March-April 2011

A Joint Professional Bulletin for U.S. Field and Air Defense Artillerymen

Fires

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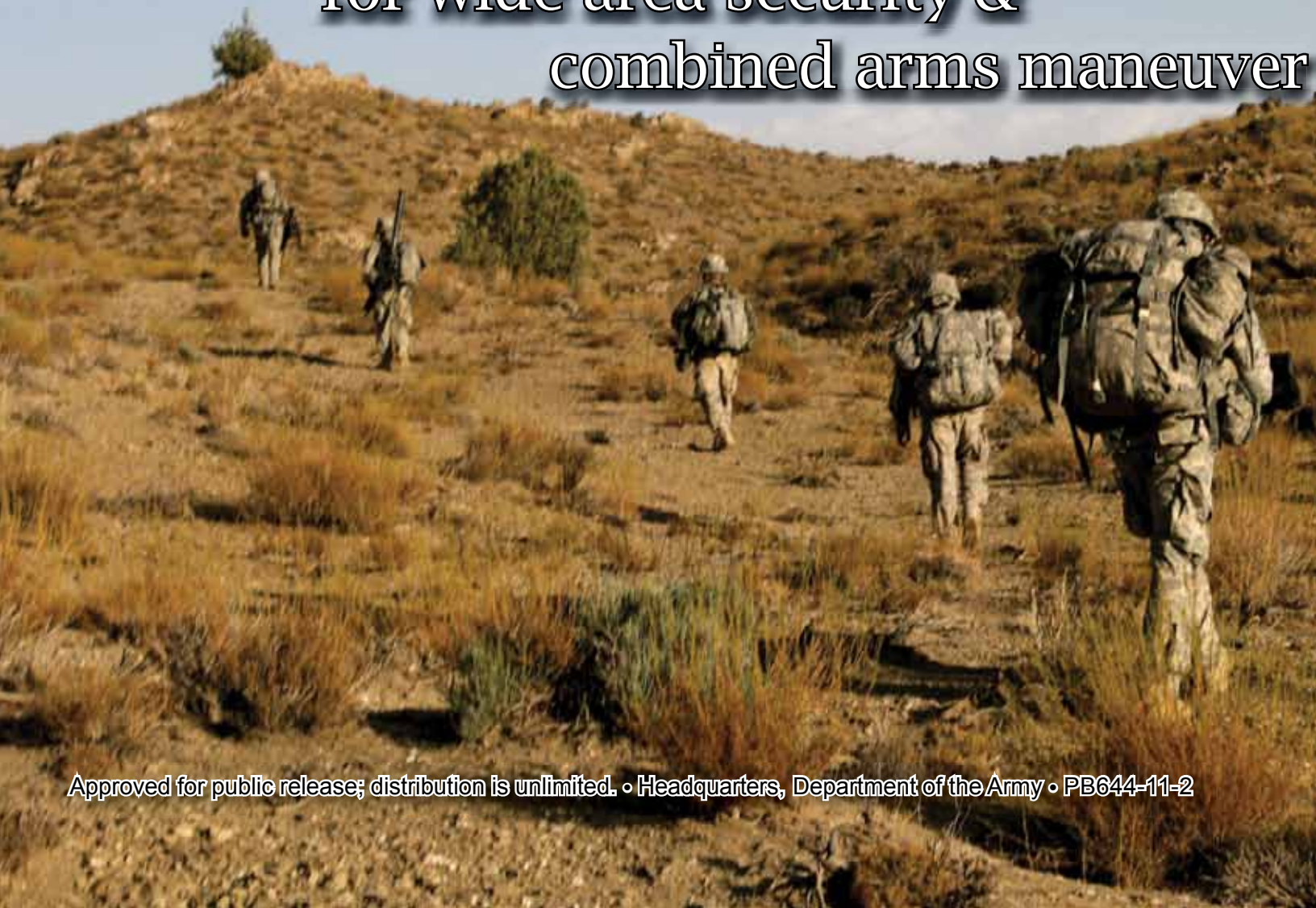
Fires Capabilities

for wide area security & combined arms maneuver



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LTG Caslen provides 'mission command' update while visiting the Fires Center of Excellence

By Sharon McBride

U.S. Army Soldiers patrol in the mountains near Sar Howza, Paktika province, Afghanistan, Sept. 4, 2010. The Soldiers are deployed with Bulldog Troop, 1st Squadron, 40th Cavalry Regiment. (Photo by SSG Andrew Smith, U.S. Army)

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George W. Casey Jr.
General, United States Army
Chief of Staff

Official:

Joyce E. Morrow
Administrative Assistant to the
Secretary of the Army, 1029203

David D. Halverson
Major General, United States Army
Commanding General
Fort Sill, Okla.

Editor-in-Chief: Sharon McBride
Managing Editor/ Interim Art Director: Jennifer McFadden
Assistant Editor: Paul Jiron

PURPOSE: Founded in 2007, ***Fires*** serves as a forum for the professional discussions of U.S. Army and Marine Field Artillery (FA) and Army Air Defense Artillery (ADA) professionals, both active and Reserve Component (RC); disseminates professional knowledge about the FA's and ADA's 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 FA's and ADA's active and RC units—all of which contribute to the good of the FA and ADA, Army, joint and combined forces, and our nation.

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Fires capabilities for wide area security

The United States Army Functional Concept for Fires

By MG David D. Halverson
Commanding General of the Fires Center of Excellence and Fort Sill, Okla.

"The dynamic nature of the 21st-century security environment requires adaptations across the force. The most important adaptations will be in how we develop the next generation of leaders, who must be prepared to learn and change faster than their future adversaries. Simply put, developing these adaptive leaders is the number-one imperative for the continued health of our profession."

-Gen. Martin Dempsey, Commanding General, US Army Training and Doctrine Command, Army Magazine Feb. 2011

Over the last two years, we have taken a comprehensive look at our warfighting function as it applies to the current and future operational environment. From this review, in coordination with the Training and Doctrine Command and Department of the Army, we have created a concept which captures both the U.S. Army Field Artillery's and Air Defense Artillery's capabilities and our ability to provide offensive and defensive Fires. It shows the depth and breadth of the problem statement and the requirement for Fires. It also describes a conceptual solution through five components which include expanding the Fires warfighting function; employing versatile Fires capabilities; identifying, locating, targeting, and engaging threats with increased discrimination; integrating joint, Army, and multinational capabilities; and providing distributive Fires for decentralized operations.

I want to highlight these five components because they show where we will focus on effectiveness as a Fires force in a variety of situations and with a variety of partners.

The other Army Functional Concepts, which cover mission command, intelligence, movement and maneuver, protection, and sustainment, all dovetail with our Fires Functional Concept and all of the six Warfighting Functions support the Army Operating Concept. Together they provide us with a conceptual roadmap for the future.

Expand the Fires warfighting function. Over time, we have learned we need to take a broader view of the operational environment due to the rapid increase of threat capabilities to joint, Army, multinational forces, population centers, and critical infrastructure. To defeat these threats, from simple to complicated, we have found through lessons learned it is imperative to provide 360 degree persistent Fires coverage, from mud to space. The U.S. Army Air Defense Artillery, together with the U.S. Army Field Artillery, is pushing forward and placing more emphasis on providing a fused sensor network tied into an integrated command and control system with complementary capabilities at each echelon. As a team, we will provide the collective and coordinated use of Army indirect Fires, air and missile defense Fires, electronic attack and joint Fires capabilities. All of this will be incorporated through an integrated process and ultimately will greatly improve air-ground integration.

Through this expansion of our Fires warfighting function we will become more operationally adaptive to defeat a wide range of targets with the right sensor and the right effects to achieve timely, effective, and efficient Fires in a wide range of environmental and operational conditions, including homeland defense.

Employ versatile Army Fires capabilities. Our foundation for employing versatile Army Fires capabilities is our leaders and Soldiers. Everyone must be skilled at full spectrum operations, not just in one core competency. Joint commanders require Soldiers and leaders who are able to operate anywhere along the spectrum of operations and do so with competence and professionalism. Through training, education, leader development programs, and operational experience we will give our leaders and Soldiers the skills necessary to perform a broad range of missions and tasks required by METT-TC.

Versatile and adaptive Fires also means providing a range of conventional-to-precision capabilities to provide effects from precision to near-precision, as well as area effects. Currently, precision capabilities have a circular error probable of less than 10 meters. Near-precision capabilities have a CEP between 10 and 50 meters. Area capabilities have a CEP greater than 50 meters. In order to get the appropriate mix on the battlefield we will use cannons, rockets, mortars, and sensors and know and understand how to access and apply joint fires.

Identify, locate, target, and engage threats with increased discrimination. For the past several years, success on the battlefield has required at times precision and use of proportional force to gain/maintain the support of indigenous populations, prevent fratricide, and minimize collateral damage. As a total force we have to be able to rapidly discriminate friend from foe on the battlefield as well as provide multi-echelon JIIM common operating picture. Due to the urbanization of the combat zones our enemies operate in, this requirement is unlikely to change any time soon.

& combined arms maneuver

In order to achieve this in the future operating environment, physical reconnaissance and surveillance will take priority and will be complemented by technology – not dictated by it. The ability to use data from both human and materiel sources will not only provide better intelligence but more reliable target –friendly and fire-control quality data.

Fires forces will have a large role in providing this information. Our systems will integrate with joint and multinational forces via an integrated fire control capability to counter evolving threats from land, sea, air and space. Automated battle management aids will recommend the best weapon to engage a target. Through these efforts target location error will be drastically minimized through the effectiveness and efficiency of the system and not just rely on the munitions. Scalable capabilities in our munitions and composite organizations need to include lightweight sensors for dismounted operations, sensor for ground operations and aerial platforms, 360-degree weapons locating sensors for offensive and defensive Fires, the fusion of these sensors, and our continued refinement of precision targeting software and imagery.

We will create discrete effects proportional to the target or threat type and situation, thus preventing or minimizing collateral damage, unintended consequences, and residual hazards.

Integrate joint, Army and multinational capabilities. In order to develop a common operating picture and offensive and defensive Fires, the capabilities of other Army warfighting functions, special operation forces, joint services, interagency, and multinational partners must be integrated on the battlefield. And although this will create some redundancy across the board, overall it will create an optimal environment because it will mitigate restrictions, resource shortfalls, as well as cover gaps within the battle space. Also, we must remember artillery is the only all weather, 24/7 Fires capability for the warfighter.

Interoperability will also be key, as well as the ability to attack targets and threats identified and located by organic and nonorganic sensors and be able to successfully hand them off to other organizations throughout the battle space. Effects coordinators at all levels must be able to coordinate, integrate and effectively manage all the assets and resources of the joint Fires realm. We must understand the capabilities and then have the knowledge and ability to apply them across Full Spectrum Operations; from combined arms maneuver to wide area security.

Distribute Fires capabilities for decentralized operations. The goal of distributed Fires is to ensure joint, Army, and multinational forces always have timely and responsive Fires for combined arms maneuver and wide area security operations. To increase operations for commanders at all echelons, the Fires network must enable centralized as well as decentralized operations. Fires capabilities will also be distributed throughout the area of operations with either "one system, one round," or to be able to combine the capabilities of multiple systems against single or multiple targets.

We're not in this alone. In order to succeed in a wide range of contingencies, the Fires Functional Concept is nested with five other Army Functional Concepts. As integrators of Fires and leaders in full-spectrum operators, the rest of the Army looks to us to match a wide range of targets with any sensor and the right effects.

Securing freedom of maneuver. Maneuver formations must gain, sustain, and exploit control over land and resources during the fight, and as the integrators of Fires we ensure the success of maneuver by employing a network of joint Fires that link sensors to shooters with scalable capabilities to achieve the desired effects to support the close fight . Maneuver forces require the capability to provide indirect fire support to widely dispersed subordinate units to support decentralized operations.

Intelligence. Future Army forces require the capability to integrate target acquisition sensors with intelligence collection, planning, and analysis to enhance operations and intelligence integration. We must provide intelligence that supports all levels of decision making.

Protection. Future Army forces require the capability to detect rockets, artillery, and mortar projectiles and provide early warning to protect personnel and vital physical assets during full-spectrum operations.

In order to protect the entire force we are here to provide the capability of offensive and defensive fires to preempt enemy actions and protect personnel and vital physical assets. We will intercept threat rockets, artillery, and mortar projectiles to protect personnel and vital physical assets, as well as employ scalable fires capabilities that minimize casualties and reduce collateral damage.

Sustainment. Future Army forces require the capability to provide sustainment to convoys and sites with rapid defensive Fires. As Fires experts we will maintain freedom of action in full-spectrum operations in the future operating environment.

Getting it done. We are making the most of our capabilities. Standards and doctrine will be our touchstone as we provide adaptive, networked offensive and defensive Fires for the warfighter. Our adversaries continue to be creative and will continue to exploit a wide range of capabilities so we must do the same. Remember, it is better to halt the enemy at a distance than allow him to engage in a direct fire battle. Oct. 13, 2010 marked the completion of the Army Concept Framework with the publication of the six Army Functions concepts. Now through April 2011, the Army Capstone will be revised and re-published, and by October 2011 the Army Operating concept will be revised and re-published. The Functional Concept for Fires is also slated for revision and republishing by May 2012.

In the interim, I invite you to come to our 2011 Fires seminar, "Fires capabilities for wide area security & combined arms maneuver," to be held May 16-20. During the seminar we will discuss at length the ongoing development of the Functional Concept for Fires, and other tentative topics will include the annual State of Fires address, discussion on the Army Operational Concept, Army Modernization, Army Force Generation, and employment Fires at the strategic and tactical levels.

We're also celebrating the 100 year anniversary of the Field Artillery School. On June 3, 1911, War Department General Orders, No. 72, authorized the School of Fire for the Field Artillery at Fort Sill. It's guaranteed to be a momentous event and I hope to see everyone there.

Fit to Fight – Fires Strong

2010 Air Defense Artillery Henry A. Knox Award

Bravo Battery, 5th Battalion, 5th Air Defense Artillery Regiment, from Fort Sill, Okla., is the winner of the 2010 Henry A. Knox Award.

The *Bushwhackers* served with exceptional distinction in support of Operation Iraqi Freedom/Operation New Dawn. Highlights of their accomplishments include providing counter rocket, artillery and mortar protection for personnel and critical assets in support of the U.S. Air Force 332nd Air Expeditionary Wing on Joint Base Balad, Iraq. Task organized as a C-RAM Joint Intercept Battery, B/5-5 is composed of Soldiers and sailors employing the Land Based Phalanx Weapons System and other C-RAM systems dedicated to providing early warning and intercept capability to the most heavily indirect fire attacked base in the Iraqi Joint Operational Area. During their year in Iraq, this ardent joint team improved the warning rate, disseminating timely early warning to 25,000 U.S. forces for more than 100 enemy indirect fire attacks, unquestionably saving lives. The battery also successfully engaged and destroyed 11 incoming rockets/mortars intended to kill U.S. forces. Because of their tireless efforts, the *Bushwhackers* maintained an operational readiness rate of 98 percent, a phenomenal accomplishment given the arduous environment of Iraq and a non-standard repair parts system. They also demonstrated critical capability of airspace management, coordination and systematic discipline, through conducting more than 85 LPWS Pre-Aimed Caliber Fires, an operation involving 20 mm aerial live fire, and requiring synchronization with multiple U.S.A.F. and Army airspace users in the busiest airspace of Iraq.

2010 Air Defense Artillery Alexander Hamilton Award

Charlie Battery, 3rd Battalion, 265th Air Defense Artillery Battalion (Avenger) from Sarasota, Fla., is the winner of the 2010 Alexander Hamilton Award.

The Soldiers of this unit recently completed a year-long deployment in support of Operation Noble Eagle in the National Capital Region; a 34.5 square-mile region over the skies of Washington, D.C. Highlights of their accomplishments include simultaneously deploying several Sentinel Radar operators (14J) to Afghanistan to enhance the early warning architecture in theater, as well as training several Joint Air Defense Operations Center crews. A large number of their 14Ss (Avenger Crewmember) also received slew-to-cue additional skill identifiers and have been certified in Forward Area Control Terminal /PONY operations and in the Forward Area Air Defense Engagement Operations Operators Course. Charlie Battery also had Soldiers who acted as tactical control officers and assistants during the NCR mission who attended the Fire Distribution Center Operators Course and the National Advanced Surface to Air Missile System Operations Course. Prior to deployment, during their missile live-fire exercise, Charlie Battery's 14Ss fired 72 Stinger Missiles with a 95.4 percent kill ratio.

2010 Air Defense Artillery James A. Shipton Award

1LT Ted M. Kimmey, C Battery, 5th Battalion, 7th Air Defense Artillery Regiment from Kaiserslautern, Germany is the 2010 James A. Shipton Award winner.

While assigned to C Battery, 5th Battalion, 7th Air Defense Artillery Regiment as the battery trainer, he developed a detailed and effective training plans that lead to the overall success of the battery's tactical readiness and a first time "go" on its PATRIOT gunnery qualification – a feat that has not been accomplished in nearly three years. Highlights of his other contributions include leading from the front when the 32nd Army Air and Missile Defense Command Standardized Patriot Evaluation and Assessment of Readiness was conducted for the first time in U.S. Army Europe. The SPEAR is designed to evaluate and assess the abilities of a PATRIOT crews to manage and direct surface to air engagements during intense simulations. The SPEAR is a 32nd AAMDC requirement for units preparing for a potential or upcoming deployment. This externally led battalion evaluation was the culmination of becoming one of the first fully mission capable PATRIOT Fire Units in Europe. His training contributions also led to an unprecedented feat of all three ECS crews receiving a first time "go" as well.

2010 Field Artillery Henry A. Knox Award

Bravo Battery, 4th Battalion, 320th Field Artillery Regiment from Fort Campbell, Ky., is the winner of the 2010 Henry A. Knox Award.

The Soldiers of the *Bonecrusher* battery proved their versatility as they trained and certified on three weapon systems (M119A2, M198, and M777A2) in preparation for their mission in Afghanistan. Highlights of their accomplishments also include flawlessly conducting New Equipment Training and certification on the M777A2 less than 60 days prior to deployment. Their M777A2 howitzer certification was truly a remarkable accomplishment with only six months notification prior to deployment. They deployed in support of Operation Enduring Freedom in August of 2010. During the first 90 days of their deployment, the *Bonecrushers* fired more than 700, 155 mm rounds in support of combat operations resulting in 30 enemies killed in action and the destruction of countless enemy rockets, all without a firing incident. They coordinated and supervised the resupply of more than 2,000 artillery rounds to both sustain their operations and build basic loads to new firebases. Bravo Battery's efforts during OEF were critical in helping provide security in the volatile province of Paktika and saved the lives of countless Americans and Afghans.

2010 Field Artillery Alexander Hamilton Award

Alpha Battery, 1st Battalion, 623rd (HIMARS) Field Artillery Regiment from Lexington, Ky., is the winner of the 2010 Alexander Hamilton Award.

Highlights of this unit's contributions include more than 1,000 hours of State Active Duty Emergency Support during the May 2010 flood that affected four counties in the south central Kentucky area. After the flood subsided, the unit was also a great example of citizen Soldiers while working with local officials and law enforcement due to water and debris that blocked 200 miles of road. In the same calendar year, the battery successfully completed the new HIMARS equipment trainer certifying all six launcher crews, performing more than 120 reload operations, dry fired more than 600 missions, and successfully fired 24 practice rockets, on time and on target and without safety infractions, accidents or injuries.

2010 Field Artillery Edmund L. Gruber Award

SFC Jose A. Weeks, Bravo Battery, 2nd Battalion, 12th Field Artillery Regiment from Joint Base Lewis-McChord, Wash., is the winner of the 2010 Edmund L. Gruber Award.

While assigned to Bravo Battery, 2nd Battalion, 12th Field Artillery Regiment, he deployed to Operation Iraqi Freedom 09-10. His contributions as a platoon sergeant led to the battery's overall success and impacted operations at the division level. Highlights from his accomplishments include leading his platoon on more than 250 combat patrols in the volatile west Baghdad area. Weeks and his troops also played a key role on the overall success of the historical Iraqi National Elections of 2010. In December 2009, the unit received a dynamic change in mission. The operation area for the battalion quadrupled in size – to encompass all of northwest Baghdad. Over the course of eight months, his platoon conducted 32 counter vehicular borne IED patrols, 44 counter-indirect fire patrols, and 67 counter-improvised explosive device patrols. He also implemented and executed the platoon's medical and casualty evacuation plans. The procedures established in these plans not only set the standard but enabled his Soldiers to successfully CASEVAC a Soldier who was severely wounded during combat operations. Also during the deployment, he mentored his platoon's NCOs and Soldiers, who won 40 percent of the battalion's NCO and Soldier of the month boards.

2011 Fires Seminar

"Fires capabilities for wide area security & combined arms maneuver"

Fires Center of Excellence
May 16-May 20
to be hosted at Cameron University in Lawton, Oklahoma

Topics of discussion:

- 2011 State of Fires
- Army Operational Concept
- Army Modernization
- Employment of Fires at strategic and tactical levels
- Fires Warfighting Funcational Concept
- Army Force Generation

100 Years of Fires celebration scheduled for May 19, 2011

All topics tentative. U.S. Army Field Artillery and Air Defense Artillery specific seminar topics to be announced at a later date.

Change 1 to Army Capstone

FM 3-0

Operations

U.S. Army Combined Arms Center
Intellectual Center of the Army

Change 1 to FM 3-0 incorporates lessons from continued operations and maturing discussions on Army doctrine. Key changes include replacing Command and Control with Mission Command as both an activity and a warfighting function, and replacing the 5 Army Information Tasks with Inform and Influence and Cyber/Electromagnetic activities.

Several other changes are also readily apparent: Hybrid Threats, Security Force Assistance is described within stability operations, CBRNE Consequence Management becomes an additional task within Civil Support, Chapter 7 is updated to include design.

Refer to the CAC web site for other changes and a more in depth overview of the changes to US Army Operational Doctrine.

The proponent for FM 3-0, Change 1 is the Combined Arms Center:
http://usacac.army.mil/cac2/FM3-0/index.asp

HISTORY OF THE US ARMY
COLD WAR AND AFTER

By Dr. Boyd L. Dastrup

Although the Field Artillery School at Fort Sill, Okla. returned to peacetime operations after World War II, it maintained a high operational tempo for the next eight decades to meet national security requirements. During those years, it underwent key reorganizations, trained field artillerymen to furnish effective and responsive fire support in conventional, nuclear, and guerrilla warfare, to provide non-lethal and lethal fires and effects in counterinsurgency warfare, and to conduct joint and precision fires and played a key role in combat developments.

