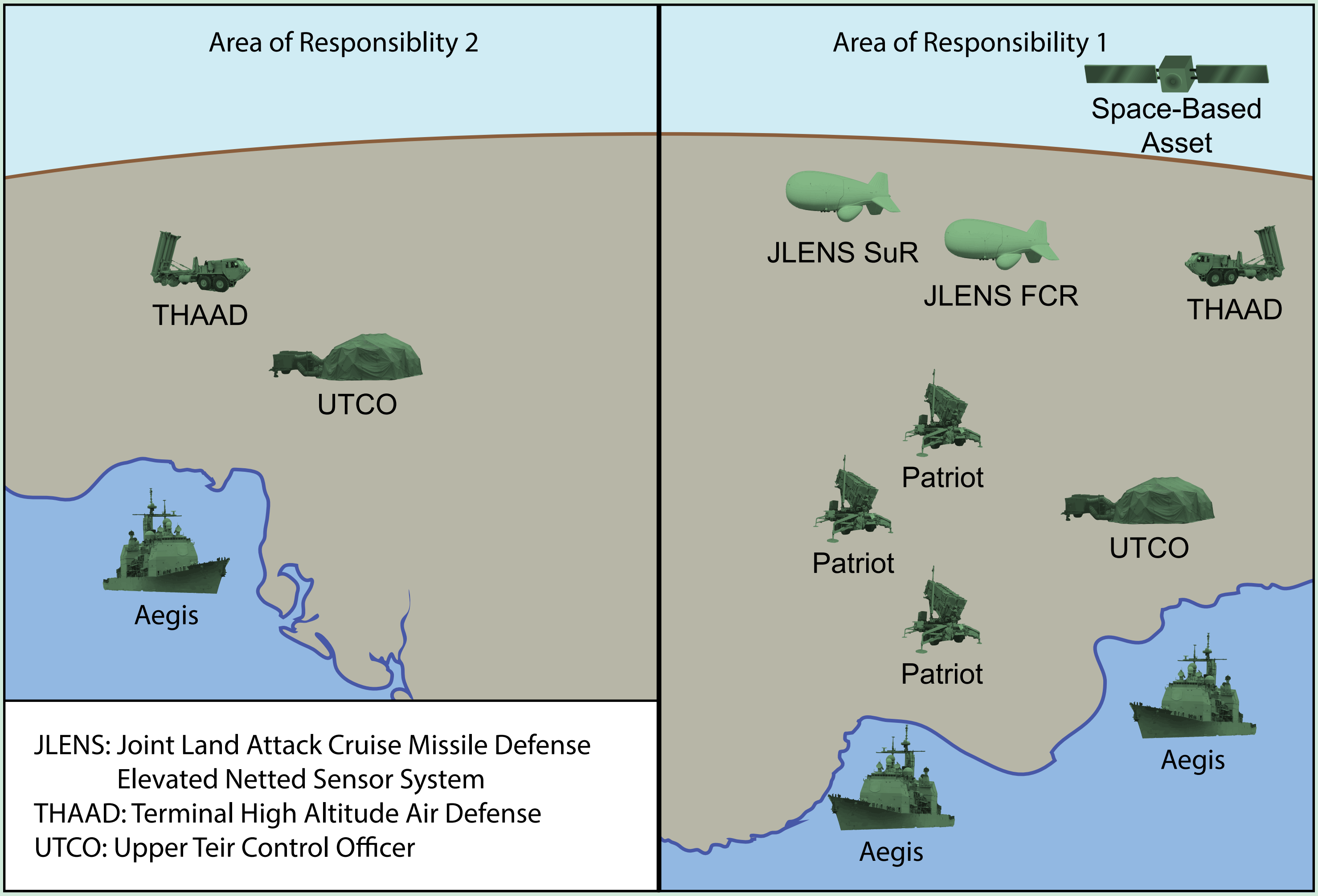



Figure 2: Joint Tactical Air Picture (JTAP) Simulation Event Operational View. (Illustration by Rick Paape, Jr., information provided by COL Edward 'Dusty' O'Neill)

JTAP Operational Views (Figure 1 and Figure 2) depict the high-level system architecture and participants for both venues. The forces depicted on the left side of 'JTAP Live Event OV-1,' are live players, while the right side depicts the simulation event that occurred in parallel/simultaneously with the live event. There was no data other than voice shared between Nellis AFB and the simulation sites. Information from the simulation event did not cross into the live event play box and vice versa. The forces depicted in Figure 2, 'JTAP Simulation Event OV-1,' are simulated forces.

**Key Takeaways and Lessons Learned from the Demonstration.** The final JTAP report was delivered to JIAMDO at the end of March. There were several key takeaways and lessons learned that can be shared with the AMD community. First, the quality of the air picture provided to RF and IP based networks using JTAP procedures were significantly improved. Operators rated air picture as 'good' and 'improved' based on previous experience. Upper tier control officers (UTCO) noted consistent track numbers during cross-area of responsibility operations. Air Defense Artillery fire control officers (ADAFCO) noted the air picture as "easier to manage" and "cleaner." Enhanced update rates of tracks improved kinematic accuracy providing timely engagement decisions. The ME 12B air defense commander's confidence significantly increased, a direct result of Patriot and Sentinel generated air picture leading to the implementation of a joint engagement zone (JEZ) operation. Patriot was considered a peer weapon system to fighters, versus a capability of last resort.

Second, JTAP architecture and procedures contributed to a common air picture. JTAP supported the distributed employment of Army air defense systems across a geographical area well beyond current capabilities. Army sensors were employed where needed vice where communications dictated. JTAP maximized the battlespace while reducing the requirement for communication resources.

JTAP procedures enabled aggregation of ground node timeslots resulting in a more efficient use of RF JTIDS. Lastly, JTAP's use of enhanced update rate over RF JTIDS allowed operators to expand engagement windows due to 'seeing' targets further and facilitated operations in a contested/degraded spectrum environment via a multi-tiered IP infrastructure. All of this was completed with minimal bandwidth issues, and all within service constraints to include disadvantaged users.

The JTAP architecture eliminated the need for Army air defense relays and enabled optimal geographic positioning of ground-based sensors. The JTAP ar-

Patriot missiles stand guard over Gaziantep, Turkey, Feb. 28, 2013. Soldiers from the 3rd Battalion, 2nd Air Defense Artillery unit are deployed to Turkey to support the NATO mission of promoting regional stability and augmenting Turkey's air defense capabilities. (Photo by Senior Airman Daniel Phelps, U.S. Air Force)

chitecture accommodated higher track update rates, while significantly reducing (by 20 percent) JTIDS time slot duty factor (TSDF). Finally, the architecture enabled integration of fifth generation fighter data through an aerial gateway allowing Link-16 IAMD shooters to send and receive target quality data.

Third, JTAP's procedures enabled the use of an airborne tactical data link (TDL) gateway between RF Link 16, IFDL, and IP networks to disseminate targeting information from fifth-generation fighters. BIS enabled beyond line of sight (BLOS) transmission of message sets (J12.6) across air and ground units. This currently does not happen in any joint operating area (JOA's) IAMD battlespace. These procedures allowed cooperative anti-jam tactics as a redundant means to prevent adversarial intrusion into the networks. The airborne TDL enabled sharing of fifth generation data from contested and anti-access regions with legacy tactical data links.

Finally, JTAP's procedures and the data link gateway enabled advanced engagement techniques through cueing, early engagement, and integrated fire control (IFC) concepts through improved sharing of fire control quality data.

The JTAP architecture technically demonstrated the ability to conduct an IFC engagement; however, the lack of operational TTP resulted in not completing an end-to-end IFC engagement. J12.6 target sorting message enabled IFC, cueing, situational awareness (SA), and integration across air and ground units.

Fifth generation fighters provided targetable information via BIS through RF Link-16/CDL (BIS-IP backhaul) BIS demonstrated high data-rate info connectivity from fifth and fourth-generation aerial systems. Lastly and unexpectedly, Patriot fire units transmitted engagement quality data (J12.6 messages) to fighter aircraft via the aerial gateway. This means that the fighters could engage air-breathing targets without ever turning on their own radars.

**Path Forward.** The joint services' team has submitted JTAP as an FY14 DoD Joint Test and Evaluation candidate. The JTAP test scope will be limited to developing a set of technical procedures and operational TTPs that, when implemented, will provide U.S. Army, Naval and Air Force warfighters a near-term improved tactical air picture and the ability to conduct integrated fire control (IFC) capabilities. This joint test (JT) will develop, test, evaluate and transition a set of JICO technical procedures for joint interoperable data sharing of both friendly and threat AMD information. This will be accomplished using existing 6016 and 3011C military standards over IP-enabled networks with EUR, which will support strike (offensive counter-air – attack-operations) and cueing of AMD weapons systems (defensive counter-air). The JT will develop, test, evaluate and transition operational TTPs, enabling COCOM weapons officers to employ advanced fire control quality capabilities. United States Pacific Command will serve as the operational sponsor, and JTAP will leverage a Tier 1 exercise to conduct the JT. The Fires Center of Excellence will serve as the resource sponsor to plan, develop, and execute the JT. JTAP will undergo a joint feasibility study through FY13 and conduct the JT in FY14. If any unit would like to understand more about this near-term capability, please contact the TCM-AAMDC at Fort Sill.★★


*Colonel Edward J. 'Dusty' O'Neill serves as TRADOC Capability Manager - Army Air and Missile Defense Command, Fort Sill, Okla., and director, Joint Tactical Air Picture (JTAP) for the Joint Distributed Engineering Plant (JDEP) for JIAMDO.*

*Mr. Michael Cochrane serves as deputy, JTAP. He recently retired as assistant commandant, United States Air Defense Artillery School.*

*Mr. Doug Blanchette is chief, Technical Integration, JTAP, and provides contractor support as a C4 Systems Architect to both the TRADOC Capability Manager – AAMDC and the Army's Integrated Air and Missile Defense (AIAMD) Program Office.*

An M109A6 Paladin self-propelled howitzer on McGregor Range, Fort Bliss, Texas. The Paladin is assigned to A Battery, 4th Battalion, 27th Field Artillery, which is taking part in the Network Integration Evaluation 12.2 (NIE-12.2) exercise. (Photo by SGT Robert Larson, U.S. Army)

# Training and Doctrine Command Capability Manager Brigade Combat Team Fires:

## The One-Stop-Shop for All Things Cannon

COL (Ret.) Donald C. DuRant

**Mission.** Training and Doctrine Command (TRADOC) Capability Manager Brigade Combat Team Fires (TCM BCT Fires) is chartered by the commanding general of the U.S. Army TRADOC. The TCM's mission is to act as the Army's centralized integrator for all current and future cannon Field Artillery howitzers, munitions, fuzes, propellants and survey capabilities organic to the armor, infantry and Stryker brigade combat teams (BCTs) and to provide user representation in organization and materiel development and modernization. As the centralized manager of all Field Artillery cannon delivery systems, projectiles, fuzes and propellants, TCM BCT Fires assists in transforming warfighter needs into capability requirements, which when approved, are developed into materiel solutions and then fielded.

The TCM's goal is to be a 'one-stop-shop' for our Fires force. We are directly responsible for material and organizational issues associated with doctrine, organization, training, materiel, leadership, personnel and facilities (DOTMLPF) and integrate all of the remaining DOTMLPF domains as issues demand. The TCM BCT Fires office may be contacted at commercial telephone 580-442-4451/6902/1885 or DSN 639-xxxx.


SPC Rodney Nichols, cannon crew member, A Battery, 3rd Battalion, 16th Field Artillery, 2nd Brigade Combat Team, 4th Infantry Division, positions an M109A6 Paladin self-propelled howitzer in preparation to conduct a field exercise on Fort Carson, Colo. (Photo by SSG Andrew Porch, U.S. Army)

**Organization.** The TCM BCT Fires office is part of the Fires Center of Excellence (FCoE) Capabilities Development and Integration Directorate (CDID) on the second floor of building 700, Knox Hall at Fort Sill, Okla. The TCM BCT Fires is a 13A Field Artillery colonel. He is assisted by a civilian deputy TCM, a civilian senior Field Artillery specialist and a civilian administrative assistant. The TCM office is organized into four capability portfolio management (CPM) teams: Armor BCT CPM Team, Infantry BCT CPM Team, Stryker BCT/ Survey CPM Team and Ammunition CPM Team. Each team is headed by a commissioned officer, either a 51A acquisition officer or a 13A Field Artillery officer. Senior noncommissioned officers (NCOs) (13B40, 13T40, and 91P40) provide their unique perspectives on the systems under development. The NCOs are key players, serving on user juries and providing critical insights on platform ergonomics and maintenance requirements. Contractor personnel also provide much-needed support to the TCM and CPMs as action officers and subject matter experts.

The FCoE Directorate of Training and Doctrine (DOTD) New Systems Division provides both civilian and NCO training developers who reside in the TCM BCT Fires' office. They ensure the training aids, devices, simulators and simulation (TADSS) aspects of new cannon and munitions systems are properly developed.

Several other entities are co-located with the TCM Office. The precision munitions new equipment training team, led by an Army National Guard 13A lieutenant colonel, conducts training for both the Excalibur 155 mm precision guided projectile and the 155 mm precision guidance kit. The project manager self-propelled howitzer has a team of five Paladin/PIM subject matter experts assigned to Fort Sill who reside in the TCM office. Additionally, Picatinny Arsenal, N.J., provides a contractor liaison officer to Fort Sill whose office is in the TCM BCT Fires area.

**Partners in Capability Development.** TCM BCT Fires works closely with the Concepts Development Division (CDD) and Requirements Development Division (RDD) within the CDID in terms of both warfighting capability and system specifications. The organization also works closely with the respective systems program executive offices (PEOs), project managers (PMs) and product managers (PdMs). As an active member of integrated process teams (IPTs), TCM BCT Fires continually interacts with the PEOs/PMs/PdMs and the training community.

Additionally, TCM BCT Fires conducts unique 'greening' hands-on, live-fire training of select civilian acquisition/engineering personnel from PEOs/ PMs/PdMs and research, development and evaluation centers (RDECs) at Fort Sill in order to familiarize them with cannon artillery and munitions systems.

**Total Package Fielding.** TCM BCT Fires coordinates with TRADOC and DA G3/5/7 and DA G8 to ensure compliance with appropriate regulations; ensures efforts are consistent with the Army's modernization and ARFORGEN plans, and are adequately funded to produce and field products that meet the warfighter's needs. It works closely with the warfighter and the PEO/PM/ PdM regarding system fielding and new equipment training (NET), e.g., precision munitions NET team, M777A2 NET team and M119A3 NET team. TCM BCT Fires continuously coordinates any DOTMLPF issues with the appropriate FCoE directorate to ensure the system is properly developed, trained and fielded.

