Field Artillery

A Professional Bulletin for Redlegs

March-April 1998

Joint and Combined Operations

Approved for public release; distribution is unlimited.

HQDA PB6-98-2

Field Artillery

A Professional Bulletin for Redlegs

March-April 1998 **HQDA PB6-98-2**

INTERVIEW

ARTICLES—Joint and Combined Operations

ARTICLES

DEPARTMENTS

Cover: *An M109A6 Paladin howitzer from the 1st Battalion, 6th Field Artillery, part of the 1st Infantry (Mechanized) Division in Bosnia-Herzegovina, with clockwise from the top left: an F-18, Apache helicopter, the* USS Ramage *(DDG61) commissioned in July 1995 and the multiple-launch rocket system (MLRS).*

PURPOSE (as stated in the first ***Field Artillery Journal*** in 1911): *To publish a journal for disseminating professional knowledge and furnishing information as to the Field Artillery's progress, development and best use in campaign; to cultivate, with the other arms, a common understanding of the power and limitations of each; to foster a feeling of interdependence among the different arms and of hearty cooperation by all; and to promote understanding between the regular and militia forces by a closer bond; all of which objects are worthy and contribute to the good of our country.*

OFFICIAL DISTRIBUTION: Distribution (free) is to US Army and Marine Corps Active and Reserve Components FA units: seven copies to corps artillery, division artillery and brigade headquarters; 13 to battalions; and seven to separate batteries. In addition, readiness groups, recruiting commands, state adjutant generate. Army and Marine Corps libraries and schools, liaison officers and other Department of Defense agencies working with FA or fire support issues or materiel may request a free copy by writing to the Editor (see "Submissions").

PAID SUBSCRIPTIONS: May be obtained through the US Field Artillery Association, P.O. Box 33027. Fort Sill, OK 73503-0027. Telephone numbers are (580) 355-4677 or FAX (580) 355-8745 (no DSN). Dues are $18.00 per year ($35.00 for two years and $52.00 for three years) to US and APO addresses. All others add $12.00 per subscription year for postage.

SUBMISSIONS: Mail to Editor, ***Field Artillery***. P.O. Box 33311, Fort Sill, OK 73503-0311. Telephone numbers are DSN639-5121/6806 or commercial (580) 442-5121/6806 or FAX 7773 with DSN or commercial prefixes. Material is subject to edit by the ***Field Artillery*** staff; footnotes and bibliographies may be deleted due to space limitations.

REPRINTS: ***Field Artillery*** is pleased to grant permission to reprint articles. Please credit the author and ***Field Artillery***.

ADDRESS CHANGES: ***Field Artillery*** (ISSN 0890-2525) (USPS 309-010) is published bimonthly. Periodicals postage is paid by the Department of the Army at Lawton, OK 73501 and an additional mailing post office. POSTMASTER: send address changes to ***Field Artillery*** P.O. Box 33311, Fort Sill, OK 73503-0311.

24-Hour Field Artillery Hotlines

Redleg Hotline:
(Organization, Materiel, Doctrine and Training) DSN 639-4020 or (580) 442-4020

Tactical Software Hotline:
DSN 639-5607 or (580) 442-5607

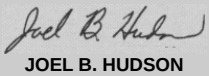
Fort Sill Home Page
http://sill-www.army.mil/index.htm

FA Branch at PERSCOM
htm://perscom.army.mil/opmd/fasitrep.htm

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:



JOEL B. HUDSON
Administrative Assistant to the Secretary of the Army, 04403

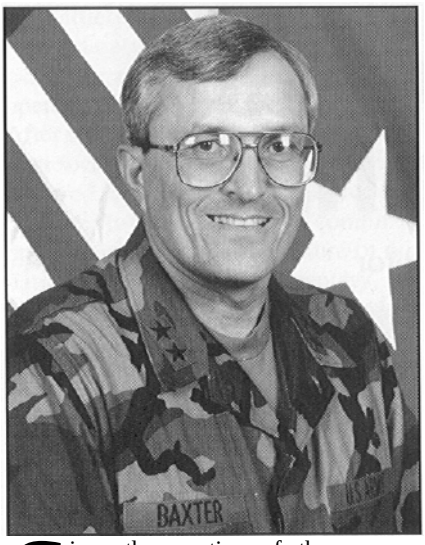
Leo J. Baxter
Major General, United States Army
Field Artillery School Commandant

Editor:
Patrecia Slayden Hollis

Art Director:
Bob T. Coleman

Assistant Editor:
Joanne Alexander Brown

MAJOR GENERAL LEO J. BAXTER
Chief of Field Artillery



Fires of the Future—
In the Blink of an Eye

Since the creation of the cannon, warriors have sought to provide timely fires—those fires that come "from the sky" when and where the ground commanders want them and while the targets are still immobile. Yet, timely fires becomes a far too "relative" term when the call-for-fire processes through a cumbersome, difficult and time-consuming system before the effects finally reach the target. Deliberate clearance procedures and coordination requirements—although the fastest of any Army in the world—are still too slow, giving the enemy temporary relief from our fires. Now is the time to press for change.

The application of decisive joint fires will have fewer constraints in the future. True situational awareness has placed us on the brink of a revolution in the nature of warfare, including a revolution in fires. Our knowledge-based Army of tomorrow will have formidable information dominance, unprecedented agility and the most technologically advanced weapons of any nation on the planet. Therefore, to capitalize on the potential for synergistic joint fires, we must exploit these capabilities to attain decisive success through fires executed in the "blink of an eye."

Removing the Handcuffs. Our quest for immediate fires has always caused a tactical paradox. On the one hand, fire supporters strive to provide maneuver forces responsive and accurate fires—fast fires. On the other hand, we strive to provide safe fires without sacrificing accuracy or speed. So which do we want, fast fires or safe fires? Of course, the answer is both. So for the sake of force protection, we carefully follow our clearance and coordination procedures for all fires...at times limiting their promptness.

The current requirement for our redundant layers of fire support command and control slows fire mission processing time. Echelons of clearance, coordination and approval impede the commander's ability to make the most of his combat power.

Control measures also restrict the timely application of fires. Boundaries, restrictive fire lines (RFLs) and other control measures–including the contentious fire support coordination line (FSCL)–require extensive coordination to engage potentially fleeting targets. But, with tomorrow's battlefield clarity, we will bring the effects of fires to bear in a much more expeditious manner, finally achieving the fire supporter's ultimate goal: safe, accurate, instant steel on target.

Exploiting Potential. True battlefield awareness (enemy and friendly), seamless communication connectivity and real-time intelligence should equate to the real-time application of fires. Fires in the future potentially have few limitations—but it's up to us to make that potential a reality. Our charter is to leverage these new capabilities through vision and creative foresight. Or it will never happen in time.

Guidance is found in the Chairman of the Joint Chiefs of Staff's "Joint Vision 2010," which states, "Instead of relying on massed forces and sequential operations, we will achieve massed effects in other ways. Information superiority and advances in technology will enable us to achieve the desired effects through the tailored application of joint combat power."

Joint Vision 2010 describes improved command and control based on fused, all-source, real-time intelligence that will provide "...improved targeting information directly to the most effective weapon system." For the fires community, leveraging this technology comes through the unprecedented control of hair-trigger fires and will be the role of a new organization called the Effects Control Center (ECC).

Creating the Hub of all Fires. As a fires control cell, the ECC will plan and orchestrate the effects of lethal and nonlethal attacks supporting operations throughout the breadth and depth of the land component commander's (LCC's) area of operations (AO). The ECC's responsibility will span rapid coordination and deconfliction of all fires or effects of fires within its AO. With a single, unified view of the LCC's intent for fires, the ECC will continuously perform the targeting functions of decide-detect-deliver-assess based on the commander's attack criteria. An interconnected web of command and control nodes will allow the ECC to instantly couple any target with the best available launch or attack platform—immediate fires.

Establishing an ECC won't solve all the problems associated with achieving our elusive goal of real-time fires, but it is a major step toward eliminating the bureaucracy that obstructs our fires process. Linked with the capabilities of future land-, sea- and air-based fire support systems, the ECC will rapidly manage and direct unparalleled effects to the critical time and place on tomorrow's high-tempo, fluid battlefield.

The ECC, a 21st century organization, is still in the concept stage. But today we must determine how and with what organizations and platforms we will exploit tomorrow's revolutionary capabilities. Staying on the cutting edge of this revolution remains a priority. The May-June edition of this magazine will publish our vision, "Fires: The Cutting Edge for the 21st Century," that delineates the possibilities for tomorrow's fires—and they are many.

Twenty-first century technology has the potential of revolutionizing warfare. It's up to us to exploit that potential to ensure fires are the spearhead of that revolution–the cutting edge...and the enemy better not blink.