From war to war. At the end of World War II, when it trained more than 100,000 field artillerymen, including 26,000 officers who were commissioned in its Field Artillery Officer Candidate School, the Field Artillery School transitioned from wartime to peacetime operations. This included reducing school overhead, eliminating many wartime courses, reestablishing the Army Extension Course program for U.S. Army Reserve and National Guard personnel, developing peacetime courses, undergoing key reorganizations, and expanding the school's mission.

Because organic field artillery aerial observation demonstrated its ability to furnish timely observation for field artillery Fires, general observation, and liaison services, among other responsibilities during the war, the U.S. Army made aviation organic to all of its combat arms on Nov. 16, 1945. The Army then redesignated the Field Artillery School's Department of Air Training which had trained mechanics, pilots, and observers for organic field artillery aerial observation in the war as the Army Ground Forces Air Training School Dec. 7, 1945. During this same time frame, it was also tasked to train all pilots and mechanics for army branches employing aviation. Eight years later, on Jan. 16, 1953, the Army redesignated the school as the Army Aviation School and moved it to Fort Rucker, Ala. in 1954, because the Army Aviation School had completely outgrown its facilities at Fort Sill.

Meanwhile, the Army initiated other far-reaching reorganizations to save money. To accomplish this goal, the Army combined its Army Ground Forces schools into three centers. Nov. 1, 1946, marked when the Army Ground Forces established The Armored Center at Fort Knox, Ky., for armored instruction, The Infantry Center at Fort Benning, Ga., for infantry and airborne training, and The Artillery Center at Fort Sill for all artillery training. The Artillery Center oversaw the Artillery School, and its branches, the Antiaircraft Artillery School at Fort Bliss, Texas, and the Seacoast Artillery School at Fort Winfield Scott, Calif. The Artillery School taught all subjects common to the three artilleries and field artillery subjects, but it still closed its Field Artillery Officer Candidate School Dec. 12, 1946. The Antiaircraft Artillery School and the Seacoast Artillery School taught subjects specific to their branches and remained at their current locations. Four years later, the Army Reorganization Act of July 1950 merged the field artillery and the antiaircraft artillery into one branch and formally abolished the coast artillery. This action preserved The Artillery School and the Antiaircraft Artillery School.

Battery C, 2D Battalion, 138th Field Artillery, on hill 88, March 1969. (U.S. Army Photo)

Meanwhile, the Korean War broke out in June 1950 and caused The Artillery School to expand its operations. Between July 1950 and July 1953 when the armistice was signed, the school trained more than 30,000 active and reserve component field artillerymen. It teamed with the 1950 Artillery Replacement Center for basic training and the reopened Field Artillery Officer Candidate School in 1951 to meet the demand for trained officers. As a team, The Artillery School, the Artillery Replacement Center, and the Field Artillery Officer Canidate School trained field artillery for the combat forces.

The Cold War and Vietnam War. Following the Korean War, The U.S. Army Artillery School faced new challenges. The Cold War fostered military readiness, promoted a high operational tempo, and introduced the school to atomic and nuclear field artillery. In 1952, the school pioneered a course on atomic warhead assembly for the 280 mm cannon, commonly known as Atomic Annie, that fired the first atomic field artillery round on May 25, 1953 at Frenchmen's Flat, Nev.

Besides moving the school into the atomic age, the subsequent development of conventional and nuclear rocket and missile courses at the school in 1953-1954 prompted a name change. On January 1, 1957, the Army revised the name to the U.S. Army Artillery and Guided Missile School. On July 1, 1957, the Army dropped "guided" from the school's name to make it the U.S. Army Artillery and Missile School.

Another name change followed 12 years later, after the Army divided the artillery into the Air Defense Artillery and the Field Artillery. Later, Department of the Army orders effective Jan. 20, 1969 officially redesignated the U.S. Army Artillery and Missile School as the U.S. Army Field Artillery School, the U.S. Army Antiaircraft Artillery and Guided Missile School as the U.S. Army Air Defense Artillery School. This action reaffirmed the U.S. Army Field Artillery School's responsibility for surface-to-surface artillery and the U.S. Army Air Defense Artillery School's leadership in surface-to-air artillery.

The Vietnam War meanwhile led to innovative changes to training on Fort Sill.

FIELD ARTILLERY SCHOOL:

PART II OF II

In 1965, the U.S. Army and Missile School introduced practical exercises on airmobile operations and built a Vietnamese village, called Tran Hoa, on Fort Sill's East Range for training exercises. Later in 1966, the school added instruction on battery defense, and developed a firing chart to simplify 6400-mil coverage. The school also designed practical exercises on firing in a complete circle, and students were trained to employ field artillery fires to prepare a landing zone. Two fire support bases for practical exercises were also built.

As the school introduced new training for the Vietnam War, the number of graduates from the school and the Field Artillery Officer Candidate School soared. Between 1965 and 1973, more than 130,000 officers and Soldiers were trained for combat. The decline in officer requirements at the end of the war caused the Army to abolish its branch officer candidate schools in 1973 and to close the Field Artillery Officer Candidate School following the graduation of Class 4-73, July 6, 1973.

Back to Europe. Following the Vietnam War, the U.S. Army Field Artillery School embarked upon an intensive effort to modernize training, tactics, doctrine, organization, and equipment. Developing and employing the concept of training as you fight, the school introduced the Army Training and Evaluation Program in the 1970s to replace time-oriented training. The ARTEP was a performance-oriented program for collective training that required a unit's Soldiers and leaders to perform to a standard. It allowed field artillery units to train as they would fight, to evaluate their training, and to use lessons learned to enhance training.

Concurrently, the school launched a Noncommissioned Officer Education System in 1972. Patterned after the officer education system that ran from basic to advanced courses, the noncommissioned officer education system consisted of progressive levels of training for each military occupational specialty. By the 1980s the school's noncommissioned officer education system had a primary leadership course for E4s, a basic noncommissioned officer course for E5s, and an advanced noncommissioned officer course for E6s and supplied the field artillery with highly trained noncommissioned officers.

As the school implemented its noncommissioned officer education system, it introduced a comparable one for warrant officers. In 1972 the Army initiated entry level training, mid-career training, and advanced training for warrant officers to give them a progressive education system. The Warrant Officer Entry Course was taught at Fort Rucker, Ala., while the basic course was taught at the U.S. Army Field Artillery School. It was called the Warrant Officer Technical/Tactical Certification Course, and qualified new warrant officers in the field artillery branch. The school also later taught an advanced warrant officer course, called the Senior Warrant Officer Training Course. The newly created warrant officer and noncommissioned officer education system complemented the existing field artillery officer education system and reflected the drive to develop proficient leaders.

Subsequently, the school revamped its training methodology. Through the 1980s, large group instruction of approximately 60 students per instructor was the standard. Instructors required students to memorize large amounts of information for recitation. In 1989, the school introduced small group instruction of approximately 15 students per instructor. This type of instruction abandoned relying upon memorizing information and encouraged students to discuss doctrine, tactics, techniques, and procedures, among other issues and topics, and to challenge their classmates' and instructor's thinking as well as conclusions.

As progressive as these reforms were, the school's combat development efforts demonstrated equal foresight. During the 1970s, the Commandant of the U.S. Army Field Artillery School, Major General David E. Ott, developed the fire support team and counterfire. Later, the school played a key role in introducing the Multiple-Launch Rocket System, the Copperhead laser-designated munition, and the Tactical Fire Direction System, among other field artillery systems.

While innovative training initiatives of the 1970s and 1980s produced high-qualified field artillerymen, combat developments enhanced the field artillery's system of systems. Together they moved the school and the branch ahead in a bold manner and created a field artillery force that defeated Saddam Hussein's ground forces in 1991.

A new era. Following the end to the Cold War and the Persian Gulf War of 1991, Congress cut the military's budget to save money. As critical as training reforms in officer and noncommissioned officer courses were to ensure graduating highly trained field artillerymen in the face of budget reductions, participating in the development of the Total Army School System and adopting advance information technology proved to be equally as important. The active Army, U.S. Army National Guard and Reserve schools were integrated into one system to provide standardized training and to reduce training costs. The Total Army Training System, organized in the mid-1990s and renamed The Army School System in 1999, represented this key innovation. Under the auspices of the U.S. Army Training and Doctrine Command, regionally-based Total Army Training System Schools organized into battalions furnished the training and were aligned with their training development proponent, while training regiments and

Men of Battery B, 75th Field Artillery Battalion, U.S. Eighth Army, fire 155 mm howitzers at Communist positions, near Kumwha, Korea, April 4, 1952. (Signal Corps Photo (Hughes)

brigades provided command and control. As a part of the system, the U.S. Army Field Artillery School accredited field artillery battalions, later called Regional Training Institutes, and provided them with training support packages.

Meanwhile, the U.S. Army Field Artillery School took advantage of advance information technology. Early in the 1990s, the school adopted the Teletraining Network. Using a satellite, the Teletraining Network sent and received courses via the air waves and transmitted viewgraphs, videotapes, graphics, digital data, and simulations beyond Fort Sill.

Subsequently, the school developed a multimedia distance learning strategy in 1994. Over the next several years, the strategy produced a single program of instruction for each field artillery military occupational specialty using computer-based instruction, video teletraining, CD-ROM instruction, and the Teletraining Network. This multimedia effort standardized instruction for active and reserve component Soldiers and furnished everything that a Soldier needed to know from initial entry into a military occupational specialty through retirement.

For the U.S. Army Field Artillery School the distance learning strategy embodied a continuation of the drive to digitize training. Using its distance learning plan of October 1996, the school produced digitized lessons, interactive computer-based modules, and on-line training. The school phased out the Teletraining Network by the end of the 1990s, converted enlisted and officer courses to the Total Army Training System, digitized them, and put them on the Internet.

The Total Army Training System represented a significant development. Through 1995 the school configured active component courses to fit the time, equipment, and facility constraints of the reserve component's training environment. Only those tasks deemed important to prepare reservists for mobilization were included in the courses. Under the Total Army Training System all critical tasks selected for active component training would be trained in the reserve component and taught to the same standard.

SPC Timothy Jones, Bravo Battery 1-43 ADA Patriot Launch Station operator/maintainer, rotates a launching station to ensure no faults during a missile reload certification event at a non-disclosed Southwest Asia location, Feb. 8, 2010. (Photo by Tech. Sgt. Michelle Larche, U.S. Air Force)

As critical part of the distance learning plan, the U.S. Army Field Artillery School modernized its classrooms. Under the Classroom XXI initiative the school converted classrooms from overhead viewgraphs, chalkboards, and dry-erase boards to advance information technology facilities. While Classroom XXI focused on school house instruction, distance learning classrooms utilized state-of-the-art information technology to beam training beyond the school house.

To reduce training costs the school simultaneously placed a greater reliance upon training aids, devices, simulators and simulations for institutional and unit training than in the past. The Fire Support Combined Arms Tactical Trainer, introduced in the 1990s, and other training aids, devices, simulators, and simulations did not replace field training but augmented and enhanced it.

While adopting progressive training methodologies and technologies, the school aggressively took part in modernizing the field artillery. It participated in the Army warfighting experiments to digitize the force to enhance situational awareness. The school established the Depth and Simultaneous Attack Battle Laboratory in 1992, to coordinate ideas and technology for future warfighting capabilities, and played a key role in fielding the M109A6 Paladin 155 mm self-propelled howitzer, among other combat development efforts.

In a few short years, the U.S. Army Field Artillery School's ground-breaking advancements improved training in the face of budget cuts and modernized the field artillery's system of systems.

New directions. During the first decade of the twenty-first century, the U.S. Army Field Artillery School continued upgrading training to meet national security requirements for Operation Iraqi Freedom and Operation Enduring Freedom in Afghanistan. To get captains back to the operational forces as quickly as possible, to reduce costs as funding was shifting to OIF and OEF, and to minimize time away from families, TRADOC discontinued the six-week Combined Arms Service School Staff course in May 2004. This permitted the school to expand its Captain's Career Course from 18 to 20 weeks to fit in tasks transferred from the staff course.

OIF and OEF influenced training captains in other ways. For example, after participating in large group instruction at the beginning of the career course on gunnery and other technical subjects, the students moved into small group instruction for practical exercises on counterinsurgency warfare and training on field artillery core competencies, such as precision Fires, staff work, and other subjects. This allowed the school to develop technically and tactically proficient leaders with the capabilities of supporting full spectrum operations.

Meanwhile, influenced by the requirement for more hands-on training, better digital training, and shared training opportunities, the school changed its basic, warrant officer, and noncommissioned officer courses. In 2006, the Army unveiled its three-phased Basic Officer Leader Course to replace the existing Officer Basic Course. Phase I consisted of pre-commissioning, while Phase II held at the Infantry School at Fort Benning, Ga., and the U.S. Army Field Artillery School developed warriors and junior leaders and brought officers from all of the Army's branches together for shared training. Upon completing Phase II, second lieutenants attended Phase III for branch-specific training. Although Phase II produced adaptive second lieutenants, rising costs prompted TRADOC to eliminate Basic Officer Leader Course Phases II and III, and to institute the Basic Officer Leader Course B for branch-specific training in 2010.

The school also revamped its Warrant Officer Basic Course and

noncommissioned officer courses to create more tactically proficient leaders and NCOS. To accomplish this, the school increased the targeting phase of training and decreased radar maintenance training in the Warrant Officer Basic Course, while the Noncommissioned Officer Academy incorporated lessons learned from OEF and OIF, and other relevant subjects into its programs of instruction in 2004. Later in 2007, the U.S. Army Field Artillery School and the Noncommissioned Officer Academy integrated live-fire training into cannon crewmember and Multiple-Launch Rocket System crewmember training in the Basic Noncommissioned Officer Course.

Live-fire exercises addressed a growing concern of retaining perishable core competency skills. Initial operations in OIF in 2003 provided field artillery units with opportunities to perform their traditional missions of synchronizing and delivering timely cannon, rocket, and missile fires. After those years, non-standard missions, such as patrolling, base defense, and convoy operations, dominated the field artillerymen's time in Iraq and Afghanistan with only a few units furnishing fire support missions; and this caused skills to atrophy.

To overcome this, the school launched resetting (retraining) Soldiers, officers, and units in field artillery core competencies. Beginning in 2006-2007, school reemphasized core field artillery skills in its training and tailored unit training to the need of each unit. Unit training generally revolved around "reach-back" services through the Internet. For more robust training needs, the school sent mobile training teams to meet specific requirements. At the end of 2008, the commandant of the U.S. Army Field Artillery School, Major General Peter M. Vangjel, funded two contract mobile training teams - the battery and below MTT and the Collective Training Evaluation Team – to support reset and to restore field artillery core competencies.

In 2009, the school expanded the Field Artillery Captain's Career Course from 20 to 24 weeks to give officers more time training in order to become experts at coordinating lethal and non-lethal Fires, precision Fires, and other tasks. The Noncommissioned Officer Academy likewise increased its training from one to three weeks depending upon the military occupational specialty.

Introducing non-lethal training in 2004-2005, meanwhile, moved the school beyond its traditional role of preparing field artillerymen to deliver lethal effects. As part of the targeting process, the school developed training on electronic warfare and information operations as well as other non-lethal effects. Besides integrating such instruction into existing courses, in 2006 the school created functional electronic warfare courses and a Tactical Information Operations Course to train not only field artillerymen but military personnel from the other armed services. In 2008, MG Vangjel made providing non-lethal effects an additional core field artillery competency.

This added a new dimension to the school's training. Providing lethal Fires and effects remained a critical aspect of the school's training, but furnishing non-lethal Fires and effects assumed a greater importance than in previous years.

Base Realignment and Closure 2005, the Fires Center of Excellence and the U.S. Army Field Artillery School. During the first decade of the 21st century, BRAC 2005 profoundly influenced the U.S. Army Field Artillery School. Among other things, BRAC 2005 moved the U.S. Army Air Defense Artillery School and

Soldiers of 1st Battalion, 41st Artillery Regiment, walk up to a Paladin after it fired an Excalibur round during the 1st Brigade, 3rd Infantry Division's mission rehearsal exercise at the National Training Center in preparation for its advise-and-assist mission in Iraq. (Photo by SPC Jared S. Eastman, U.S. Army)

Center from Fort Bliss, Texas to Fort Sill and co-located it with the U.S. Army Field Artillery School and Center to form the Fires Center of Excellence.

After four years of planning and hard work, BRAC 2005 reached a critical milestone when the Fires Center of Excellence achieved its initial operational capability in 2009. On June 4, 2009 the Commandant of the U.S. Army Field Artillery School and the Chief of Field Artillery, Major General Peter M. Vangjel, passed authority to Brigadier General Ross E. Ridge to be the commandant of the U.S. Army Field Artillery School and the Chief of Field Artillery but retained the position as the commanding general of the Fires Center of Excellence.

Later, the official transition of authority for the U.S. Army Air Defense Artillery School from Fort Bliss to Fort Sill occurred on June 23, 2009 when the Commandant of the U.S. Army Air Defense Artillery School and the Chief of Air Defense Artillery, Major General Howard B. Bromberg, transfered authority to Brigadier General Roger F. Mathews. Subsequently, the U.S. Army Air Defense Artillery School opened its doors at Fort Sill in August 2009 when it started teaching its Air Defense Artillery Captain's Career Course. Although the two schools were critical subordinate commands of the Fires Center of Excellence, they remain separate entities and maintain responsibility for training their own officers and Soldiers.

The Fires Center of Excellence, under Major General David D. Halverson, obtained full operational capability in 2010. As a preferred Fires training location for international partners, the FCoE's key joint initiatives and innovative training and education methods established the conditions for developing proficient Fires officers and Soldiers. For example, the Joint Fires Observer Course conducted by the FCoE's Joint and Combined Integration Directorate, grew from 500 graduates in 2008 to 1,000 in 2010. This course and other joint courses, such as the Joint Fires and Effects Course, and the breaking of ground for the Joint Fires and Effects Training System Center in July 2010, reflected the FCoE's commitment to joint operations and training.

U.S. Marine Corps Staff Sgt. Robert L. Worthington, a High Mobility Artillery Rocket System instructor with Marine Corps Artillery Detachment, HIMARS Test Unit, Fort Sill, Okla., checks the heat from empty pods of MG8A2 training rockets after a test fire from a HIMARS vehicle at Range 131, Observation Post Foxtrot, Marine Corps Base Camp Pendleton, Calif., May 7, 2007. This is an example of joint training that the Fires Center of Excellence teaches and supports. (Photo by Lance Cpl. Seth Maggard, U.S. Marine Corps)

Meanwhile, the FCoE's Joint and Combined Fires University initiative that is scheduled for initial operational capability in the summer of 2011, also outlined significant training and education reforms. By late 2010, the Joint and Combined Fires University became the model for life-long learning within TRADOC with its 24-hour, seven-days-a-week, reach-back capability and ability to employ the social media, distance learning, and knowledge management for training Fires officers and Soldiers.

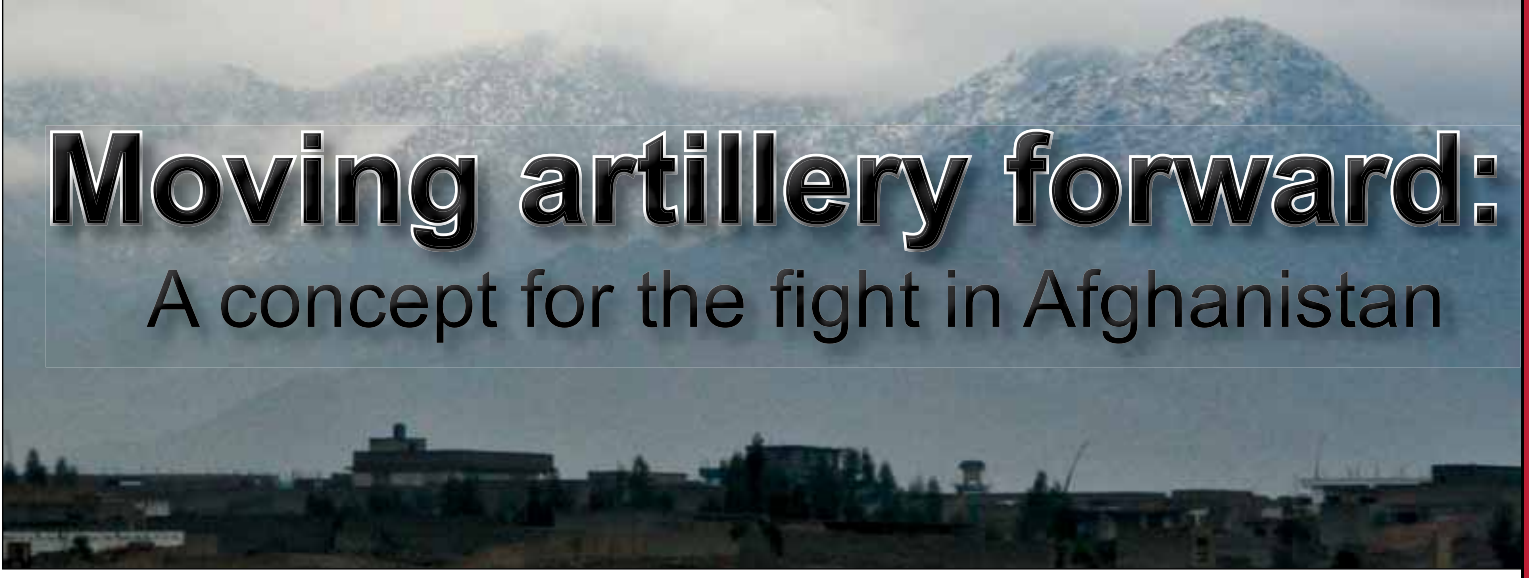
With the U.S. Army Learning Concept for 2015 providing a framework for training and education, the FCoE and the U.S. Army Field Artillery School also envisioned changing instruction from instructor-centric to learner-centric. Transforming training into a learner centric model would be more relevant, tailored and engaging learning experiences for all Fires Soldiers, both air defense and field artillery. Instructor-led PowerPoint lectures would be reduced across the board and virtual and constructive simulations or other technology-delivered instruction would become the norm.

As a part of an Army initiative to improve cultural and foreign language capabilities, the FCoE also established the Cultural and Foreign Language Program to help Soldiers and leaders understand how culture influences military operations. To this end, the U.S. Army Field Artillery School and the U.S. Army Air Defense Artillery School revised officer, warrant officer, and noncommissioned officer courses to provide cultural and foreign language training to make graduates more effective in dealing with a local populace. An all-volunteer language and cultural awareness orientation class was also created in July 2010, to assist Fires Soldiers and leaders in learning a foreign language.