**Top Five Systems.** TCM BCT Fires currently manages 24 programs with a portfolio value of $17.8 billion. Our office is currently responsible for one acquisition category (ACAT) 1D program [M109 Family of Vehicles (Paladin Integrated Management)] and one ACAT 1C program (Excalibur). TCM BCT Fires' Top five systems under development are:

- M109 Family of Vehicles (FOV), Paladin Integrated Management (PIM) 155 mm self-propelled howitzer
- M982A1 Excalibur 155 mm precision guided projectile
- M777A2 155 mm joint lightweight howitzer
- M119A3 digitized 105 mm towed howitzer
- XM1156 precision guidance kit

**M109 Family of Vehicles (FOV), Paladin Integrated Management (PIM).** The M109 FOV/PIM consists of two individual platforms, a self-propelled howitzer (SPH) and a carrier ammunition tracked (CAT). The platforms share a common chassis with substantial increases in force protection and survivability over the current M109A6 Paladin and M992A2 FAASV. The PIM SPH is an indirect-fire weapon system with the ability to deliver accurate, long range, lethal and non-lethal cannon Fires in support of combined arms maneuver and wide area security in decisive action operations. The PIM SPH can be employed within any brigade combat team formation to neutralize, suppress, or destroy enemy forces, while providing protected transport of a Field Artillery howitzer section on the modern battlefield. The PIM is capable of delivering both conventional and precision 155 mm munitions and retains manual backup features for all on-board automated systems. PIM uses the same armament (cannon, breech, etc.) as Paladin. PIM brings increased force protection and survivability to support decisive action operations as an integral part of heavy brigade combat team, combined arms team. It has growth potential for future requirements and technology insertions with space, weight and power as the critical enabler. It reduces the logistical burden with fewer unique components, provides increased responsiveness and accuracy of Fires and has the ability to accept enhanced network capability and situational awareness.

Improvements over the current M109A6 Paladin include:

- Electric elevation and traverse mechanisms and electric rammer; utilizes a 600 volt system
- Engine, transmission, final drive, suspension and track have commonality with the Bradley Infantry Fighting Vehicle (IFV)
- Improved force protection and survivability with capacity for add-on armor (belly and side); protects Soldiers from threats Paladin cannot
- Fully network capable
- Traverse limits +/- 800mils; beyond requires pivot steer (significantly faster when firing out-of-sector missions than M109A6 by about 30 seconds)

PIM completed the limited user test at Yuma Test Center, Ariz., in November 2012. Soldiers from 4th Battalion, 27th Field Artillery, manned two PIM prototype SPHs and their associated CATs. The vehicles fired 1,255 rounds and drove 882 miles during the 96-hour

Marines from Gun-3, A Battery, 1st Battalion, 12th Marines, ram a satellite-guided Excalibur XM982 Precision Engagement Projectile during a fire mission on Fire Base Saenz, Helmand province, Afghanistan. (Photo by SGT Earnest J. Barnes, U.S. Army)

Soldiers from B Battery, 1st Battalion, 9th Field Artillery, run through drills on the M777A2 howitzer at Forward Operating Base Hadrian. The Soldiers have been conducting intensive training and fire missions to support operations in Uruzgan province, Afghanistan. The gunners are tasked with providing offensive support to Combined Team Uruzgan missions using the M777A2. (Photo courtesy of 2nd BCT, 3rd ID)

test. PIM is currently undergoing additional developmental testing. Production is scheduled to start in 2015, and fielding to begin in 2017.

**Excalibur XM982(Ia-1), M982 (Ia-2), M982A1(Ib).** Excalibur is a precision guided, extended-range 155 mm, high-explosive cannon artillery projectile with integrated Global Positioning System (GPS)-Inertial Navigation System guidance and unitary warhead. It provides artillery capabilities in urban areas and restrictive terrain while minimizing collateral damage. Excalibur is currently compatible with Paladin and M777A2 (LW155) howitzers and will be compatible with the Swedish Archer howitzer when available. Excalibur is being developed in three increments: Ia-1 (urgent materiel release) and Ia-2 (full materiel release) are both in production and fielded, and are currently in use in the area of responsibility by both the U.S. Marine Corps and Army. Excalibur was used in Iraq in 2007, to take out a high value target (the number two al-Qaeda leader in Iraq). It is in development and will start fielding in FY14.

**M777A2.** The M777A2 is a highly mobile, digitized 155 mm towed howitzer operated by a 10-man crew. The digitized platform increases responsiveness and is lighter and smaller than the M198 howitzer. Planned improvements to the M777A2 include:

- Lethality
  - Hydraulic Power Assist Kit (FY13)
  - Electronic Thermal Warning Device (FY13)
  - Traverse Assist Kit (Dec 13)
- Networked Battle Command
  - On-board technical fire control computations [Digital Fire Control System (DFCS) 4.1.0, FY13]
  - DFCS refresh (FY14)
- Improve force protection for Stryker BCT M777A2 crews
  - Evaluate/approve Stryker ICV as prime mover

The M777A2 has been fielded, to both U.S. Army (SBCT Fires battalions and Fires brigade's battalions) and USMC Field Artillery battalions, and has seen successful combat action in Iraq and Afghanistan. Recently, the U.S. Army decided to change the infantry brigade combat team (IBCT) Fires battalion's design to include M777A2s. These IBCT composite Fires battalions will have one battery of M777A2s and either one or two batteries of M119A3s.

**M119A2/A3.** The M119A2 is a 4,270 pound, 105 mm towed howitzer with a seven-man crew and replaces both the M119A1 and M102. It will be the organic indirect fire asset in all IBCT by the end of 2012. The M119A2 is deployable by air, via C130 and heavy lift rotary aircraft. The M119A2 has seen successful combat action in Iraq and Afghanistan. Efforts are underway to develop

Soldiers from the Virginia National Guard's Hampton-based 1st Battalion, 111th Field Artillery Regiment, 116th Brigade Combat Team conduct live-fire training with their M119A2 howitzers, June 14, at Fort A. P. Hill, Va., during the unit's two-week annual training period. (Photo by Cotton Puryear, U.S. Army)

and field the M119A3 digitized 105 mm howitzer, which will significantly improve emplacement and displacement times and increase responsiveness. Fielding is scheduled to begin in the second quarter of FY13. Planned improvements include:

- On board ballistic computations: Digital Fire Control System V2.0.0 (fourth quarter FY14)
- Integrated Muzzle Velocity System: V2.0.0 (fourth quarter FY14)
- Capability Set 15-16 call For fire processing (sensor to shooter) for
- DFCS V3.0.0 (second quarter FY15)
- Suspension Lock-out-System (SLoS):
  - 50 systems
  - Fully funded
- Weight Reduction Strategy:
  - Gas equilibrator redesign – 94 pounds (TBD)
  - Optimized recoil system – 20 pounds (FY14)
  - Titanium spade design – 20 pounds (FY14)
  - Lower carriage redesign – 200 pounds (TBD)

**XM1156 Precision Guidance Kit (PGK).** PGK is an inductively set GPS guided fuze kit that enhances existing high explosive (HE) artillery (155 mm) projectiles' (M795 and M549A1) accuracy to 50 meters circular error probable (CEP) with an objective accuracy of 30 meter CEP. PGK utilizes GPS guidance and fixed canards mounted on the fuze to correct the projectile's trajectory in range and deflection guiding the projectile to the programmed target grid. PGK is set using the enhanced portable inductive artillery fuze setter (EPIAFS) to transfer power and initialization data. Once fired, the PGK fitted projectile follows a ballistic path while the PGK begins to de-spin (roll-control). When roll-control has been established, the acquisition of GPS satellites starts. Upon GPS acquisition, PGK will make corrections off the ballistic path to guide the projectile onto the target grid. PGK will begin fielding in second quarter of FY13.

As can be seen from the above paragraphs, TCM BCT Fires continues to put enhanced cannon artillery capabilities into the hands of *Redleg* Soldiers and Marines. It truly is the one-stop-shop for all things cannon artillery!★★

*Colonel (Ret.) Donald C. DuRant is currently serving as the senior Field Artillery specialist in the office of the TRADOC Capability Manager Brigade Combat Team Fires. DuRant, a distinguished military graduate of North Georgia College, was commissioned in the Field Artillery in 1974, and served both on active duty and in the U.S. Army Reserve for a combined 30 years. He commanded at the battery, battalion and group levels.*

An M270A1 Multiple Launch Rocket System (MLRS) crew fires a training round toward the South Arbuckle Impact Area on Fort Sill, Okla. The bright blast from the round created a reflection in the camera lens shown above the rocket. (Photo by SSG William Sallette, U.S. Army)

# Training and Doctrine Command Capability Manager – Fires Brigade

**By Mr. Jeff Froysland and CW4 Scott Prochniak**

Training and Doctrine Command (TRADOC) Capabilities Managers (TCM) Fires Brigade (FiB) Charter/Mission Statement: TCM FiB, represents the TRADOC commanding general, and reports to the director, Capabilities Development and Integration Directorate (CDID), Fires Center of Excellence (FCoE), Fort Sill, Okla., and acts as TRADOC's centralized manager for all user activities associated with the Fires brigades (FiB). The TCM is responsible for integrating, synchronizing and coordinating efforts across doctrine, organization, training, materiel, leadership and education, personnel and facilities domains in support of the FiB to ensure success on the battlefield. TCM FiB is also responsible for current fielded and developmental Field Artillery rocket, missile and radar systems and is the user advocate and counterpart to pertinent program managers.

**Launcher Platform Program Desciptions:**

**M270A1.** M270A1 is a tracked, indirect fire, rocket/missile system with an Improved Fire Control System (IFCS) capable of firing the current and future Multiple Launch Rocket Family of Munitions (MFOM). Currently, there are seven active duty battalions and two National Guard battalions. The M270A1 launcher is mounted on a Bradley chassis. The M270A1 provides rocket/missile capability in support of heavy, light, airborne and air assault divisions. It also supports the Stryker and future forces.

The Multiple Launch Rocket System (MLRS) is in the sustainment phase. TCM FiB is currently planning long-term efforts to meet system development objectives and major modification efforts. In the near-term TCM FiB will:

- Provide assistance to units
- Improve launcher hardware and software functionality to accommodate Guided MLRS rockets and Army Tactical Missile System (ATACMS) missile configurations
- Update munitions command and control interfaces between Advanced Fielding Artillery Tactical Data Systems and the M270A1
- Develop a reset/recapitalization plan that upgrades and extends the useable years to 2030 and beyond, consistent with expected capabilities (fewer C130 transport assets) and life expectancy of High Mobility Artillery Rocket System (HIMARS)
- Major modification efforts include the Improved armored cab, long-range communications (HF radio, AN/PRC-150), drivers' vision enhancement, Blue Force Tracker, Crew Chief Restraint System and Fire Control System-Update

**M142 HIMARS.** HIMARS is a wheeled, indirect fire, rocket/missile system that is capable of firing all of the current and future MFOM. The HIMARS launcher is mounted on a Family of Medium Tactical Vehicles (FMTV) 6x6, all-wheel drive, five-ton truck. HIMARS provides rocket/missile capability in support of heavy, light, airborne and air assault divisions and forced/early entry contingency force operations. It supports the Stryker, IBCTs, and future forces. HIMARS provides inter-theater and intra-theater deployability by C-130 or larger aircraft. The C-130 permits rapid insertion of HIMARS into a contingency area and redeployability to critical areas within the theater of operations. HIMARS will utilize the operation and organization (O&O) plan, similar to all MLRS, and will expand the O&O plan to include early entry operations. The M142 HIMARS will complete full rate production in FY13 and move into sustainment. Currently, 16 of 17 HIMARS battalions have been fielded with one battalion remaining to be fielded to an active duty unit. TCM FiB will continue to plan long term efforts to meet system development objectives and major modification efforts. Those efforts include:

- Provide assistance to units engaged in contingency planning and combat operations
- Field battalions as directed by Headquarters Department of the Army
- Provide user representation during design and testing of the improved crew protection cab (currently being fielded)
- Develop requirements for onboard enhanced technical and tactical command and control capabilities
- Implement major modifications to include the improved crew protection cab, long-range communications (HF radio, AN/PRC-150), Blue Force Tracker, Crew Chief's Restraint System and drivers' vision enhancement

**MLRS Family of Munitions.** The M26 rocket with dual-purpose improved conventional munitions (DPICM) submunitions was the initial rocket developed for the MLRS. After Operation Desert Storm (1991), reports indicated the M26 rocket was out-ranged by enemy artillery systems: MLRS rockets required additional range and greater accuracy. The M26A2 extended-range (ER) rocket provided an interim solution for increased range (45 kilometers); however, greater accuracy remained a capability shortfall. In 2003, the M30 (GMLRS with DPICM submunitions) rocket was fielded to satisfy both increased range and accuracy requirements. The fielded M30 rocket is a GPS-aided area weapon system capable of engaging targets at both a greater range and improved accuracy using 404 DPICM submunition grenades.

**Army Tactical Advanced Conventional Munitions (ATACMS).** With the termination of the ATACMS program in 2007, the Army's ability to engage threat artillery, suppress active integrated air defense systems (IADS) and destroy time-sensitive surface targets at extended ranges was greatly diminished. This, coupled with the Secretary of Defense Cluster Munition Policy Letter (June 19, 2008), restricting cluster munitions with >1 percent unexploded ordnance (UXO) after 2018, further reduced our ability to engage large area targets or imprecisely located targets.

The remaining ATACMS in the inventory are going through a Stockpile Reliability Program (SRP) designed to assess the continuing reliability, performance and safety of field ammunition. The SRP consists of field surveillance, subsystem component testing, and system flight testing. Results are used to establish, verify and identify possible strategies to extend the service life of missile systems. Service life extension decisions are typically done in three-year increments and conducted to collect the necessary data to support a service life extension determination.

As of today, future extensions to the Block I service life (beyond the current 20-year mark) are considered unlikely due to a documented decrease in missile guidance set reliability over the last three years. The last SRP extension for the Block I was March 13, 2012; the service life will expire in FY16.

The service life for both Block IA and Quick Reaction Unitary (QRU-M48) munitions is 15 years with an extension to 18 years expected. The service life will expire in FY21 for Block 1A and FY22 for the QRU munitions.

The service life for ATACMS Unitary (T2K) is 10 years. A service life extension to 15 years is anticipated. The last ATACMS Unitary (T2K) was produced and fielded in 2011.

Once the Guided MLRS (GMLRS) program was initiated with GMLRS dual-purpose conventional munitions (DPICM), an incremental acquisition approach was developed to improve the entire GMLRS family of munitions. Listed below are the developed or planned GMLRS Increments.

- Increment I-GMLRS carrying DPICM submunitions. This increment was developed to satisfy 2003 MLRS ordnance (ORD) requirements. Due to the restrictions imposed by the Department of Defense (DOD) Policy on Cluster Munitions (CM) and Unintended Harm to Civilians, implemented in 2008, the Army ended procurement of this increment.
- Increment II-GMLRS carrying a unitary warhead capable of engaging point targets in restricted/urban terrain in close proximity to friendly troops while minimizing collateral damage. This increment satisfies 2003 GMLRS Unitary Operational Requirements Document (ORD) requirements. Increment II was sub-divided into parts 'a and b' in response to Urgent Needs Statements (UNS)

from forces fighting in Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF).

- Increment IIa--GMLRS rocket and unitary warhead with a dual mode (point detonate and delay) fuse. Approximately 1,200 of these rockets were developed and provided to U.S. and allied forces who employed them in combat operations with great success. Increment IIa was first fielded to U.S. forces in 2005. This increment was produced to satisfy the UNS and is no longer in production.
- Increment IIb--Increment IIa plus the addition of a proximity mode to the fusing system and software updates enabling trajectory shaping. These enhancements greatly improved the versatility and performance of the unitary warhead in urban /counter-insurgency (COIN) operations. In excess of 2,500 Increment IIb rockets have been fired in support of OIF and OEF. This increment is currently in full rate production.
- Increment III (GMLRS-AW) is being developed in response to the new DoD policy on cluster munitions and unintended harm to civilians. Increment III GMLRS replaces the DPICM warhead with an alternative warhead to comply with the new cluster munition (CM) policy while still achieving effectiveness requirements against specified MLRS ORD target sets. This increment successfully completed Milestone B in 2011, and is currently in the engineering and manufacturing development phase.
- GMLRS Increment IV Capability Development Document is currently being staffed worldwide and articulates the required capabilities for a new rocket. This rocket will have a range of 250 kilometers (T) and fill a capability gap for multiple combatant commands (COCOMs), which was exacerbated by the termination of ATACMS and the CM policy. GMLRS IV will have an area type warhead effective against the same target set as ATACM Block 1A. Increment IV will provide commanders a single munition to effectively engage area targets at extended ranges in complex terrain. This increment will allow target engagement in situations where limited launch assets and/or target location error considerations may influence munition selection.
- Increment V and future increments will develop a munition for modular forces that will enable engagement of time-sensitive surface moving/fleeting and hidden targets; attack of targets in complex and urban terrain; in-flight retargeting; increased range; and production of muti-tailored effects against a wider range of targets. Increment V may include the ability to deliver a variety of kinetic, non-kinetic, lethal, and non-lethal effects. Expected Milestone A for Increment V is FY22-24.