INTERVIEW

Interview with General Richard I. Neal,
Assistant Commandant of the Marine Corps

Fires for Lean, Mean, Maneuverable Marines

Interview by Patrecia Slayden Hollis, Editor

Editor's Note: *The Marine Corps is in the process of fleshing out its Operational Maneuver from the Sea (OMFTS), a concept of littoral power projection that makes the most of combat situational awareness and advanced technologies. OMFTS uses the sea as maneuver* space to *generate tempo and momentum against an enemy vulnerability and is applicable at the theater level down to smaller scale contingencies (SSCs). In OMFTS, logistics, fire support and command and control remain seabased, wherever possible.*

Ship-to-Objective Maneuver (STOM), a subset of OMFTS, is a concept for tactical amphibious operations. In STOM, the force maneuvers from the ship over the horizon to the military objective deep inland without the traditional pause ashore. This eliminates combat build-up at the beachhead, increasing operational tempo and decreasing the Marine "footprint" ashore.

Q *What are the implications of OMFTS and its tactical amphibious maneuver of STOM for fire support?*

A One main implication is a reliance on seabased fires. In rapid movement ashore, how do we move in artillery and lay, fire and sustain it before moving again? In STOM, we need fire support that can "reach out and touch" an objective area so our forces can get there.

In the Marine Corps, we balance fire support with naval gunfire, artillery and aviation fires for the Marine air ground task force–the MAGTF. So, where we may be a little light on the artillery, we employ the fires of fixed-wing aviation or helicopters.

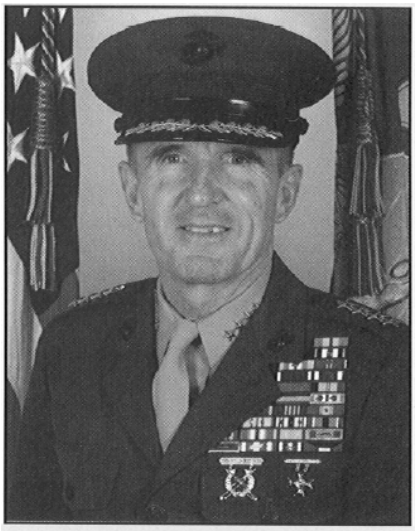
The Navy is committed to supporting us with naval surface fire support at a minimum range of 41 and out to around 63 nautical miles–which needs to be increased to 200 miles inland as we enter the 21st century. The Navy is developing an extended-range guided munition (ERGM) for improved 5-inch guns and the vertical gun advanced ships (VGAS) that will reduce the gun's footprint on the ship while shooting longer ranges. It's also considering a naval variant of ATACMS [Army tactical missile system], called Navy TACMS.

The new MV-22 Osprey [vertical takeoff and landing, or VTOL, aircraft] will allow us to reach great distances inland, and coupled with the improved LCAC [landing craft air cushioned], AAAV [advanced amphibious assault vehicle] and the LPD-17 [will replace four classes of amphibious ships], we'll be able to bring the forces to bear on the objective. Responsibility for command and control, including fire support coordination, may remain shipboard vice being passed ashore as it is today.

Q *Implementing OMFTS, what part will the Marine Corps play in joint and combined operations?*

A Desert Storm is a great example to illustrate our contribution. In Desert Storm, we had six months to build up huge stockpiles–Army, Navy, Air Force and Marines. Now, with the "CNN effect," our future enemies know we like to stockpile things.

In STOM, we'll remain seabased. So, essentially, if the objective is within our operating radius from the sea as it was in Desert Storm, then we won't get loggered down into a beachhead construct.



During the war, the 1st and 2d Marine Divisions punched through from Saudi Arabia to Kuwait City. Using STOM in that same scenario, we'd move from the North Arabian Gulf directly to Kuwait City. Once we have the Osprey, we'll have the legs to do it. Fire support would come from our aviation on the carriers plus our artillery, once ashore. We'd move our LAVs [light armored vehicles] and tanks ashore in LCACs and, together with our AAAVs, maneuver in combat formations.

We might employ something like the fire support cells we experimented with during Hunter Warrior at Twentynine Palms and Camp Pendleton [California]. [The 1997 Hunter Warrior was the first of three Marine Corps Warfighting Laboratory experiments.] We formed squad-sized fire support cells with the assets to communicate with the Navy and the Marines and their aviation at great distances. They were highly mobile, but in some cases, they didn't move-they stayed in their locations and became our eyes and ears. They were very lethal.

Now, at the same time, we must be careful. We don't want to put little "penny

packets" all over the battlefield to try to annihilate the enemy piecemeal. The teams must be focused–positioned on the battlefield to help move the force forward onto the objective.

So, our part in joint and combined operations is to "kick the door down." After we rapidly take our objectives, we then secure those port and air facilities required for the introduction of follow-on forces to conduct joint and combined operations. Although the nature of our nation's forces is complementary, the unique abilities of the Marine Corps ensure its place in future joint and combined operations.

Q *What ground-based fire support systems do you see for the near future?*

A The "long pole in the tent" is having fire support available at all times to enable maneuver. The farther you get away from the shore, from the seabased construct, then the more range you need–or the more you must depend on either air or ground-based systems for fires. So, our ground-based fire support is a critical part of the picture.

We're committed to the lightweight 155-mm howitzer being developed jointly by the Marine Corps and Army as our land-based artillery system. When I commanded the 5th Battalion, 10th Marines, we had several systems. Our battalion had 155 self-propelled and 8-inch self-propelled howitzers. At that time, the Marine Corps also had 175-mm howitzers along with 105-mm and 155-mm towed howitzers. We've "necked" down to one system, the M198, which will be replaced by the lightweight 155. That's it.

In terms of munitions for the lightweight 155 howitzer, we'll have high-explosive rounds, sense and destroy armor (SADARM) and the developmental XM982 extended-range projectile that will fire out to 40 kilometers. Add the multi-option fuze and the modular charge system and you have a system robust enough to engage targets for our maneuver forces.

We have an agreement with the Army for MLRS [multiple launch rocket system] support, depending on the situation. We looked at HIMARS [high-mobility artillery rocket system] a wheeled, lighter weight variant of MLRS. There's a lot of support for HIMARS in the Marine Corps, but in prioritizing systems and considering their costs, it didn't make the cut. If it were a perfect world and we had a bigger budget, HIMARS would be a part of the Marine arsenal.

Our Marine Corps Warfighting Lab is looking at a 120-mm autonomous mortar (Dragon Fire) for our infantry. We're also looking at putting a turreted 120-mm mortar on an LAV-type vehicle.

But basically, the lightweight 155 is our land-based fire support for the foreseeable future, ably complemented by our aviation combat element. For the deep battle or for targets beyond the range of the 155, we'll depend on our aviation, joint assets or a combination of both.

Q *As you "kick the door down," what will your all-weather, around-the-clock close support-even danger close-fire support system be?*

A Right now, in addition to our organic mortars and artillery and naval surface fires, we have the F/A-18 Hornet, AV-8B Harrier and AH-1W Super Cobra, all three of which provide close support with a variety of conventional and precision-guided munitions. The Hornet and Harrier can provide danger close support with their 20- to 25-mm guns and laser-, IR [infrared]-or TV-guided ordnance. The F/A-18 D-model fighter is a two-seater version for a FAC [forward air controller].

The three platforms are being re-manufactured to increase their combat effectiveness at night and during adverse weather, among other capabilities. The modifications are for the F/A-18 C/D for the night attack, the day attack Harrier to a night attack/radar configuration and the addition of a new night targeting system to the Cobra. The Cobra will have a number of other upgrades-for example, adding a four-bladed rotor system for higher speed, longer range and an increased payload of precision-guided munitions.

We'll neck down to one fixed wing aircraft by 2015. The joint strike fighter [JSF] will replace the F/A-18s and Harriers and be fully capable of close and danger close support under all conditions.

Q *As a result of the Quadrennial Defense Review mandate to downsize the active Corps by 1,800 Marines, a force structure review has recommended eliminating the two active 496-man air naval gunfire liaison companies (ANGLICOs). Is the Marine Corps implementing the recommendation? If so, how will the changes affect Army forces the ANGLICOs support?*

A To answer the first part of your question–Yes, we're eliminating the ANGLICOs and forming a Marine Liaison Group (MLG). We'll deactivate the 2d ANGLICO [Camp Lejeune, North Carolina] in September; support for Army forces will continue through March of 1999 until the deactivation of the 1st ANGLICO [Camp Pendleton].

We're in the process of determining exactly what the mission and capabilities of the MLG will be. Essentially, the MLG in the MEF [Marine expeditionary force] will give the CINC [commander-in-chief] a 21st century coalition liaison capability. It will provide personnel who speak other languages and focus on interfacing with joint and combined forces rather than providing nice-to-have radio operators. The MLG won't have the number of people-about 100 total–or communications assets to work with the Army down at the company FIST [fire support team] level.

Now in terms of the effect on the Army, eliminating the ANGLICOs was one of the biggest discussions in our Marine Corps General Officers' Symposium. The MEF commanders were very concerned about our ability to liaison with the XVIII Airborne Corps and other units designated to support the CINCs. We had a tough time selling them because their CINCs, with the air and ground component commanders on the CINCs' left and right, are comfortable with the ANGLICO.

"The farther you get away from the shore, from the seabased construct, then the more range you need–or the more you must depend on air or ground-based systems for fires."