In a few short years, the FCoE and the U.S. Army Field Artillery School have took bold steps to improve training. Both have embraced new training technologies and training methodologies to produce proficient Fires officers and leaders who understood the complexities of full-spectrum operations and could adapt to changing conditions.

As the U.S. Army Field Artillery School approaches its centennial in 2011, it can boast about its 10 decades of dedicated service to the United States during times of peace and war and being part of the recently created, innovative Fires Center of Excellence. With the exception of being closed during the Pershing Expedition into Mexico in 1916-1917, the school kept its doors open, adapted to changing times, developed progressive training methods, employed the latest training technologies, took an aggressive lead in developing and teaching the latest field artillery tactics, techniques, and procedures, and participated in the fielding new field artillery systems and equipment.

Dr. Boyd L. Dastrup is the U.S. Army Field Artillery branch historian for the U.S. Army Field Artillery School, at Fort Sill, Okla. He received a Ph.D. in U.S. Military and Diplomatic History from Kansas State University, in 1980. He has written, "The U.S. Army Command and General Staff College: A Centennial History;" "Crusade in Nuremberg: Military Occupation, 1945-1949;" "King of Battle: A Branch History of the U.S. Army's Field Artillery;" "Modernizing the King of Battle: 1973-1991;" "The Field Artillery: History and Sourcebook;" and "Operation Desert Storm and Beyond: Modernizing the Field Artillery in the 1990s." He has also written articles in, "A Guide to the Sources of United States Military History;" "The Oxford Companion to American Military History;" and "The U.S. Army and World War II," and "Professional Military Education in the United States: A Historical Dictionary." He has also appeared on the History Channel in, "Dangerous Missions: Forward Observation (2001);" and "Extreme Marksman (2008);" as well as the Military History Channel on, "Artillery Strikes (2005)," and "Weaponology: Artillery (2006)." an previously.



Moving artillery forward:

A concept for the fight in Afghanistan

Iowa National Guard Soldiers from 1st Battalion, 133rd Infantry Regiment, a part of the 2nd Brigade Combat Team, 34th Infantry Division, awoke Jan. 14 to find the mountains outside Forward Operating Base Mehtar Lam, Afghanistan, capped with snow following a rain shower the evening before. (Photo by SSG Ryan Matson, U.S. Army)

By Joseph A. Jackson

The United States Army is no stranger to mountainous and high-altitude war fighting. American history contains many instances of successfully executed mountain conflicts. Central to this success was the movement and use of artillery in direct support of those campaigns. The first notable American instance of moving artillery across mountainous terrain occurred when Colonel Henry Knox's Continental Army soldiers wheeled, sledged, and levered the guns from Fort Ticonderoga across the Berkshire Mountains in the winter of 1776. These 59 assorted cannons became the deciding factor in General George Washington's siege of Boston. Other notable campaigns include the U.S. Army operations in the Italian Alps during World War II, the Taebaek Range of Korea, and the Annamite Range in Vietnam. Each of these locations and conditions provides ample instruction on artillery use in mountain warfare; yet this time fighting in the mountains of Afghanistan is proving to be a greater challenge than anticipated.

"In Afghanistan, the terrain and weather dictate the tactics and choice of weapons."

Strategists and commanders who consider employment of artillery in Afghanistan should take a fresh look at history, doctrine, and tactical concepts. Doing so will ensure artillery can employ optimally, in sufficient strength, and of the correct caliber to create the tactical conditions for success. Without a significant increase in firepower delivered by a correspondingly lightweight and maneuverable field howitzer, the long-range fight in Afghanistan will devolve into an even deadlier and protracted conflict.

Solely relying on technology and precision munitions incrementally applied across the current arsenal will not achieve the conditions to exploit and pursue the insurgent fighters ever higher and farther into the mountains between Afghanistan and Pakistan. Operational planners, artillery professionals, congressional staffers, and military acquisition officers should examine these relevant histories, review doctrine, and consider their implications. These sources serve as a guide to develop successful and sustained operational approaches to combat the Afghan insurgency. They also provide a reference for adaptive tactics and procurement requirements for weapons needed in protracted high-altitude mountain warfare.

Defining the operational environment. In Afghanistan, the terrain and weather dictate the tactics and choice of weapons. Understanding the operational environment necessitates consideration of multiple factors. These dynamics include warfare in mountains that force non-linear fighting, training that does not prepare Soldiers for vertical terrain, awkward and counterproductive positioning of the weapons, changing and treacherous weather conditions, and punishing temperatures that renders troops less effective.

In Afghanistan, significant mountain ranges such as the Himalayas and the Karakoram rise in the east. The Hindu Kush towers in the center of the country. The Suleman and Kirthar ranges jut toward the eastern border with Pakistan and extend into Baluchistan. Finally, the Paghman Range shrouds the capital city of Kabul. These ranges elevate more than two-thirds of Afghanistan's territory above 5,000 feet. These ranges provide natural concealment and protection for the insurgent fighters.

Fighting in extremely mountainous terrain and at high-altitudes is not linear. While forces move along pre-designated phase lines as on flat terrain, difficulties arise in maintaining continuity between units as they methodically scale from one point to the next. Fronts do not necessarily follow contiguous and sequential sets of ridges; they may even require simultaneous attacks on crests, ledges, and tactical objectives in opposite directions. A valley floor lying several thousand meters below may provide the only geographical point of continuity.

Most armies train and equip themselves for conventional warfare on terrain that facilitates effective command and control and allows efficient employment of combined arms. Ideal terrain for mechanized forces are wide plains, rolling hills, plateaus, deserts, or sparsely populated regions that favor the linear and contiguous properties of maneuver warfare. None of these conditions are present in the bordering highlands along the eastern length of Afghanistan.

Extreme terrain also constrains fire support weapons. Artillery faces limitations imposed by steep road gradients and sharp bends that prevent deployment of the support vehicles and guns. To maintain the employment of guns as far forward as possible, batteries must disperse into sections, one or two guns per position, to maximize coverage to the supported units. To optimize the usefulness of the artillery, forces position their guns in terrain folds and on reverse

slopes. Other positioning options include road heads, near villages, and along valleys. Deployment of artillery is often constrained because of logistics to support their use, according to the article "Ground Combat at High Altitude" by the Foreign Military Studies Office.

Positioning of artillery becomes even more important when defending in mountainous terrain. The drastic changes in elevation and uneven ground make maintaining a continuous line of units tied together along their flanks difficult. A reverse-slope defense poses problems as well. While these positions mask unit movements and strengths, troops often lack sufficient overhead cover. Positions become susceptible to artillery fire and airbursts showering positions with fragmentation. Meteorological implications affect artillery use at higher elevations. Low air pressure, cold temperatures, and high wind speeds make standard firing tables ineffective, according to the Foreign Military Studies Office.

These conditions increase inaccuracy. The lack of adequate maps and surveyed locations and the lack of precise meteorological reports increase the probability of error in range and altitude. Spotting rounds at high-altitude requires extra observers to walk rounds onto targets and to make drastic shifts to achieve accurate fire.

Human endurance must factor into the problem as well. Men cannot endure temperatures ranging from as high as 128°F and as low as -15°F in the central highlands of Afghanistan and greater Southwest Asia. Prolonged exposure at high-altitudes depletes the strength of infantry units and requires frequent rotations of the troops. This condition places greater responsibility for augmentation by the field artillery. Firepower must compensate for the aggregate reduction in troop strength. The tactical, geographical, and physical conditions interlock. Continued exploitation of the environmental conditions by the insurgents who are accustomed to these extremes allows them to engender more credibility than their weaponry and troop strength warrant.

Other weapons systems do not improve these circumstances. In fact, their limitations reinforce the demand for an artillery capability. Aircraft are of limited utility in high-altitude operations. Atmospheric conditions such as heavy rain, blizzards, fog, high winds, and low oxygen density limit performance. Camouflaged ground troops use the natural contours of the mountains that include deep shadows and overhanging ledges to prevent visual identification by aircraft. Aircraft use in valleys is dangerous; pre-positioned air defense weapons and massed small arms fire force aircraft to fly higher. This technique creates a visual positive identification problem and increases the risk of fratricide. Helicopters serve as good artillery spotters but weather and elevation limit their usefulness. Noise from approaching aircraft provides advance warning for units giving them time to hide among the rocks, states information provided by the Foreign Military Studies Office.

The current paradigm. Presently, the United States Army has implemented self-limiting measures in Afghanistan. This formidable institution refuses to commit its full spectrum of ground combat capabilities to overwhelm the enemy forces of the Taliban and Al Qaida. Instead, it continues to deploy its weapons in piece-meal fashion, arriving with a force that is too little too late. Nowhere is this more obvious than in the employment of the United States Field Artillery.

Delineating present limitations on the current artillery corps helps define the problem. Field artillery battalions in support of expeditionary brigades continue to deploy with less than their full complement of cannons. Batteries often deploy with only 50 percent of their guns while the troops spend alternate periods serving as provisional infantry, quick reaction forces, augment logistics activities, and a myriad of training tasks focused on host nation capabilities. Additionally, the current arsenal lacks mobility. Cannons positioned on forward operating bases arrive by helicopter. Once in position, they do not often reposition. U.S. artillery limits itself to only two calibers, 105mm and 155mm to engage targeted Taliban cells. Although these have proved effective in conventional wars in the mountains of Afghanistan, two is not enough. The other choice of weaponry, the M 270, Multiple Launch Rocket System, provides a significant capability and extreme precision. However, its optimal use fires at targets well beyond the immediate reach of the infantry involved in the fighting where individual and crew-served weapons make the difference.

Afghanistan presents a prolonged challenge. The restrictive practices of U.S. forces coupled with creative Taliban tactics create an operational dilemma. Direct insurgent attacks against fortified

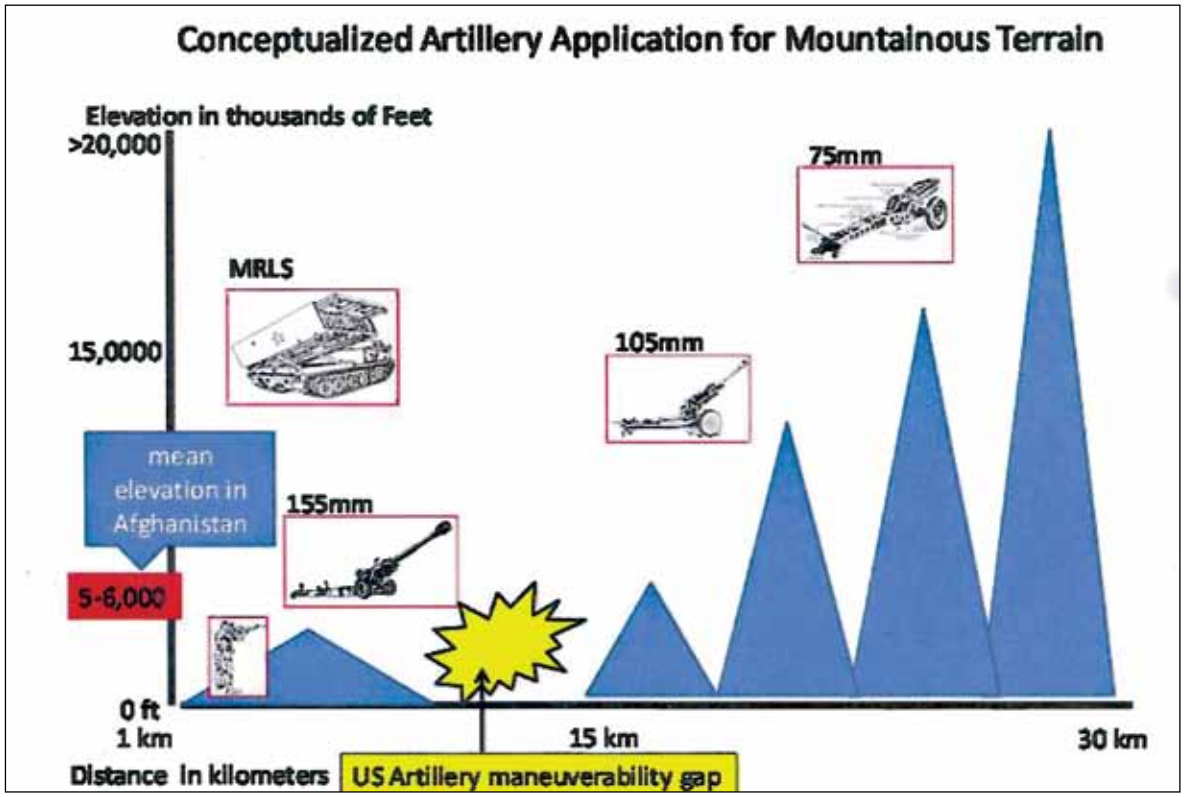


Figure 1: Field Artillery Application and Capability Gap in Afghanistan. (Source: Author's Conceptualization.)

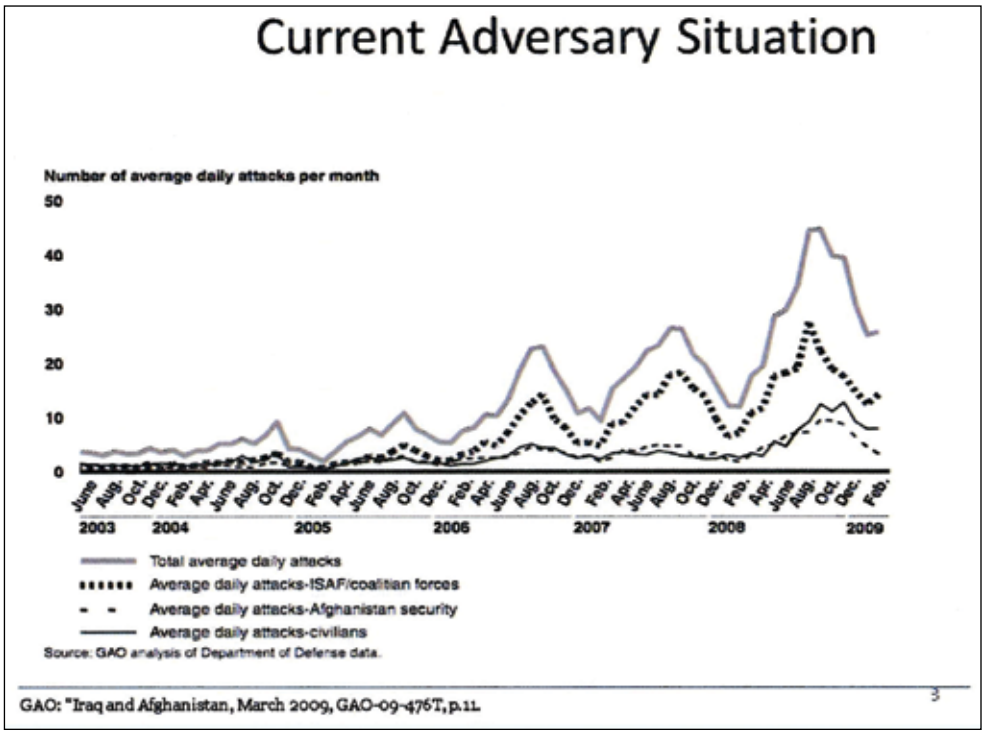


Figure 2: Location and Percentage of Taliban attacks by region in Afghanistan. (Source: School of Advanced Military Studies, data extracted from U.S. Government Accounting Office Report on Iraq and Afghanistan, March 2009.)

positions pit enemy rockets, rocket-propelled grenades, and machine guns against mortars, and heavy and light crew-served weapons. The distance created by the insurgents using these weapons ensures that rifleman cannot effectively range them with their small arms. These tactics enable a small group of insurgents to attack and pin down a technologically advanced force in a fixed position. The result is that two divergent tactical fights emerge. The first fight belongs to the infantry, fighting in platoon or squad-sized actions at ranges of one kilometer or less. The second fight is in the purview of the artillery as it attempts to fight a much deeper battle against selected small targets out to 30 kilometers (See Figure 1 on page 20).

Taliban groups study and comprehend U.S. tactics. They observe that artillery remains fixed on bases and lacks mobility to follow the infantry into the deep defiles and higher elevations. After eight years of conflict, insurgent fighters further understand the limitations of shell fuse combinations and the restrictions that the environment places on rotary and fixed wing aircraft. By moving under cover of the mountains and along remote paths, they can avoid U.S. radar and the limited number of forward observers who can engage them.

Insurgent fighters use the natural shape, strength, and remoteness of mountains to retain their freedom of maneuver and create the conditions for a long-range fight. They utilize the man-made caves that served them well during the Soviet conflict 20 years ago. Cave utilization forces heavily encumbered American Soldiers to pursue the enemy into forbidding regions often beyond the range of direct support artillery. While mortars may provide a quick response, they still lack the punch, mass, and range to support the fight in Afghanistan for the long-term. This lack limits the ability of offensive forces to achieve two important aspects of offensive operations – exploitation and pursuit. The inadequate application of combat power over the past six years facilitated the increase in hostilities by the Taliban (See Figure 2, above).

As recently as 2009, improved insurgent tactics now include firing volleys of rocket-propelled grenades, mortar rounds, and missiles from the back of trucks to allow insurgent groups to maneuver to disrupt coalition forces and seize key objectives such as remote outposts and towns. The lack of coalition troops in any given area and a corresponding lack of artillery to mitigate that deficiency in troop density has allowed the insurgency to fight along increasingly conventional lines not witnessed since Operation Anaconda in 2002, according to a 2009 *Associated Press* article by Alfred de Montesquiou, "Marines launch new Afghan assault against Taliban."

The tactical dilemma that presented itself then emerges again now. The weapon system designed to engage in the long-range fight (cannons, howitzers, and rockets) remains noticeably absent from the majority of the fighting in significant numbers.

The lens of history. The Soviet occupation and American approaches to fighting in Afghanistan warrant attention and denote significant but important contrasts. For the Soviet Union's five and two-thirds divisions, the geographical and operational limitations of Afghanistan reinforced the Soviet reliance on artillery as the centerpiece of their army formations. In contrast, Afghanistan has been an example of limited incremental technological application for the United States.

The complexity of fighting in Afghanistan produced an arguably counter-intuitive response for the Soviets. At first glance, the task of fighting an asymmetric enemy in largely uncharted territory would seem to warrant limited artillery formations in favor of lighter and more mobile forces. However, the experience of the Soviet artillery corps in the prosecution of the army's campaigns clearly noted that it remained a central combat arm in counterinsurgency warfare. Despite the limited maneuver space, winding mountain roads, and narrow valleys, creative methods of utilization allowed the artillery in certain circumstances to fight with limited or no infantry support. Moreover, the Soviet infantry fully appreciated the necessity for maintaining adequate fire support assets on all types of missions given the limited numbers of infantry battalions attempting to cover the entire country.

The Soviet Artillery Corps worked to integrate their weapons systems into the overall operational plan, rather than work to the exclusion of other arms. Mortars in significant numbers shared battle space with howitzers, aircraft and cannons in large numbers synchronized their efforts against objectives, the Soviets sought to integrate as many weapons systems of as many calibers as possible to execute a combat mission. The Soviets did not permit the Mujahedeen's tactical exploitation of the environment to dictate the terms of the utility of rockets and howitzers, both towed and self-propelled systems proved useful. The decentralization of the artillery to support infantry platoon, company, and battalion level operations also revealed that Soviet army officers became more adaptive and innovative over time. Though initially resistant to change, the Soviet army proved increasingly flexible and adaptive out of tactical necessity.

Two notable examples illustrate the effectiveness of the Soviet artillery in Afghanistan. First, the successful artillery ambush conducted by Lieutenant V. Kozhbergenov, a D-30 (122 mm) howitzer platoon leader, displays the accuracy that Soviet artillery operating in decentralized platoons could achieve through indirect and unobserved fire planning (See Figure 3 on page 22).

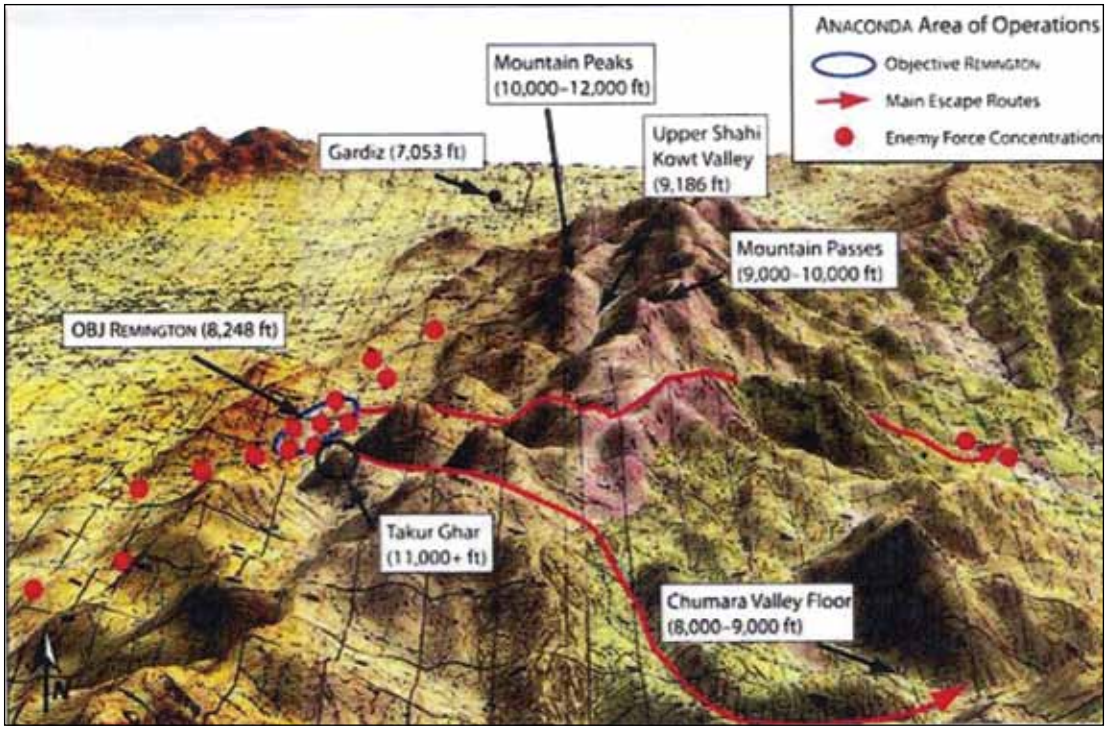


Figure 3: Map Displaying Altitude and General Disposition of Enemy Forces in the Shah-i-Kot Valley. (Source: http://www.army.mil/cmh/brochures/Afghanistan/Operation%20Enduring%20Freedom.html.)