**Radar System Program Descriptions:**

**AN/TPQ-53 (EQ-36) Enhanced Counterfire Target Acquisition (CTA) Radar.** Q-53 is an Acquisition Category (ACAT) II program under DoD oversight for operational test and evaluation. The Q-53 is organic to the brigade combat team and Fires brigade; mitigates radar coverage gaps with a 360 degree capability and will replace the legacy AN/TPQ-36 and AN/TPQ-37 Firefinder Radar Systems. The Q-53 provides a highly mobile system capable of rapidly providing Advanced Field Artillery Tactical Data System (AFATDS) mission command nodes with precision/near-precision target location data against mortars, cannon and rockets in a 90-degree (stare) or 360-degree (rotating) search sector and is a primary sensor for Indirect Fire Protection Capability Rocket Artillery Mortar (FPC RAM) Warn, providing early warning to the BCT; increasing Soldier survivability. Reduced crew size (10 down to five personnel) is a key enabler to resource manning requirements for the AN/TPQ-50 (A-LCMR). Acquisition Strategy consists of two components: Quick Reaction Capability (QRC) and program of record (POR). The current Objective Army Requirement (OAR) is 174 systems. In the QRC phase, HQDA directed requirements for a total of 45 QRC systems: 32 systems procured, 31 systems delivered, 13 fielded, and six systems supporting OEF. QRC systems will retrofit and become part of the OAR. Under the POR, on Feb. 27, 2012, the Milestone C decision update approved the purchase of 25 low rate initial production (LRIP) systems; contract award was Feb. 29, 2012. Limited User Test (LUT) was completed in October 2012, (first quarter FY13) with initial operational test & evaluation (IOT&E) scheduled for first quarter FY14.

**AN/TPQ-50 (A-LCMR).** Q-50 is an ACAT III program. The Q-50 radar provides critical short range (10 kilometers) 360-degree CTA capabilities as well as force protection for personnel and facilities. The Q-50 is designed to locate mortar, artillery, and rocket with a target location error enabling first round fire for effect and is sufficiently lightweight to support insertion by airborne and air assault means. Q-50 is deployable in a vehicle mounted or tripod configura-

tion and is operated and maintained by a crew of two. The system is fully interoperable with the AFATDS and IFPC RAM Warn mission command systems. The Q-50 mitigates close combat radar coverage gaps and compliments the current longer-range radars, fully supporting brigade combat teams and Fires brigades operations. The program's Milestone C decision March 2012, IOT&E was successfully completed in June 2012, and full rate production decision is scheduled for May 2013. The Q-50 acquisition strategy consists of two components:  QRC and POR. For the QRC phase, FY09 and FY10 OCO funding was used to award two undefinitized contract actions (UCA) and one firm fixed price (FFP) contract. FY11-15 POM dollars will fund LRIP and full rate production (FRP) quantities in a sole-source contract with SRCTec, formerly known as Syracuse Research Corporation Technologies. Current OAR is 400 systems.

**AN/TPQ-36(V)10 Firefinder Radar System.** The radar set AN/TPQ 36(V)10 is a currently fielded, pulse Doppler radar with a multiple target capability. There are 116 systems in the fleet. The radar set utilizes a phased array antenna whose scan is controlled by phase in azimuth and by frequency in elevation.

PVT Zachary Hilleary, a radar operator from Headquarters and Headquarters Battery, 1st Battalion, 37th Field Artillery, takes a defensive position after completing certification on the new EQ-36 Target Acquisition Radar. (Photo by SGT Austan Owen, U.S. Army)

The radar set requires a crew of four personnel and operates with the operations central (OC) on a wheeled vehicle or on the ground with no vehicle. It detects and locates in-flight projectiles and displays their point of origin over a continuous range from 750 to 24,000 meters and over a continuous azimuth sector of 1,600 mils. It is capable of providing friendly artillery registration and adjustment. This system will be retired as the Q-53 is fielded. The Q36 is projected to be retired from the fleet by FY16. The AN/TPQ-36 is part of the foreign military sales (FMS) program and is sold world-wide with varying software capabilities.

A radar crew from Headquarters and Headquarters Battery, 3rd Battalion, 29th Field Artillery, 3rd Advise and Assist Brigade, 4th Infantry Division, cleans up after washing the Firefinder Radar System. (Phto by Pfc. Khori Johnson, U.S. Army)

**AN/TPQ-37(V)9 (RMI) Firefinder Radar System.** The AN/TPQ-37 Reliability/Maintainability Initiative (RMI) was developed to reduce the system sustainment costs and increase the life span of the radar system. Fifty-nine RMI kits were purchased and are being installed by Tobyhanna Army Depot, Pa. The RMI system converts a liquid cooling system to the latest heat-sink and airflow technology. The traveling wave tube (TWT), a single point of failure, is being replaced with the Power Amplification Modules developed in the Phoenix program. A receiver/exciter upgrade and new radar processor (RP) has been developed as a common processor for both the Q36 and the Q37 radars. This system requires a crew of 10 personnel. Fielding of the RMI kits is expected to be completed FY14. This radar will retire from the fleet in early FY19.★★

*Chief Warrant Officer Four Scott Prochniak is the Capability Developer and Requirements Manager for Field Artillery Target Acquisition Radars currently assigned to TRADOC Capability Manager - Fire Brigade (TCM FiB). Previously he served as a division and brigade targeting officer, assistant fire support coordinator, electronic warfare officer, and radar section leader for both the Q-36 and Q-37 Firefinder radars, in the 101st Airborne Division, 10th Mountain Division and 2nd Infantry Division. He holds a Masters Degree from Liberty University.*

*Mr. Jeffrey L. Froysland is a retired Lieutenant Colonel, U.S. Army Reserve, Acquisition Corps, and is currently an Assistant TRADOC System Manager Fires Brigade (TCM FiB) at Fort Sill, Okla. He is responsible for all the Multiple-Launch Rocket System (MLRS) launcher, rockets and missiles programs in the TCM office. He served in the active Army Field Artillery branch in Korea and Germany, leaving the Army as a captain in 1989 to work for the Directorate of Combat Development at the Field Artillery School, Fort Sill. He is a graduate of the Materiel Acquisition Manager's Course, Fort Lee, and the Program Manager's Course, Fort Belvoir, both in Virginia. Froysland holds a Master of Business Administration from Oklahoma City University.*

General officers from the Republic of Korea visit the 210th Fires Brigade on Camp Casey in Dongducheon, South Korea. During the visit, the visitors viewed the AN/TPQ-37(v) 9 Radar System. (Photo by SSG Carlos Davis, U.S. Army).

# Fires Radar Strategy

By Mr. Daryl Youngman

The ability to detect, track, classify, and identify aerial objects, including manned and unmanned aircraft, ballistic and cruise missiles, and rocket, artillery, and mortar projectiles, is a core competency of the Fires warfighting function. The proliferation of the use of unmanned aerial systems, both friendly and threat, further drives the need for airspace coverage. Although each current radar program has a modernization plan, there is not a unified strategy to guide the path forward.

Although it is always good to have a vision and strategy to guide decisions on the allocation of resources, in an era of constrained resources it is even more critical. The Fires Center of Excellence (FCoE), Fort Sill, Okla., is in the process of developing a radar strategy to guide currently planned programs and future science and technology efforts. The vision for the strategy is to:

**Ends.** Provide persistent, integrated, all weather, ubiquitous Fires (Air Defense Artillery and Field Artillery) radar coverage in support of homeland defense and joint, combined, and unified land operations.

The first step in the development of the strategy, is to document the current Fires Materiel Roadmap (page 46), which reduces the total number of unique radars and variants and shows the current plan for modernization.

Currently there are nine distinct Air Defense Artillery and Field Artillery radars in the Fires force, not including multiple variants of the same radar. Some of these radars, such as Lightweight Counter-Mortar Radar (AN/TPQ-48 and

AN/TPQ-49), and the Multi-functional Radio Frequency System, are not programs of record.

In the near term (FY15-19), there is a plan to converge the short range-counter-fire radar variants, leaving just the AN/TPQ-50. There is also a plan to retire the older variants of long-range counter-fire radars, the AN/TPQ-36 and AN/TPQ-37, leaving only the AN/TPQ-53.

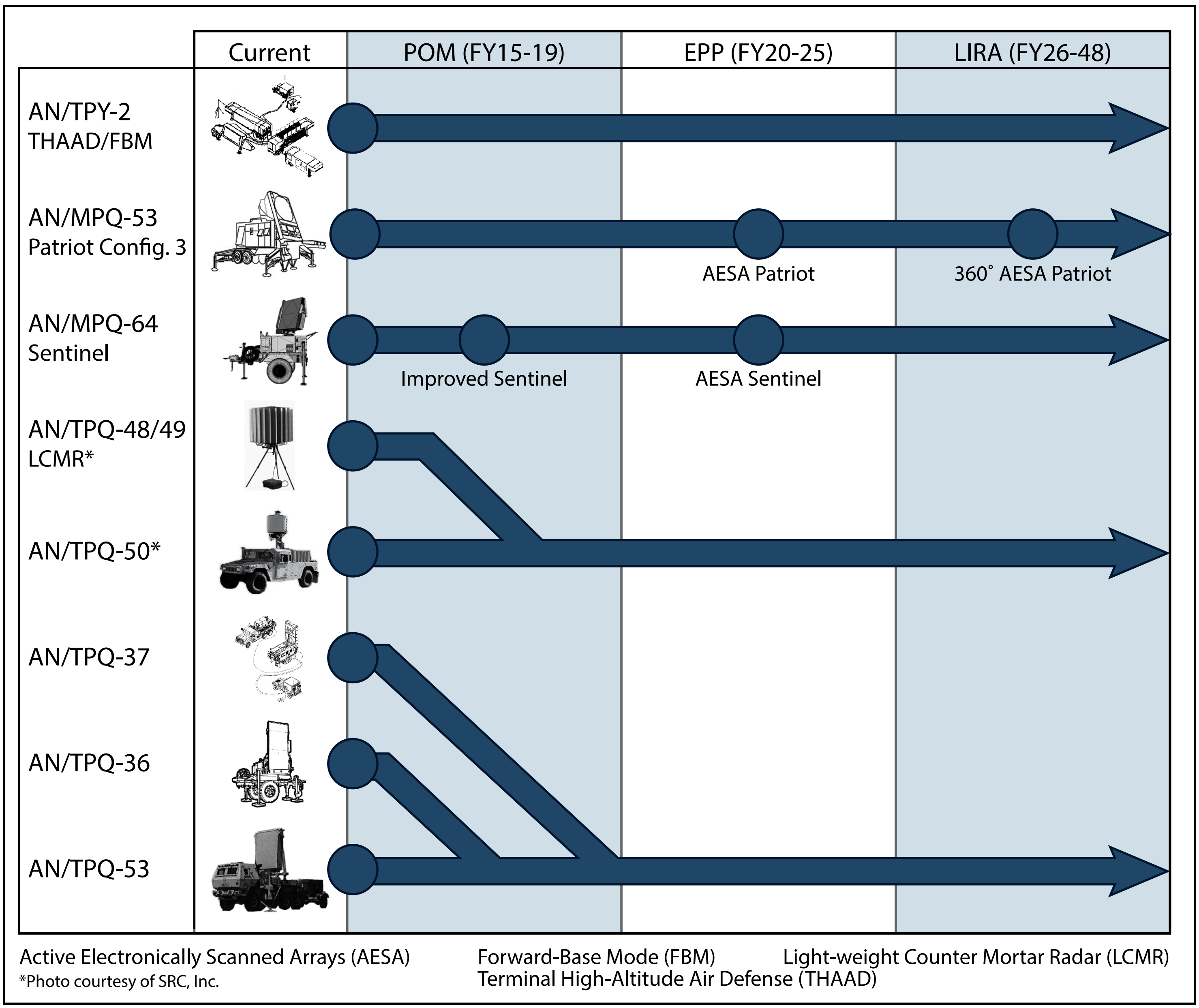
In the mid-term, there is a plan to update two of the Air Defense Artillery radars, Sentinel (AN/MPQ-64) and Patriot (AN/MPQ-53), to modern active electronically scanned arrays (AESA) technology. Updating the Patriot radar will significantly reduce operations and maintenance support costs, while improving availability and readiness. Additionally, the new technology will provide a basis to improve performance against emerging threats.

As we look beyond the current materiel roadmap, there are four major 'ways,' that when applied across the Fires' mission area, will assist us in achieving our vision. They are:

**Ways.** Commonality, expeditionary, network integration, and optimize force structure. We define the first of these ways, commonality, as optimizing the use, re-use, and adaption of hardware components, software, and interfaces to increase operational efficiency, logistics, and training. Implementation of small-scale commonality, including common man-machine interfaces, common algorithms, or common components, could lead to significant cost savings. As technology matures, commonality could extend to multi-functional or multi-mission radars that increase operational flexibility and efficiency in addition to providing cost savings.

The purpose of the next way, expeditionary, is to ensure Fires radars have the requisite combination of deployability and mobility to support joint, combined, and unified land operations. This characteristic is mission dependant. For example, tactical counter-fire radars may require cross-country mobility and transportability on C-130 aircraft, while

The current radar materiel roadmap. (Illustration by Rick Paape, Jr., information provided by Daryl Youngman)



An AN/TPQ-53 Counter-Fire Target Acquisition Radar Systems sit on display. (Photo courtesy of the US Army Acquisition Support Center)

strategic ballistic-missile defense radars may only require mobility on improved roads and transportability on C-5/C-17 aircraft.

Network integration is the 'way' we apply to maximize Fires radar coverage and capability through data sharing. One of the key capabilities network integration enables is sensor fusion. When multiple counter-fire radars detect a target, sensor fusion can significantly reduce target location error. In the air defense mission area, network integration, enables both improvements in combat identification and advanced engagement techniques, such as engage on network. Additionally, as radars move to become multi-functional or multi-mission, network integration allows the appropriate information to be shared across mission areas.

The final 'way' of our strategy, optimizing force structure, will allow us to maximize capabilities and flexibility while minimizing required force structure. As we achieve more commonality and achieve better network integration, this could allow us to potentially provide more complete coverage with the same amount of force structure and radars, reduce the number of military occupational specialties, or even reduce crew sizes.

The next step for the Fires Strategy is to develop the 'means' that will allow us to attain our 'ends.' During this step, the FCoE will reach out to both the materiel development, and science and technology communities to determine the necessary steps and timing to achieve the ways outlined above. The 'means' will likely include focused science and technology efforts that will result in informed decisions for future modernization.

One example of a 'means' that would further the execution of the strategy would be to increase investment in multi-role, mutli-functional, and/or multi-mission radars. Some of today's radars are already multi-role, simultaneously fulfilling multiple roles within the same mission. An example of this is the Patriot radar, which simultaneously provides air defense surveillance and fire control. As technology matures, some of the more modern radars, such as those with active electronically steered array (AESA) technology, have the potential to be developed into multi-functional radars, performing multiple missions at different times or even possibly multi-mission radars, performing multiple missions simultaneously. This investment could support commonality, network integration, and optimizing force structure, helping to achieving the vision of our strategy.