We're going to have to rededicate our efforts toward ensuring we're interoperable, toward ensuring we can communicate with each other. We went through that dismal phase in Grenada where we couldn't talk to each other. There were even instances in Desert Storm when we couldn't communicate. We've done much better, but we still have a ways to go.

Q *What has the Corps learned about fire support issues in Hunter Warrior, the first of the five-year "Sea Dragon" program–the Marine Corps Warfighting Lab's experimentation to develop the Marine Corps through 2010?*

A The purpose of the experimentation program is to reduce the time required to get equipment into the force by eliminating R&D [research and development] in the acquisition process. We experiment with a commercial off-the-shelf piece of equipment and, if we see a warfighting advantage, we buy it–basically cutting out R&D. If there is no warfighting advantage, we thank the contractor for his interest in the national defense and move on to experiment with something else.

Hunter Warrior was the first such experiment. We've already talked about the squad-sized fire support cells we employed during Hunter Warrior that were very successful at bringing fires to bear from different indirect fires assets. Hunter Warrior showed that indirect fires can give a smaller force a decisive advantage against a numerically superior enemy, given emerging technological advantages in precision, target acquisition, digital communications and enhanced fires coordination. The problems that came out were that long-range fires take time to get to the targets and moving targets are hard to hit, even using precision munitions. Volumes of fires, such as preparation fires or final protective fires, are difficult to support on the extended battlefield. Air support proved to be decisive in the scenarios we used.

One experiment in Hunter Warrior that stands out is with the Dragon Drone. The drone is a retrievable UAV [unmanned aerial vehicle] that sends back pictures and can employ munitions. We can use Dragon Drone to target the enemy over the hill or horizon, and it only costs $10,000 a copy–*nothing* in the military costs only $10,000. And a young lance corporal with about an hour's instruction can become a very proficient Dragon Drone operator.

This summer, the 15th MEU will receive 10 drones for experimentation at sea and, by the end of the year, the 26th MEU will have 10 drones. This is just one example of the Marine Corps Warfighting Lab experimentation process of getting equipment to Marines as fast as possible.

In the upcoming Urban Warrior experiment, among other things, we'll look at different fire support capabilities for urban areas that don't destroy the people or objective and that don't cause us to lose the ability to maneuver through the environment. Urban fires are a challenge because targets within cities are almost always in close proximity to friendly forces and noncombatants and enemy forces are usually well protected.

We'll look at, for example, employing a regular 155-mm round with an inert warhead that punches a hole through a building rather than blowing the building up. Given likely rules of engagement, we anticipate the dominance of direct fire over indirect fire. We'll look at different attack profiles for aviation ordnance, types of ammunition that reduce rubbling and allow us to move through a city.

Urban fire support coordination is difficult. For urban warfare, we need an automated system that allocates fires for the maneuver forces and deconflicts the projectiles' trajectories with the flights of manned and unmanned vehicles in the same airspace. These are the kinds of fire support issues we'll be looking at in Urban Warrior.

Q *In the past few years, the Marine Corps' artillery emphasis has shifted to providing direct support (DS) fires for smaller unit operations (some up to the division level) and supplementing them with aviation fires; in contrast, the Army's emphasizes providing DS and general support (GS) fires and serving as fire supporters at all levels up to echelons above corps. Do you see the training, doctrine or materiel development relationship between the Marine and Army artillery at Fort Sill changing?*

A Our artillery has changed. We still may say we provide general support, but we're basically a direct support artillery. And as the Marine Corps necks down, the configuration of the Marine artillery could change even more. But I don't see it any less than three active regiments.

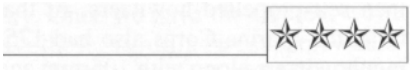
We'll always keep the Reserve regiment–the 14th Marines. At some future date, we may look at a GS role for that regiment, possibly equipping it with MLRS. Right now, cost is prohibitive.

In terms of our relationship with Fort Sill and as a product of its FAOBC [Field Artillery Officer Basic Course] many years ago, I don't see a change. Fort Sill lays the bedrock for Marine Corps fire support and fire support coordination. We work hand-in-glove to develop most doctrine and training associated with artillery.

The Marine Corps can't always afford to develop the capabilities the Army can. But we do a good job of taking the best of what the Army develops or codeveloping what we need with the Army. We're joined at the hip, and I think it's going to stay that way.

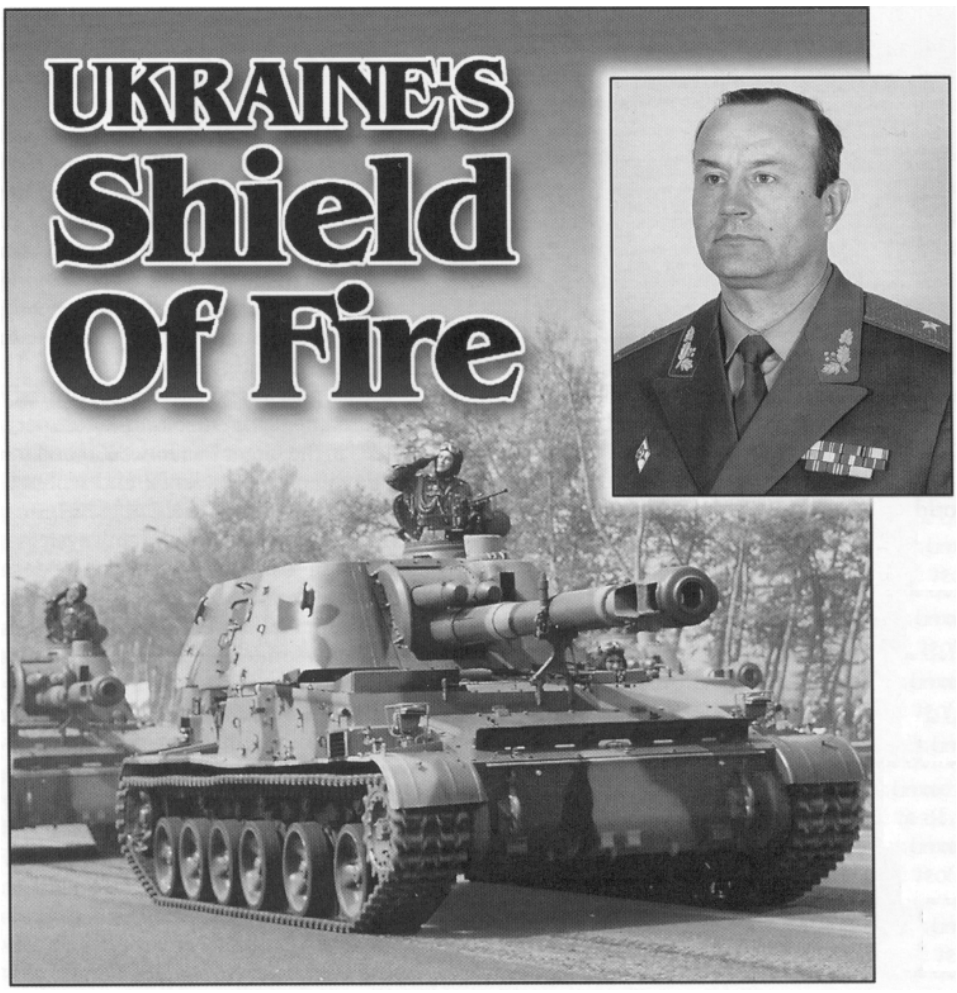
Q *What message would you like to send Marine and Army Field artillerymen stationed around the world?*

A Be very proud of what you bring to the battle, for your contribution is critical. The demands on you are high, and you don't always get credit for being what your are–the best artillerymen in the world.



General Richard I. Neal has been the Assistant Commandant of the Marine Corps since 1996. In his previous assignments, he was Deputy Commander-in-Chief and Chief of Staff, Central Command (CENTCOM) at MacDill, AFB, Florida; Commanding General of the 2d Marine Division, Camp Lejeune, North Carolina; and Commanding General of the Joint Task Force for Operation Gitmo, a humanitarian relief effort for Haitian migrants at Guantanamo Naval Base in Cuba. He also served as the Deputy Commanding General for II Marine Expeditionary Force (MEF) at Camp Lejeune; Deputy for Operations at CENTCOM in the Gulf for Operations Desert Shield and Storm; and Director of the Manpower Plans and Policy Division of Headquarters, Marine Corps. General Neal commanded the 5th Battalion, 10th Marines, and the 2d 155 Howitzer Battery, 2d Field Artillery Group, both at Camp Lejeune; and completed two tours in Vietnam.

UKRAINE'S Shield Of Fire



152-mm (2S3) Akatsiya Howitzer

by General-Major Volodimir I. Tereshchenko
Ukrainian Armed Forces

The Ukrainian Armed Forces as a whole and Rocket Forces and Artillery in particular have been shaped by a range of decisions. Among them are the Ukraine's decision to have non-nuclear status, adopt a defense-oriented military doctrine and modernize the Armed Forces by analyzing current and future battlefield conditions and comparing weapons developments in neighboring countries.