At night, the *Realii-U* operator, (a seismic recording device), reported that 10-15 people, two trucks and pack animals were passing through the eastern most concentration, number 112. The platoon leader fired three concentrations. As the Mujahedeen continued to approach concentration 111, the gunners fired a volley. Then, the first piece switched to fire concentration 112 and the third piece switched to fire concentration 112. Number two gun continued to fire on concentration 111. The platoon destroyed two Toyota trucks, four pack animals and six men as well as destroying small arms and ammunition, according to an 1997 historical article by Lester W. Grau, "Artillery and counterinsurgency: The Soviet experience in Afghanistan."

In a second example, the Soviets made maximum use of a battalion of 152 mm, 2S3 howitzers in direct fire mode in 1986 in the Baghlan province of Afghanistan. A battalion of self-propelled howitzers employed direct fire across a wide front and moved forward by coordinated bounds by battery. Each successive bound brought the guns between 100 and 150 meters closer to their targets. The supporting towed 122 mm, D-30 artillery battery groups continued to fire concentrations across a one-and-a-half kilometer front and a depth of three kilometers. These concentrations effectively pinned the enemy inside the valley and the fortified villages, while the maneuvering 2S3 batteries systematically reduced specific enemy targets. By matching the sequencing of the fire plan to map lines, the guns accurately shifted fires from one line to the next destroying the enemy-covered firing positions, according to the article, "The Soviet-Afghan War: How a super power fought and lost," translated and edited by Lester Grau and Michael A Gress in 2002. The integrated fire plan successfully suppressed the opposition and enabled the capture of the village with limited exposure of Soviet troops to enemy fire. It eliminated the village stronghold.

For the Soviet army changing tactics and fully integrating their indirect firing systems into the fighting gave them an increased level of success. The final withdrawal from Afghanistan rested not on faulty tactics. The Soviet political leadership in Moscow realized that the continued cost in lives and materiel could not substantiate or guarantee a clear political victory, according to a 1993 article by Robert F. Baumann, "Russia-soviet unconventional wars in the Caucasus, Central Asia, and Afghanistan."

The artillery gap of Operation Anaconda. In 2002, the United States committed troops to fight in Paktia province. Ironically, this had also been the location of brutal fighting between the Soviets and the mujahedeen during the Soviet-Afghan War. The Shah-i-Kot Valley, the "Place of the King" had historically been a refuge for Afghan guerrillas. The valley became the scene for one of the largest battles of the U.S.-Afghan War.

The fighting in the Shah-i-Kot Valley rested on two inferences. First, that Al Qaida would not stand and fight, and second, that those weapons systems at hand (mortars and fixed and rotary-wing aircraft) would be sufficient to handle any fighting that did occur. In the months prior to Operation Anaconda, the U.S. military, coalition special operations troops, and local Afghan militias banded together and defeated Al Qaida and elements of the Taliban in their attempt to control of the city of Kandahar and a few weeks later at Tora Bora, stated an 2007 article by Steve Call, "Danger Close: Tactical air controllers in Afghanistan and Iraq."

The United States Army did not recognize the fallacy in those assumptions until after fighting in the Shah-i-Kot Valley commenced. During Operation Anaconda, March 1-18, 2002, unlike the previous Soviet intervention, no artillery was present for the coalition and American troops. This absence of artillery created a noticeable capability gap that placed an increased burden on other weapons platforms such as mortars, helicopters, and an array of fixed-wing aircraft. Eventually, the application of mortars combined with air power destroyed large stores of enemy munitions, sealed off caves, spoiled a would-be counterattack, and scattered the survivors, chronicled by Call's article.

Unfortunately, the notable achievements made by the use of coordinated close air support did not occur before significant delays, including fratricide, occurred in the original plan for the operation. Initially, the enemy retained the advantage in weapons and used them to disrupt the sweep through the valley. They not only possessed mortars of equal and greater caliber than the Americans, but also employed D30, 122 mm howitzers that could range the length of the valley floor, according to an article by the Combat Studies Institute, "Op 4: Field artillery in military operations other than war: An overview of the U.S. experience."

In response, the U.S. employed a number of aircraft including Apache AH-64 helicopters and fixed-wing aircraft that included A-10s, F-15Es, F-18s, and AC 130 gunships. These eventually bridged the gap between the limited mortar range and total lack of friendly artillery.

It is doubtful that the use of the current U.S. artillery arsenal in

support of Operation Anaconda would have produced a decisive change in the immediate engagement. The overall inability of the artillery to support the mission due to a lack of expeditionary systems is the real point of significance. Of the two American systems that are air transportable (the M198 and the M119), only the M119, 105 mm howitzer might have provided some measure of equal range and impact to offset the enemy D30s. The real value of Operation Anaconda to the artillery is that it illustrated how unprepared the U.S. artillery arsenal was to fight an expeditionary war in Afghanistan's rugged landscape.

Future possibilities. Fighting in Afghanistan reinforces the point that the fundamentals of artillery gunnery remain relevant regardless of the nature of the conflict and terrain. These recommendations serve as a basis of consideration and warning that while digital advancements in weaponry and precision munitions serve an important role, fighting in extremely mountainous terrain also requires the ability to move and to mass fire support at close ranges. During these engagements, aggregate rounds, not surgical precision establish a decisive advantage. Therefore, fundamental changes should match the demands of the operational environment.

Reforms must align people with devices, and that combination with the geography. To accomplish this, the U.S. Army should consider expanding its arsenal of weapons systems and revising its doctrine. Specifically, the 75 mm pack howitzer is ideally suited for Afghanistan. This system, still in use by Pakistan and India along the Siachen Glacier and Kargil regions of the Kashmir, allows the artillery to move with the infantry into narrow defiles and up steep escarpments. It permits a high velocity, direct or indirect fire capability to destroy targets nested in caves and formidable terrain.

In the United States, the 75 mm pack howitzer saw extensive wartime service. The U.S. Army issued 75 mm howitzers to airborne and mountain units during World War II, (See Figure 4).

An airborne division, according to the organization of February 1944, had three 75 mm howitzer battalions. Glider units fielded two field artillery battalions that contained two six-gun batteries each and one parachute field artillery battalion (three four-gun batteries) totaling 36 pieces per division. In December 1944, new tables of organization and equipment increased the divisional firepower to 60, 75 mm howitzers. The 10th Mountain Division contained three, 75 mm howitzer battalions, containing 12 guns each.

In the U.S. Marine Corps, under the E-series tables of organization, from April 15, 1943 divisional artillery included three, 75 mm howitzer battalions of 12 guns each. The F-series TO from May 5, 1944 reduced the number of 75 mm battalions to two, and the G-series TO eventually removed them. The Marine Corps then shifted to 105 mm and 155 mm howitzers. Although the G-series TO was adopted on Sept. 4, 1945, in practice in some divisions the change was introduced early in 1945.

The 75 mm howitzer, during its time of employment, proved successful. Nearly 5,000 guns were produced. As a part of Lend Lease, more than 800 saw service with the British forces in the Balkans where they proved excellent for fighting in that mountainous region. Today, Afghanistan provides another opportunity to use this weapon or something similar, according to a 1999 article by *Asian Defence Journal No. 3.*

As a practical matter, converting these largely ceremonial guns

Soviet equipment of the Democratic Republic of Afghanistan in ruins outside Kabul, Afghanistan. (Photo by Joseph A. Jackson)

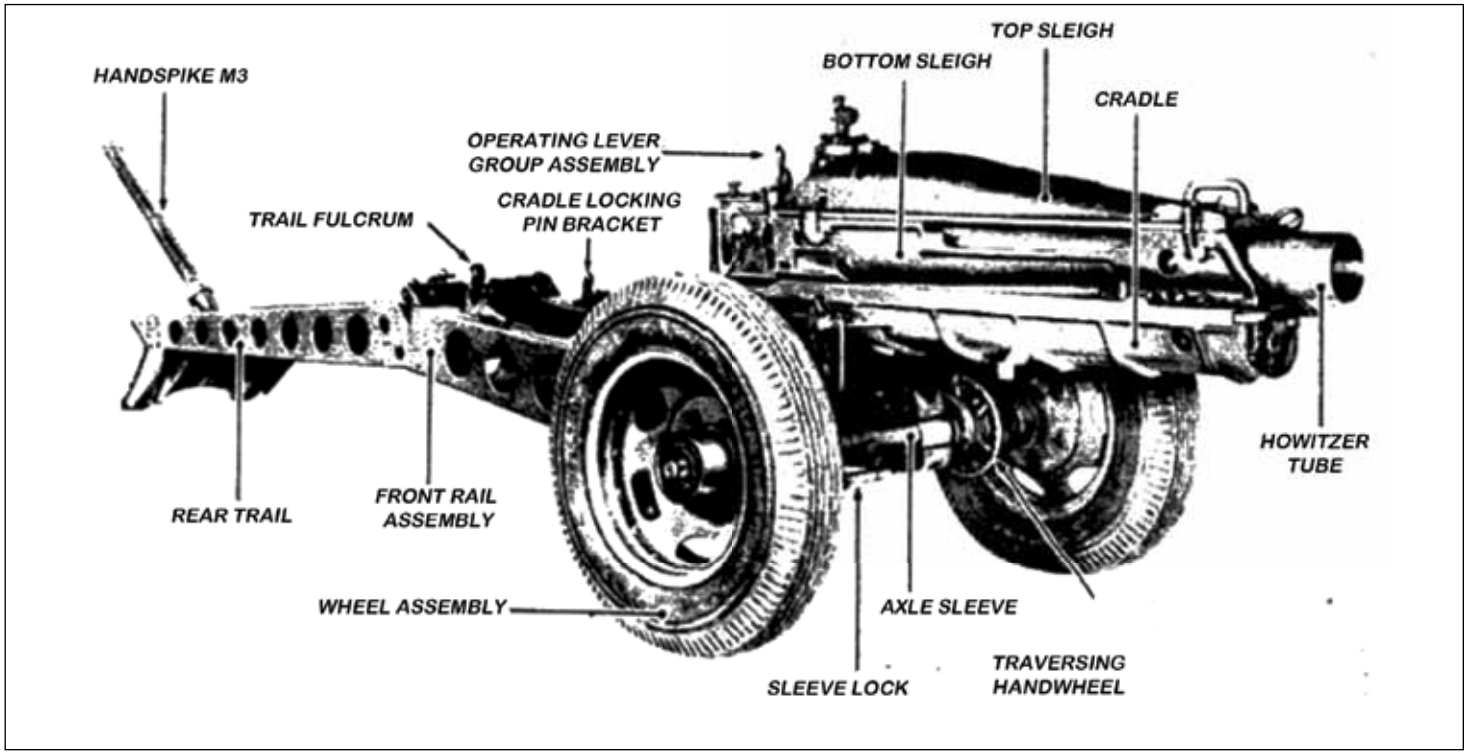


Figure 4: Diagram of the 75 mm pack howitzer (Source: Technical Manual 9-319 U.S. Army)

into operational howitzers should not be beyond consideration. The pack howitzer ranges out to nine kilometers firing high explosive, anti-tank, and smoke rounds. It disassembles into six components and its total combat configured weight is 1,009 pounds. A concept for employment would not require replacement of the current 105 mm and 155 mm systems already present in Afghanistan. Instead, these weapons would augment the infantry with platoons or sections of pack howitzers as they pursue the Taliban into the highest points along the Afghan-Pakistan border.

Recommendations do not limit themselves to weapons systems. Training doctrine provides the link among the Soldier, weapon, and the environment. Soldiers and leaders require access to core documents from which to draw relevant and expedient tactics and methods. A review of U.S. doctrinal history reveals that the army previously experienced fighting in mountainous terrain. The following points regarding texts and training deserve consideration. The army should revise and publish Field Manual 70-10 *Mountain Operations*, Field Manual 70-15 *Operations in Snow and Extreme Cold*, and Field Manual 25-7 *Pack Operations*, all published in 1944. Some reprinted field manualdo exist, however they remain in the prevue of the special operations forces. These manuals explain in detail methods of mountain warfare. The lessons and methods still apply to the mountain ranges of Afghanistan and Southwest Asia.

The need for full spectrum of indirect weapons systems. Historical case studies and eight years of experience validate the need and utility of a significant artillery arsenal in Afghanistan. The rugged landscape provides a natural fortress for insurgents that make locating and destroying them difficult. Transnational insurgencies such as Al Qaida and the Taliban exploit the network of mountain ranges between Afghanistan and Pakistan to their advantage, states the book by Bard O'Neill, "Insurgency and Terrorism: From Revolution to Apocalypse." Insurgents use the mountains and the protection they offer to maintain weapons parity with U.S. forces. American forces must adjust to the limits imparted by geographical and environmental conditions to offset the enemy advantage.

Mountain warfare dictates that combatants redefine their tactics and operational approaches to isolate and destroy these natural makeshift forts. Creating that isolation requires artillery. However, to fill that requirement the artillery must become mobile and directly support a limited number of infantry with a significant volume of fire to reduce and destroy these positions. The example of the Soviet Union's forces in Afghanistan points to the utility of using the full spectrum of indirect weapons systems from mortars to rockets, towed cannon, and self-propelled howitzers. They further reveal that field artillery can provide a useful and leading role in shaping operations and can directly defeat known insurgent defenses.

According to Bard, the United States Army's institutional memory remains short and neglects the fact that the field artillery proved effective in massing fires for decades in full-spectrum operations. Whether for offense, defense, or in deterring enemy forces, the artillery facilitated operational success in numerous contingency operations. Maneuver commanders rely upon the presence of artillery to provide "firepower insurance" – having organic or assigned artillery capabilities present for any eventuality.

Certainly fighting in rugged terrain with artillery presents difficulties, but the case studies reveal that it is possible to use all types of artillery effectively and well beyond the confines of forward operating bases in Afghanistan and in the greater region of Southwest Asia. American forces need weapons that can destroy a smaller force in terrain not suitable for the current arsenal.

Editor's note: This article was originally published in the 2010 Small Wars Journal. The Fires Bulletin would like to thank Major Joseph A. Jackson for his permission to republish this article.

Major Joseph A. Jackson is a U.S. Army Field Artillery officer currently serving his second tour on the NATO Training Mission – Afghanistan staff. He has deployment and combat experiences in Bosnia, Korea, Iraq, and Afghanistan. He earned a bachelor's degree in history and Russian from Purdue University and master's degrees from the U.S. Army Command and General Staff College and the School of Advanced Military Studies.

An interpreter shakes hands with a man in the village of Bidak, May 9, 2010, Logar province, Afghanistan. U.S. Army Soldiers assigned to the 173rd Brigade Support Battalion visit the village frequently to conduct security checks. (Photo by SPC De'Yonte Mosley, U.S. Army)

Interpreter Management 101

By CPT Brandt A. Murphy

Deploying to a combat zone will offer several different types of new challenges and obstacles that platoon leaders/fire support officers will encounter. One that is seldom, if ever, trained for is utilizing a local national linguist and getting to know them and earning a mutual respect for each other as well. Interpreters understand the overall mission of the U.S. military and why we are in their country but will not truly open up to you as their supervisor until you take a sincere interest in their culture. The following should act as an anecdotal guideline for establishing a positive working relationship with your interpreter so that your mission capability is not only enhanced, it is greatly multiplied.

The need for assistance. Interpreters play a vital role within the entire brigade combat team from the battalion level to platoon as well as squad-sized elements. There are always situations arising from the local populace that will require the attention of your linguists; whether it is giving aid to the patrol as it passes through a town or translating documents in order to help a unit's campaign to win hearts and minds. Furthermore, the situation will always dictate what decisions leaders make when adjusting to tactics, techniques, and procedures of the insurgency which is why the local national interpreter is a great tool that leaders on all levels are afforded. Generally speaking, the brigade and battalion level linguists will accompany the commander on the larger scale meetings with members of the local government and tribal leadership. Alternatively, company and platoon level linguists will be the ones who are out on patrol with the platoons in order to gather intelligence about the developing battle space.

Cultural and religious nuances. Since the vast majority of Iraq is Muslim, a common error made by leaders is to assume that Iraqi citizens will inherently be forthcoming and friendly to an interpreter simply because he/she is Iraqi or Muslim. The split between Sunni and Shi'i is incredible because one group will not trust or be very suspicious of the other simply because of the differences between the interpretations of the Muslim religious texts. Sheiks will always be courteous when an American patrol comes to visit but may be quite uninviting towards a linguist if he suspects the linguist is from another part of the country or does not follow the same Muslim sect as he does. This will hinder intelligence gathering with local leaders. Always be careful to take the cultural differences into consideration when selecting which interpreter will accompany you on missions – it will be very beneficial.

Rules of engagement. Each battalion should be assigned several interpreters upon the unit's arrival to the battle space. It is in everyone's best interest as a platoon leader/interpreter manager to meet each interpreter who is assigned to the company/battery and get to know a little about them during the first meeting. They in turn will want to know all the unit's information. They will also want to know who their main point of contact will be. This person is usually a lieutenant and it is imperative this person foster a professional relationship with him/her in order to maximize the benefit of the linguist. Typically, one interpreter per platoon will be assigned with a few extra interpreters in the company. This will allow flexibility in the patrol schedule.

It's important to note that each interpreter will request "off" time to spend with their families. Each unit should have an SOP for interpreters' work hours and days off. For example, while I was

Forward Operating Base Bullard, Zabul-Rock, the unit interpreter, and 1LT Sal Corma, platoon leader (right), talk to a local in the village of Pasani, April 26, 2010. Teams from the Alpha Company, 1st Battalion, 508th Parachute Infantry Regiment find out information to help local communities through visiting and relationship building. (Photo by SrA James R., Bell, U.S. Air Force)

in Iraq, qualified local nationals were hired to work with the U.S. military, and current contractual agreements stipulated interpreters were to receive no less than four days off per month. Having this information allowed me to plan around each interpreter's needs for "off" time. Granted, some needed more time off than others (and they will be pretty creative in order to get it) but it is inherent upon the unit's POC to deem how much time will be allowed in order to maintain the unit's readiness. Most importantly, I suggest sitting down with all of the interpreters to establish guidelines and expectations.

Who they belong to. Being contracted through the U.S. military, the local national linguists belong to the brigade in which they were assigned. However, battalions should receive several linguists upon request. The battalion will then assign them to a respective company, who then supports the requirements of each platoon. The POC's role is to place an interpreter into a platoon based on need. For instance, if there's an interpreter who needs a lot of time off each month, it is advisable not to assign him/her to the company's main effort. Perhaps that interpreter could be better utilized as a document translator who may facilitate contracts or training when tasked to train the host nation's security forces. Also, be mindful of the physical condition of each linguist. Do not put an overweight interpreter with the platoon that is tasked to conduct several hours of foot patrols per day.

Managing problems. The POC functions as the interpreters' manager, by making sure they are working and that they get paid for the amount of time they do work. Inevitably they will have problems. Count on it. It's the POC's job to take each of their concerns and address them at the lowest level first and then consult battalion representatives – if needed. Typically, the linguist will have complaints about pay or time off. If the POC sets parameters properly, they will understand and uphold the contract that they willingly signed. It is acceptable and almost advised to bend every now and then in order to maintain rapport and trust with each interpreter as necessary, but it is highly advisable to not establish a relationship of always giving in because of a busy schedule or apathy. If each POC proves themselves to be forthcoming and trust worthy, most interpreters will do almost anything to ensure the unit succeeds. If they are not, well, most interpreters will either quit or be just as apathetic.

Before, during, and after a mission. The platoon leader should have a generally well established and grounded relationship with his/her interpreter as the deployment goes on. It is usually the case that the POC will notify the linguist a few hours before the next mission so as to allow the linguist to prepare for it. It is important to note that it's never acceptable to share a week or month's worth of mission plans with an interpreter. A good standard is to notify him about six hours in advance so that he is not surprised by a hasty mission, although they will occur. It is acceptable to allow the interpreter to sit in on the patrol brief prior to leaving because he may be able to offer information about a certain area the unit may pass through.

During the mission, always ensure the interpreter rides with the patrol leader so as to give that ground commander the tools for success when a problem arises. If taking two, allow for them to be split between the patrol leader and the next highest ranking NCO. Each linguist should be issued body armor by the supply chains. Make sure that they wear this on missions. It is vital to have an interpreter feel safe during a mission in order to allow him to do his job. Also, wearing the armor will allow him to identify with the unit he is working for.

Do not leave your interpreter in the vehicle when dismounting as that will negate the need for him to join the mission. When dismounted, always speak to the person whom you are addressing, not the interpreter. It is considered rude to speak solely to the interpreter when addressing a local. It is always OK to clarify with the linguist before trying to get a point across to a local national. Remember, there are several meanings and differences for words and terms between Arabic and English.

After returning to base, be sure to debrief the interpreter to see if there was anything that may have missed while on patrol. Perhaps there were less children playing outside than usual. This may be an indicator of an impending attack upon coalition forces. This kind of information will be more available once a solid rapport and professional working relationship has been established with the interpreter. Also, always notify him/her of the next mission if it is not too far off.

As a POC and platoon leader, the more interaction with an interpreter the easier it becomes to gain his trust and loyalty. It is advisable to measure his reactions to words spoken during a mission in another language. Be mindful to hone in on these gestures and subtexts portrayed by the linguist. It will give insight to how he is

performing when it comes to speaking with the local populace and gathering intelligence in support of the company/battalion's mission.

Timesheets. An interpreter is paid for the days he works. In order to keep track of this, the contracting company utilizes a timesheet which is completed by the POC and verified by the interpreter. Always ensure that the employee name matches the master roster provided by contracting company as the names are often misspelled from document to document. Copy the name right off of the linguist's employee badge provided by the contractor. Failure to ensure the names match could cause the timesheet to be denied or returned for corrections which could, in turn, hold up the payment process. Failure to keep track of days worked and turning in time sheets in a timely manner guarantees there will be problems. Not only will the interpreter miss a paycheck, but he/she might quit because the lack of pay directly affects their livelihood. Denying interpreters their pay is a good recipe for a minor revolt.

Upon notification of pending payouts by the contracting manager, it is the POC's responsibility to ensure the interpreter is able to receive payment. In order to achieve this, coordination for the linguists to return to the forward operating base must be made or the pay agent must come to unit's location.

If a deadline is missed for a timesheet turn in, the POC must contact the contracting regional manager in order to see if there are any "work-arounds" available. Be careful not to abuse this privilege because too many missed deadlines will cause an irreversible repair to the entire process.