The Fires Radar Strategy, summarized above, is intended to provide a holistic plan to guide the way forward towards accomplishing the Fires warfighting function's core competency of detecting, tracking, classifying, and identifying aerial objects, including manned and unmanned aircraft, ballistic and cruise missiles, and rocket, artillery, and mortar projectiles. It is intended to guide the science and technology, the modernization of current radars and the development of new radar systems.★★

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*Daryl Youngman is the air and missile technical advisor at the Fires Center of Excellence, Fort Sill, Okla. He has more than 20 years of air defense experience, including more than 15 years in combat development. He received a Bachelor of Science Degree from the U.S. Military Academy, a Master of Science Degree from Colorado State University, and a Master of Business Administration Degree from Northcentral University, Ariz.*

# Path Forward to Capability Development – 2013 Training and Doctrine Command Capability Manager – Army Air and Missile Defense Command

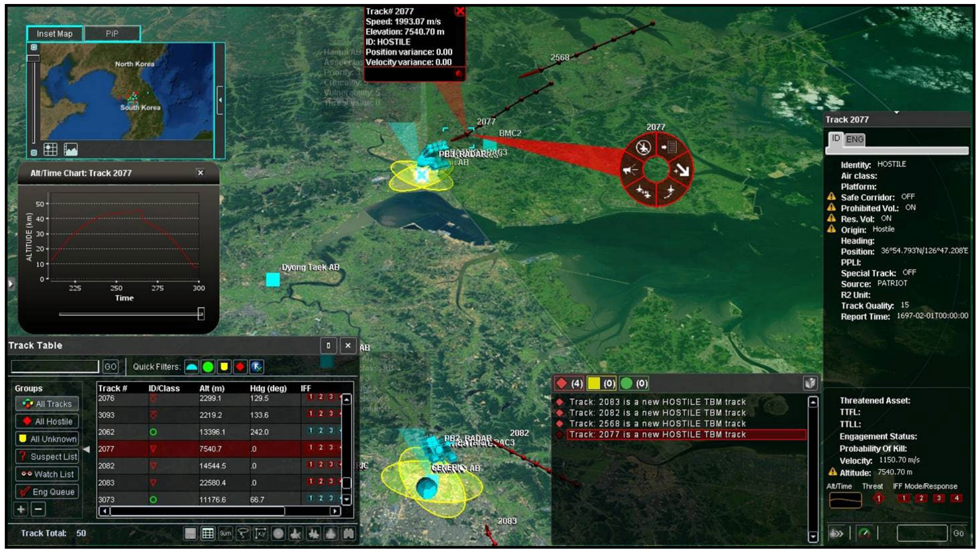
**By COL Edward 'Dusty' O'Neill, Mr. Michael Blose, and Ms. Linda Sovocool**

The proliferation of ballistic missile technologies and continued development of advanced capabilities necessitates the Army remain at the forefront of missile defense. As our national strategy shifts towards the Pacific, it's incumbent on the air and missile defense capability development community to ensure our warfighters maintain their ability to prevent, shape and win the next ballistic missile fight. The Army continues to invest robustly in near and long term modernization efforts to keep Air Defense Artillery (ADA) relevant as part of Army 2020 efforts and beyond. The Fires Center of Excellence (FCoE), Fort Sill, Okla., is transforming air and missile defense (AMD) capabilities to meet any challenge with the transformation centerpiece being the Army Integrated Air and Missile Defense (AIAMD) program. The FCoE has crafted a multi-point strategy to maintain Patriot viability through 2041, balance AMD capabilities between forward stationed and rotational deployments, modernize and field AMD capabilities designed to defeat emerging ballistic missile threats, and develop and field a common mission command capability using an integrated fire control network to fully integrate sensors and shooters. This strategy and the fielded capabilities ensure that Army AMD force remains agile, tailorable, and fully integrated with joint and Army forces.

Before we look to the future, we think it is worthwhile to review 2012 on the multitude of key events and activities that have been accomplished in support of the entire AMD force. For Terminal High Altitude Area Defense (THAAD), key activities included conditional materiel release (CMR) to the Army, execution of the first ever interoperability flight test, and activation of the third THAAD battery, D/2 ADA at Fort Bliss, Texas. A/2 ADA (T) and A/4 ADA (T) have led the way in developing tactics, techniques, and procedures (TTPs), fielding and training latest system upgrades, and remaining certified, all while continuously maintaining readiness to deploy for any contingency.

For Patriot, key activities included initial operating capability for 1st Battalion, 62nd Air Defense Artillery at Fort Hood, Texas, as part of the 69th ADA Brigade, our last 'Grow the Army' battalion, Post Deployment Build-7 (PDB 7) developmental and operational tests, multiple flight tests, including missile segment enhancement (MSE) testing and advanced engagement techniques, such as Integrated Fire Control (IFC), and fielding various minor software and missile readiness improvements. PDB 7 provides significant improvements in software and hardware most visible with new Modern Man Stations and Modern Adjunct Processors. All missile flight tests were successful with perfect 100 percent intercepts, proving our hit-to-kill capability remains preeminent. Much of the credit for the success of this testing goes to 3rd Battalion, 43rd Air Defense Artillery and 2nd Battalion, 43rd Air Defense Artillery, who served as our Army's test battalions this past year. Through their efforts, they have validated new concepts and capabilities for current and future operational employment.

Finally, for AIAMD, the program completed the critical design review for building our next generation mission command capability, conducted a series of warfighter participation events to develop the Common Warfighter Machine Interface (CWMI) that is the cornerstone for the Integrated Battle Command System (IBCS), and set conditions for an upcoming capability demonstration to determine specific AIAMD capabilities could be fielded earlier than FY16. TRADOC Capabilities Manager-Army Air and Missile Defense Command (TCM-AAMDC) in conjunction with joint partners and 2-43 ADA executed the joint tactical air picture (JTAP) demonstration, examining near-term capability enhancements over IP-based beyond line of sight communications and providing a gateway to better fire control capability across the joint force. This was a very successful demonstration that is directly transitional within the AIAMD program and a huge success this year, bringing future capability to the AMD force to keep *Air Defenders* relevant and modernized. We could not have done this without tremendous support from the AMD community, our program offices – Lower Tier Project Office (LTPO), AIAMD, and THAAD, and especially the test units! Thanks for making 2012 a great success!




A developing capability concept of the Common Warfighter Machine Interface (CWMI). (Photo courtesy of COL Edward 'Dusty' O'Neill)

We have several initiatives that will focus our efforts on the warfighter in 2013. First in the cue will be the planned fielding of PDB 7 and modernization components which begins in March 2013 and completes by April 2015. Updates to the Patriot Performance Notebook will be published as well. Work has begun already on PDB 8 to resolve remaining challenges and set conditions to take advantage of IBCS capabilities beginning in FY16. A-2 ADA (T) will lead the way to a successful operational test with Patriot and Aegis Combat System (AEGIS) systems in summer 2013. Shortly thereafter, D-2 ADA (T) begins new equipment training (NET) and fielding of their tactical equipment. B-2 ADA (T) activates in the fall 2013. Lastly, AIAMD program will conduct a final series of warfighter events to finalize the Common Warfighter Machine Interface (CWMI) design, complete design review on the Launcher Integrated Network Kits (LINK) and culminate with a robust AIAMD capability demonstration in September-November 2013. TCM executed the first series of engagements regarding AIAMD, presenting an operational concept to 94th AAMDC leadership and staff as well as the ADA commandant and his staff. This will be an evolutionary process to get the TTPs right, so we will provide the primer to establish the dialogue on AIAMD development prior to the FY15 Limited User Test (LUT). We are looking forward to a great 2013 that brings real capability to our warfighters.

**Army Integrated Air and Missile Defense (AIAMD).** AIAMD Team - LTC Rob Fruehwald/MAJ Ken Heebner/

Figure 1: What the Emergency Operations Center (EOC) provides. (Illustration by Rick Paape, Jr., information provided by COL Edward 'Dusty' O'Neill)

### Command Center System

- Internal EOC Collaborative Planning
- LSOs for COP/Situational Awareness
- Enhances Net-centric Battle Command

### EOC Communications System

- TOCNET
- Battalion and Below
- Desktop Remote Radio Control
- Telephone Communications

### EOC LAN

- Classified and SSU LAN

### IBCS

- Common MC for AMD Weapons and Sensors
    - Replacing Existing MC Elements
- Integrated Collaborative Environments
    - Commander in the Loop
- Integrated EO
- LandWarNet and JIIM Interoperability
- CWMI (Operation Role Based Capabilities)
- Leveraging Standard Army NDIs (SWHW)

### Trailer Mounted Support System

- SICPS Family of Tents
- Environmental Control Unit (ECU)
- Power Generation for ECU and Lighting

Air and Missile Defense (AMD)
Common Warfighting Machine Interface(CWMI)
Joint, Interagency, Intergovernmental, and Multinational (JIIM)
Standardized Integrated Command Post System (SICPS)
Tactical Operational Center Network (TOCNET)
Center of Operation (COP)
Emergency Operating Centers (EOC)
IAMD Battle Command System (IBCS)
Integrated Air and Missile Defense (IAMD)
Emergency Operations (EO)
Liaison Officer (LSO)
Mission Command (MC)
Switch Supervisory Unit (SSU)


An aerial view of the exercise area on MECK Island, showing the areas of operation for A Battery, 4th Air Defense Artillery, A Battery, 1st Battalion, 1st Air Defense Artillery, and Headquarters and Headquarters Battery, 1st Battalion, 44th Air Defense Artillery during the Flight Test Integrated-01. (Photo courtesy of COL Edward 'Dusty' O'Neill)

Mr. Brad Bishop/Mr. Tracy Brewington. AIAMD is facilitated through the IAMD Battle Command System (IBCS), which transforms Air Defense Artillery from a stove-piped entity to an integrated net-centric enterprise with the objective to integrate and interoperate any sensor with any launcher. As the system capabilities are refined and understood, we are making significant progress towards implementing them into every doctrine and training manual. The ADA community, within the FCoE, conducted an intensive three-day table top exercise from Jan. 23-25, 2013, to war game and validate the conceptual changes being made to ensure such changes are operationally sound. The current focus is primarily on the impact to Patriot interoperating with Sentinel and the joint, interagency, intergovernmental, and multinational (JIIM) forces. The secondary focus is to war game the impact to all ADA systems/echelons in preparation for incorporating those systems/echelons into the development process for fielding in FY18.

AIAMD is conducting several Common Warfighter Machine Interface (CWMI) events throughout 2013. CWMI event one was conducted Jan. 7-11, 2013, at Huntsville, Ala. Each group had one tactical director, two tactical control officers, and two tactical control assistants. The objectives of event #1 were to identify potential usability problems, design modifications, and information gaps. The event also assisted in gaining a better understanding of the warfighter needs for maintenance and diagnostics support. CWMI event two is scheduled for March 11-15, 2013, at Fort Bliss. This event is designed to assist the contractors in collecting data for the software design process observing 2-43 ADA in a training exercise. They will compare the users' perspective of ADA training events that are conducted during training to the actual training process to develop scenarios. The overall goal is to include warfighters in the design process, building a system that works for warfighters. The final product will allow for optimizing tasks and decision-making, and minimize training time, training needs and manpower. CWMI event three is scheduled for April 23-25 at Fort Bliss. The contractor will present the Soldiers with embedded training prototype designs, maintenance and diagnostic prototype designs, and engagement operations software designs based on findings from past CWMI events. This process allows the Soldiers to validate the refinements made throughout the previous CWMI events held over the past two years. CWMI event four is scheduled for July 23-25, 2013, at Fort Bliss. The contractor will be presenting and validating the Integrated Defense Design (IDD) user interface. Based on the feedback received, the IDD will be further refined for implementation into the software that will be utilized to conduct testing in FY14.

AIAMD will be conducting a demonstration from Oct. 14 - Nov. 8, 2013, at Tobin Wells, Fort Bliss. The AIAMD 2013 demonstration will include Patriot assets equipped with PDB-7 software, Sentinel radar via the Integrated Fire Control Network (IFCN), Air Defense Airspace Management/Brigade Aviation Element (ADAM/BAE) Cell with AIAMD upgrades, and the AIAMD Integrated Battle Command System Collaborative Environment (ICE). The demonstration is intended to show case a snap-shot of the AIAMD system-of-systems development efforts, to include integration of SIPRNet/NIPRNet Access Point (SNAP)/ Tropospheric (TROPO) for communication between emergency operating centers (EOCs) and accessing the global information grid (GIG)/land warfare network (LANDWARNET).

**Terminal High Altitude Area Defense (THAAD).** THAAD Team – MAJ Brent Hettle/CW4 Scott McCaleb/Mr. Michael Bearce/Mr. Danny Hardwick. The THAAD system reached a major development milestone on Feb. 9, 2012, when the Army approved the conditional materiel release of the system. Materiel release is the Army's process to certify the system is safe for Soldiers when operated within stated parameters; it is suitable, has been fully tested, and meets operational performance requirements. The system can be supported logistically in its intended operational environmental. The THAAD system was approved with conditions that have to be resolved to obtain full materiel release. Each of the 39 conditions has a 'get well plan' that has been accepted by the gaining command, Forces Command (FORSCOM) and the Army. Expected resolutions for the 39 conditions and THAAD development continue through 2015.

A-4 ADA (T) successfully intercepted a medium range ballistic missile target, air-launched north of Wake Island in its first attempt at Flight Test Integrated-01 (FTI-01), Oct. 25, 2012, at Reagan Test Site, Kwajalein Atoll in the Republic of the Marshall Islands. This marks the first step in the process of the Army declaring a full-up capability against medium range ballistic missiles. The test was a risk reduction developmental test for Flight Test Operational-01 (FTO-01) this summer but included the operational realism of employing fielded equipment and trained Soldiers. FTI-01 was the first flight test to integrate THAAD, Patriot, and an Aegis Ballistic Missile Defense (BMD) capable ship in the same event. A Battery, 1-1 ADA (P) from Pacific Command (PACOM) successfully intercepted a short range ballistic missile and a low-flying cruise missile over water. Headquarters and Headquarters Battery, 1-44 ADA from Fort Hood, served as information coordination center (ICC) and tactical control of the deployed Air and Missile Defense Task Force (AMDTF) for the event. The USS Fitzgerald successfully intercepted a cruise missile and tracked and launched an SM-3 Block 1A interceptor against a short range ballistic missile.

Based on combatant commanders' requests for THAAD support, FORSCOM requested approval to accelerate the activation of two THAAD batteries. The early activation will provide the Army strategic depth and flexibility for future THAAD deployments. The Army approved the request in April 2012, enabling the eventually early activation of D-2 ADA (T) on Oct. 24, 2012, when 11th ADA Brigade conducted an activation ceremony at the Fort Bliss museum.

2013 will be a busy year for THAAD as the program develops new capabilities and the batteries train for potential real-world missions/deployments. D-2 ADA (T) begins new equipment training in summer 2013, through second quarter FY15. A-2 ADA (T) leads the way to a successful operational test with Patriot and Aegis systems in summer 2013, as part of Flight Test Operational-01 (FTO-01). This operational test certifies THAAD's capability as part of a joint interoperable ballistic missile defense. Later in 2013, the Army will activate its fourth THAAD battery, B-2 ADA (T) at Fort Hood, providing additional capability to the Army towards its objective of six THAAD batteries fielded.