As a major component of the Ukrainian Ground Forces, the Rocket Forces and Artillery provide a shield of firepower. They include operational-tactical and tactical missile formations; cannon, rocket and antitank artillery formations and units; artillery observers; and mortar and tank-guided missile units.

This article examines the evolution of the Ukraine's Rocket Forces and Artillery through the World Wars as part of the Soviet Union to their composition and operations today. The Ukrainian Rocket Forces and Artillery are a significant combat multiplier for the independent nation of the Ukraine.

Evolution of the Artillery

The history of the birth of Ukrainian artillery extends back to ancient times. The first references to the use of cannons in Kievan Rus date back to the 1382. Thus, one may consider the 14th century as the beginning of Ukraine's artillery history.

Ukrainian artillery first developed as fortress and, then later, field cannons. The Ukrainian Army headed by Bohdan Khmelnitsky had a fairly large artillery force. Artillery played a key role as part of the Ukrainian-Galician Army during the liberation war of the Ukrainian People's Republic.

World War I. Artillery proved to be one of the major means of warfare during World War I's extensive static defense warfare. Breaking through defenses was only possible with concentrations of heavy artillery fire. During World War I, infantry losses due to artillery reached 75 percent, out-numbering casualties due to rifle and machinegun fire by three times. The experience of World War I demonstrated that a sudden and massive artillery preparation and massive fires attack in support of the main effort was an effective way of employing artillery.

At that time, artillery observation took a significant step forward. New observation means were introduced, including artillery observation aircraft and special equipment. The Soviet Union's artillery was the first to use audiometric stations in battle.

World War II. Soviet artillery met expectations on the battlefields of World War II in the fight for the freedom and independence of the Soviet homeland. In 1942, it acquired the nickname of "The God of War" and gave the Soviets a dramatic advantage over the German and Japanese army artilleries in terms of both numbers of cannons, mortars and rocket artillery engaged in operations and in artillery direction and observation. With the goal of employing artillery most effectively in all combat conditions, the Soviet Union improved the organizational structure of its Rocket Forces and Artillery and, as much as the country could afford, increased the numbers of pieces on the battlefield.

By the end of the Second World War, the artillery of a Soviet rifle division was more powerful than that of other countries. For example, the number of Soviet antitank artillery pieces in the division was four times the number of German pieces, three times the number of American, four and one-half times more than the Japanese and only slightly behind the British.

The artillery was organized into the Operational Artillery (battalion, regiment, division, army and front) and reserve artillery, the latter under the command of the Reserve Commander-in-Chief (CINC). Field Artillery developments entailed improving capabilities for conducting fire missions independent of maneuver forces and operating jointly with motorized and armored units to conduct antitank defense and counterbattery operations.

The Reserve Artillery included different types of artillery: rocket, self-propelled and antitank, which were better

developed than cannon artillery. During the war, the Reserve Artillery improved both qualitatively and quantitatively. The number of mortars increased by 17 times, and the number of guns and howitzers increased more than fivefold. This underscored the importance placed on the role of the artillery in combat.

In 1943, the creation of artillery "break-through" divisions and corps increased the artillery's abilities to mass fire and maneuver in combat as well as improved its organization. Thus, the Soviet artillery structure was not stagnant. Rather, it constantly changed and improved to provide the most effective employment of the God of War.

During the Great Patriotic War (World War II), new techniques of moving artillery and massing fires were introduced in support of the main effort in the attack. At the same time, the range of artillery weapons surpassed all others in the history of war.

Artillery movements and fire-massing capabilities outgrew the tactical level and were used at the operational and even strategic levels. For example, in June 1944, the 7th Artillery Division moved rapidly from the Ukraine to Karelia, a distance of nearly 2,000 kilometers. Then, in five days, the division redeployed for the Yask-Chisinau operation. On another occasion during the Berlin operation, the artillery of the 1st Ukrainian Front moved to the Teltov Channel within 25 hours-a distance of some 180 kilometers.

The artillery employment principle of massing fires decisively is best achieved by increasing the density of artillery in both offensive and defensive operations. In 1945, the operational density of artillery in breakthrough zones had increased to 200 to 300 guns, howitzers, mortars and rocket artillery pieces for every kilometer of front; this is compared to 70 to 80 pieces per kilometer in 1941. The creation of large artillery units (corps and divisions), the use of long-distance movements and large-scale massing of fires promoted artillery from a tactical to an operational tool.

The Soviet's basic principles of artillery employment in battle were the most advanced at the time and further improved during World War II. For example, experience demonstrated the effectiveness of task organizing artillery groups based on the mission and maneuver organization.

The "artillery attack" was developed as a form of target destruction. The effective range of an artillery preparation increased from six to eight kilometers in 1944 to eight to 12 kilometers in 1945.

Artillery support during the majority of operations was by double volley (linear sheaf) fire and a combination single volley (linear sheaf) with concentrated converged sheaf. The range of artillery support corresponded to the depth of the enemy's first-echelon regiments.

During the war, the artillery received high marks in battle from the Supreme High Command. More than 2,100 artillery units received awards for actions in World War II with approximately 1,200 units given the designation of "Honor" and 137 redesignated "Guards" units. The artillery's success was due to the high moral and professional qualities of its personnel–more than one million awards and medals were given to artillerymen. Of those, 1,800 soldiers, officers and generals received the highest decoration "Hero of the Soviet Union," and two of them, Major Petrov V. S. and Lieutenant Shylin A. P., received the decoration twice.

Post World Wars. The postwar period is known for rapid science and technological developments and the introduction of nuclear weapons. A new branch of the Ground Forces was created: Rocket Forces and Artillery. Certain artillery units were reequipped with rocket and missile systems and transferred to the Strategic Rocket Forces—a new branch of the Armed Forces.

The emergence of nuclear missiles led to a reconsideration of the roles and missions of conventional weapons. In the mid-50s, this meant downsizing the artillery. However, in the beginning of the 60s, the artillery started to regain significance as a means of destroying smaller sized targets, providing protective fires and engaging targets close to the opposition forces.

In the postwar years, Soviet artillery developments were based on experiences in the Great Patriotic War and the achievements of science and technology. The artillery fielded new guns, howitzers, rocket and antitank systems, mountain cannons, mortars, modern reconnaissance and fire control means and computer systems. Artillery systems' performance improved significantly in terms of range, munitions effectiveness, rate-of-fire and precision. Artillery also fielded self-propelled systems, which improved its maneuverability and survivability.

The adoption of new armament and equipment and changes in the nature of warfare called for new tactics and techniques for the Rocket Forces and Artillery firing and fire direction and forward observation. Rocket Forces personnel and artillerymen were quite successful in developing them.

During World War II, Soviet soldiers wrestle a 76.2-mm field gun across the Oder River about 50 miles from Berlin. The First Ukrainian Front beat the First Belorussian Front to Berlin by nine days.

Today's Firepower Shield

The early 1990s featured the collapse of the Soviet Union and the emergence of the new state of the Ukraine, which declared its independence 24 August 1991. The Ukraine is one of the largest countries in Europe with a population of 52 million people. Its land area is 603,700 square kilometers with a water surface area exceeding 20,000 square kilometers. The Ukraine shares 7,569 kilometers of borders with Russia, Belarus, Poland, Slovak Republic, Hungary, Romania and Moldova.

The Ukraine is a democratic republic headed by

the President, who is also the Commander-in-Chief of the Armed Forces. Legislative power belongs to the one-chamber Supreme Rada (Parliament) while executive power rests with the Cabinet of Ministers.

Equipment. The Rocket Forces and Artillery units deployed in Ukraine's territory after the Soviet Union dissolved became Ukrainian. The Ground Forces retained operational-tactical and tactical missiles, multiple rocket launchers (MRLs), self-propelled and towed artillery of various calibers, antitank systems (including antitank missiles) and other systems.

Built in 1974, the *Uragan* multiple rocket launcher (MRL) was designed to destroy targets up to 35 kilometers away.

The operational-tactical and tactical rocket systems *Skad* and *Tochka* (with ranges of 300 and 120 kilometers, respectively) feature high precision volumes of fire. They can fire in any weather or geographical condition from both prepared and unprepared launch sites as well as from the march to engage planned and unplanned targets.

The MRL systems *Smerch, Uragan* and *Grad* are designed to destroy concentrations of personnel and various vehicles at distances up to 70 kilometers. They can remotely launch mines, and carry guided and unguided demolition, fougasse (including cluster) and incendiary munitions. These systems are highly mobile and can provide significant firepower.

The most common systems–*Giatsint, Akatsiya* and *Gvozdika*–are manufactured both as self-propelled and towed models and provide fire support for army units and accomplish various independent missions.

Antitank artillery means are used for engaging tanks and other armored targets. With its radar target location system, the antitank cannon *Rapira* can fire long ranges at night.

The self-propelled antitank guided rocket systems *Sturm* and *Konkurs* have an accuracy rating of 0.9 (probable error of 0.1) and can hit specified targets at five kilometers.