Letters of recognition/recommendations. Interpreters are proud to work with the U.S. military. They will always ask for something to remember the unit by. Also, if they have done a good job it is necessary to reward them. The most effective way to accomplish this is by making them a personalized certificate of appreciation. This not only thanks them for the unit's successes, it will help them to keep their job by acknowledgment when the next unit deploys to the region. Also, many linguists seek a new start in the United States. Often, they will ask the POC to help them by writing a memo which describes the length of service and the unit that employed him. This is a vital step towards citizenship. Often, the linguist will display incredible aptitude and a burning desire to become an American citizen. If you have any doubts about the interpreter's motives for wanting to become a citizen, discuss the situation with the unit commander and make the decision to either support or decline such requests.

Alternatively, if the interpreter is displaying poor qualities of a contracted worker then he should be released. The non-quality linguist only hinders the success of a mission by refusing to go on patrol or not showing up for work at all. It is never the case where a poor linguist deserves his job. He must work to keep it and earn the unit's trust.

Getting a head start. In conclusion, there are several different areas of linguist management that most likely will not be covered in pre-deployment briefings. This article, when utilized and referenced, will allow a head start when assigned as a POC or receipt of a first local national linguist. Be sure to keep a positive and open dialogue with the interpreter and common respect and courtesy by the interpreter will be ensured. Treat them how you would like to be treated. Finally, remember they are not in the military and cannot handle the same amount of stress and work that most Soldiers do on a daily basis.

Captain Brandt A. Murphy is currently assigned the executive officer at Headquarters and Headquarters Battery, 3rd Battalion, 16th Field Artillery Regiment, 2nd Brigade, 4th Infantry Division at Fort Carson, Colo. He deployed in support of Operation Iraqi Freedom 08-10 from Sept. 3, 2008 to Aug. 19, 2009 with Delta Company, 2nd Battalion 8th Infantry Regiment. While there he was stationed on Forward Operating Base Echo and Combat Outpost 4 in Diwaniyah, Iraq as well as Forward Operating Base Basrah and Camp Sa'ad in Basrah, Iraq.

SGT Bill Hunter with the 2nd Battalion, 87th Infantry Regiment's Counter-IED team and his interpreter, 'Mari' (left), speak with an Afghan man and his wife while their vehicle is being searched by Soldiers during a Traffic Check Point in Wardak province, Afghanistan, June 13, 2010. The interpreters are valued members of the mission as they not only assist with relaying instructions and information, but also have the ability to put local nationals at ease when dealing with the Soldiers. (Photo by SGT Rob Frazier, 5th Mobile Public Affairs Detachment, U.S Army)

A Global Missile Terrestrial High-Energy

By Howard Kleinberg

"Victory will smile upon those who anticipate changes in the character of war, not upon those who wait to adapt themselves after changes occur"

- LTG Giulio Douhet, The Command of Air

Mobile, Terrestrially-Based High-Energy Lasers form the cornerstones of a network of weapons with which to defend the U.S. and its allies around the world against ballistic missile attacks from virtually any source this globe-spanning defense system, on land, at sea, and in the air, but not in space.

Space-based laser relay mirrors are the key enabling technology and global force-multiplier for this defense force, freeing up the laser sources to be terrestrially-based. In that way, they can be made as large as they must be, and to be based wherever feasible, so long as they are sufficiently numerous, globally deployable and mobile, making the collective 'Laser World-Wide Web' robust and strategically effective.

A ballistic missile's flight is comprised of three segments, or phases, according to the Missile Defense Agency's, 2004 "Ballistic Missile Defense Challenge Fact Sheet."(See Figure 1 below).

Boost Phase: The first phase is the initial, rocket-propelled 'boost' segment, in which the missile burns its fuel in order to depart the Earth's surface and exit the atmosphere into space. While its motors are firing, a boosting missile burns enormous quantities of highly combustible fuel, generating immense amounts of heat. Infra-red sensors can detect a boosting ballistic missile's heat plume from great distances away, especially from space, making such an event relatively easy to detect, according to the 2009 Independent Working Group's work on Missile Defense "Space Relationship, and the Twenty-First Century," by Robert L. Pfaltzgraff and William R. Van Cleave.

Another important aspect of the nature of a boosting ballistic missile is that in order to accelerate the missile's payload to the necessary velocity and loft it out of the atmosphere, all of the missile's contents must be contained with the missile until all the boosting is done. As the Independent Working Group points out, a boosting missile is a very 'rich' target, indeed; all of its destructive cargo can be destroyed simultaneously, just by striking one big, relatively slow, glaringly obvious, combustible-laden target. A ballistic missile is thus easiest to find and kill in its boost phase.

However, the boost phase is also the toughest phase in which to actually reach it. According to information provided in 2004 by the Missile Defense Agency, a missile's boost phase only lasts between 180-300 seconds. Any boost-phase missile-defense system must detect, decide, launch and fly out to intercept a boosting ICBM within that time-frame, severely curtailing the effective range of any boost-phase interceptor missile. Like its target, a boost-phase interceptor missile must also leave the ground, climb and accelerate to catch its similarly-climbing-and-accelerating target. As a consequence, surface-based boost-phase missile defense is severely range-limited. This is only achievable for defense against missiles from smaller, geographically-accessible states such as North Korea and to, a lesser extent, Iran. Boost-phase interceptions are impossible in most cases against Russia and China, which boast much greater interior distances from their borders to their missile launch areas, i.e., much greater strategic depth. Worst of all, according to the 2000 International Institute for Strategic Studies' Adelphi Paper, "Ballistic Missile Defense and Strategic Stability," by Dean A. Wilkening, these very same states also possess the most numerous, and dangerous, of the ICBMs that could be aimed at the U.S.

Effectively, the same sorts of range limitations apply to the Airborne Laser Test Bed. Its laser-weapon can reach hundreds

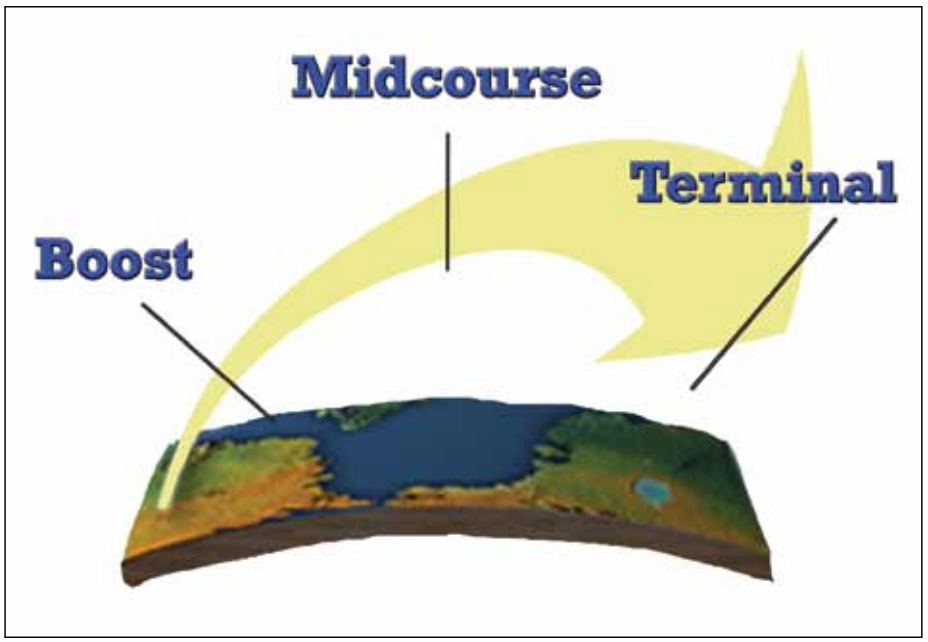


Figure 1: Diagram of the Three Phases of a Ballistic Missile's Flight

Defense 'networK'

Lasers and Aerospace Mirrors

Part 1 of 2

of kilometers into enemy territory, given that it is a line-of-sight, at-altitude weapon platform, putting boost-phase missiles into its near-instantaneous reach. However, its chances of intercepting a lofting ballistic missile are limited by the line of sight to the Earth's horizon (since a laser beam travels in straight lines), atmospheric absorption and distortion, and the less-than-100 percent probability that it will be both airborne and within range at the very moment a ballistic missile is fired.

Midcourse Phase: The second phase is the unpowered, 'midcourse' phase, during which time the missile's payload travels outside the atmosphere on a ballistic trajectory towards its target. Exoatmospheric travel exploits the airlessness of space to avoid air drag, maximizing the achievable range. By the midcourse phase of a ballistic missile's flight, the weapon has expended all of its propellant, completed its boosting process, and exited the atmosphere. In the airlessness of space, any and all warheads are released from the confines of the missile's nose-cone section and set adrift to follow their requisite ballistic trajectories. Worse, countermeasures can now be deployed: chaff, decoys, spent booster stages (especially if they are deliberately fragmented), and housing shrouds, can all be used as clutter with which to deceive defending sensor systems, and conceal the real weapons. In the airlessness of space, all objects behave in the same manner, regardless of their shape or weight. The Missile Defense Agency points out that this presents multiple targets for the defenses to sort out and intercept, rather than just one.

However, midcourse weapons have little or no maneuvering capability, and are set on their trajectories until they re-enter the atmosphere. Ballistic missiles spend most of their flight-time in this mid-course phase, as long as 20 minutes for ICBM payloads. This phase also affords the longest time during which to engage these targets. That and their relative inability to maneuver or change direction beyond their ballistic trajectory during this phase, make them vulnerable to defensive weapons.

Challenges facing defenses in the midcourse phase are twofold. First, the defenses must correctly discriminate between warheads, decoys and countermeasures, usually over distances of thousands of miles. Second, the travel time for a ground-based interceptor may mean that only one round of interceptions can be attempted during this time. Thus, while the midcourse phase is the longest time-window in which to attempt an interception, it is also the most complex and time-consuming stage to do so.

Terminal phase: The third and final, 'terminal' phase is the one in which the missile's warheads reenter the Earth's atmosphere and deliver their destructive payloads onto their targets.

During this phase, the warheads and countermeasures reenter the atmosphere at extremely high speed. The warheads are designed to survive atmosphere-reentry heating to reach their ground targets. By contrast, air drag will cause any chaff and decoys to either lag behind the warheads, or burn up in the upper atmosphere, 'separating the wheat from the chaff' (sic). The terminal phase is thus inherently 'self-discriminating,' with only the warheads surviving reentry to the lower atmosphere, separating them out for targeting.

However, three very difficult challenges must be met in attempting interceptions during this phase. First and foremost, warheads entering

Boost	•Duration (sec): 180-300 •Advantages: "Rich" compacted-threat target. Slow-moving target. Climbing target. Highly IR-visible target. Missile physically vulnerable. •Disadvantages: Limited distance. Getting there in time to effect interception.
Midcourse	•Duration (sec): 1,200 •Advantages: Time to 'scan' and distinguish bogies. Time to send interceptors. •Disadvantages: Long distance to intercept. Lots of clutter to sift through. Warheads can disperse. Risk of missing one or more warheads. Only one or two round of shots at targets.
Terminal	•Duration (sec): 30-60 •Advantages: Warheads are separated from decoys and countermeasures. •Disadvantages: Very little time to engage and destroy warheads. Must engage ALL warheads. Warheads can be dispersed. Risk of missing one or more warhead. Only one round of shots at targets.

Table 1 provides a summary of the three phases of a ballistic missile's flight, with an emphasis on the advantages and disadvantages of defending against each of the flight phases, according to the 2004, staff fact sheet from the Missile Defense Agency's, "Ballistic Missile Defense Challenge."

the lower stratosphere take only 30 to 60 seconds to complete their transit and strike their ground targets. Second, this is the last chance for the defenses to stop the warheads, so it must intercept all that remain. Third, the warheads are at their most spread-out point, forcing the defender to either cover all of its terrain, or to cover only its highest-value areas or assets. Fourth, more technologically advanced states such as Russia possess Maneuvering Reentry Vehicles, which can glide and maneuver at ultrahigh speeds, making them even more difficult to intercept.

The terminal phase is the shortest time-period of all in which to intercept a ballistic missile's warheads, once again requiring very high-performance weapons, as with boost phase defenses. Also as with boost phase defenses, interception ranges and thus coverage zones are very limited for terminal-phase defenses.

Of all the phases of a ballistic missile's flight, the boost phase is the best time in which to detect, target and destroy the missile. During this time, the missile is a large, slow, vulnerable, singularly 'rich,' and glaringly obvious target. This densely-packaged, fully-fuelled 'flying bomb' reduces the defense's burden from having to distinguish and kill any and all small, ultra-rapid warheads, to being able to kill everything at once. Finally, the debris from a BP-downed missile (possibly including WMD warhead contents) would most likely rain back down onto the state that launched it, well away from the defended territories.

By contrast, the later the phase, the more difficult becomes the task of successfully stopping the consequences of a single missile's launch. The later the phase, the more targets there are, the faster they are going, the more spread out they become, and the more complicated the detection and targeting problem becomes. This is not to say that midcourse or terminal phase defenses are impossible or impractical, for they are neither. Rather, the defense should not have to count solely on these latter and progressively more difficult phases as the primary zones of engagement, but should perforce cull the incoming numbers of warheads as early and as expeditiously as possible.

Boost-phase is the best time to kill a ballistic missile; however, it is also the most difficult to reach, especially against those most dangerous of targets, Chinese and Russian ICBMs, which are typically based well inland and far from their borders. The same holds true for submarine-launched ballistic missiles (scattered and concealed beneath the Earth's oceans.) Russian ICBMs also often carry multiple warheads, are carried on mobile launchers, and laden with countermeasures. This access-restriction applies to both ground-based and air-based boost-phase defense systems.

Boost-Phase Kinetic-Kill Defenses cannot be land-based. As described above, no terrestrially-based boost-phase interception missiles, whether land, sea, or even air-based, have sufficient range to intercept Chinese and Russian ICBMs, or those of any other power with sufficiently large inland or internal distances from their borders. Further, in his research, Wilkening also showed that starting an interception from a 'standing start' on the ground, critically handicaps the interceptor weapon, regardless of its type, ultimately constraining its usefulness.

There are other complications involved in planning and positioning terrestrial-based BP interceptor missiles. First, in the case of land-mobile ballistic missiles, there is considerable uncertainty as to the location of their launch sites, which greatly complicates basing calculations for both land and sea-based missile defenses. Even air-based missile defenses might be out of position when the missile is launched; and once the missile is aloft, any aircraft is effectively 'standing still' by comparison. Then there is the problem of geography, wherein borders and coastlines, and politics, may prevent terrestrial BP missile-defense systems from being placed in locations from which they can provide effective defenses. Even air-based defenses must obey international borders, or risk triggering a war. Further, the basing problem is multiplied for boost-phase defenses against submarine-launched ballistic missiles, which could virtually be fired from any of the Earth's oceans. Evidence of this contention, taken from a *Washington Times* article, "Obama's Gutless Missile Defense Policy," by Michael Turner, lies in the 2009 cancellation of the Kinetic Energy Interceptor Program.

Optimization of boost-phase defenses. Nevertheless, all things considered, the best time in which to intercept a ballistic missile is during its boost phase. The key to unlocking this challenge lies in finding and exploiting the best possible BMD basing medium. What is needed is a system that can somehow be or get close enough to engage a boosting missile launched from any location anywhere in the world that threatens the U.S. or its interests, and can cover any potential launch site on the earth's surface, regardless of its nature, land or sea. Such a system must also defend against Submarine-Launched Ballistic Missiles full, as much as ICBMs. Such a system must somehow also comply with international treaties, to legally surmount issues of borders or sovereignty. It should further be capable of the following: achieving as high a maximum speed as possible, to reach its targets as quickly as physically possible, enough to enable repeated attempts; afford the greatest possible ranges and probabilities of success; and, be 'on duty' at all times, and positioned or within range to engage boosting missiles (especially ICBMs) anywhere on earth, with as few deployed weapons as necessary.

However, it is for the longer term future, in which missile, especially ICBM threats, are foreseen to be growing worldwide, that an answer must be found that can defend against all such threats. There is a solution, which can only be fully provided, and fully covered, from space.

Obviously, there is no way to cover the entire Earth with ship-based, land-based, nor even air-based limited-range boost-phase interceptor missiles; that would require thousands of weapons, far too expensive a proposition even for the U.S. This is not to say that the current generation of ground-based boost-phase BMD systems, such as KEI and ALTB are unneeded. Quite the contrary, they are vital answers as part of the layered defenses against the near to mid-term threats of rogue states with short-range, medium-range, and intermediate range ballistic missiles, with coastlines and internal territories small enough to be covered with these weapons, from one direction or another. In the longer term, they would still provide the ability to reinforce the defenses, in and around vital areas, such as major cities and military bases. However, it is for the longer term future, in which missile, especially ICBM threats, are foreseen to be growing worldwide, that an answer must be found that can defend against all such threats. There is a solution, which can only be fully provided, and fully covered, from space.

Advantages of space-based weapons for missile-defense. Space-based weapons, for missile defense, have many critical advantages over terrestrial-based systems. The first and foremost of these is the old real-estate adage, 'location, location, location.' Objects in orbit circle the globe in as little as 90 minutes. According

to James G. Lee, with the U.S. Air Force Air University, speeds are typically as much as 4.5 miles per second in Low Earth Orbit (LEO), granting them as much initial velocity (more, with booster motors) as is technologically possible, while still being located near the Earth. From LEO, they have as little distance as possible to reach a boosting BM, while still being in orbit proper. In fact, Lowell Wood described in "Ballistic Missile Defense in an Ideal World," they would most likely follow a downward path from their orbital altitude to effect an interception of a boost-phase missile, giving them maximum advantage in an intercept flight. In all, Space-Based Ballistic Missile Defense weapons have an immense advantage of speed over their ballistic missile adversaries, since they are already going faster than their targets ever will, i.e., at orbital velocity, and will add even more speed (i.e., more mi/sec.) in the process of boosting and descending to intercept their targets.

Second, under international law, space-based systems are legally entitled to overfly any place on Earth at any time they do so. In addition, Lee showed, objects in orbit overfly the same points and areas on Earth many times a day, every day, for spans of years or more. Even if international law prohibited space overflights, the complexity and cost of stopping objects in space would limit the possibilities of doing so to a very few states (at least at present.)

Third, objects in space have the advantage of height, always a critical advantage in warfighting, and one that gives the added advantages of line of sight (range), descent, speed, and range, especially with respect to a boosting ballistic missile target as it struggles up out of its ocean of air, up out of Earth's gravity well, from far below. Space-based objects also have the advantage of persistence, since they lose speed and altitude only very marginally, enabling them to remain in orbit for years. Such devices are also necessarily automated. Thus, all of these aspects enable space-based missile defenses to remain active, in service, and always 'on duty' for several years straight.

Fourth, and arguably the greatest single advantage of SB-BMD weapons, is their inherent force-multiplier effect. As Gregory Canavan observed in his article, "Estimates of Cost and Performance for Boost-Phase Intercept," any single space-based weapon can replace hundreds or even thousands of ground-based weapons to cover the same territory. This is because an object in space will sweep over the entire globe, covering a swath of ground, and air, for thousands of miles on either side of its flight-path. This same "force-multiplier" effect holds true for space-based weapons when compared with sea-based forces, though the latter's greater mobility and freedom of movement reduces the advantages somewhat. However, like their land-based counterparts, sea-based weapons must also climb out of the earth's gravity-well and atmosphere, with zero initial velocity and altitude, the same constrictions that apply to all surface-launched systems.

Finally, SB-BMD weapons would be placed in orbiting 'bands' of interceptors in approximately the same orbits, providing both continuous coverage of target regions, and affording multiple opportunities to intercept any given ballistic missile throughout its flight, although this depends upon the interceptor's boost capabilities. Further interception opportunities are available in the missile's midcourse and even terminal phases as much as the boost-phase, according to Pfaltzgraff's and Van Cleave's 2009 report, "Independent Working Group on Missile Defense, the Space Relationship, and the Twenty-First Century."

ASAT Defense. China's January 2007 ASAT test, in which a weather satellite was destroyed, was a wake-up call for the seriousness of space warfare in general, according to Craig Covault's article in *Aviation Week and Space Technology*, "Chinese Test Anti-Satellite Weapon." It was also no mere 'experiment,' as the Chinese government claimed, but was, in fact, a live-fire test of a full-up weapon system. After all, this weapon was fired from a road-mobile launch platform, a decades-old ballistic-missile combat-basing mode designed to evade preemptive- or counter-strikes, as Amy Butler explains in her 2007 article, "Chinese ASAT Strike Was Third Try, Had Mobile Element," which also ran in *Aviation Week and Space Technology*.

Fortunately, this recently-revealed, real-world ASAT threat also brings a silver lining in it. As is the case with ballistic missiles, SB-BMD weapons can also defend against ASATs. All ASATs, at least, whether direct-ascent or co-orbiting, must first be launched from the Earth's surface, regardless of the launch platform, and must first go through a boost phase.

Indeed, this nearly-operational ASAT system is the logical consequence of a Chinese national military policy that calls for the development of capabilities to destroy satellites as part of a greater, anti-U.S.-access warfighting strategy, towards its long-stated goal of eventual "reunification" of Taiwan by force, according to Larry Wortzel, in his 2003 article, "China and the Battlefield in Space."

Fortunately, this recently-revealed, real-world ASAT threat also brings a silver lining in it. As is the case with ballistic missiles, SB-BMD weapons can also defend against ASATs. All ASATs, at least, whether direct-ascent or co-orbiting, must first be launched from the Earth's surface, regardless of the launch platform, and must first go through a boost phase. And since SB-BMD provides the single best way to stop any such missile attack from taking place, Robert Butterworth, suggests in his article, "Assuring Space Support Despite ASATs," it would also provide the single best way to defend against ASAT attacks; same mission, different payload inside the threat missile.

SB-BMDs could also intercept ASATs in other phases of their flight, at least within lower Earth orbit. For instance, the Missile Defense Agency's GMD can intercept ICBM warheads at the peak of their trajectories, some 1,100 km (500 miles) or so. Similarly, an ASAT (direct-ascent or co-orbiting) on terminal approach towards a satellite in LEO would present a target of comparable size, density and velocity as a "mid-course" ICBM warhead (if not even larger), at a similar altitude, and possibly similar speed and trajectory. As a result, the ASAT could also be targeted and intercepted by a midcourse-defense-capable SB-BMD weapon, in addition to its primary role of boost-phase defense, giving a "second-chance" round of shots with which to try to stop any ASAT.