**Patriot / PAC-3 Program Way Ahead for 2013.** Patriot Team – CW5 Donald Hendricks/CW5 Nathaniel Jones/CW4 Thomas Montgomery/Mr. Phil Adams/ Mr. Joe Spencer. With the decision to cancel the Medium Extended Range Air Defense (MEADS) program, Patriot will remain the foundation for ground based AMD through 2041. Our plan is to conduct pre-planned product improvements (P3I) to incrementally modernize Patriot.

This year, the Army begins fielding its next software Post Deployment Build (PDB) 7 to the Patriot force. This capability incorporates numerous operator requested performance enhancing system improvements including Search Mode 5, Anti-Ship Missile (ASM)/Tactical Ballistic Missile (TBM) Assets, Tactical Data Link (TADIL)-J engagement coordination, operator tabular enhancements, and integrated fire control capabilities. PDB 7 fielding includes a modern adjunct processor (MAP), air defense interrogator (ADI), Sweep 8 of small modifications to Patriot, and High Accuracy North Finding System (HANFS). The Reconfigurable Table Top Trainer (RT3) software will include updates supporting tactical control station/battery command post (TCS/ BCP) integration for training along with many other user desired enhancements. Enhanced Tactical Office Trainer (TOT) software in support of defense planning and training along with many new Patriot Multi-Echelon Trainer (PMET) scenarios supporting Patriot maintenance fault isolation, remove and replace procedures. Besides critical improvements over PDB 6.0, this new software build begins to set conditions for transition of Patriot to a net-centric capability with AIAMD fielding beginning in FY16.

This fall, the Lower Tier Project Office (LTPO) and TRADOC Capability Manager (TCM) will present the PAC-3 Missile Segment Enhancement (MSE) to a defense acquisition board for a procurement decision. The MSE missile has had seven consecutive successful flight tests and closes a critical gap. Pending the Milestone C (MS C) decision, MSE should be fielded to the Army in FY15 along with an upgraded M903 launcher.

Preliminary work has commenced for PDB 8 development that will coincide with the fielding of AIAMD in FY16. This software build may be one of our greatest capability-enhancing builds. PDB 8 focuses on addressing all PDB 7 limitations and high priority test incidents. PDB 8 will include additional user prioritized requests, advanced electronic counter-counter measures (AECCM), enhancements to identification friend or foe (IFF) mode five operations, improvements in debris mitigation capabilities, improved high altitude discrimination, Patriot/THAAD/BMD, TADIL-J engagement coordination enhancements, radar loading/false track mitigation improvements and additional capability exploitation of MSE missiles.

PDB 8 is also anticipated and currently planned to include critical hardware improvements to provide Patriot with the capability to continue required software improvements and sustain operations throughout its lifecycle. Enhanced weapons control computer (EWCC) emulator and fire solution computer-rehost (FSC-R) will eliminate current rack and circuit card assemblies while modernizing to operating on single board computers. The Patriot radar will go through a modernization process of implementing the radar digital processor (RDP). RDP will eliminate numerous hardware aspects of the radar with a modernized computer. RDP provides the platform to allow use of enhanced radar software improvements, such as combat identification capabilities and complex waveforms.

For the long term, the FCoE is examining specific radar improvements to potentially incorporate active electronically scanned array (AESA) technologies to vastly improve our current 90-degree sectored defense to 240- to 270-degree sector to expand our defended footprints, drive towards a 360-degree surveillance, track and defeat capability, and lower overall operations and sustainment (O&S) costs. These modernization efforts chart a course to keep Patriot preeminent in the long term with a balanced approach and fiscal resource availability. Combatant commands' unquenchable appetite for additional AMD capability ensures continued modernization and capability development viable into the future. We will need the collective air and missile defense community, particularly our warfighters, to examine what kind of capabilities our Army needs beyond

2040. That may seem too far in the future, but thinking through needs, requirements, experimentation, materiel development, testing, procurement, and sustainment is a long process. The time is now to chart the course for the next generation AMD capabilities, and we will need everyone's ideas to make it a reality.★★

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*Mr. Michael Blose is currently the deputy TRADOC Capability Manager Army Air and Missile Defense Command and technical advisor responsible for the development, fielding and integration of the Patriot, THAAD, and AIAMD programs. Blose previously served in the Capability Development Integration Directorate (CDID) working system integration and requirements determination. Mr. Blose retired from active duty in 1993, serving almost 26 years in the Field Artillery in a number of command and staff assignments.*

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*Ms. Linda Sovocool is the administrative assistant for the TRADOC Capability Manager Army Air and Missile Defense Command located at Fort Sill, Okla. Sovocool has been actively involved in supporting the Air Defense Artillery and Fires communities at Fort Bliss, Texas, and Fort Sill since 1987, supporting HAWK, Patriot, Terminal High Altitude Area Defense (THAAD) and Integrated Air and Missile Defense (IAMD) activities.*

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Figure 2: The Patriot modernization focus is qualification and materiel release. (Illustration by Rick Paape, Jr., information provided by COL Edward 'Dusty' O'Neill)

**MMS**

- 30" color LCD displays with touchscreens
- Upgrade replaces 221 obsolete parts in 41 assemble

**THAAD/Patriot Interoperability**

- Enhanced robustness of THAAD/Patriot Interoperability
- Determine Patriot performance versus THAAD air threat
- Provide THAAD protection
- Increase interoperability level between THAAD and Patriot systems

**ELES**

- Upgrades existing launcher to fire PAC-3 missiles
- Facilitates future upgrades to the MSE

**Recap**

- Improved RAM
- Reduces ONS costs
- Technology insertion

**PDB-7**

- Increased processor throughout memory
- Facilitates integration of MMS, RDP, commo upgrades, etc.

**RDP/PDB-8**

- AN/TPX-57 IFF full capability
- Combat identification
- 64 module types replaced with six
- 432 total modules to 12

**AESA Radar Modernization**

- Enhances reliability, reduces high ONS cost drivers
- Improves sector coverage approaching 360°
- Supports capability improvements against evolving threats
- Supports Radar-on-the-Net AMD integration

**UDTM**

- Monitor THAAD testing
- Potential software improvements

**MSE**

- Fills gap between PAC-3 and THAAD
- Engages maneuvering and advanced threats early
- Designed to provide increased maneuverability in thinner air
- Single canister provides desired logistical flexability to the user

**Commo Upgrades**

- Supports joint technical architecture
- Provides BLOS/NLOS communications
- Communicates with supported force

Operational Needs Statement (ONS)
Random Access Memory (RAM)
Air and Missile Defense (AMD)
Enhanced Launcher Electronic System (ELES)
Liquid Crystal Display (LCD)
Modern Man Station (MMS)
Post Deployment Build (PDB)
Terminal High Altitude Air Defense (THAAD)
Beyond Line of Sight (BLOS)
Identification Friend or Foe (IFF)
Missile Segment Enhancement (MSE)
Non-Line of Sight (NLOS)
Radar Digital Processor (RDP)
Upper Tier Debris Mitigation (UTDM)

U.S. Air Force Airman 1st Class Alexander White and Staff Sgt. Carrie Facer, both from 27th Special Operations Support Squadron, assist a civilian aircraft flying through their airspace from the Radar Approach Control facility at Cannon Air Force Base, N.M. (Photo by Airman 1st Class Eboni Reece, U.S. Air Force)

# Fires Integration and Airspace Management

**By COL David Ell and MAJ Adam McCoy**

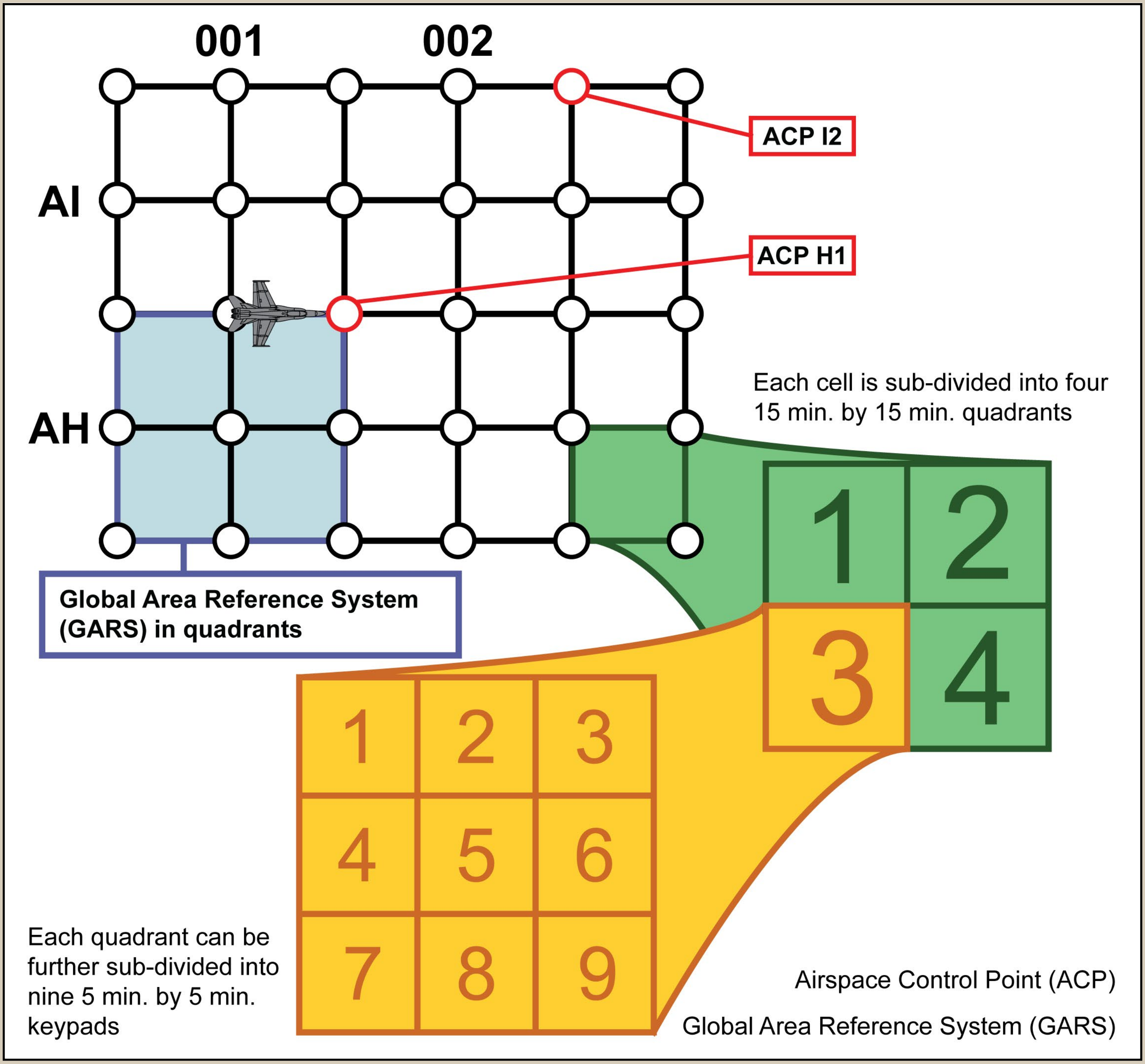
In the recent years of combat operations, the U.S. military has advanced into a joint force possessing capabilities that are unmatched by any other force. A preponderance of those advancements require airspace to operate, such as remotely piloted aircraft (RPAs), manned intelligence, surveillance and reconnaissance (ISR) platforms and precision-guided, surface-to-surface munitions. Consequently, the need to deconflict airspace has increased exponentially.

In the future, the U.S. might face extremely limited overall space for conducting unified land operations (ULO), resulting in congested and contended airspace. To maximize our unique capabilities, we must ensure we provide our assets the freedom to operate with as few restrictions as possible and reduce the associated risks of operating in congested airspace.

The III Corps, *Phantom Warriors*, recently conducted the first corps-level ULO warfighter exercise (WFX) in more than a decade. WFX 12-4 was a complex scenario, which presented opportunities to develop solutions to long-standing challenges found in joint operations. Additionally, the exercise afforded III Corps a unique opportunity to leverage U.S. Air Force airpower by utilizing a fully manned battlefield coordination detachment (BCD), 1st BCD. The 1st BCD, located at the Air Operations Center at Hurlbut Field, Fla., additionally provided a liaison team at Fort Hood, Texas.

The challenges we would face deconflicting airspace quickly became obvious. Throughout the exercise, we developed and adapted several methodologies to deconflict airspace. This article is intended to detail practices that proved to meet those challenges.

The management of airspace continues to be one of the U.S. military's most daunting tasks. Clearing Fires above the coordinating altitude (CA) and integrating a high volume of artillery fire within close proximity to aircraft is a significant challenge for airspace managers during combined arms maneuver (CAM) operations. During the WFX, several organizations collaborated to develop new tactics, techniques, and procedures (TTP) to solve this complicated problem set. The solutions encompassed using Army Battle Command Systems (ABCS), the Joint Air Ground Integration Cell (JAGIC), and the utilization of the Global Area Reference System (GARS). These TTPs replaced the 'big sky, little bullet,' and 'rockets are self clearing' ideologies. The success of these solutions hinged upon a multitude of factors.




The Airspace Control Point (ACP) and Global Area Reference System (GARS) methodology. (Illustration by Rick Paape, Jr., information provided by COL David Ell)

The combined forces air component commander (CFACC) and the combined forces land component commander (CFLCC) both have airspace management responsibilities and concerns. The CFACC requires procedures which ensure command and control of aircraft and maximizes aircraft capabilities while reducing the probability of fratricide. The CFLCC requires procedures that allow for the freedom of maneuver for air assets and minimize coordination requirements for the effective delivery of indirect Fires, while also reducing the probability of fratricide. During WFX 12-4, three concepts were developed to address Fires and airspace deconfliction. The key components of these TTPs were the use of ABCS, a JAGIC, and GARS to provide maneuver forces responsive Fires that required minimum coordination and mitigated the risk to aircraft.

ABCS addresses the management aspect of Fires, airspace, and to some degree, coordination. However, coordination for Fires that breach the CA have always been the limiting factor in the timely delivery of Fires, especially with long-range Fires attacking time-sensitive targets (TST) and dynamic targets (DT).

The CA is a vertical boundary that delineates airspace for the purpose of deconflicting operations between airspace control agencies. All airspace users coordinate with the responsible airspace control agency when transitioning or firing through the CA. In the case of

WFX 12-4, the CA was set at 20,000 feet and III Corps gained control of all airspace below the CA for the entire joint operations area, which reduced the coordination required for indirect Fires. Below the CA, III Corps developed control procedures, allowing fixed wing assets that transitioned from the rear to the forward area.

An additional consideration is the coordination level (CL) that is outlined in the airspace control plan (ACP) and is a procedural method to separate fixed and rotary wing aircraft. The CL is typically 3,000 feet above ground level (AGL) in which rotary wing traffic is not allowed to go above without coordination. Fixed wing aircraft are prohibited from going below 3,500 feet without coordination, providing a buffer between fixed wing traffic.

The 1st BCD established minimum risk routes (MRRs) to permit fixed wing aircraft to freely transition from the III Corps rear area forward. Designated MRRs were used by close air support (CAS) platforms and remotely piloted aircraft (RPA). Ingress and egress MRRs vertically separated aircraft based upon the platform being manned or unmanned. MRRs were assigned frequencies and utilized an airspace control points system for traffic situational awareness. Tactical unmanned aircraft systems (UASs), Shadows and smaller, remained below all MRRs. For air interdiction (AI) platforms, the 1st BCD developed separate MRRs designed for the aircraft to be above 20,000 feet and were under Air Force Tactical C2 control for tactical routing. A holding area was established, at the end of each ingress, that utilized MRRs for routing, sequencing, and separation of tactical aircraft while also serving as a back stop. In the event that CAS aircraft were unable to reach a tactical ground controlling agency, the holding area served as a control measure so the aircraft could climb to 20,000 feet and contact Air Force TAC C2 for tactical routing. JAGIC was responsible for the tactical routing of CAS platforms, while AI platforms were the responsibility of Air Force TAC C2. GARS boxes were used to facilitate this process.