Training. High-quality training has always been key to the artillery's combat readiness and success in military operations. The Ukrainian Rocket Force and Artillery training system provides comprehensive training for commanders' staff and personnel and ensures the Armed Forces will be able to employ the might of rocket and artillery in divisions, battalions and other units.

Officer professional qualifications are vital. A high level of Rocket Forces and Artillery officers' expertise is a major criteria for combat readiness in the branch. During commanders' meetings, classes and exercises, officers improve their skills in managing rocket attacks and artillery fire to fulfill their duties of engaging the enemy with fires.

The bulk of Rocket Forces and Artillery training consists of practical field exercises. Up to 50 percent of the Rocket Forces and Artillery's training time is spent conducting field exercises at training areas and centers.

During tactical exercises, Rocket Forces and Artillery units practice combined arms training with mechanized, armored and aviation units to execute timely and efficient attacks. An attack is usually carried out using the three-part formula of "observe–compute firing data–fire." Radar and audio and optical observation devices define coordinates and the types of targets and pass this information to fire direction posts to compute the firing data. The data then is given to firing units to engage the targets.

It is well-known that Rocket Forces and Artillery training was of fairly high quality in the Soviet Union. Training was provided by seven schools, three of which were located in the Ukraine. In all, the Ukraine inherited 34 military schools and 73 military faculties devoted to civil educational institutions after the collapse of the Soviet Union. Annual output of personnel from these institutions would greatly exceeded the Ukrainian Armed Forces' demand.

On the other hand, the Ukraine lacked military schools that trained rocket specialists and munitions and supply personnel for Rocket Forces and Artillery units. Furthermore, nearly all the managing directorates of the military education system remained outside the Ukraine. The system required substantial review and reorganization.

The Ukraine's creating a military education system with a network of institutions and corresponding regulations and management structures was a major challenge. In addition, this new education system had to be integrated with the existing state structures. This integrated educational system trains experts for the Ukrainian Rocket Forces and Artillery at all stages from basic military training up to the operational-strategic level.

The Ukraine's announcement of its nuclear-free and non-block status and its becoming a party to the Conventional Forces in Europe Treaty (CFE) became the impetus to restructure the Ukrainian Armed Forces. Among other things, the Rocket Forces and Artillery were reorganized to reflect the defensive character of the Ukraine's military doctrine and the principle of defensive sufficiency.

In times of peace, Rocket Forces and Artillery personnel of the Ukrainian Armed Forces focus on improving their military skills and knowledge as well as developing high morals and pride in serving their newly independent country.

In times of war, the Rocket Forces and Artillery surely would be the Ukraine's Shield of Fire.

General-Major [Brigadier General] Volodimir Ivanovich Tereshchenko is the Deputy Commander of the Army and Commander of the Rocket Forces and Artillery of the Ukrainian Armed Forces. He was appointed as the Ukraine's first Commander of Rocket Forces and Artillery in September 1992 and simultaneously became the Deputy Commander of the Army starting in July of 1996. He joined the military in 1964 and has served in a variety of positions, including as an artillery platoon leader, chief of staff of an artillery battalion and regiment and commander of an artillery brigade. In 1976, he graduated from the Military Artillery Academy. From 1987 to 1992, he was the chief of Rocket Forces and Artillery of a corps and an army and then deputy commander of Rocket Forces and Artillery of a military district. General-Major Tereshchenko was born in the town of Romy in the Sumy area in 1946; he's married and now resides in Kiev.

Bosnian Artillery American Style

by Colonel (Retired) Christopher C. Shoemaker

There is perhaps no more powerful symbol of the brutality of the four-year war in Bosnia and Herzegovina than the image of Sarajevo under siege. For much of the war, Serb artillery ringed the capital, firing indiscriminately day and night into the heart of the city and laying waste to what had been one of the showcases of old Yugoslavia and the site of the 1984 Winter Olympics. As a result of this artillery bombardment, not a single building in the city was left undamaged, families were torn apart and civilian casualties numbered in the tens of thousands. The Army of Bosnia and Herzegovina (ABiH) charged with the defense of the city simply had no capacity to protect Sarajevo from the Serb artillery. The artillery weapons of the ABiH and HVO (Croatian Defense Council) were largely employed in the direct fire mode, and the artillery had no target acquisition (TA) capability.

Today, the guns are silent–a by-product of the sometimes maligned General Framework Agreement for Peace (the Dayton Accords)–and the reconstruction of Sarajevo has begun in earnest. But the Federation of Bosnia and Herzegovina made up of the Croatians and the Bosnian Muslims (the latter called Bosniacs) recognizes that peace in that part of the world is fragile and must be carefully nurtured with a credible deterrence and a capable defense.

Critical to the maintenance of peace in Bosnia is establishing an Army of the Federation that can accomplish these critical missions. American advisors acting under the aegis of the US Train and Equip Program have been helping to shape and train the Army of the Federation since July 1996.

During the first year of the program, much has been accomplished: the Federation's Ministry of Defense and Joint Command have been established; the structure of the Army of the Federation has been adopted; the Federation's Military Strategy has been approved; and training of Federation soldiers, units and leaders at all levels is moving forward in earnest.

A vital dimension to the Federation Army's requirement to deter and defend is a trained and equipped Field Artillery, not only for the tactical firepower the artillery brings to brigade commanders, but also for its irreplaceable capability to defend critical targets. In this regard, Field Artillery becomes a strategic asset of incalculable value to the Federation and for deterrence in this crucial part of the world.

Tactical Organization

To accomplish its tactical missions of deterrence and defense, the Federation Artillery is being organized into battalions and brigades. The highest tactical maneuver organizations in the Army of the Federation are the four corps, each of which consists of three maneuver brigades (see Figure 1).

Photo by MAJ Robert G. Black, Jr.

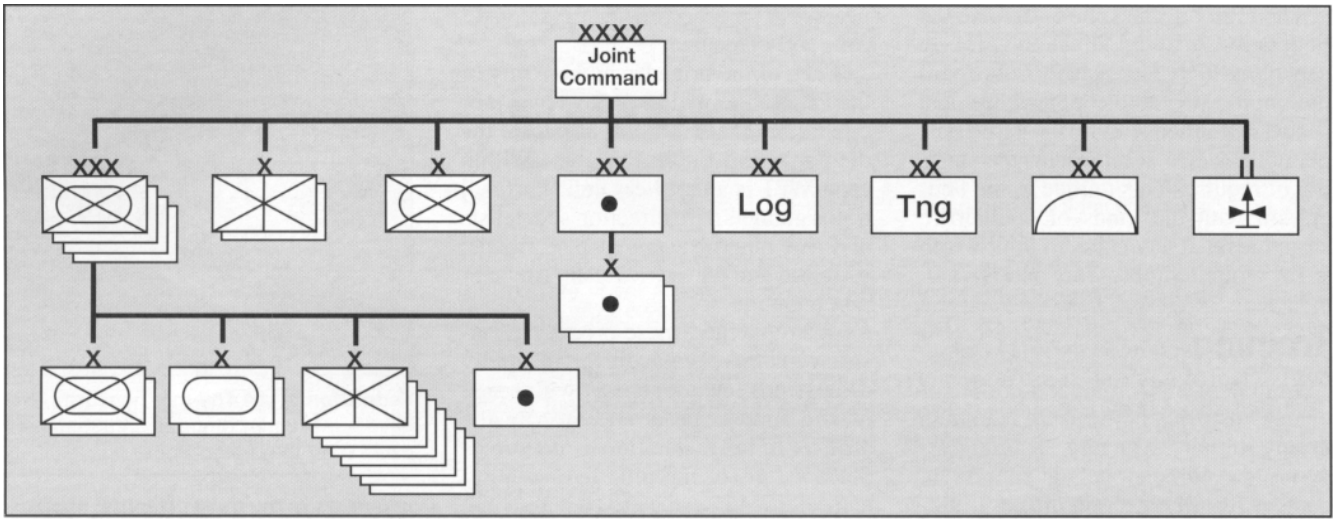


Figure 1: Organization of the Army of the Federation. The organization of the artillery brigade in each division is outlined in Figure 2.

When fully operational, each corps will have one organic artillery brigade with three direct support (DS) cannon battalions, one or two general support (GS) cannon battalions and one rocket battalion (Figure 2). These battalions are being designed under the 3x6 configuration and will adhere to standard US/NATO tactical missions, including DS, reinforcing (R) and GS. Each artillery brigade also will have a TA battery.

The artillery battalions will be equipped with a variety of weapons systems,

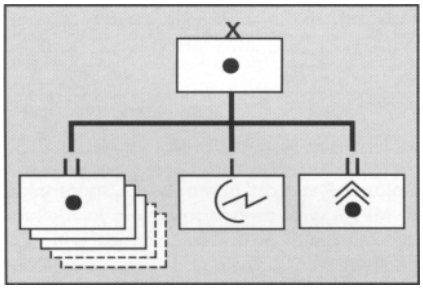


Figure 2: Organization of the Artillery Brigade Organic to Each of the Corps

including L118 (M119) howitzers donated by the United Arab Emirates, M114 155-mm howitzers from the United States and M46 field guns and D30 howitzers from Egypt. The Federation also has other weapons captured during the war.