Disadvantages of Space-Based Missile Defenses. There are, of course, limitations to SB-BMD systems. First and foremost among these is that their orbits cannot be varied either easily or greatly, meaning that there is little scope for freedom of maneuver to change a SB-BMD system's orbit over time. Next, the scope, duration, and view/reach/range depend on the nature of the orbit in which the object is initially inserted. And, since an object in orbit is 'coasting'

virtually all the time, its motion is predictable, enabling any space-savvy adversary to evade or target orbiting defenses. According to an 2006 article in *The Space Review*, "Military Space Systems: the Road Ahead," by Matthew Hoey, this particular issue of vulnerability to attack will eventually drive the development of either passive or active defenses with which to defend the constellation itself, as and when adversaries develop ASAT weapons. Further, the total amount of orbit-changing possible is currently limited by the quantity of onboard fuel that the device is initially supplied with. While on-orbit refueling and repair is currently under investigation, it is not currently slated for active implementation, and is only in the initial investigative phase. However, it can be done, as was illustrated by the successful test operations carried out by DARPA's Orbital Express spaceflight experiments in 2007. Caravan found that if no on-orbit replenishment/repair system is available at the time of deployment of a space-based weapon array, the constellations themselves would have to be replenished as the elements exhausted their maneuvering fuel, expired, were expended, or rendered obsolete. This would be an expensive, complex, ongoing, and nontrivial process.

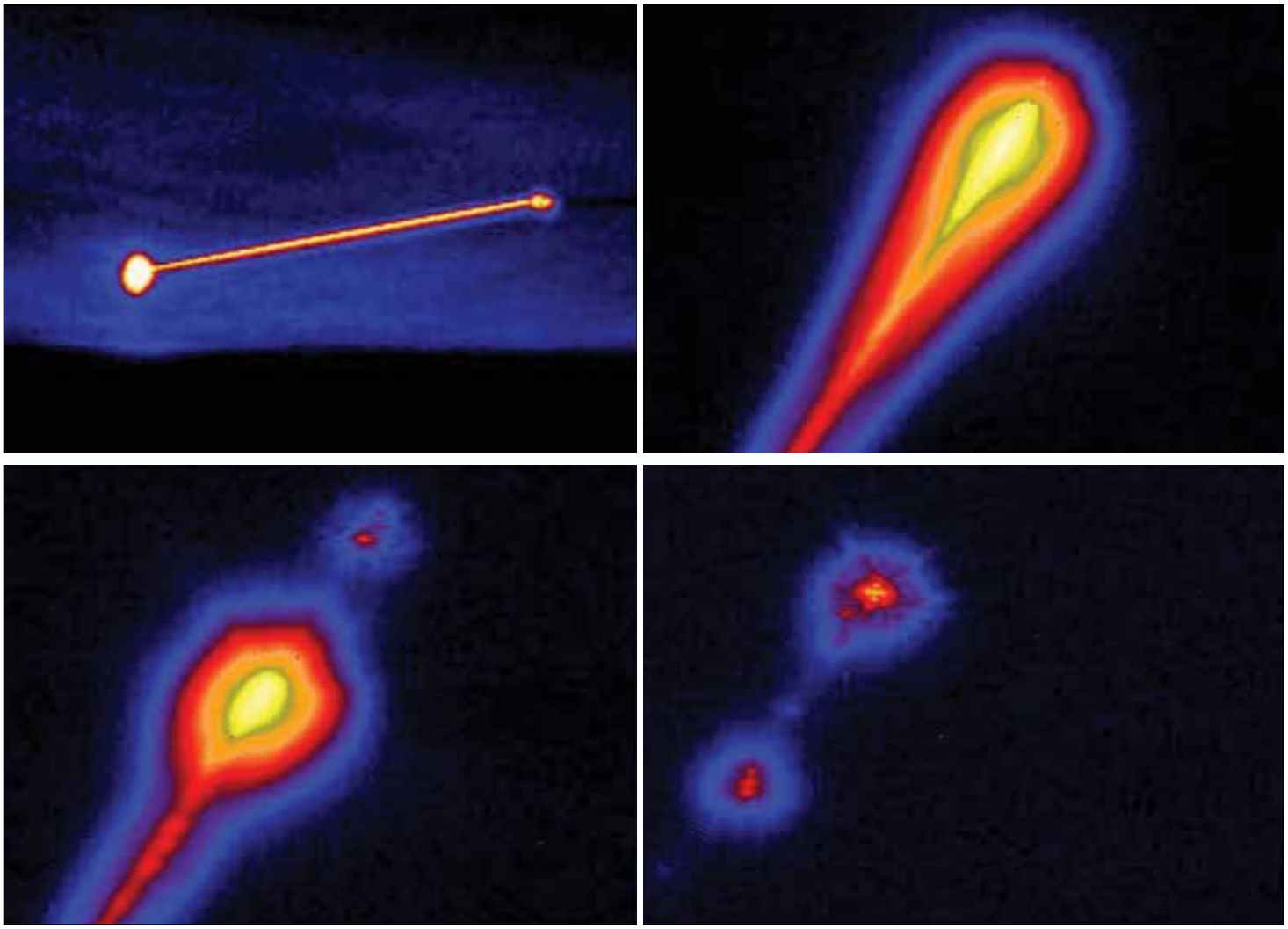
Another potential disadvantage is that any single weapon is unlikely to be in a position to engage a boosting target at any given time. Given the approximately 25,000 mile circumference of a LEO orbit, and a hypothetical 2,000 mile weapon range, any single weapon is only in a position to fire at any given target for about eight percent of its orbit. This problem can be overcome with sheer numbers, i.e., by distributing numbers of interceptors in constellations throughout the same orbit, so that at least one is always within range of a launch-site of threat-zone at all times. Caravan also found this coverage effect can also be enhanced by concentrating 'bands' of interceptors in an orbit that overflies the threat or region of threats of greatest concern. It is, in effect, akin to deploying a long series of missile-batteries on a non-stop, high-speed, high-altitude, 25,000 mile-long conveyor-belt, albeit one that is also endowed with the tremendous advantages of immense starting speed and height, and is available 24 hours-a-day, seven-days-a-week, for years on end. In all, this innate behavior of orbiting objects of circling the globe in as little as 90 minutes, at greater speeds and heights than anything else currently possible, and on a constant, always-on-duty basis that lasts for many years, gives space-based systems profound combat advantages over any other missile-defense basing mode.

Space-based weapons, precursors and the path forward. Over the past 40 years or so, several prospective concepts and technologies for space-based weapons were proposed as a means of providing effective defenses against ballistic missiles. These designs, to the varying extents to which they were developed, are reprised here. In essence, these weapon designs fall into one of two types of space-based weapons, kinetic-energy and directed- energy. KE uses extremely high 'hyper-velocity' impact speeds to destroy a target. DE uses focused beams of high-intensity electromagnetic energy to damage or destroy a target. Both approaches have great potential for SB-BMD, as is discussed in the following sections.

Brilliant Pebbles. The original space-based kinetic-energy-kill weapon, Brilliant Pebbles was a critical component of the Reagan administration's strategic defense initiative program in the 1980s. Indeed, Brilliant Pebbles was by far the most mature of all the SDI weapon programs, and was ready for RDT&E as a deployable weapon system, back in that era. It was to have been deployed in large numbers in LEO to defend against Soviet ICBMs in their boost and midcourse flight phases, with some terminal phase capability inherent in the system, as well.

Contrary to popular misconceptions both then and now, the technologies underlying BP were entirely viable at that time, as was proven in the Clementine I lunar-orbiter and ASTRID flight test programs of the early 1990s. The original cost to deploy 1,000 interceptors was slated to be $11 billion in 1989 dollars; this figure would be $16.4 billion today. A constellation of this size is estimated

The YAL-1A, a modified Boeing 747-400F known as the Airborne Laser, lands at Edwards Air Force Base, Calif. The Airborne Laser Testbed successfully destroyed a boosting ballistic missile Feb. 11 over the Pacific Ocean. (U.S. Air Force photo)



An infrared image of the Missile Defense Agency's ALTB (right) destroying a threat-representative short-range ballistic missile (left). Then, clockwise, beginning with photo in upper right corner: The sequence of events in the recent ALTB demonstration. (U.S. Missile Defense Agency photo)

large-scale ICBM attack from Russia.

The salient point of the Brilliant Pebbles legacy is that all of the relevant technologies for kinetic-energy SB-BMD were viable and flyable in the 1990s, some 20 years ago, and were ready for several years before that. The debate over the viability of a space-based BMD system was also effectively ended in the affirmative, that long ago. As Brilliant Pebbles' creators point out, producing such a defense today would only require the 'resurrection' of its technologies. Indeed, the relevant avionics, sensors and guidance algorithms have leapt ahead by some 5 generations or more since the original development work in the early 1990s, at least in the form of the current generation of U.S. ground-based KE BMD weapons. Brilliant Pebbles-like weapons would form the optimal basis for a first generation of U.S. space-based missile-defense systems, according to Pfaltzgraff and Van Cleave.

Space-based lasers. Laser energy travels at the speed of light, the maximum speed possible for anything in the universe; and, it also travels in a straight line. These factors vastly simplify the aiming process needed to strike even the fastest-moving material targets with a laser, according to Douglas Beason's book, "The E-Bomb – How America's New Directed Energy Weapons will Change the Way Future Wars Will be Fought." A system that can generate and accurately aim a beam of laser light of sufficient power (High-Energy Laser, or HEL) would be highly capable of shooting down ballistic missiles, particularly in their vulnerable, 'lucrative' boost phase, as discussed above. The problem then becomes one of basing, and of placing the weapon within line-of-sight range of the missile's launch-point or flight path, without exposing the laser-source itself to attack.

However, ground-based lasers are the least viable weapon system for boost phase interceptions, since they would face the same political contentiousness and range limitations that ground-based interceptor-missiles would face. Worse, the range of the GBL would be limited by the Earth's horizon. And finally, their locations would be fixed, known and easily targeted.

The other two options for basing a laser weapon considered during the SDI era were air- and space-based laser platforms. The now-proven Airborne Laser Test Bed (Left) is the airliner-based platform currently under full-up flight testing by the Missile Defense Agency. Indeed, its recent successful test (See above) ushers in a new era of defense against ballistic missiles. However, even the ALTB's direct-line-of-sight range of 'hundreds of kilometers' limits its usefulness to such geographically-smaller (and less politically contentious) threat states as North Korea and Iran, according to Wilkening's research.

By contrast, a Space-Based Laser (as depicted in Figure 4) would have the effectiveness-multiplying advantages of greatest-possible altitude and speed of an orbiting spacecraft, in addition to the optical clarity of the vacuum of space, all boosting its reach and operating range considerably. This concept, shown in "An Illustrated Guide to Space Warfare – 'Star Wars' Technology Diagrammed and Explained," by David Hobbs, was also part of the strategic defense initiative. However, unlike Brilliant Pebbles, the necessary high-energy-laser beam-generation technologies never matured sufficiently to achieve

any flight testing.

Space-Based High-Energy-Laser-Relay Mirrors. Space-Based Laser Relay Mirrors are another technology that was flight-tested proven during the SDI era. Its purpose was to provide a means of extending the range and reach of laser weapons, far beyond their physical direct-line-of-sight limitations. The plan was to place a constellation of SBLRMs in orbit to provide a series of reflection-relay-points from any laser-source to any required area of coverage, at all times, anywhere around the world, in a schema later utilized in the IRIDIUM communication-satellite constellations. With a sufficient number of mirrors in orbit, one laser source could be used to engage targets anywhere around the world, and to do so virtually instantaneously. The high-energy laser emitter could also be located anywhere in the world, from the ground, to the air, to up in space, or all of these. This methodology would also give redundancy to the intended area of coverage if one or more laser sources are lost. All of these advantages, as Beason showed, lend enormous flexibility and robustness to an array of HELs and SBLRMs.

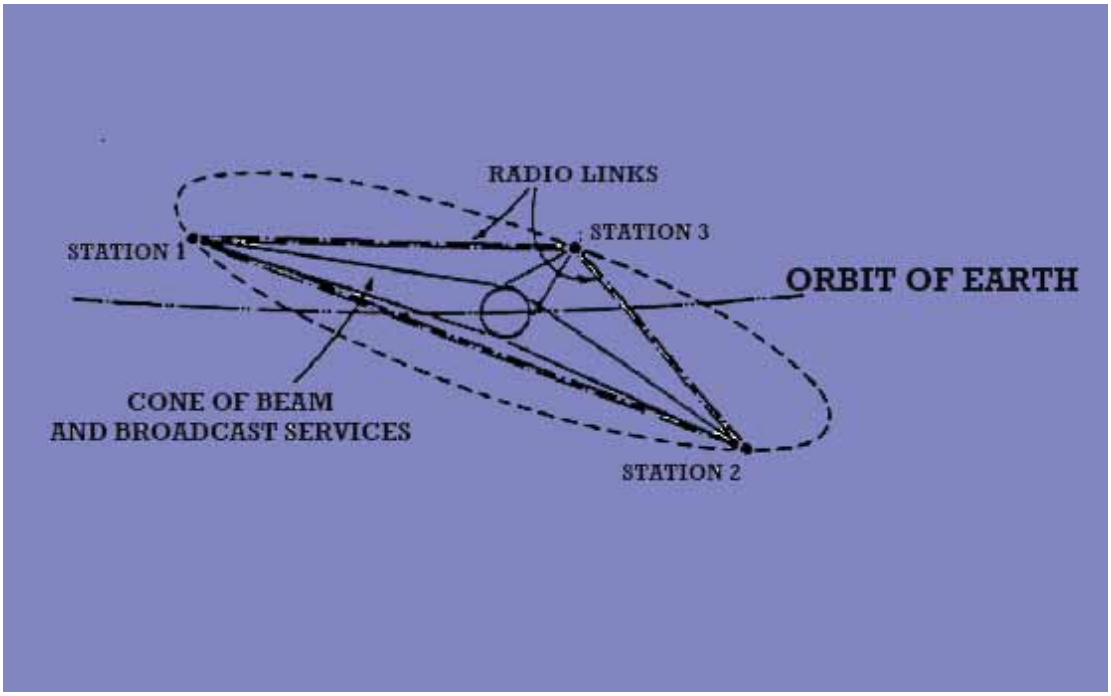


Figure 5 – Arthur C. Clarke's Three-Stations-for-Global-Coverage Drawing

Importantly, this technology is the most mature of all the DE systems proposed and tested as a result of the SDI program. The first Space-Based Laser Relay Mirror was flight-tested on February 1990, in the Relay Mirror Experiment. In this experiment, a satellite bearing a specially-built mirror was orbited, and successfully and accurately reflected an Earth-based laser's beam back down to the ground and onto a nearby stationary ground-target, all while the satellite was passing overhead in LEO at an altitude of over a hundred miles, and travelling at a speed of 4.5 miles a second. The RME used adaptive optics to compensate for atmospheric distortions in the laser beam, and produced a reflected laser beam that arrived in essentially coherent form on the ground (See Figure #). As Clementine I and ASTRID vindicated Brilliant Pebbles, so too did RME prove this element of SDI's proposed directed-energy technologies; arguably, even more so.

Contemporary revalidation of the laser-relay-mirror methodology lies in its more resurrection and successful testing of the Aerospace Relay Mirror System for tactical battlefield applications. In this July 2006 test, two balloon-lofted mirrors were used to reflect a laser from a ground-based emitter to a ground target, two miles away. The system was intended to draw upon the power of a 15- to 25kW ground-based Solid-State-Laser to detect and destroy improvised explosive devices at extended distance, and was to be deployed in Iraq by 2007.

An SBL loses much of its combat effectiveness in isolation, since its orbital flight-path is more likely than not to put it out of position to achieve a line-of-sight engagement of a ballistic missile. Orbiting at an altitude of 800 miles, an SBL is estimated to have only 20 minutes of in-theater line-of-sight combat coverage time out of a 90-minute orbit. This, of course, necessitates placing a constellation of SBLs in orbit, as well, but these would be very expensive to produce, limiting its numbers, according to the article "Airborne and Space-Based Lasers," by Kenneth Barker.

However, Beason describes in his research that combining a series of HELs with a much greater number of the less-expensive Space Based Laser Relay Mirrors would give each and every single SBL instantaneous global reach and range. Space-based mirrors are critical force-multiplying components of any global-reach High Energy Lasers fleet, since they can not only extend every single HEL's range out to distances far beyond the current hundreds of kilometers, e.g. for an ALTB, but would further enable the straight-line-following laser beam to 'bend' around the Earth itself, to reach any boosting ballistic missile target around the world.

The concept of space-based relays to reach any point on Earth using electromagnetic energy dates back to the late science- and science-fiction writer, Arthur C. Clarke, who first envisioned the ability to reach any point on earth instantaneously with radio signals (a form of EM) via three orbiting 'relay stations' in his article, Extra-Terrestrial Relays," back in 1945.

Ground-Based Laser. Ground-Based Laser weapon systems could draw upon any of the upcoming high-energy beam-generating technologies, from chemical to solid-state or free-electron laser technologies. Being ground based, they would not be limited by the weight, volume, packaging or cost limitations of aircraft or space-launch systems, and could become the largest and most powerful laser weapons of all. Indeed, such a weapon is already in the works for the U.S. arsenal, in the form of an electrically-powered High Energy Lasers proposed for the DDG-1000, albeit for defense against short-range ballistic missiles, UAVs, and especially cruise-missile defense. Nevertheless, a GBL's Achilles Heel is its location at the bottom of the Earth's power-sapping and range-limiting atmospheric 'ocean,' although these losses can be minimized using the same Adaptive Optics as used on the ALTB to compensate for atmospheric distortion.

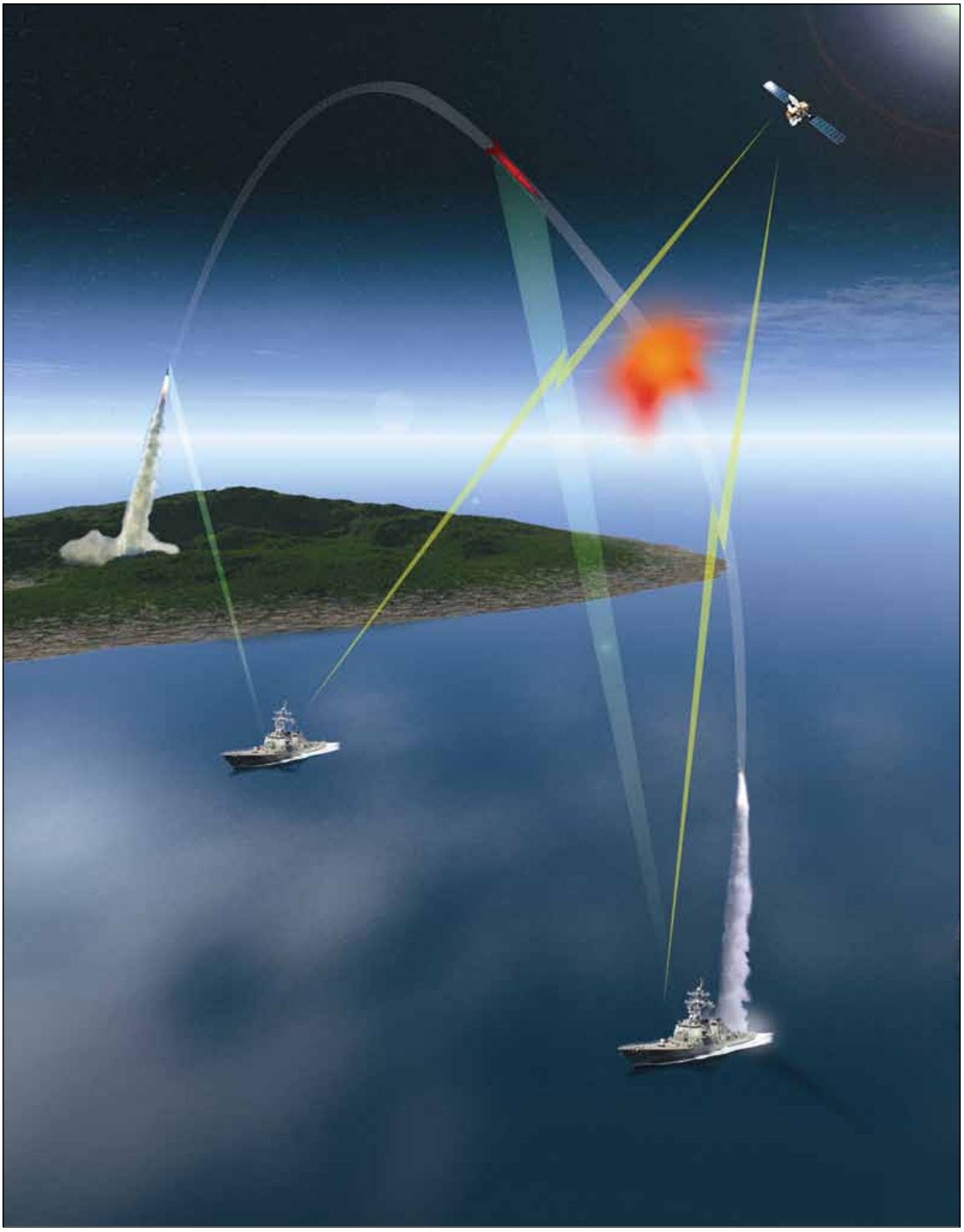
GBLs of varying sorts and power levels have been in use since the Soviet Union first used one to track and disrupt the flight of the Space Shuttle Challenger in 1984. The U.S. also successfully

developed GBLs, albeit of relatively low power, in the form of the Starfire Project (See Figure 7) which validated the technological viability of acquiring and tracking orbiting objects with GBLs.

More recent proof for GBL weapons systems is the U.S./Israeli Tactical High-Energy Laser, which ran dozens of successful tests from 1998 through 2005. These lasers shot down volleys of Katyusha rockets, artillery shells, and even downed mortar rounds, achievements of profound significance, proving the revolutionary capabilities of HELs as weapons, and GBLs in particular. This is proof that a laser weapon can be built and used to shoot down previously-unstoppable, high-speed, high-flying weapons, indeed, of proving superior to all the most formidable tactical projectiles on the contemporary battlefield. The combination of Starfire and High Energy Lasers show that GBL-based BMD is indeed possible.

Finally, and ominously for U.S. space security, contemporary adversaries are already building and using GBLs against U.S. space assets, as was proven by the U.S. Defense Intelligence Agency's 2006 revelation that China had "repeatedly fired high-powered lasers at U.S. spy satellites flying over its territory."

While a GBL is not a Space-Based Weapon, or SBW, it is a space-accessing weapon system, if used against targets in space, which could be ballistic-missile warheads, satellites, or ASATs. Since 'space-weapons' are a subject of great hostility in the security policy realm, this issue could be very problematic for building BMD-dedicated High Energy Laser programs. Alternatively, it may simply be time to put such frivolities aside, and recognize that satellites are merely another group of high-value assets that are potential targets in a future war between powers possessing space-based capabilities, and adversaries that can, and will, either target satellites or deliver their own weapons (i.e., nuclear warheads) through space.