GARS quadrants were utilized, not only to create the battle areas, but also to establish the framework for the airspace control point (ACP) tactical routing system throughout the entire JOA (figure above). The ACP framework allowed aircraft to transition through the JOA as directly as possible, regardless of the battle area color. Battle areas were developed in order to provide the CFLCC and CFACC with maximum flexibility.

The 1st BCD also further designated GARS boxes as blue and purple kill boxes. To simplify the clearance of airspace, we used existing Army doctrine for kill box management.

**Blue Kill Box.** A blue kill box permits air-to-surface Fires in the kill box without further coordination with the establishing headquarters.

**Purple Kill Box.** Same as above, but with the integration of surface-to-surface indirect Fires with air-to-surface Fires into the purple kill box without further coordination with the establishing headquarters.

Additionally, the doctrinal terms for controlling kill boxes were employed: open, active, cold, closed, and cancelled.

Each quadrant could be designated as a kill box or as a green battle area to establish the framework for the ACP tactical routing system throughout the JOA. The 1st BCD defined green battle areas as a control measure to reduce coordination required for surface-to-surface Fires. Green battle areas extended from the surface to 45,000 feet. Aircraft were prohibited to enter the GBAs unless positive control was established with the JAGIC.

Blue and purple kill boxes along with GBAs were employed throughout the JOA. The fire support coordination line (FSCL) did not determine the use of these control measures and was not the defining control measure that determined the location of blue kill boxes; however, it has become common practice. If the land and air component commanders agreed that an area needed free flowing AI support area would be established as a blue kill box. This led III Corps to question the legitimacy of needing the FSCL as a control measure, especially when it takes 12 hours to change and push that information to the lowest level across a corps-sized maneuver force. With our current automated command and control systems, it is much simpler to utilize the procedures discussed. We can quickly and easily turn GARS boxes into different colors to symbolize the control measure needed.

A JAGIC is a modular and scalable cell designed to integrate and coordinate Fires and air operations within a division's area of operations. The JAGIC collocates decision making authorities from the land and air components with the highest levels of situational awareness to support the maneuver commander's tactical operations, JFACC's objectives and intent, and requirements of JFC designated authorities, such as ACA, AADC, etc. The JAGIC combines Fires, airspace, and airborne C2 deconfliction an echelon closer to the fight in order to more effectively execute the mission and reduce risk at the lowest tactical levels. The cell is composed of key Air Force and Army personnel that facilitate the responsiveness of air power and indirect Fires. JAGIC does not replace C2 nodes; but rather it defines the way they integrate organizationally and procedurally to conduct operations.

During the III Corps WFX, JAGIC was responsible for tactical routing instructions, for both CAS and RPAs, within the JOA. Tactical routing was conducted from the end of the MRRs to the division's boundary, utilizing the ACP framework. Aircraft were handed off to JTACs by the JAGIC for terminal control. JAGIC also synchronized all Fires that breached the coordinating altitude outside green battle areas directly with Air Force TAC C2.

The direct link between the JAGIC and the Air Force TAC C2 reduced coordination time for Fires. In the past, requests for Fires that breached the CA were submitted to the Combined Air and Space Operations Center (CAOC) by the battlefield coordination detachment (BCD) via airspace control measure request (ACMREQ). Processing time and clearing aircraft using this method can easily take more than 40 minutes. Clearance of Fires for the JAGIC, with direct link to Air Force TAC C2, reduced this time significantly. The JAGIC was able to prosecute long range time sensitive and dynamic targets with extreme efficiency while minimizing fratricide.

The TTPs developed and employed during WFX 12-4 provided the needed flexibility, to both the CFACC and the CFLCC, in maximizing the capabilities of their organic and joint assets. MRRs are an efficient way to bring aircraft forward in the JOA. Tactical routing, using the ACP framework, minimizes fratricide while maximizing flight hour efficiency by providing the most direct routing possible to the targets. The JAGIC proved to be a necessary element for controlling aircraft within the division's area of operation. Green battle areas facilitated surface-to-surface Fires and provided ground commanders the timely Fires necessary during CAM. ABCSs are paramount to ensuring that TTPs are executed throughout the joint force.

WFX 12-4 was a complex and dynamic scenario that proved to be an exceptional training event for the joint force. As a team, we replaced some of the legacy ideology regarding airspace management with relevant TTPs, solving several long-standing challenges facing us as joint warfighters. ★★

*Colonel David J. Ell graduated from The Citadel and was commissioned a second lieutenant in the Field Artillery on May 12, 1990. He has served in a wide variety of Field Artillery officer positions, including platoon fire direction officer and platoon leader, company fire support officer, and varied staff positions. In June 2007, Ell assumed command of 4th Battalion, 320th Field Artillery Regiment, 101st Airborne Division (Air Assault), deploying in 2008, in support of Operation Enduring Freedom 07-09. Currently, Ell is the 1st Battlefield Coordination Detachment Commander at Davis-Monthan, Ariz.*

*Major Adam McCoy currently serves as the airspace officer for the 1st Battlefield Coordination Detachment. He was assigned to B Company, 3rd Battalion, 82nd Combat Aviation Brigade, 82nd Airborne Division Fort Bragg, N.C. While serving at Fort Bragg, he deployed in support of Operation Enduring Freedom (OEF) and then attended the Military Intelligence Captains Career Course. He was then assigned again to 3rd Battalion, 82nd Combat Aviation Brigade, 82nd Airborne Division, Fort Bragg, where he deployed again in support of Operation Enduring Freedom as a forward support company commander. Upon return from Afghanistan, he assumed command of B Company, 3rd Battalion, 82nd Combat Aviation Brigade; the 82nd Airborne Division's only dedicated CH-47F unit. He has over 700 combat flight hours.*

# Field Manual 3-52, Airspace Control Update

**By LTC Kerrye A. Glass**

Field Manual (FM) 3-52, *Airspace Control*, updates Army airspace control doctrine to apply recent lessons learned and align with unified land operations doctrine. The updated airspace control doctrine establishes principles that will maximize the airspace control capability the modular Army provides the joint force commander. The new doctrine reflects the Army's role within unified action. In addition, FM 3-52 provides commanders, staff officers, and airspace elements with tactics and procedures for the exercise of airspace control. This doctrine will help maximize all airspace users' capabilities while minimizing adverse impacts. FM 3-52 will help Army forces achieve the primary goal of integrating all airspace users during operations, in accordance with the commander's intent, priorities, and risk guidance.

**Major Doctrinal Changes.** FM 3-52 makes two significant changes from the previous manual. The first is a shift in emphasis from Army airspace control as a linear and centralized coordination activity to a process designed to increase the optimal use of airspace and maximize operational effectiveness. The second is the establishment of the operations process as the overarching framework for exercising airspace control. This edition corrects the 2002 manual's narrow focus on planning and execution with an expanded discussion of the preparation and assessment activities of the operations process.

**Unified Land Operations and Airspace Control.** Unified land operations is how the Army seizes, retains and exploits the initiative to gain and maintain a position of relative advantage in sustained land operations through simultaneous offensive, defensive, and stability operations in order to prevent or deter conflict, prevail in war, and create the conditions for favorable conflict resolution (ADP 3 0). Army forces conduct unified land operations as part of a larger national effort called unified action. During operations, Army commanders have the authority to direct (control) the maneuver of all Army airspace users over their designated areas of operations to make best use of airspace. However, an airspace control plan or airspace control order may assign airspace control responsibility for a certain volume of airspace to Army commanders in which case they exercise airspace control over all airspace users. (This authority to exercise airspace control for an assigned volume of airspace does not include the authority to approve, disapprove, or deny joint combat operations.) Airspace elements continuously share information and coordinate directly with other theater air-ground system (TAGS) elements to increase flexibility and responsiveness to changing situations.

The Army air-ground system (AAGS) provides for interface between Army and airspace control agencies of other services. Airspace elements are organic to Army brigades and higher. Corps and division contain identically structured airspace elements. Modular brigade combat teams and support brigades (except sustainment) contain a version of an airspace element called an air defense airspace management/brigade aviation element (ADAM/BAE).

Two Army UH-60 Black Hawk helicopters prepare for landing at Forward Operating Base Kalagush. The Black Hawks are used for a variety of missions including medical evacuation, air assault, personnel transport and airlift. (Photo by Staff Sgt. Samuel Morse, U.S. Air Force)

**The Operations Process, Mission Command, and Airspace Control.** The Army's overarching framework for exercising airspace control is the 'operations process'—the major mission command activities performed during operations: planning, preparing, executing, and continuously assessing the operation (ADP 5-0). The previous version of FM 3-52 emphasized the planning and execution activities of the operations process. Airspace control was highly centralized, and large volumes of airspace had to be blocked for significant periods to ensure deconfliction of airspace users. Though effective in preventing fratricide, this approach severely limited the commander's ability to maximize flexible and efficient use of airspace during operations. The new FM includes a thorough discussion of the preparation and assessment activities of the operations process, ensuring airspace control is addressed throughout.

'Mission command' is the exercise of authority and direction by the commander using mission orders to enable disciplined initiative within the commander's intent to empower agile and adaptive leaders in the conduct of unified land operations (ADP 6-0). FM 3-52 supports mission command by providing maximum flexibility to the commander.

Airspace elements provide subject matter expertise to commanders and staffs during planning. Airspace planning focuses on setting conditions for near real-time airspace control during execution. This provides commanders with increased flexibility and reduced risk. Airspace element planners—

- Consider the echelon commander's priorities for airspace use
- Keep the plan for integrating airspace users simple and flexible
- Maximize the use of procedural control
- Limit (in number, size, and duration) airspace coordinating measures (ACMs) to the minimum required for mission accomplishment, to maximize flexibility for airspace users
- Structure ACMs to facilitate recognition by ground forces and aircrew members through alignment with major terrain features

Airspace elements play an integral role in a unit's preparation—activities it conducts to transition from planning to execution. Airspace elements actively participate during rehearsals, facilitating a shared understanding of air-ground integration, potential ground operations' effect on airspace use, and potential airspace use effects on ground operations. Rehearsing near real-time airspace control events builds requisite skills to integrate airspace users successfully and to resolve conflicts quickly.

During execution, Army commanders and staffs use positive control, procedural control, or both. When tasked by the joint force commander, Army forces procedurally control airspace up to a designated altitude—for example, the airspace up to the coordinating altitude. In addition, Army forces sometimes use positive control for small volumes of airspace. Using near real-time procedural control, an airspace element can direct Army airspace users to shift airspace use to a different route, altitude, or volume of airspace. The airspace user still retains the responsibility for safely maneuvering to the new airspace.

Airspace elements maintain constant communications with the Fires cell, air liaison officer, tactical air control party, intelligence sections, unmanned aircraft system operators, and all other staff elements that represent airspace users. Airspace elements track and establish communication links with all manned and unmanned airspace users. This communication enables the airspace elements to improve situational understanding and to synchronize airspace users. By establishing these communication links, airspace elements can solve airspace user conflicts in near real time by recommending adjustments to timing, trajectories, or flight paths to the staff elements and subordinate headquarters that control the conflicting users.

**Airspace Elements Continuously Assess Operations.** This enables staffs to identify shortcomings in key airspace planning documents, most notably the joint air operations plan, the airspace control plan, the area air defense plan, and higher headquarters' operation orders and associated airspace appendixes. Based on the shortcomings identified, airspace elements recommend needed adjustments to set the conditions for future operations.

**Risk Mitigation and Airspace Control.** Risk mitigation for airspace must account for significant uncertainty of position and the rapid speed of aircraft travel. These factors make risk mitigation for airspace very complex in comparison to ground operations. During mission analysis, course of action development, and course of action analysis, commanders and staffs assess information derived from the density, diversity, duration, and promptness of airspace users. They consider anything that could have an impact—directly or indirectly related to the mission. Their assessment results in an initial estimate of risk for each identified hazard. To setup brigade commanders for success, the airspace element actively collaborates with the joint force commander while developing and refining airspace risk guidance and decision support tools, such as risk assessment matrixes. This collaboration includes early and continuous component participation in producing and updating the joint air operations plan, the area air defense plan, the airspace control plan, and airspace control orders. Once the higher-echelon commanders have agreed to acceptable risk, the joint force air component commander publishes risk mitigation guidance (including any constraints) in the joint air operations plan, and the airspace control authority publishes it in the airspace control plan.

FM 3-52, *Airspace Control*, updates the 2002 version to reflect lessons learned through recent operational experience and adapts to the Army's new operational concept of unified land operations. This version shifts the emphasis from Army airspace command and control as a centralized coordination activity. It focuses on an airspace control process designed to maximize operational effectiveness and the increased capabilities of the modular Army. Additionally, the manual's organization reflects the operations process as the overarching framework for exercising airspace control. The central idea of FM 3-52 reflects the Army's role within unified action and focuses on maximizing airspace use through the execution of mission command and the operations process.★★

U.S. Air Force 1st Lt. Stephen Greenwade, a 774th Expeditionary Airlift Squadron copilot, watches the airspace aboard a C-130 Hercules aircraft prior to landing at Bagram Air Field, Afghanistan. (Photo by Master Sgt. William Greer, U.S. Air Force)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# 2012 Army Air and Missile Defense Strategy

By COL Robert W. Lyons

In view of new policy guidance from the Department of Defense (DoD), and after a thorough assessment of the operational environment, the Army took the initiative to codify an overarching air and missile defense (AMD) strategy. On Sept. 4, 2012, that quest became a reality when the Army released its first-ever 'Air and Missile Defense Strategy,' designed to guide AMD future development and support Army campaign objectives enumerated in the 2012 Army Campaign Plan. The resulting AMD Strategy is approved by the chief of staff and secretary of the Army.

This article highlights key elements of the AMD Strategy, charting a course from today to the joint, integrated and networked capabilities

**"[Air and Missile Defense] is essential to mission success and remains an Army core function." - Secretary of the Army and Chief of Staff of the Army, Sept. 4, 2012**

planned for 2028. The Army G-8 is using this strategy to inform follow-on program objective memoranda (POM) and long-range investment requirements analysis (LIRA). It will also serve as a baseline for communicating future capabilities required to Congress, combatant commanders, the Missile Defense Agency and other stakeholders. Finally, the Fires Center of Excellence (FCoE), Fort Sill, Okla., in a leading role along with Space and Missile Defense Command (SMDC), Department of the Army Headquarters (HQDA) and a myriad of other key players, has begun the critical work of translating the strategy into actionable doctrine, organization, training,

A Patriot crew from B Battery, 6th Battalion, 52nd Air Defense Artillery, received reloads for one of the launching stations during a training exercise. (Photo courtesy of the U.S. Army)

SPC Christopher Cameron, assigned to the 263rd Army Air and Missile Defense Command, operates an Avenger Missile System during Vigilant Shield 2012, at Naval Air Station Key West, Fla. Vigilant Shield is a week-long annual exercise designed to emphasize an integrated Department of Defense and civil response in support of the national strategy of aerospace warning and control, defense support of civil authorities and homeland defense. (Photo by Tech. Sgt. Dennis J. Henry Jr., U.S. Air Force)

materiel, leadership and education, personnel and facilities (DOTMLPF) tasks and responsibilities.