The exception to the design described is the artillery battalion in the Federation Reaction Force. The force is the cutting edge of the Army of the Federation and, when fully trained, will be equipped with US M60A3 tanks and M113A2 armored personnel carriers.

The artillery in the Federation Reaction Force is being organized into a 24-gun, 3x8 battalion of D30 122-mm howitzers. The battalion will be larger and more flexible than the standard DS artillery battalions because of the mission of the Federation Reaction Force and its Federation-wide area of operations.

For the most part, however, the tactical artillery within the Army of the Federation will conform to basic US design, reflecting the Federation objectives to ensure its army is compatible with NATO standards and has a high degree of interoperability.

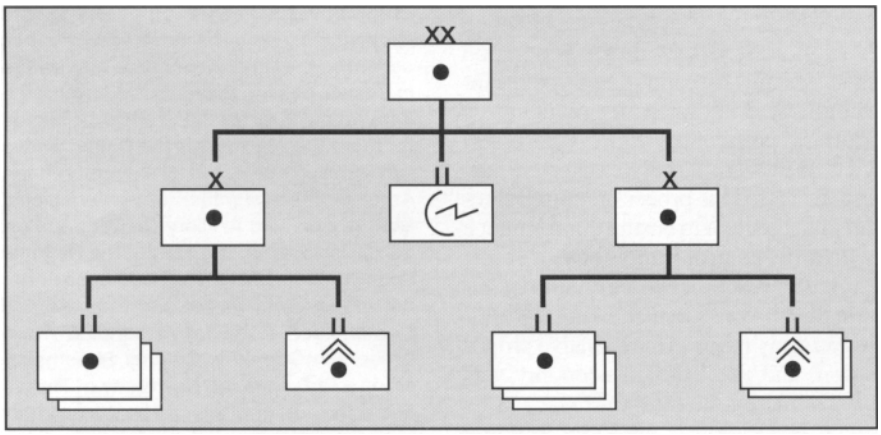


Figure 3: Organization of the Federation Artillery Division

Strategic Organization

Because of the relatively small size and geographic isolation of the Federation and the current lack of attack aircraft in its force structure, the sole defense of strategic urban targets from enemy artillery is counterfire. This requires a unique approach to artillery organization: the Federation Artillery Division (see Figure 3). The Artillery Division's primary mission is to provide strategic counterfire in the defense of critical urban targets such as Mostar, Tuzla and, of course, Sarajevo itself.

The Artillery Division is being organized into two identical brigades, each with two rocket and three extended-range cannon battalions. Target acquisition is provided by the division's TA battalion with two batteries that can be used separately to support each brigade or together to provide blanket coverage of one major target area.

Along with the Federation Reaction Force, the Artillery Division enjoys the highest priority in the army. The Federation has recently contracted with Romania to buy 36 *Apra* 122-mm rocket launchers that fire extended-range rockets out to 32 kilometers. This provides a sufficient overmatch for any system that could be reasonably massed against strategic targets in the Federation. The cannon battalions will be equipped with M59 and M46 field guns currently in the Federation's inventory and be augmented with long-range systems to be acquired in the future.

When fully trained and equipped, the Federation Artillery Division will be a capable artillery force and form the foundation for a credible deterrence and successful defense in this volatile corner of the world. It represents the melding of requirements unique to the Federation with the kinds of counterfire structures that have proven their worth in the United States Army and NATO.

Training

Equipment and organization are, of course, insufficient to ensure readiness of any military structure. Training remains the cornerstone for success in combat. In the Federation, artillery training is being conducted at many levels—from "cannoneers' hop" to battalion fire direction centers (FDCs). Federation artillerymen are learning the art and the science of US artillery tactics, techniques and procedures (TTP) in several programs.

• In January 1998, the first rounds were fired from Federation Artillery batteries at the Federation's Army Combat Training Center at Livno. Herzegovina. This signaled the advent of combined arms training in the Army of the Federation.

• As the Train and Equip Program for Bosnia entered its second year, counterfire tactics have assumed center stage, and the Federation is growing in its ability to defend its critical assets from the threat of enemy artillery.

• At the Federation's Center for Leader Development at Pasaric, brigade, battalion and company officers and sergeants are schooled in the integration of fires and maneuver.

Federation M119 105-mm howitzers that have a maximum range of 17,200 meters were donated by the United Arab Emirates.

• Each of the brigades in the Army of the Federation will be trained by a mobile training team (MTT) as part of the the Train and Equip Program. Within each MTT is an artillery cell. This cell trains gunners, fire direction specialists and fire support teams at the brigade, battalion and battery levels in fire support techniques.

Taken together, these programs constitute a comprehensive effort to rapidly achieve proficiency across a wide range of fire support tasks and prepare the artillery of the Federation to assume its place as one of the pillars of stability and defense in Bosnia and Herzegovina.

The Challenges

To be sure, the Federation faces many challenges as it creates the capability to deliver effective fires. The challenges are caused by the realities the Federation confronts–for example, the fact that the Army of the Federation is new and growing out of cooperation between two former adversaries: the Bosniacs and Croats. In addition, much of the equipment in the Army of the Federation was captured from the Bosnian Serbs and the old Yugoslav National Army (JNA) during the war. Quite naturally, this creates enormous problems in standardization and maintenance. While this is being offset by the arrival of US systems and new weapons from other sources, it will remain a challenge for the foreseeable future.

Second, the arms control limitations imposed by the Florence and Vienna Accords set the ceilings for Federation Artillery at 1,000 total weapons, including mortars over 75-mm. The Army of the Federation entered into the agreement with nearly 3,000 weapons, the overwhelming preponderance of which were mortars. So, while the Federation is increasing its cannon and rocket inventories, it is drastically reducing its mortars, particularly those whose service lives were largely exhausted during the war. This process requires careful management to ensure conformance with arms control limitations.

Finally, resources to build and maintain the army is a real challenge. Building an army is not an inexpensive proposition, and the Bosnian economy was bled white by the four-year war.

The Federation is carefully aligning its priorities to ensure it uses its limited resources in the most effective manner. And this means that not every system and weapon required by the force structure can be acquired at once. Risks have to be taken in some capabilities to protect the systems fundamental to near-term deterrence and defense.

Federation M114 155-mm howitzers that have a maximum range of 14,600 meters came from the United States.

The Army of the Federation–with its artillery–is a courageous attempt to build a security framework in an explosive corner of the world, a framework that will help undergird peace and stability far into the future. There are many challenges to overcome and pitfalls to avoid in the months and years ahead, and success is by no means certain. But substantial progress has been made, and the Federation has a realistic road map that, with patience and good will, can be achieved.

Colonel (Retired) Christopher C. Shoemaker of MPRI, with its headquarters in Alexandria, Virginia, is under contract with the Federation of Bosnia and Herzegovina under the auspices of the US Train and Equip Program. He is the Director of Senior Leader Development of the Military Stabilization Program in the Federation of Bosnia and Herzegovina. For the past year, he has served as the Director of Force Integration in Bosnia, helping to create the Army of the Federation. Prior to joining MPRI, he served for more than 20 years in the United States Army and was selected for General Officer. Among other assignments, he was Chief of Staff of the Field Artillery Center and Fort Sill, Oklahoma; on the staff of the National Security Council at the White House under both Presidents Carter and Reagan; and Commander of the 1st Armored Division Artillery in Germany. Colonel Shoemaker holds a PhD from the University of Florida and is the author of several books on international relations and a member of the Council on Foreign Relations.

CRUSADER UPDATE

Overview of Crusader Development. In December 1997, the Crusader program successfully completed the first of three annual, internal, system reviews that will build to a major program decision in 2000: approval to enter engineering and manufacturing development (EMD). At that time, the program will be five years away from the fielding of the first Crusader battalion in 2005. This update provides an overview of the Crusader development schedule, focusing on major activities.

The Beginning. In the concept exploration phase, the office of the Training and Doctrine Command (TRADOC) System Manager for Cannons (TSM-Cannon) drafted the operational requirements document (ORD). The ORD contains the major, system-level operational needs the system must meet.

In 1994, the Defense Department's senior acquisition executive authorized the Crusader program to enter the demonstration and validation (DEMVAL) phase through the year 2000. The Army awarded the contract to United Defense, Limited Partnership, the contractor that produced an advanced technology demonstrator in the previous phase. The $900M contract gave United Defense the five-year mission to "design a weapons system that will meet the user's warfighting requirements and build prototype vehicles to validate the design."

The "system" includes two new ground combat vehicles–not modifications or improvements of existing vehicles. The system is revolutionary and ambitious, and the program to develop the Crusader system is progressing very well.

The first two years of this phase (1995 and 1996) were characterized by the development of systems specifications. The ORD requirements were partitioned to flow from a system-wide perspective to the individual vehicles (howitzer and resupply vehicle), to major elements of the vehicle (armament; resupply; mobility; command, control, communications and crew; etc.), to subsystems (projectile magazine, crew displays, powerpack, etc.). The process ensures all requirements are incorporated into the vehicles systematically and that the impact of each requirement is assessed across the entire system's design.