The guided missile Aegis cruiser, USS LAKE ERIE (CG 70), upgraded with the BMD 4.0.1 Weapon System, successfully detected, tracked and conducted simulated SM-3 Block IB engagements against a variety of different ballistic missile targets during a series of tracking exercises. The targets ranged from simple separating medium-range missiles to sophisticated, separating short-range missiles designed to confuse missile defense systems. All test objectives were met. (U.S. Missile Defense Agency photo)

The path forward. Ironically the very same sorts of threats that spawned SDI during the Cold War are reemerging in the current, post-Cold-War era, in such states as North Korea, Iran, and an increasingly capable China, as well as a gradually-revitalizing Russia. Pfaltzgraff and Van Cleave also show, as a result, and perhaps only appropriately, several of the more viable ideas from the SDI era are similarly reemerging as solutions to these threats, most importantly, using space-based defensive systems. Ongoing technological improvements over the intervening years in directed-energy generation, as well as in computing, software, materials, and perhaps even propulsion, could add even greater potential to future implementations of past R&D. Some of the more readily practicable concepts are presented here.

Orbiting kinetic-energy-kill vehicles. The most mature design of all the SDI-era SBW weapons, per se, and thus the closest to being ready for operational deployment, is the previously-cited Brilliant Pebbles-era orbiting kinetic-kill vehicle design, according to Pfaltzgraff and Van Cleave. A modern incarnation would utilize the latter's two-part design configuration. The first part would be an

A long-range Strategic Targets System rocket is launched from the Kodiak Launch Complex on Kodiak Island, Alaska on Sept. 28, 2007. The rocket was successfully intercepted by a Ground-Based Interceptor launched from Vandenberg, AFB, Calif., as part of a Ballistic Missile Defense System flight test. (U.S. Missile Defense Agency photo)

exterior "life-jacket" housing, to serve the functions of protection, life-support, and sensors. The second, shown in a 2002 white paper available through the Lawrence Livermore National Laboratory entitled, "Initial Space-Based Experiments to Support Boost Phase Intercept Using the Advanced Technology Kill Vehicle," a critical part of the design would be a kinetic-kill interceptor weapon stored inside the life-jacket. It would also draw upon the latest generation in computer chips, sensors, algorithms, data fusion, materials science (lighter weight, greater strength, stealth) and so on, to gain further advantages of decreased on-orbit mass, greater interception performance, and greater SSPK, suggests Wood.

It would be linked with the Missile Defense Agency's Command, Control, Battle Management and Communications infrastructure, currently under advanced stages of development and deployment. Another 'hidden blessing' of the original Brilliant Pebbles design was that the interceptors themselves were designed to perform double-duty, functioning as both target detection and tracking sensors, as well as weapons per se. These orbiting kill-vehicle weapons were to be deployed in large numbers, or constellations, numbering in the hundreds, or thousands, depending upon the level of protection required, to provide continuous coverage of any required region of the world. Canavan suggests actual coverage would depend upon the numbers and distributions of the weapons in orbit. Orbits would be shifted to concentrate needed numbers and concentrations over areas of greatest threat.

On the need for Space-Based High-Energy Lasers. KE BMD is a valid, viable, highly capable weapon system. However, its primary function, and greatest capability, is to defend against boost-phase missiles, with limited midcourse or later-phase defense capability. Further, given the world-circumferential distribution of a constellation of orbiting interceptors, only a fraction of the KE BMD constellation would be overhead or in a position to intercept boosting missiles, especially ICBMs. The best solution to the boost-phase BMD problem is thus Space-Based High-Energy Lasers, or SBLs. As the IWG states, a space-based laser system "…would complement it [KE-BMD(Ed.)] in two ways: (1) lasers operating at the speed of light assure the earliest possible boost-phase intercept capability, maximizing the likelihood that debris from the intercept would fall back on the launcher's territory; and (2) while lasers would not be effective in destroying nuclear warheads in space, they would be capable of the active discrimination of warheads from decoys, thus enabling intercept by Brilliant Pebbles or other midcourse defense systems," according to Pfaltzgraff and Van Cleave. As a result, maximizing our best chance to defend against ballistic missiles, in their boost phase demands a space-based laser weapons capability.

Editor's note: This article is part I of II. Part II will be in the May-June 2011 issue of the Fires Bulletin.

Howard Kleinberg is a member of the graduate faculty of the Department of Public & International Affairs at University of North Carolina Wilmington. The author has a Master of Arts in the Security Studies Program from Georgetown University, Washington, D.C. and a Bachelor of Science in Electrical Engineering from the University of Toronto, Canada. He also has 25 years of experience in the U.S. Defense Sector, the Space Industry, and software engineering.

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Soldiers from the 1st Battalion, 38th Field Artillery, conduct chemical, biological, radiological and nuclear training with their Republic of Korea army counterparts during a field exercise, in 2010. (Photo courtesy of 210th Fires Brigade)

Sharpening the sword of the king:

A primer for getting back to the basics of major combat operations

210th Fires Brigade - 2nd Infantry Division - Korea

By COL Steven A. Sliwa

The recent artillery exchange between North Korea and the Republic of South Korea in November 2010 provides a stark reminder of why we must be prepared to fight in major combat operations. We should not forget our own history of the sheer complexity of synchronizing the operations of large numbers of units, like during Operation Iraqi Freedom-I and Desert Storm - at that time the focus of the Army was to prepare for large scale operations. Operations of this magnitude have not been executed at this level of intensity since OIF-I. To prepare units for major combat operations, one must understand or try to visualize the dramatic change in scope; the complexity, intensity and speed of operations that will be present on that battlefield. While the majority of units have focused on counter insurgency operations over the past nine years, 2ID has been directed to retain its focus on major combat operations.

A hostile border and a detailed operations plan allow this organization the ability to plan for a unique mission in great detail. However, the following article is not meant to provide Korea specific tactics techniques and procedures – rather it is meant to provoke thought in our junior leaders in how MCO differs from the majority of operations being executed by the U.S. Army at this time. All field artillery units need to be able to shoot, move and communicate throughout the spectrum of operations. This article will address the challenges associated with those three tenets of our profession in an MCO environment focusing on: command and control, protection of widely dispersed forces, A2C2/ISR Radar management, sustainment operations and readiness.

Command and Control. Command and control in a rapidly changing high intensity environment is no easy task. The large scope, numerous units, multiple and varied control measures, complex terrain and confusion stemming from the fog of battle add to the overall complexity of MCO. Command and control in MCO must be able to process multiple reports and information and issue coherent orders and fragmentary orders to keep pace with the environment. Mission type orders may be the best way to

achieve the commander's intent. Analysis and use of the military decision making process and rehearsals give leaders at all echelons the ability to accomplish the mission in a rapidly shifting environment. Subsequent planning by staffs results in preparation for branches and sequels providing training focus for the unit and adds flexibility to the force commander. Aggressive and realistic rehearsals on large scale terrain models provide the fidelity and realism needed for all Soldiers as they demonstrate their knowledge and understanding of how their role fits into the bigger picture.

When possible, units should execute large scale, detailed terrain models complete with photos of key intersections and infrastructure to facilitate the common understanding of the mission. This will help train their units on rehearsals in order to prioritize rehearsal methods when time and resources are constrained. Units should rehearse the plan at echelon, when time permits, allowing leaders and Soldiers to see how they fit into the bigger plan and receive guidance to assist mission execution in the absence of higher directives. Routine activities and battle drills can be trained as preparation for operations in a high intensity environment.

Communications in MCO can be challenging. Leaders should expect to communicate with the means they bring and are trained on. The communications architecture is often immature (limited or no hard wire communications) and will rely on retransmission capability to support moves at distance. Units benefit from establishing standard operating procedures and being realistic about what form of communication will be used for a given situation (i.e. Command Post of the Future will not work on the move).

Units, when conducting live, virtual and constructive exercises for an MCO must, whenever possible, utilize the communication systems that would match the operation and from the command and control node or combat platform from which they will fight from.

Establishing and maintaining communications and battle tracking is particularly difficult in MCO. Repositioning of forces and C2 nodes across large expanses of battle space requires detailed planning and disciplined battle drills to maintain communications. Routine and scheduled training on all available communication systems is a necessity at echelon. Even when used in relatively close proximity, FM-RETRANS is planned and exercised to ensure reliable FM communication. Wire can also be integrated when appropriate as a secure back-up method from company/battery to brigade command posts, and within unit positions for alert and reporting means. Regardless of the communications method, its purpose is to inform and to track the battle. Each method needs a redundant means.

CPOF is generally preferred as the digital battle tracking system in the Army; however it requires a back up. Analog back up to digital battle tracking is a skill that must become second-nature and requires constant refresher training as new Soldiers enter the force. Battle tracking on status boards and paper maps provide reliable and proven alternatives in what is likely to be an immature architecture to support digital processes. This analog mentality can be summed up by the statement "If it takes AC power or batteries…have a backup." It is essential that redundant communications are maintained during high-end full spectrum operations to maintain effective command and control amidst the 'fog of battle.' Routinely practiced, there is always another way to talk and record essential information.

PFC Timothy Waldrum of Bravo Battery, 6th Battalion, 37th Field Artillery conducts training with his Multiple Launch Rocket System in his mission oriented protective posture gear, during a 2010 field exercise in the Republic of Korea. (Photo courtesy of 210th Fires Brigade)

Units training C2 for an MCO would be wise to include the following in any of their training events:

- Nested rehearsals at echelon (section to brigade.)
- TOC setup and Jump operations (C2 on the move.)
- Communication drills emphasizing backup methods.
- Communications redundancy.
- Disciplined and trained coordination venues (battle update brief, commander's update brief, operating assessment.)
- Paper maps are a must. What is the backup when the power goes out?
- Status boards as a complement to digital battle tracking.

A2C2 and radar management. Army airspace command and control and radar management are a portion of command and control that deserve special consideration in MCO. Large volumes of air platforms, competing demands for airspace, rapidly changing airspace coordination measures and potential for fratricide makes detailed airspace coordination critical. A close relationship with higher headquarters facilitates timely, integrated and de-conflicted use of unmanned aerial vehicles and attack aviation assets.

Effective radar management has at its core: placement, security, movement, and sustainment. Additionally, movement of radars is a continuous process as the threat changes and repositions indirect fires assets. Ensuring maximum coverage of assigned areas, survivability of position areas and movement routes that provide concealment from enemy forces are critical to the overall force success. Each radar has its primary, alternate and supplementary position, each with a primary area for indirect fires coverage and allows the force commander to choose which position best supports the mission. Routine radar maintenance must be balanced with radar cueing schedules. Rehearsed, practiced and continuously refined, the combined effort in the protection of the counter battery radars cannot be overstated.

Zone management and radar survivability is also a key component of the effective use of intelligence, surveillance and reconnaissance assets in MCO. Zones are managed within the unit's assigned sector as required to minimize duplication of acquisitions, and prioritize counterfire- This is required based on significantly large volume of enemy indirect fires.

In summary, units should focus on:

- Detailed and constant synchronization of A2C2.
- Radar planning for movement, placement, maintenance.
- Zone management.

Protection. In MCO scope is relevant. Protection assets are limited and units must plan for the use of organic force protection assets to deal with a wide range of threats that include: mounted/ dismounted forces, massed indirect fires, air attack, minefields and chemical, biological, radiological and nuclear assets. Routine planning and training with organic and attached protection and combat support elements is the key to preserving and maintaining combat power as well as assisting in survivability, maneuverability and counter mobility. Equally important is close coordination with adjacent maneuver forces. Integrating all attachments in rehearsals and training to the section level provides a close-knit and integrated combat force.

A lesson from counterinsurgency operations applicable to MCO is protecting

PV2 Thomas Schemmel, of Alpha Battery, 6th Battalion, 37th Field Artillery conducts decontamination as part of a 2010 field exercise in the Republic of Korea. (Photo courtesy of 210th Fires Brigade)

Soldiers with Charlie Battery, 1st Battalion, 38th Field Artillery prepare M26 rockets for transport during a deployment readiness exercise in December 2010. (Photo courtesy of 210th Fires Brigade)

vulnerable lines of communication including logistic assets. Well planned and executed combat logistics patrols mitigate threats to the safe delivery of supplies to forward units. Due to the limited number of convoy protection platforms, convoy security teams are limited and must be proactively trained for survivability and protection. It is essential that convoy security teams are trained to work as a team and are prepared to engage targets effectively on the move. The convoy live fire exercise program provides security team crews with an operator and crew qualification program that culminates with collective tables that exercise convoy live fire tactics, techniques, and procedures for convoy defense.

CBRN remains a relevant and credible threat in any foreseeable MCO environment. Training in individual and collective CBRN defense is a critical component of MCO and must be reflected in the execution of trained battle drills to ensure we can continue to shoot, move and communicate in a contaminated environment. Individual chemical equipment packs issued to every Soldier should never be further than arms reach in an MCO environment. CBRN equipment receives the same maintenance consideration as vehicles and weapons systems.

Effective reconnaissance and training for operational and deliberate decontamination sites provide a solid foundation for further CBRN planning and execution. It is a perishable skill that is not easily recovered during a rapid transition to MCO. It is too late after being alerted for movement to expect CBRN to be highly trained and effective.

Focus for protection tasks in unit training plans should include:

- Integrate organic protection assets in rehearsals and training.
- Train combat logistic patrols at echelon to fix, fuel and arm forward.
- Conduct convoy live fire and small arms training at echelon.
- Practice movement and security for logistics elements.
- Regular training in CBRN detection and decontamination.
- Operations in CBRN gear (driving, shooting, tactical operations center.)
- CBRN reporting and movement in and through contaminated areas.
- PMCS of assigned CBRN equipment.

Sustainment. Major combat operations will stress the units' organic maintenance capabilities (contracted maintenance may not be an option). A unit's sustained readiness rate is dependant largely on a disciplined preventive maintenance checks and services program. The strength of the units' garrison maintenance program has its roots in operator level preventative maintenance checks and is the foundation for efficient equipment operation and reduced downtime. The ability to fix forward in MCO is maximized by positioning forward support company unit field maintenance teams with company sized elements. Proactive management of the authorized stockage list and shop stockage list significantly decreases vehicle down time for critical parts.

Additionally, controlled substitution and locally procured parts when the Army supply system is critically low are also tools for the commander to increase readiness. Using organizational readiness floats and training on battle damage assessment and repair can also increase readiness rates when lack of parts or replacement vehicles increase downtime of pacing items. Motor officers, maintenance technicians and motor sergeants

PFC Dearman and SPC Kimball, mechanics with FSC 6th Battalion, 37th Field Artillery conduct field maintence of an M270A1 launcher in the snow covered mountains south of the Korean DMZ, January 2011. (Photo courtesy of 210th Fires Brigade)

at the unit and forward support company must aggressively pursue battle damage assessment and repair and requisitioning of parts and from all sources of supply in order to reduce repair cycles. These combined efforts yield the equipment operational readiness rates that prepare units for success in high-end operations.

Invariably, ammunition support operations are the most resource intensive sustainment task in high-intensity operations. Storage and distribution of the various field artillery munitions taxes the unit logistics footprint significantly.

Movement of the large and varied amounts of ammunition required for MCO requires planning and rehearsal to execute this task in a timely manner. In addition, detailed analysis of roads traffic ability for large vehicles and difficult terrain provides tremendous challenges to logistics convoys and gives the enemy excellent opportunity for engagement. Rehearsing movement from ammunition supply points to units during field training exercises provides the building blocks for successful ammunition management.

These events provide sustainment units the opportunity to rehearse allocation of assets and movement on roads, familiarize operators with handling Class-V cargo, rehearse routes to cache locations and validate timetables to complete delivery of ammo.

These rehearsals also verify material handling equipment requirements at ammunition sites and validate the number of transportation assets required to move ammunition.

Key tasks to execute for successful sustainment operations include:

- Disciplined PMCS
- Battle damage assessment and repair
- Determination of ammunition requirements at all echelons.
- Movement of ammo – right amount and type – prior to hostilities.
- Determination of required haul assets and allocation to execute within required

timelines – maximize prepositioning of assets prior to alert.

- Material handling equipment availability and trained operators at ammo sites.

Readiness. Readiness exercises can make a difference in preparing for an MCO, emergency deployment and readiness exercises can be a tool for commanders at echelons to identify gaps in preparedness by conducting pre-combat checks, pre-combat inspections, testing special team tasks and confirming maintenance status and load plans for equipment and ammunition. "Roll-outs" prepare units for their role in high-end operations by speeding reaction and developing a sense of competence and pride within the unit. Additionally, emergency deployment readiness exercise training provides a sound foundation and test of fundamental command and control skills. All units can benefit from the logical exercise of asking the simple question "What will I need, where will it go, and where is it now?"

Load exercises and alerts conducted at section, platoon, battery, battalion and brigade ensure familiarization and validation of load plans. Additionally, a load exercise allows leaders to inspect individual Soldier readiness (CTA-50, Soldier readiness processing, assigned tasks) as well as account for the need of items that will make the unit successful in combat that are not found on the property book (seven magazines per soldier, spare tires for select vehicles and trailers, water and fuel cans, etc.). For the unit training on high-end skills, every EDRE becomes a refinement and validation of rehearsed battle drills.

Areas for special consideration in MCO include:

- Alert and roll-out exercises (especially as part of a planned field exercise)
- Load plan enforcement and refinement
- Inspection of personal equipment to include A&B bags and necessary equipment
- CBRN equipment inspection
- Ammunition loading (ACL retrieval and distribution when possible)

Special teams must be formed and trained from within the unit to accomplish critical tasks within an MCO, and may be inspected as part of an EDRE program. Training special teams is essential to providing lethality, survivability and sustainability to the unit.

Examples of special teams and battle drills are:

- Field Sanitation Teams (porta-johns do not exist in MCO)
- Crater analysis and minefield marking.
- Obstacle emplacement and reduction .
- Enemy prisoner of war teams.
- Local quick reaction force.
- Emergency destruction team.
- Perimeter defense and security teams
- Advance Party (for reconnaissance selection and occupation)
- Aid and litter teams

A M270A1 Multiple Launch Rocket System from Charlie Battery 1st Battalion, 38th Field Artillery fires downrange during a combined live-fire exercise with the Republic of Korea army, October 2010. (Photo courtesy of 210th Fires Brigade)

Training MCO sharpens the sword. MCO training has not been the focus of our Army as counterinsurgency dominates the majority of our current operations worldwide.

MG Michael Tucker, 2ID commander, points out in his white paper dated July 2010, "Restoring this capability to the force means that we must have leaders and Soldiers at all echelons proficient on our directed (mission essential task list). Currently the Army's only expertise and experience with these skill sets resides with our senior NCOs and senior field grade officers. When these leaders leave the Army, and we have not trained and mentored our future leaders on such skills, it will result in loss of hard-earned institutional knowledge which was resident in the Army of Desert Storm and OIF I."

Past experience by senior leaders provides the operational framework to practice the unique and demanding skills necessary in the high-end of full spectrum operations and the flexibility in responding to challenges throughout full spectrum operations.

Additionally, MG Tucker states, "2ID is the Army's only forward deployed committed division, it is also the Army's only modular division currently focused full time on 'high end' FSO in support of the Army's new METL." This is a stark difference from just 10 years ago when U.S. Army National Training Center in Fort Irwin, Calif., rotations focused on the type of engagements that would be typical of an MCO. Therefore, it is incumbent on all units to utilize the experience and time available, whenever possible, to train on these tasks as directed by our Army leadership.

COL Steven A. Sliwa has commanded 210th Fires Brigade, 2nd Infantry Division at Camp Casey, Korea, since July 2009. He has also served in operations across the spectrum to include Operation Desert Storm, Operation Uphold Democracy, and commanded 1st Battalion, 37th Field Artillery (3-2 Stryker Brigade Combat Team) FA as a maneuver Task Force in Operation Iraqi Freedom. Most recently, he served as the chief of the Current and Future Warfighting Capabilities Division (Requirements) in the G-3/5/7, Headquarters, Department of the Army. He is a 1986 graduate of the United States Military Academy, holds a Masters of Military Science from the United States Army Command and General Staff College and has served as a National Security Fellow at the John F. Kennedy School of Government, Harvard University.

Past experience by senior leaders provides the operational framework to practice the unique and demanding skills necessary in the high end of full spectrum operations and the flexibility in responding to challenges throughout full spectrum operations.

Task Force Professional leads the way in executing

2nd Battalion, 321st Field Artillery Regiment provides

By Sharon McBride, Editor- in-Chief

With the official adoption of the Army Capstone Concept in December 2009, the U.S. Army officially embraced the concepts of 'mission command' and 'combined arms maneuver.'

According to the ACC, the term mission command is now preferred over command and control. At its essence it's decentralized concept which enables agile and adaptive leaders to execute disciplined initiative within the commander's intent as part of unified action in a complex and ambiguous environment. Combined arms maneuver is defined as the application of the elements of combat power in a complementary and reinforcing manner to achieve physical, temporal, or psychological advantages over the enemy, preserve freedom of action, and exploit success.

With the outlining of these concepts in the ACC, the stage has been set for the Army of 2016-2028, however, the 2nd Battalion, 321st Field Artillery Regiment which was part of the 82nd Airborne's Task Force Fury (4-82nd Airborne Brigade Combat Team) forming Task Force Professional, recognized the need for an early transformation in how they conducted their mission to Afghanistan last year.

The unit was assigned an 'in-lieu' mission in three northwestern provinces, Badghis and Herat. The airborne Fires battalion was transformed into a COIN Task Force that included a rifle company, cavalry troop, two additional rifle platoons and a platoon of 120 mm and 81 mm mortars. Historically, this part of Afghanistan has been relatively safe. But insurgent groups have emerged there in the past couple of years. They terrorized locals with illegal checkpoints, demanding food, money and other support, said Lt. Col. William Huff, battalion commander of Task Force Professional. Additionally, the combined threats to the population included corrupt contractors who failed to deliver services and local government officials not connected with the concerns of the local population.

There, Task Force Professional partnered with Afghan Security forces, along with NATO soldiers and U.S. Marine Special Forces elements. The task force worked for year trying to secure the underdeveloped and previously Taliban governed provinces. These areas were also severely compromised due to the only economic opportunity for the people living in area was a poppy route that runs through the valley and finances counter insurgency.

A U.S. Forces Afghanistan cultural advisor offers his condolences to a villager whose family members were killed during an operation targeting insurgents near Herat province, Feb.17, 2009. (Photo by Lt. Cmdr. John Gay, Department of Defense USN)

Although, considered relatively new processes, mission command and combined arms maneuver, were at the essence of everything the unit practiced during the deployment, said Huff.