**The Future Strategic Environment.** The future environment, in which our military will operate, will be complex and uncertain and characterized by rapid change and varied threats. Air and missile defense remains an Army core function, vital to the Army's core competencies of combined arms maneuver and wide area security. More significantly, the Army is the only service designated to conduct both air and missile defense in support of joint campaigns. As the service component responsible for AMD, the Army must protect against air and ballistic missile attacks and employ available forces to defeat these attacks.

Several agencies and commands play vital roles in ensuring the AMD force is organized, equipped, trained and ready to execute air and missile defense in support of the nation. The proponent for this transformation rests primarily with the FCoE, under which the Air Defense Artillery School is assigned. The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command is the proponent and Army integrator for global missile defense. The primary materiel development and acquisition agencies for AMD are the Missile Defense Agency (MDA) and the Program Executive Office (PEO), Missiles and Space. MDA manages and directs materiel development of the Ballistic Missile Defense System (BMDS). PEO, Missiles and Space is the proponent for acquisition of new tactical systems and modernization of currently fielded assets and works closely with MDA to seamlessly integrate AMD systems into the BMDS architecture.

**The Global Security Environment.** In January 2012, the president and secretary of defense released the new defense guidance, entitled, "Sustaining U.S. Global Leadership: Priorities for 21st Century Defense." This guidance charts a significant change to U.S. Defense Policy – including a rebalancing towards the Asia-Pacific region, a focus on preparing for asymmetrical warfare to include Anti-Access/Area Denial (A2AD), a renewed emphasis on building partner capacity, and an acknowledgement of today's fiscally constrained environment. It also highlights the following challenges relevant to Army AMD:

"…the United States must maintain its ability to project power in areas in which our access and freedom to operate are challenged. In these areas, sophisticated adversaries will use asymmetric capabilities, to include electronic and cyber warfare, ballistic and cruise missiles…"

This policy shift presents a multitude of security challenges for the nation, our Army and its AMD forces. These challenges, as they relate to AMD, include:

**Protracted Long Term Threats from Persistent State, Non-State, Hybrid and Transnational Threats.** Non-state actors, such as transnational terrorist organizations, will continue to threaten the security of the United States and its allies. Unmanned aircraft systems (UAS) will be used to locate friendly deployed positions and facilitate attacks by indirect weapons. Furthermore, non-state actors are becoming more adept at using weapons once considered solely 'tactical' in nature (e.g., rockets, artillery and mortars) in an effort to achieve their strategic objectives.

**Increased Threats from Traditional Ballistic Missile Capabilities.** A Ballistic Missile Defense Review Report, dated February 2010, says, "The ballistic missile threat is increasing both quantitatively and qualitatively and is likely to continue to do so over the next decade." Nations with even a few dozen moderately advanced missiles can create significant and even strategic effects on the battlefield, in the media and to our coalition allies. The same report also says, "Similar to our commitment to homeland defense, there are simply no 'acceptable' levels of enemy effectiveness without disproportionate consequence, especially if the threat missiles are combined with a WMD capability."

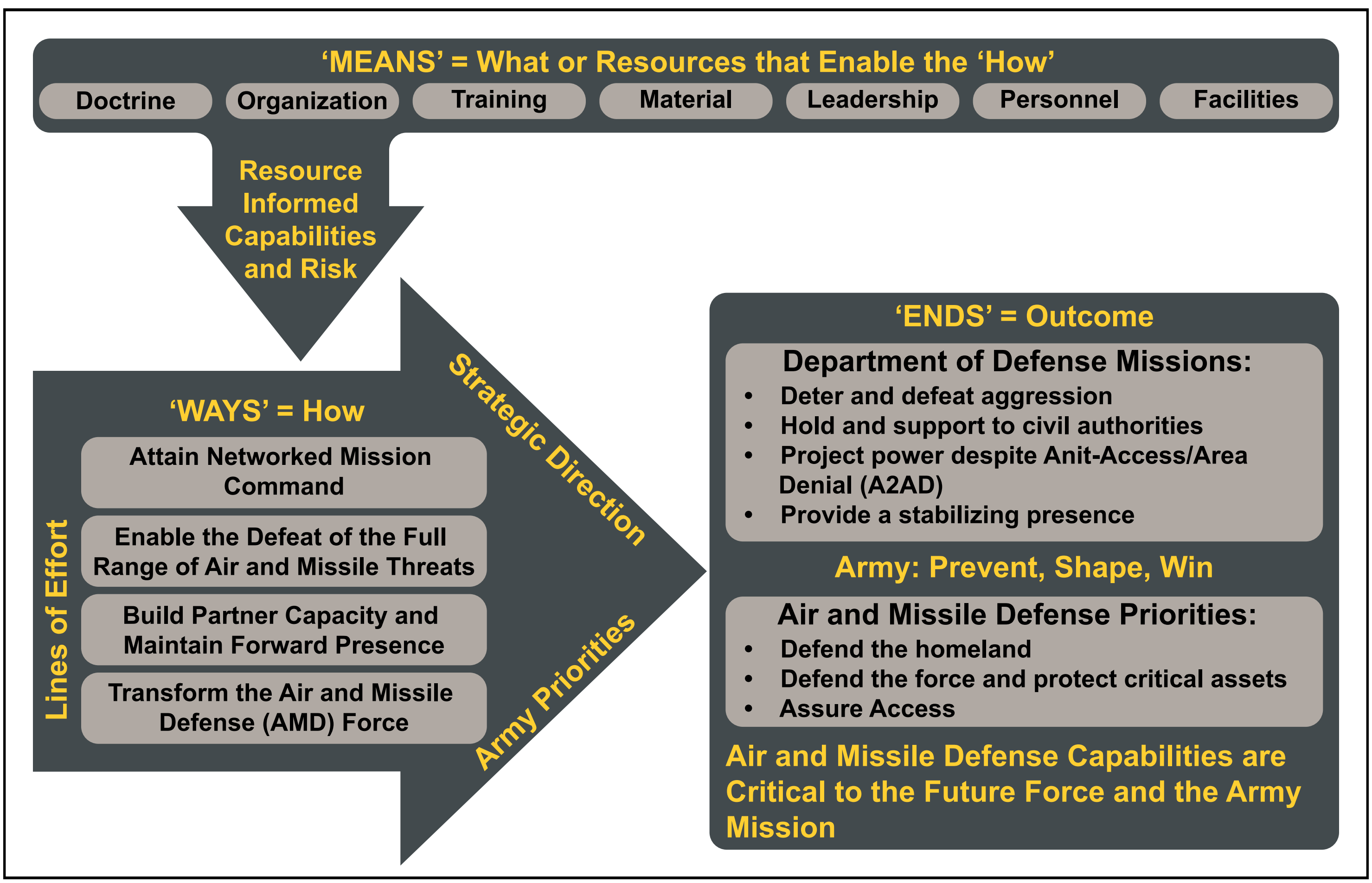
**Ascendency of 'New' Asymmetric Threats.** Not only do our adversaries have access to the increasingly sophisticated ballistic missiles described above, but they also have a range of cruise missiles, UAS and easily attainable and lethal rockets, artillery and mortars (RAM) at their disposal.

**Increased Demand for Strategic Assurance and Deterrence.** Today, seven of the Army's 15 Patriot battalions, all four of the Army's operational Joint Tactical Ground Station Systems, and the four AN/TPY-2 Forward Based Mode (FMB) radars are forward deployed or forward stationed. The AMD mission is key in facilitating joint and coalition forces' ability to build partner capacity, defend forces, protect critical assets and assure access.

**Adversary Investment in Anti-Access and Area-Denial.** Adversaries are investing in anti-access strategies and area-denial capabilities to counter the United States' ability to project military force into an operational area with sufficient freedom of action to accomplish assigned missions. Sophisticated adversaries will use asymmetric capabilities, to include electronic and cyber warfare, ballistic and cruise missiles, advanced air defenses, mining, special operations forces, and other methods, to complicate the operational calculus. Army AMD is a critical set of capabilities for successfully enabling joint operations in an A2/AD environment.

**Army Strategic Principles: Prevent, Shape, Win.** The desired Army end

The Air and Missile Defense (AMD) strategy articulates the AMD vision as part of the Army end state in the context of, 'Ends, Ways, and Means.' (Illustration by Rick Paape, Jr., information provided by COL Robert W. Lyons)



state is defined as: "A versatile and agile mix of capabilities and formations that is rapidly deployable and sustainable in order to Prevent conflict, Shape the environment, and Win the nation's wars as part of the joint force." Air and missile defense is integral to these strategic principles in the Army end state and captures these principles in the Army air and missile defense vision and AMD strategy.

**Army Air and Missile Defense Vision.** Provide the Army and combatant commanders with a flexible, adaptive and integrated AMD force capable of enabling defeat of the full range of aerial threats across unified land operations.

**The AMD Strategy.** The AMD Strategy articulates the Army air and missile defense vision as part of the Army end state in the context of 'ends, ways and means.'

**Ends.** The 'ends' of any strategy are defined as the desired outcome or end state. From the overarching guidance to "Prevent, Shape and Win," three primary 'ends' for Army AMD can be derived:

- Defend the homeland
- Defend the force and protect critical assets
- Assure access for our forces

**Defend the Homeland.** Army AMD has provided aerial defense of key areas in the United States since World War II and continues to provide this capability for the homeland today. Today, Army National Guard (ARNG) air and missile defense units support the National Capital Region's Integrated Air Defense System (NCR-IADS), protecting our nation's capital and providing manning for USASMDC/ARSTRAT's Ground-Based Midcourse Defense (GMD) systems deployed in Alaska, Colorado, and California that deter and defeat ICBM attacks on our nation.

Soldiers launch a missile from a 32nd Army Air and Missile Defense Command Patriot during a combined live-fire exercise at McGregor Range, N.M. (Photo by Rick Nielson, U.S. Army)

**Defend the Force and Protect Critical Assets.** AMD provides missile and early warning information in support of passive defense, and provides ground-based defensive Fires as part of the Fires warfighting function to defend the force and protect critical assets. Army AMD is uniquely qualified to engage the threat and can be directed to integrate multiple lethal and non-lethal capabilities across the Army, with our joint, interagency, intergovernmental, and multinational (JIIM) partners, and with our coalition allies.

**Assure Access for Our Forces.** Readily available AMD capability facilitates strategic access for our forces in a time of peace and conflict. If deterrence fails, AMD is integral to not only defeating A2AD efforts of our adversaries, but also ensuring freedom of action to the joint force. This includes protecting critical assets such as seaports, air bases and lodgment areas of the joint force, allies and partners.

**Ways.** 'Ways' in a strategy are defined as the 'how' to accomplish a desired outcome. AMD will pursue four lines of effort (LOEs) to achieve the three 'ends' of the AMD Strategy. The four LOEs are:

- Attain networked mission command
- Enable defeat of the full range of air and missile threats
- Build partner capacity and maintain forward presence
- Transform the AMD force

**Attain Networked Mission Command.** Networked mission command applied to AMD envisions a single, common air and missile defense command and control system operating via an open modular architecture integrated into Army mission command and joint engagement architectures. This capability will reside at all AMD mission command nodes and will include common interfaces for sensors and weapons. It will provide AMD forces the ability to integrate air and missile defense engagement and force operations and present decision-makers at all levels with tools to manage the aerial fight.

**Enable Defeat of the Full Range of Air and Missile Threats.** Army AMD must focus on countering increased future capabilities of adversaries from both a proficiency and sufficiency standpoint. Present and future Army AMD forces must possess the capability to enable the defeat of a large portfolio of threats, ranging from micro-unmanned aerial vehicles and mortars to cruise missiles to sophisticated short and medium range ballistic missiles, to ICBMs. The Army recently added the C-RAM intercept mission to the AMD portfolio and separated 'Countering Unmanned Aircraft Systems' from 'Cruise Missile Defense.' These changes reflect our growing understanding of an evolving threat as well as the complexities of identifying and defeating those threats.

Key future capabilities of the AMD force include:

- A single, modular, open architecture that enables components
- A 360-degree surveillance and fire control capability that enables the employment of advanced engagement concepts with other joint IAMD capabilities
- The ability to defeat advanced countermeasures such as early release of sub-munitions and digital radio frequency memory electronic attack
- The ability to provide relevant situational awareness and early warning across multiple joint operations areas simultaneously

**Build Partner Capacity.** Army AMD has a long history of assisting and defending our allies, partners and friends consistent with our national priorities. More than a dozen nations own or are buying U.S. AMD systems. It is in our nation's best interest to help our friends and allies attain increased defensive capabilities. We will work with those dozens of nations who have already committed to field AMD capability to ensure we can work, train and if needed, fight together.

**Maintain Forward Presence.** For decades, Army AMD has deployed forward and remained, protecting national and JIIM interests. AMD forces will continue to be forward-stationed and deployed in Korea, Japan, throughout the Gulf, and in Europe, according to the president's priorities and phased adaptive approaches for Europe, Asia-Pacific, and the Middle-East. AMD's Patriot force is currently greater than 40 percent forward deployed or stationed and global demands for Patriot continue.

**Transform the AMD Force.** Characteristics of the future AMD force include:

- Depth and versatility: The Army must provide a trained and ready AMD force that includes a viable operational reserve.
- Adaptive and innovative: Army AMD leaders must be adaptable and innovative; willing to accept prudent risk in unfamiliar or rapidly changing situations and able to adjust based on continuous risk assessment.
- Flexible and agile: Army AMD must remain capable and responsive across broad lines of effort including ballistic missile defense, cruise missile defense, counter unmanned aircraft system (CUAS) and counter-rockets artillery and mortars (C-RAM).
- Integrated and synchronized: Army AMD does not operate independently; rather it operates as a part of a larger joint, interagency and frequently multinational effort. AMD leaders integrate and synchronize operations and routinely leverage joint capabilities to enhance the joint force commander's defense.
- Lethal and discriminate: Army AMD has unmatched lethality against some of the world's most sophisticated asymmetric and conventional air and missile threats. Simultaneously, AMD forces must protect friendly aircraft and apply scalable force response within the joint force's rules of engagement.

**Means.** 'Means' of a strategy articulate the 'what' or resources needed to accomplish the 'ways.' The 'means' of the AMD Strategy are: doctrine, organization, training, materiel, leadership and education, personnel and facilities (DOTMLPF), with an emphasis on organizational transformation, joint leader training and development, and service capability interdependence.

**AMD Strategy Execution Plan.** The AMD strategy execution plan (ASEP) - the follow-on to the AMD strategy – is being developed as the AMD strategy implementation document. This plan represents the 'intellectual bridge' between the Army Campaign Plan (ACP), the AMD vision of the future, and the detailed planning, execution and synchronization between the various AMD strategy lines of effort to make that vision a reality. The ASEP will provide a more detailed roadmap of actions and activities to achieve the AMD strategy end state through 2028. The Army will document the major objectives detailed in the ASEP, which will be nested within the ACP strategy map; then use that map to track the progress of each objective.