During this period, conceptual alternatives were considered for all architectures: physical (what will it look like, and how will the major components fit together spatially), software (how will the crew use the man-machine interface to control the machinery) and electrical (how will power and signals be distributed). In addition, significant work was done to mature individual technologies that would become the foundation for the howitzer of the future: the engine and transmission, the propellant and cooled cannon, and docking and ammunition storage/handling subsystems.

In mid-1996, the program completed a major system functional review (SFR) and transitioned into preliminary design. The preliminary design conducted during 1996 and 1997 was characterized by many requirement and engineering trade studies. These studies helped the government-contractor team answer the question. "How do we maximize performance and reliability while minimizing cost, weight and risk?"

For example, the original ORD required Crusader to store and fire Copperhead rounds in addition to standard-length projectiles. As the operational and physical concept for the vehicle emerged, it became obvious that forcing Copperhead on Crusader was not a good idea. An artillery system optimized for automated handling of ammunition and high rates of fire does those tasks extremely well, but cannot easily accommodate the manually intensive task of preparing and firing Copperhead. In addition, sense and destroy armor (SADARM) is now the munition of choice to attack armored vehicles. A trade study documented the benefits and burdens associated with Copperhead, the analysis was presented to TSM-Cannon and the user removed the Copperhead requirement from the ORD.

Developments Now and Beyond. In parallel with the technical progress of the vehicle's design, there are many other activities underway in this phase that are important to integrating a new weapon system into the Army. The impact of fielding Crusader to the Army is being assessed and managed across the domains of doctrine, training, leadership, organization, materiel and soldiers (DTLOMS). This requires an extensive reexamination of organizational structures and supporting equipment that will culminate in the development of Crusader tables of organization and equipment (TOEs) and modified TOEs (MTOEs). We must determine education and aptitude requirements as we assess the ability of 13Bs to fight using the system. Training strategies and courseware have to be developed to ensure the individual and unit can capitalize on the technological strengths of Crusader.

A major task underway is the development of the tactics, techniques and procedures (TTP) for employing Crusader fire units. This task is being performed concurrent with the technical development of the vehicles, and was well laid out in the November-December 1997 article "TTP for the Crusader Battalion—A Beginning," by Major Warren N. O'Donell and Lieutenant Colonel (Retired) William A. Ross.

The next major program milestone will be a review in March 1998. At this time, the Commandant of the Field Artillery School and the Program Executive Officer for Ground Combat and Support Systems (PEO-GCSS) will assess the readiness of the program to begin prototype fabrication. Four vehicles (two howitzers and two resupply vehicles) will be completed in 1999 and 2000 to support technical and operational testing. One of the resupply vehicles will serve primarily as a mobility test platform. These vehicles will closely resemble the final Crusader configuration, but their early hands-on evaluation by soldiers will undoubtedly lead to refinements before the final system is fielded.

Artillerymen should monitor the development of Crusader as the program continues through this phase into EMD and on to production and fielding in 2005. Not only is the program's progress an instructive and fascinating case study of innovative materiel development, but the Crusader program also will yield the Army's cornerstone weapon for combat in the 21st century.

MAJ John R. Holland, FA
Field Artillery School Representative
Team Crusader, Minneapolis, MN

Centaur Outpost

Training the SFOR Artillery in Bosnia

by Captain Brett J. Gullett

US and Russian artillery firing at Centaur Outpost.

At Glamoc, Bosnia-Herzegovina, the 1st Battalion, 6th Field Artillery (1-6 FA), part of the 1st Infantry Division (Mechanized), assigned with the NATO Stabilization Forces (SFOR) established Centaur Outpost for Field Artillery training. The object was to keep the skills and training of 1-6 FA Redlegs up-to-date during Operation Joint Guard. Field Artillery training opportunities were also extended to other SFOR artillerymen in the US-led sector, including the British, Russian and Turkish.

This article discusses establishing Centaur Outpost and the SFOR training that followed, including a live-fire howitzer shoot with Russian artillery-perhaps the first ever.

Background. In March 1997, 1-6 FA, a 155-mm self-propelled battalion, left Bamberg, Germany, to relieve its sister battalion, 1-7 FA, in Bosnia-Herzegovina. Since that time, the battalion has had the mission of Force Field Artillery Headquarters for the 1st Infantry Division in Bosnia. The battalion is distributed throughout the approximately 15,000 square kilometer area (roughly the size of the state of Maine) occupied by the Multinational Division (North), the US-led sector.

While the majority of the battalion continued to execute the primary fire support mission, an enhanced detachment established the Centaur Outpost camp about 250 kilometers southwest of Tuzla in Glamoc in early June. Glamoc is in the British sector.

Centaur Outpost was for gunnery and fire support training, allowing the battalion to conduct baseline calibrations of the unit basic load (UBL) propellant lots, establish muzzle velocities, qualify firing platoons, certify a radar section, train observers and conduct combined training with SFOR nations.

Training was conducted at Resolute Barbara Range Complex at Glamoc, which was formerly a training area and airfield built by the Yugoslavian National Army. The British named the range complex after Saint Barbara, the patron saint of the artillery. Resolute Barbara Range Complex lies in a scenic valley that once was controlled by the Bosnian Serbs and later overrun by the Bosnian Croats. The roughly 20 villages that dotted the valley are now abandoned; all human life in the valley is concentrated at Centaur Outpost.

We established Centaur Outpost with a permanent party of 64 soldiers, including organizational and direct support maintenance, food service and ammunition personnel. We had a squad of infantrymen from 2-14 Infantry for force protection. Centaur Outpost had 12 general purpose (GP) medium tents, a field kitchen, two military vans (MILVANs) with showers and latrines, guard shacks, a 10,000-gallon water blivet and six light towers. We surrounded the outpost with triple-strand concertina and barbed wire, designated AT-4 positions and established a continuous roving guard.

The British maintain an artillery battery at the range complex to function as range control. The range impact area is approximately 100 square kilometers and is bisected by the Inter-Entity Boundary Line (IEBL) separating the Entity Armed Forces (EAF).

Training Plan for Centaur Outpost. The training plan for Centaur Outpost was ambitious. Although the original intent was simply to calibrate powder and obtain muzzle velocities, we quickly realized the outpost's potential for a broad range of training opportunities. Making the most of the opportunity to fire live rounds, we incorporated Field Artillery Cannon Tables VII Platoon Live-Fire Practice and VIII Platoon Qualification into the scheme. This, in turn, afforded us the opportunity to train the fire support teams (FISTs) and combat observation lasing teams (COLTs) as well as a Q-36 radar section. We used the little time left in the schedule to run a familiarization range on the M2 .50-caliber machinegun for each platoon.

The plan was to rotate one platoon through Centaur Outpost every week. Day One, the platoon staged its howitzers and lowboys at the base camp. On Day Two, the platoon conducted a road march from base camp to set up camp. On Day Three, the platoon drew ammunition and trained on the M2 range and direct fire range. On Day Four, the platoon calibrated and shot Artillery Table VII Illumination. Day Five was for

Table VII Platoon Qualification Practice and Table VIII Illumination. Day Six was Platoon Qualification (Table VII). The last day, Day Seven, was for the platoon to refire, conduct an after-action review and return to the base camp.

With the division commander's approval, the offer was made to all other SFOR nations operating in the US sector to train at Centaur Outpost. As it turned out, our soldiers got at least as much, perhaps more, out of the multinational training as our own unit-specific training.

The initial instructions were to admit any SFOR soldier with proper identification. After one day, it was clear that this policy had be modified; overnight, the otherwise deserted valley became a mecca for anyone looking for a shower or a hot meal. Rumors spread like wild fire, and every SFOR countryman within 100 miles tried to breach the wire in search of our nonexistent post exchange and Burger King. One Marine Corps major drove an hour and a half from the town of Livno looking for a "Value Meal." We tried to show everyone a little hospitality, but some, like the major and locals applying for employment, went away disappointed.

SFOR Training. For the first week of training, we were joined by seven Turkish artillerymen: a battery commander, his executive officer, three gun chiefs, a fire direction center (FDC) chief and a driver. They stayed for three days, during which they compiled what seemed to be several thousand pages of notes, shot 25 rolls of film and even drew pictures of our ammunition. They were particularly interested in our low-cost training round (LTR), or "Smurf"–a munition the Turkish Army apparently does not have.

As the Officer-in-Charge of the camp, the Turkish visit gave me a chance to try my hand at diplomacy. At our first evening meal together, the kitchen proudly served pork chops and ham slices to our visitors...who were Muslim. I'm happy to report, however, that this was the closest we ever came to an international incident during our stay at Centaur Outpost.

By the third day, having successfully completed dry-fire certification, we decided to let the Turks live-fire under the supervision of our section chiefs. Because only the Turkish executive officer could speak English, the certification took a bit longer than normal. It went well enough, and we finished by giving them a two-round, fire-for-effect mission to see who was fastest. By the time the Turks left, we all felt we were ready for the United Nations.