Huff, and key members of his team, was on hand recently at Fort Sill, Okla. to speak about lessons learned about their deployment to a very pretentious area with a high security threat.

Keep it simple. At its core, mission command, means operating in a decentralized manner and within the commander's intent, Huff said. It means taking decision making power and assignment of accountability for results and pushing those responsibilities down to the individual leader and the unit at lower echelons. According to Huff, the best way to make sure the commander's intent is interpreted correctly is to keep it simple.

"I started crafting my intent early, and tested it prior to our deployment at the Joint Readiness Training Center (Fort Polk, La.). I found keeping it simple allowed understanding throughout the unit," he said.

Huff said he distilled down his intent, which was nested with LT GEN David M. Rodriguez's, to three basic concepts; these were: protect and respect the population; Shohna ba Shohna – a Dari expression which means 'shoulder to shoulder,' or team always with their Afghan Security Force partners; and fear in the enemy. Rodriguez is the commander, International Security Assistance Force Joint Command & Deputy Commander, United States Forces – Afghanistan.

"These simple criteria drove all our decision making processes," Huff said. "If my guys could answer 'yes' to all these questions, then they were operating within my intent."

Huff said another key to success was he also had very few standing orders, which allowed his paratroopers to develop situational understanding rapidly and to seize, retain and exploit the initiative under a broad range of conditions.

"I did have one and that was to never break contact with the enemy – never." Huff said. "We never ran away from a fight. Not because lethal actions alone will prevail, but because the local population was observing to see who was committed to their protection. Returning to the FOB and claiming victory in a skirmish was not considered 'victory' in the eyes of the Afghan population."

Because of this determination and simplicity in intent, the insurgent element in the unit's operating area nick named Task Force Professional "the flood."

"The enemy knew when the U.S. paratroopers and our Afghan brothers came around it was like a 'flood,'" Huff said.

The term "flood" has a lot of meaning to Afghans, he said. "It meant essentially they could not stop us."

The concept of operating like a "flood" was then taken a step further, once again borrowing from analogies that are typical in

'wide area security' and 'combined arms maneuver' lessons learned from Afghanistan

LTC William Huff, battalion commander of Task Force Professional, receives calls from both military and local government officials during 2nd Battalion, 321st Field Artillery Regiment's 2010 deployment to Afghanistan, expressing their support for lethal fires when required. (Photo courtesy of 321st FAR)

nature, Huff said.

The swarm. I adopted the term "swarming" to explain what our contact with the enemy should look like –both lethal and non-lethal. The analogy and concept we adopted is similar to how fire ants have a decentralized reaction to a perceived enemy, Huff said.

"The fire ant scout does not call back to the main nest and ask, 'May I attack?'" Huff said. "He understands the intent and attacks. He sends little pulse out and everyone else swarms to him.

"For us, swarming meant maintaining persistent mobile reconnaissance and security patrols which allowed friendly forces not only to dominate key terrain and deter threat action, but also to produce a positive psychological effect.

"We attempted to swarm with contact non-lethal, and when required, lethal actions. It was essential to keep the tempo high in order to operate faster than the insurgents," Huff said. "Reporting indicated that local population and insurgency estimates of our combat power were five times greater than what we actually had," he said.

By incorporating "swarming" into mission operations it not only degraded enemy effectiveness but produced effective combined arms maneuver, allowing Task Force Professional to achieve physical, temporal, and psychological advantages over the enemy, preserve freedom of action, and exploited success.

As a result, the traditional smuggling and criminal element cross border coordination particularly between the Northern Herat Districts and Badghis were severely compromised, Huff said.

More than three cups. Key leader engagements were also essential to their mission success in Afghanistan, Huff said.

"SSG Joshua Thomas, as a platoon sergeant partnered with the Badghis province Police Quick Reaction Force did everything in support of the provincial governor or provincial police chief," Huff said. As a result he was constantly out and about, because the QRF often operated 100 kilometers from the nearest mutually supporting element and with limited communications.

"I spent the majority of my time with Afghans rather than my own guys," Thomas said. Because of terrain and technology issues, Thomas said he really no choice but to function decentralized.

He also said that is the way the Afghan National Army is used to operating and for them it was "business as usual."

Learning how the Afghan National Army worked was also a key to the unit's success.

"Building key leader engagement by drinking three cups of tea is a misnomer," said CPT Zack Tegtmeier, who commanded a COIN team, which consisted of two rifle platoons, two transformed howitzer platoons and a mortar section. The team operated in a once-Taliban dominated hub of Bala Murghab in northern Badghis.

"It's more like 5,000 cups of tea, while working with the district governor, district police, NDS, the ANA, and an Italian battle group," he said.

Time and proximity are the only ways to gain the information and intelligence needed to accomplish the mission, emphasized Thomas and Tegtmeier.

"Building key leader engagement by drinking three cups of tea is a misnomer," said CPT Zack Tegtmeier..."It's more like 5,000 cups of tea, while working with the district governor, district police, NDS."

KLEs were vital to fostering an environment of mutual respect and trust with Afghan counterparts, Tegtmeier added. It also aided in learning the local challenges, and facilitated the understanding of the provincial government's goals. All leaders of Task Force Professional stressed the importance to not always talk about business with the ANSF but rather utilize influencing techniques to develop a bond and augment rapport, which in turn, will increase the cooperation and execution of operations on both sides.

In a permissive humanitarian environment, the art of communicating can either make or break you, he said. Procrastination – either deliberate or because the leaderships gets caught in the military decision making process or risk assessments – can also be problematic.

When conducting missions with the ANSF, its better if every decision is followed by action, Thomas added.

"You can't say give me 72 hours and I'll work up a contingency operation when there's a problem – it doesn't work that way – you lose face, The QRF needed to operate as fast or faster then the insurgents, and the traditional U.S. operational process is simply too slow," Thomas said.

Live, eat breathe. Another sustain that made the difference was the combined teams were also truly embedded with their ANSF partners. Living, sleeping, eating and conducting all operations together are a must, Huff said. This allowed for shared understanding and immediate decision making.

"This trust and interdependency extended beyond the U.S. and Afghanistan National Security Forces relationship into the ANSF combined relationship," Huff said.

Varying levels of success were achieved by area but after the deployment was over, the secured area had increased considerably in each of the provinces and the Afghan National Army and Afghan National Police, supported by National Directorate of Security, were able to conduct routine, deliberate and hasty operations with confidence in their ANSF sister services.

"Living permanently among the populace, as opposed to isolating ourselves in COP/FOB with physical standoff, allowed us to truly secure the population, prevent INS from influencing the people, develop positive relationships between the populace and ANSF through proximity, and truly gauge the populace's perception of the ANSF and government," Huff said.

TF Pro also deliberately refrained from conducting threat-focused offensive operations without valid specific intelligence, as these types of operations more often distance the population from the government and security forces with little tactical success.

Operations instead were prioritized for development and security of the population; building a positive relationship with the population and ensuring their security marginalized the insurgents by denying them safe haven and reducing the effects of their propaganda, Huff said.

"The key Afghan leaders who we supported understood the importance of non-lethal action and population security; however, there were a population of mid-level commanders and staff who only wanted to conduct lethal operations and return to their FOB. It was a habit they learned from the Americans and ISAF over the last several years, "Huff said.

Trust technology but verify. "Mission command is not about what technology you have ... it's a mindset," Huff said. "I think the true test came for us when some of our elements were forced to operate with limited communications due to various conditions, and were also required to act without approval from higher."

"We never let our lack of communication hinder our decisiveness – down to the lowest level. I never wanted these guys to be paralyzed because the 'boss' wasn't around to tell them what to do."

It's imperative not to depend on technology,

CPT Dennis Williams, Task Force Professional team commander, plans with partners, from the Afghan National Army, Border Police, National Police, and the National Directorate of Security future population security operations during the unit's 2010 deployment. (Photo courtesy of 321st FAR)

Huff explained.

"There's a difference in mission command and net centric warfare. Net centric warfare, I believe, is too associated with technology – technology can fail," Huff said. "If you got it, it should increase your situational awareness but not dictate it."

Practice courage and responsibility. "Courage in the face of danger is what we ask our Soldiers to do every day," Huff said. Leaders at all levels must demonstrate courage and personal responsibility along with the decentralized concept of mission command.

"If this is not practiced it limits mission command," Huff said.

So along these lines, Task Force Professional as a whole tried not to get wrapped up in formal and distinct risk assessments, Huff explained.

"It doesn't mean, you're flippant, cavalier or a maverick – not at all," Huff said. "We emphasized probabilities vs. possibilities. This is a principle dating back centuries, but is sometimes ignored. We found wasting limited time on possibilities was not positive."

But in Afghanistan, the time it can take to map out a formal and analytic risk assessment prior to action can cause failure of the mission.

"As long as my troops were acting within my intent, we were succeeding and we assumed risk as necessary," Huff said. "The decisions were assessed based on results and not on what might have happened. In warfare, results matter, it is not an academic exercise."

Key points achieved. Economic development tripled the region. Production at local coal mine more than tripled after operations and security increased, Huff said.

"Establishing security allowed workers who had fled the area to return to the mine in Zapzak Pass; also, cargo trucks were much more capable and willing to transport the coal (and any other goods) to Herat with the new greatly diminished threat along their main highway," Huff said.

Prior to deployment, the ANA in the operating area had never trained for or conducted any night operations. Multiple night rehearsals built confidence in the ANA PLT, shaping them into a much more effective reconnaissance force by allowing them to achieve true tactical stealth and surprise through effective night movement.

Task Force Professional also used local solutions to fix problems rather than relying on the traditional solutions. For example, the addition of motorcycles for transportation allowed freedom of movement throughout the AO.

"Motorcycle reconnaissance allowed the ANSF to match and even exceed the insurgent normal mobility advantage," Huff said.

With the use of motorcycles, ABP scouts were able to rapidly deploy to key terrain to confirm/deny (and ultimately deter) any threat activity, he said.

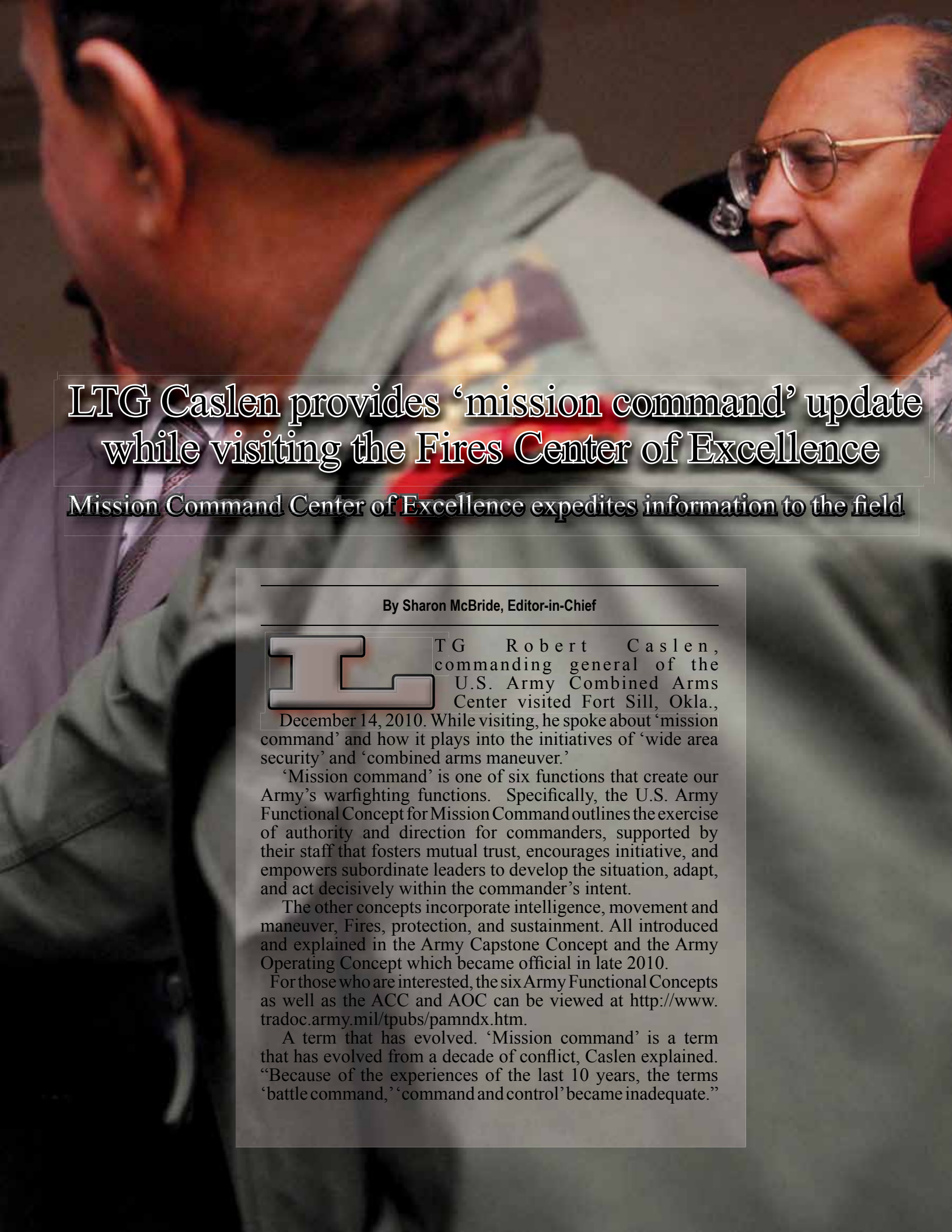
Controlled swarming was coordinated through a partnered ABP/ANA/US C2 node, from which the Afghan Border Police recon officer directed movement via handheld radio. This unparalleled mobility advantage neutralized the threat and ensured successful decisive operations.

Required mindset. According to the ACC, operational adaptability requires a mindset based on flexibility of thought calling for leaders at all levels who are comfortable with collaborative planning and decentralized execution, have a tolerance for ambiguity, and possess the ability and willingness to make rapid adjustments to the situation. This ability is essential to seizing, retaining and exploited the initiative under a broad range if conditions.

2nd Battalion, 321st Field Artillery Regiment which was part of the 82nd Airborne's Task Force Professional Fury and the 4th Brigade Combat Team defined this mindset as they started in a small area, secured the population, and then as NATO's presence expanded so did security in the area.

2nd Battalion, 321st Field Artillery Regiment (Task Force Professional) came home in September 2010.

(Then) MG Robert Caslen, commanding general, Multi-National Division-North, shakes hands with LT GEN Abdul Kareem, commander, Diyala Operations Center, after the signing of a security agreement outlining how the tranfer and payment of the Sons of Iraq in Diyala province from coalition forces to the Government of Iraq will be carried out , Jan 4, 2010. (Photo by SPC Eric J. Martinez; U.S. Army)



LTG Caslen provides 'mission command' update while visiting the Fires Center of Excellence

Mission Command Center of Excellence expedites information to the field

By Sharon McBride, Editor-in-Chief

LTG Robert Caslen, commanding general of the U.S. Army Combined Arms Center visited Fort Sill, Okla., December 14, 2010. While visiting, he spoke about 'mission command' and how it plays into the initiatives of 'wide area security' and 'combined arms maneuver.'

'Mission command' is one of six functions that create our Army's warfighting functions. Specifically, the U.S. Army Functional Concept for Mission Command outlines the exercise of authority and direction for commanders, supported by their staff that fosters mutual trust, encourages initiative, and empowers subordinate leaders to develop the situation, adapt, and act decisively within the commander's intent.

The other concepts incorporate intelligence, movement and maneuver, Fires, protection, and sustainment. All introduced and explained in the Army Capstone Concept and the Army Operating Concept which became official in late 2010.

For those who are interested, the six Army Functional Concepts as well as the ACC and AOC can be viewed at http://www.tradoc.army.mil/tpubs/pamndx.htm.

A term that has evolved. 'Mission command' is a term that has evolved from a decade of conflict, Caslen explained. "Because of the experiences of the last 10 years, the terms 'battle command,' 'command and control' became inadequate."

General David H. Petraeus, commanding general, U.S. Central Command (left), is welcomed upon arrival at Contingency Operating Base Speicher, near Tikrit, Iraq, by (then) MG Robert L. Caslen Jr., commander, Multi-National Division-North (center), and Command Sgt. Maj. Frank M. Leota, division command sergeant major, Multi-National Division-North (right), Dec. 25, 2009. Petraeus, the top U.S. general officer in Iraq, paid a visit to Task Force Lightning leadership at Speicher, who assumed control of northern Iraq earlier that month. (Photo by PVT Jesus Aranda, U.S. Army)

"Over time 'command and control' became very process oriented as well and was heavily based on the network and its capabilities," he said. In current conflicts, he said, the commanders often found themselves hamstrung by staff analysis and operations processes.

"Today's battlefield environment is significantly different than it was 10 years ago," Caslen said. "So how do you describe what commanders do on today's battlefield when the previous terminology becomes inadequate?

"The term the Army adopted was 'mission command' because what it essentially means is the commander drives the operations process –not the other way around. The process should not drive the commander," Caslen said.

Ten years ago, commanders were successful if they massed combat power at a decisive point on the battlefield. That is not the case today. Today we find commanders who have to build teams among modular formations and among joint and indigenous forces. These commanders have to have a thorough, detailed understanding of the operating environment and must drive the operations process, he said.

Each commander should be able to react and decide courses of action based on factors at hand. There is no text book derived or one-size-fits-all solutions for missions on today's battlefield, he explained.

"The operating environment is a fabric of many threads that are interwoven and interlaced," he stated. Pulling on one thread can cause hundreds to unravel.

"Our actions on the battlefield cause second, third, fourth, fifth and sixth order effects," Caslen said. "All commanders have to be able to understand what the consequences are of these actions and then adjust accordingly."

'Mission command' also means more than just the process of empowering decentralized operations and small units to be effective across wide areas of security. Although decentralization is a key response to the changes on the battlefield, at some point, commanders need the ability to aggregate resources.

"We have to be careful to not only describe a commander's operations exclusively as decentralized," Caslen said. "Think about it in terms of combined arms maneuver and conducting a forced entry airborne drop. If you've ever been on one of these mass tactical airborne drops, it is a very centralized operation. Our Army must still conduct these types of missions."

Our conflicts have evolved. "When I was a division commander in Iraq, I was concerned," Caslen stated. "Brigade commanders who were assigned to our division in Iraq during the later part of our rotation were still in the mind set of what the war was about when they were battalion commanders three years earlier."

They had not grasped how the operating environment had changed, he said. This issue highlighted for us at the Combined Arms Center how to best capture the latest changes in the operating environment as well as units' lessons learned on tactics, techniques, and get all that pushed out to the field as expeditiously as possible. The Army's answer was to create the Mission Command Center of Excellence.

"The Mission Command Center of Excellence collects and analyzes lessons learned as they are fused at the Center for Army Lessons Learned and transfers those lessons directly to the field," he said.

CALL can quickly transfer knowledge Army-wide through the production of handbooks, newsletters, and on-line professional forums. MC CoE can further distill these lessons into long-term doctrine through the Center for Army Doctrine Development. Finally, MC CoE, through the Capability Development Integration Directorate, develops resource-informed, integration-focused, outcome-based solutions that enhance our current force, supplement our future force, and leverage existing joint capabilities across the Army, he said.

There's no 'I' in team. The other key aspect leaders must learn from 'mission command' is the ability to create relationships and use interpersonal skills, he said.

"The most successful commanders if they have the ability to foster interpersonal relations and teams not only within their units but with indigenous forces or foreign governments," he said. "These relationships do not come with any authority. To be effective with those types of governments and indigenous forces, it requires high levels of interpersonal skills in order to build trust and mutual respect. The Army has also morphed into a modular organization which puts teams of various sizes together at the last minute, he added. "Commanders must be able to build teams; because they won't always have the luxury of training ahead of time."

'Mission command' is a term that has evolved from a decade of conflict, Caslen explained. "Because of the experiences of the last 10 years, the terms 'battle command,' 'command and control' became inadequate."

(Then) MG Robert L. Caslen, Jr., 25th Infantry Division commander, observes Soldiers from a 3rd Battalion, 7th Field Artillery fire team transport an artillery round to an M102 105 mm towed howitzer during a fire mission while visiting the 3rd Infantry Brigade Combat Team. The 3rd IBCT was training in preparation for their deployment to Iraq in 2005. (Photo by SSG Tim Meyer, U.S. Army)

Co-creation of context and risk assessment. Embracing 'mission command' also means embracing risk when and where it is prudent, Caslen said. According to the Army Capstone Concept, when applying 'mission command' in daily operations, commanders recognize that collaboration and trust are as important as directive authority. They understand that information from the lowest tactical echelon is often more timely and accurate than what may come from higher headquarters. Equally important is to generate and fuse this intelligence, so that commanders at all echelons can see the same operating environment, and to develop it simultaneously. Commanders must also share risk and maintain a constant dialogue with their subordinates as they decentralize resources and authority.

"Commanders must have a command climate that allows a frank discussion of where risk exists and where risk is mitigated," Caslen said. "In this wide area security battlefield of Iraq and Afghanistan – we have these small units that are operating on the tactical edge."

The Army Operating Concept describes 'wide area security' is the application of the elements of combat power, in coordination with other military and civilian capabilities, to deny the enemy positions of advantage protect forces, populations, infrastructure, and activities; consolidate tactical and operational gains; and set conditions for achieving strategic and policy goals.

Forward deployed units, especially in Afghanistan, can be separated by a two-hour helicopter ride, Caslen explained. As a result, how quickly can the commander get fire power, logistics, and intelligence to them?

"Our officers need to discuss at least two levels up where calculated risk can be taken, and decide where some risk can be underwritten," he said. "Discussions have to be clear and subordinates have to be comfortable operating within a certain amount of ambiguity and assume risk as necessary."

Professional education. Lastly, Caslen talked about what it would take for officers and NCOS to embrace the Army as a profession. During FY 11, the Training and Doctrine Command will undertake a study of the Army profession. The Combined Arms Center through the Center for the Army Profession and Ethics will publish a campaign plan that will set objectives and guide this effort to completion.

"After more than nine years of war, our military education, in many cases has been put on the back burner," Caslen said. Proof is the extensive backlog that still exists of those who need to attend career professional development schools.

"If you don't have the education you are living off the experiences of the present," Caslen said. "Leaders can broaden their perspectives by broadening their education. Don't mortgage your education.

"As leaders we cannot let professional education become a liability for the development of future leaders," he said.

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An Afghan National Army soldier, center, provides security with U.S Army Soldiers from the 4th Brigade Combat Team, 10th Mountain Division in the Logar province of Afghanistan on Nov. 27, 2010. (Photo by PFC Donald Watkins, U.S. Army)

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