The enduring missions and demands on air and missile defense will continue to grow more challenging and complex. As we look at the operating environment over the next decade and beyond – hybrid threats, budget constraints, continued deployment cycles, and transformation – we must stay focused on the risks to our forces and those they protect. While we cannot predict the future of our increasingly uncertain and complex strategic environment, we can prepare for it and develop plans to mitigate risks across all mission areas. Army AMD will remain a core function for our service and the joint force for decades to come. It will help the Army prevent conflict through its forward presence and capacity, shape the environment with our allies and by ensuring access, and if prevention fails, win by enabling defeat of the full range of aerial threats on tomorrow's battlefield.★★

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*Colonel Robert W. Lyons graduated from the United States Military Academy in 1990, and was commissioned as an Air Defense Artillery officer. He is also a graduate of the Combined Arms and Services Staff School and the College of Naval Command and Staff. Lyons holds a Master of Arts in National Security and Strategic Studies from the Naval War College, Newport, R.I. He has served in a wide variety of staff and command positions, including commander of A Battery, 1st Battalion, 3rd ADA, and battalion commander at 3rd Battalion (Airborne), 4th Air Defense Artillery Regiment located at Fort Bragg, N.C. Lyons has served overseas tours in Germany and deployed in support of Operation Iraqi Freedom. He is currently assigned to the Army staff HQDA G-3/5/7 as the director of DAMO-AMD.*

Soldiers of A Battery, 4th Battalion, 3rd Air Defense Artillery during a unit photo. (Photo courtesy of A BTRY, 4th BN, 3rd ADA)

# Air Defense Artillery Henry A. Knox Award

The Henry A. Knox Award recognizes the outstanding active duty Army Air and Missile Defense Battery of the Year for superb mission accomplishment and overall unit excellence. The winner of the 2012 Knox Award is A Battery, 4th Battalion, 3rd Air Defense Artillery for achieving several notable accomplishments and demonstrating overall unit excellence.

A Battery's technical and tactical proficiency are unmatched. During their current deployment to the Central Command (CENTCOM) area of responsibility, they were the only battery whose crews certificated as first-time 'GOs' during their Relief-In-Place/Transition-of-Authority. The battalion performed the best standardized Patriot engagement assessment of readiness that 32nd Army Air Missile Defense Commander (AAMDC) had seen in seven years. A Battery's engagement control station crews obtained the highest overall scored in the battalion, earning that section the coveted Blackjack Silver Award. Also, their command post crews scored the second highest overall in battalion. Earlier in the year, A Battery won the 31st ADA Brigade Garner's Cup for 'Best Battery' and Gunfighter competition, first place for 'Best MO&E Crew' and second place for 'Best Reload Crew.' Throughout their numerous Table VIII Gunnery evaluations, the battery has continually certified to the highest standards.

A Battery is committed to excellence and safety. They have maintained an equipment readiness rating of 98 percent or greater, and they were the first battery in the battalion to achieve 100 percent structured self-development for respective enlisted grade. A Battery has had no DUIs, no incidents with law enforcement, no positive urinalysis, no incidents of sexual assault or harassment, no equal opportunity complaints and ran all weapons ranges safely. The battery conducted deployment preparation, deployment, and re-deployment without a single safety incident. Two of the battery's Soldiers won Soldier of the Quarter, and one won the battalion and brigade Soldier of the Quarter. Previously a battery Soldier had won the Fort Sill, 32nd AAMDC, and III Corps Soldier of the Year. The same Soldier had also placed second for FORSCOM Soldier of the Year. A Battery was also the only battery to have Soldiers nominated as Heroes of the Battle for their performance during the pre-deployment mission readiness exercise.

The battery maintains high unit morale due to the focus on

Soldier care and selfless service. During a busy and high stress time prior to deployment, a Unit Risk Survey was conducted by the Fort Sill Risk Reduction Program, and the results showed that A Battery's unit cohesion was not only above average for the battalion, but across post. The unit has created a positive atmosphere that delivers results. Battery leaders make necessary checks and establish conditions for subordinate success. The battery's method is to understand the commander's intent, receive input from all parties involved (higher, lower, or lateral), give overall guidance and standards to subordinates, and empower them to execute as they see best. By using this method, the battery generates pride at all levels within, as each Soldier and section take ownership of their respective part of an operation. This generates tremendous unit morale when there are positive results, but it also creates resiliency. The battery also has a caring and active Family Readiness Group that maintains consistently high meeting attendance by having its key callers and members actively communicate with its Soldiers and Families.

In short, regardless of mission, whether a battalion evaluation, a joint air defense exercise, or a real-world air defense mission in a combat zone, A Battery, 4th Battalion, 3rd Air Defense Artillery delivers outstanding results. The unit has demonstrated that they possess the tactical proficiency, war fighting readiness, standards and discipline, and leadership that define superb mission accomplishment and overall unit excellence.★★

# Air Defense Artillery Alexander Hamilton Award

The Alexander Hamilton Award recognizes the outstanding Army National Guard Air and Missile Defense Battery of the Year for superb mission accomplishment and overall unit excellence. The 2012 award winner is B Battery, 2nd Battalion, 174th Air Defense Artillery (ADA). The battery was rated on tactical proficiency, operational readiness, safety, and other indicators, such as community service.

On Oct. 25, 2011, B Battery's *Team Arrow* conducted a live-fire exercise in which it employed the Avenger, the FIM92 (Stringer) Man-Portable Air-Defense System (MANPADS) and National Advanced Surface to Air Missile System (NASAMS) Fires in accordance with National Capital Region (NCR) specific techniques, tactics and procedures within a combined link architecture at two different ranges, achieving a 96 percent kill rate.

This was the second successful NASAMS live-fire exercise in the history of the National Guard; making it one of only two batteries in the Army to successfully fire the combined systems. B Battery earned 'mission ready' (highest possible rating) in the NORAD Inertial Guidance Ground-Based Alert Force Evaluation (GBAFE) live-fire evaluation on Jan. 31, 2012. The battery conducted 10 Table VIII Avenger crew drills and Falcon Virgos culminating in more than 500 Avenger crew certification prosecutions. Throughout mission execution the battery maintained 100 percent sustainment of all Avenger crew Table VIII certification. The Avenger and NASAMS platoons completed their respective crew certifications, establishing record pass rates for visual aircraft recognition and a high academic average at the launcher course.

The battery enjoyed an overall operational readiness rating above 98 percent. They maintained a voice and data communications operational readiness rate of more than 98 percent during the past year. The battery also maintained operational readiness of the Sentinel radar and associated equipment, which included Equipment Readiness Code A items at 98.7 percent. The high levels of operational readiness/established had a direct result in the unit's exceptional scores during its certification processes.

B Battery had zero losses in man-days during their mobilization. The battery also conducted out-of-state operational preparation, deployment to out-of-state, and re-deployment to home station without a single safety incident. While on mission, B Battery executed a successful rehearsal of a site-specific emergency response plan that addressed major environmental vulnerabilities and aided in development and rehearsal of techniques, tactics and procedures with local emergency response agencies, which resulted in reducing safety incidents.

B Battery implemented a 10-session Noncommissioned Officer Development Program (NCODP), designed to enrich Soldiers in their military career and civilian life. The new NCODP agenda included guest speakers on topics incorporating drug and alcohol abuse, nutrition, personal finance and property accountability. The battery planned and executed an Army birthday 'Fun Run,' which incorporated community members handing out bottled water, 60 Soldiers pledging more than 380 miles and exercises and birthday cake for all participates. The battery improved the NCR Command Supply Discipline Program from 66 percent to 97 percent compliance within the first 120 days: this effort resulted in 'green' rating in two operational readiness evaluations.

Through the execution of a variety of missions, B Battery, 2nd Battalion, 174th Air Defense Artillery proved to be an agile, adaptable and decisive force that serves as a benchmark for the ADA and Fires community. The battery's actions contributed significantly to the legacy of the branch, the Army National Guard and the nation.★★

# Air Defense Artillery James A. Shipton Award

The James A. Shipton Award recognizes an Air Defense Artillery professional for outstanding performance and contributions that significantly enhanced the Air Defense Artillery mission. The 2012 Shipton award winner is CPT Kyle L. Kirkpatrick, commanding officer of A Battery, 3rd Air Defense Artillery, Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System (JLENS) Battery, Dugway, Utah.

The awardee is rated against leadership, technical and tactical knowledge, selfless and community service and commitment to excellence criteria. Kirkpatrick's score was well above his peers in each of the rated criteria.

He led his battery with a clear vision and a mission focused approach. As commander of the first JLENS battery, he continually balanced critical tasks with minimal resources and personnel. He was hand-selected to take this second


The 2012 James A. Shipton award winner is CPT Kyle L. Kirkpatrick, commanding officer of A Battery, 3rd Air Defense Artillery. (Photo courtesy of the U.S. Army)

command in a geographically separated unit, for the superior performance he tendered as the commander of B Battery, the battalion's 14G and 14H training unit. His dynamic and proactive leadership style has been crucial to the success of his unit's mission, allowing him to anticipate needs and align teams in advance of requirements.

From day one of command, Kirkpatrick took charge of a misguided unit with dangerously low morale and shaped it into a unit with vision, focus and discipline. Initially, his mission was to conduct JLENS testing with only 38 Soldiers assigned. As the testing mission grew, Kirkpatrick drafted JLENS requirements to build his Soldier strength to 103, developed training on individual and collective tasks from scratch, and coordinated the equipment required to support his Soldiers, all within six months. His technical knowledge in Air Defense Artillery has allowed him to supervise the creation of doctrine that was nonexistent for the JLENS program, and his mentorship of 11 officers directly enabled them to work jointly with outside Department of Defense (DOD) agencies to ensure the JLENS mission was not only being conducted, but exceeding all expectations. His vision and abilities have facilitated in the transformation of the JLENS program from a test project to a system the Army has high expectations for fielding.

On the personal level, Kirkpatrick's selfless service and willingness to provide back to the community have enabled a successful partnership between Dugway Proving Grounds' Morale, Welfare and Recreation (MWR) and his battery. Kirkpatrick revitalized the Family Readiness Group, established a program supporting the local city of Tooele during community events, and partnered with the local school district to have Soldiers inspire young adults during physical education classes.

Kirkpatrick embodies the Army Values in all aspects of his position, as a leader, as a father, and as a mentor, and he sets the example for not only his Soldiers, but the United States Army. In short, he epitomizes the ideal company grade officer and is highly deserving of the James A. Shipton Award.★★

# Field Artillery Henry A. Knox Award

The Henry A. Knox Award recognizes the outstanding active duty Army Field Artillery Battery of the Year for superb mission accomplishment and overall unit excellence. The winner of the 2012 Knox Award is B Battery, 1st Battalion, 77th Field Artillery .

Deployed from July 2011 until June 2012, B Battery, 1st Battalion, 77th Field Artillery clearly met the standards to be recognized as the Henry A. Knox Award recipient. For 12 months, the battery served in eastern Paktika province, Afghanistan, in support of the 172nd Infantry Brigade. With a composite battery configuration consisting of three platoons (1/B - 2 x M119s, 2/B - 2 x M119s and 1 x M777, 1/A - 2 x M777s), the battery fired more than 7,000 rounds during their deployment.

Afghanistan's Regional Command-East (RC-East) is known for its tough fighting conditions. B Battery's experiences were no exception. In the high mountainous regions with steep terrain, the battery demonstrated a keen attention to the five requirements for accurate and predicted fire, which enabled incredible effects on enemy fighters. On several occasions, B Battery was directly involved in the defeat of massed enemy attacks.

RC-East is also known for its high volume of enemy indirect Fires. During the deployment, the battery was able to achieve an impressive average counterfire time of less than three minutes from acquisition to counterfire. While focused on speed, they never wavered on safety requirements, which enabled extreme accuracy and safety; not one civilian casualty occurred as a result of their Fires.

Congratulations to the Soldiers of B Battery, 1-77 FA on being selected as the FY12 Knox Award winner.★★

Soldiers from B Battery, 1st Battalion, 77th Field Artillery, prepare a M777 howitzer for firing. (Photo courtesy of CPT Brian Jenson, U.S. Army)

Soldiers from B Battery, 2nd Battalion, 218th Field Artillery, perform night training. (Photo courtesy of B Battery, 2nd BN, 18th FA)

# Field Artillery Alexander Hamilton Award

The Alexander Hamilton Award recognizes the outstanding active Army National Guard Field Artillery Battery of the Year for superb mission accomplishment and overall unit excellence. The winner of the 2012 Alexander Hamilton Award is B Battery, 2nd Battalion, 218th Field Artillery .

The Alexander Hamilton Award-winning Field Artillery battery has to be more than just a good firing battery. In fiscal year 2012, B Battery proved this to be true.

The Alexander Hamilton Award competition winner will always be judged by their demonstrated proficiency in their Field Artillery core competencies, and B Battery proved to be up to the task. During annual training, the battery excelled in Field Artillery certifications. Throughout the annual training period, the battery continued to demonstrate their skills and they culminated annual training, section certification and Table VIII live-fire, by winning the battalion's direct fire competition and the Top Gunner Award.

Organizational adaptability is a clear indicator of a truly professional unit. Early in FY12, the battery was tasked to serve as the Chemical, Biological, Radiological, Nuclear and Explosives (CBRNE) Enhanced Response Force Package (CERFP) for the state of Oregon. After just seven months of intense training, the battery was required to certify on a number of difficult tasks including casualty/patient decontamination, mobile mass decontamination apparatus operation, hazardous materials identification, and mass casualty response operations. Like true professionals, they exceeded all standards in a certification conducted by the National Guard Bureau.

In addition to these challenging missions, B Battery also responds to a third, distinctly important mission. Known as the 'Governor's Own,' the battery is dedicated to provide howitzer salutes at community and state functions on the order of the governor and adjutant general. During 2012, the battery provided salutes for Veterans Day, Oregon Armed Forces Day, governor's inauguration, University of Oregon spring football game, Memorial Day services and NASCAR West series events.

Congratulations to the Soldiers of B/2-218 FA on being selected as the FY12 Hamilton Award winner.★★

# Field Artillery Edmund L. Gruber Award

The Edmund L. Gruber Award recognizes the outstanding active Field Artillery Soldier whose service results in significant contributions to or the enhancement of the Field Artillery's warfighting capabilities, morale, readiness, and maintenance. The winner of the 2012 Gruber Award is SFC Thomas Robinson of C Battery, 1st Battalion, 377th Field Artillery .

The Field Artillery is the 'King of Battle' because of the incredible leaders within the branch. This year, 23 nominations were submitted for this prestigious award. Identification of the winner was not an easy task for the selection panel; all of the nominations merited distinct consideration. Ultimately, SFC Thomas Robinson of C Battery, 1st Battalion, 377th Field Artillery was selected as the FY12 winner.

There are numerous qualities the Army demands from its leaders; courage, intelligence, innovation and adaptability are but a few. Robinson has demonstrated all of these and many more throughout his career and especially during his recent deployment.

Within weeks of his arrival at Joint Base Lewis-McChord, Wash., Robinson was tasked with the challenge of establishing a fire direction center (FDC) for a newly formed platoon, and then certifying and leading the team in Afghanistan. Dual-hatted as the battalion's digital master gunner, he was also responsible for training and certifying FDCs across the task force area of operations.

Shortly after arrival in country, a need arose for a firing platoon sergeant and the battery selected Robinson for this mission. With the utmost professionalism, he was able to seamlessly assume these responsibilities and lead his platoon in the safe and accurate employment of more than 600 rounds of 155 mm artillery ammunition. He also embraced a training mission to grow capacity in Afghan gunners and provided training, mentorship and technical support to an Afghan National Army D-30 battery, eventually certifying all six sections. Congratulations to SFC Thomas Robinson of C Battery, 1-377 FA on his selection as the FY12 Gruber Award winner.★★

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Soldiers with the 3rd Battalion, 2nd Air Defense Artillery, perform maintenance on Patriot missile launchers on Feb. 5, 2013, in Gaziantep, Turkey. U.S. and NATO Patriot missile batteries and personnel deployed to Turkey in support of NATO's commitment to defending Turkey's security during a period of regional instability. (Photo by CPT Royal Reff, U.S. Army )

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