For the next platoon's rotation, the British range control 329 Corona Battery put on a live-fire demonstration of its own. The British have the AS90, which is similar to the M109A6 Paladin, but equipped with an auto-loader and the battlefield artillery tracking system (BATES). The guns, which fired an impressive three rounds in 9.47 seconds, also have air conditioning, an over-pressurized ventilation system and a suspension lockout that eliminates the need for spades.

The British let our drivers take the howitzers for a spin, and enthusiasm was high. We returned the favor by providing 16 minutes of continuous illumination for their primary leadership development course/basic NCO course (PLDC/BNCOC) small-arms range. Between the British tracers and our illumination rounds, it looked like a fireworks factory on fire. The British were grateful for the support, and we had our 4th of July celebration out of the way two weeks early.

Week Three of the training was easily the high point of the Glamoc rotation. The Russians arrived with 59 personnel, three 2S9s, a fire direction vehicle, a FIST vehicle and assorted wheeled support vehicles. Each morning we conducted unit-specific training, and each afternoon was devoted to combined training. The Russians also used the outpost to certify 15 new artillery officers on gunnery and fire support tasks, similar to the capstone exercise at the end of our Field Artillery Officer Basic Course (FAOBC).

During that week, we cross-trained on each others' equipment and conducted a combined live-fire. In that exercise, we certified one Q-36 Firefinder section, E Battery, 101st Field Artillery (Target Acquisition) from the Massachusetts Army National Guard, which successfully tracked both US and Russian artillery.

The Russian "Chief of Artillery" attended the combined shoot and wanted a head-to-head competition. The General pointed into the impact area and said, "Fire at that target!" Both the US and Russian forward observers scrambled for radios to initiate the mission. The rounds impacted on the target simultaneously, and both sides were declared winners.

The week finished with a full-scale American barbecue, a gift exchange with the Russian soldiers and a group "photoopp" second only to the Meeting on the Elbe. That evening, soldiers of both nations traded uniforms to the extent that no one could tell a Russian soldier from an American soldier. The unanimous sentiment of those present was that the week with the Russians was the capstone event, not only of the Glamoc rotation, but of the Bosnia rotation as well.

The remaining three rotations went smoothly. The result was above 90 percent calibration of UBL and three base lots of powder established, muzzle velocity variations for all howitzers, Table VIII qualified platoons and all M2 .50 caliber machinegun crews familiarized. The *Swift and Bold Battalion*, 1-6 FA, accomplished all training objectives.

Centaur Outpost was a success. We demonstrated that, even in the middle of a deployment, training opportunities present themselves. Given the right combination of initiative, imagination and motivation to foster and exploit these opportunities, the benefits can exceed even the expectations of seasoned artillerymen.

Today we have the satisfaction of knowing the soldiers of 1-6 FA are well-trained, mission-ready, and have taken a giant step forward in fostering professional relations with artillerymen of other nationalities.

Captain Brett J. Gullett was the Officer-in-Charge of Centaur Outpost at Glamoc, Bosnia-Herzegovina. At that time, he was the Fire Direction Officer (FDO) for the 1st Battalion, 6th Field Artillery, 1st Infantry Division (Mechanized), in the Stabilization Force during Operation Joint Guard. Currently, he is the Assistant S3 of the same battalion. He served as the Operations Officer of A Battery, 6th Battalion, 32d Field Artillery (Multiple-Launch Rocket System), and Platoon Leader of C Battery, 6th Battalion, 32d Field Artillery, 212th Field Artillery Brigade, III Corps Artillery, Fort Sill, Oklahoma. Captain Gullett also served in the 2d Squadron, 11th Armored Cavalry Regiment in Germany before its deactivation as a Platoon FDO, on the G Troop Fire Support Team and as a Platoon Leader. In 1989, he enlisted in the Army as an 11B Infantryman and received his commission in the Field Artillery through Officer Candidate School in 1991.

German FA on Its Way into the Future

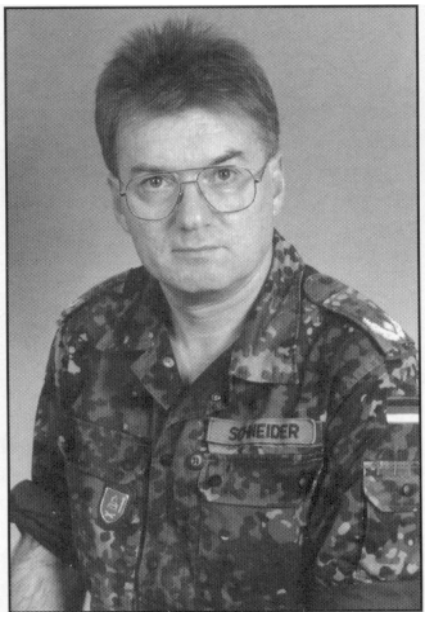
by Brigadier General Jochen Schneider, General of the German Artillery

The demands of modern warfare are constantly changing. Those who can clearly identify the military requirements for future war and fulfill them will prevail. This is the process by which we're developing the German Field Artillery into one of the most advanced in the world.

In the future, the German Army will have to meet the critical challenge of territorial and alliance defense-namely, control the width and depth of large areas with few forces. To support this defense, the German Army has to achieve local superiority (despite global inferiority) to win decisively at the critical time and place. This requires highly effective reconnaissance and target acquisition capabilities; state-of-the-art information and command and control systems; and long-range weapons that can operate in large areas.

The "information battle" is of particular importance. We must have the lead in both time and data on the enemy. Winning the information battle will allow us to gain (or regain) our freedom of operations, implement our intentions and attrit the enemy deep with long-range weapon systems so our maneuver forces can win with as few losses as possible. Friendly forces must be able to use terrain; fight in depth; rapidly tailor combat organizations; operate with forces of varying strengths from different directions; engage the enemy simultaneously at the front, in the flanks and in the rear; and defeat him in a second strike.

Field Artillery is the backbone of target acquisition, surveillance and fighting with fires. These and other missions are the basis for its doctrine, equipment and structure as well as the definition of FA tasks and capabilities. The principles of joint and combined arms combat are fundamental and lead to the capabilities required of the modern Field Artillery, as outlined in the figure.



These capabilities only can be attained by employing the FA as an "advanced system," as an integrated element of a modernized army. Based on the commander's guidance, the FA must be flexible enough to bring to bear its effectiveness (depending on access to target acquisition assets and weapons systems) for joint or allied operations, in addition to operations at its usual organizational assignment and command level.

But modern equipment is not enough to qualify an arm of service as "modern." The basis for a modern artillery is an integrated system that links command and control, reconnaissance and target acquisition, and target engagement. Integrated into an army-wide network, this FA system must be controlled and employed by commanders who master the art of independent and combined arms operations. These commanders must be capable of thinking creatively and acting independently and reliably within the alliance—in other words, thinking and acting in a modern way.

Command and Control. An FA system integrated into the army's system ensures well-balanced, real-time and smooth operations with uniform command and control. Its backbone is the *ADLER* command, control and weapon employment system (*FüWES* in German parlance). ADLER is an artillery computer system that provides information on equipment, personnel and ammunition status, and situational awareness and processes operational data.

ADLER is the first system of its kind to be fielded in the German Army. It links all target acquisition and weapon systems with tactical operation centers (TOCs) and Field Artillery commanders. They now have target acquisition information constantly available to assess the combat situation. ADLER is a data processing asset for conducting fire support and controlling artillery target acquisition, including the analysis of results. It helps optimize and economize fire support.

ADLER links artillery subsystems with *HEROS*, the German army-wide command and control system. Using common interfaces, ADLER is interoperable with allied artillery automatic data processing (ADP) systems, such as the US' advanced FA tactical data system (AFATDS).

Integrating Field Artillery into one system, from the forward observer (FO) to the division artillery commander, provides force commanders at all levels comprehensively informed gunners. By the end of 1998, all artillery formations will have ADLER.

Target Acquisition. Since the fielding of the *CL 289 Reconnaissance Drone* system in 1990, Field Artillery has had a high-speed, preprogrammed, unmanned system providing reconnaissance in depth. Currently, it's the only airborne reconnaissance system in the German Army. The system has a range of 400 kilometers and can transmit infrared (IR) sensor data in near real-time out to a range of 75 kilometers and take IR and black-and-white pictures, which are recovered after the drone lands. The drone battery interfaces via ADLER.

By 2001, improvements to the CL 289 will increase its range to 600 kilometers and its real-time data transmission to 125 kilometers. In addition to IR and optical sensors, the improved CL 289 will have synthetic aperture radar (SAR).

Troop trials of the *KZO Unmanned Aerial Vehicle (UAV)* for target location are scheduled to start in 1998, leading to operational deployment of the system after 2001. The KZO is a reusable, preprogrammed and remotely piloted aerial vehicle that is designed to reconnoiter targets in the open or concealed, stationary or moving. It flies out to a depth of about 60 kilometers with an endurance of about 3.5 hours any time of the day under most weather conditions. The IR forward-looking infrared (FLIR) sensor data are transmitted in real-time, interpreted without delay and available via ADLER.

The *Cobra* counterbattery radar, a joint development by Germany, France and the United Kingdom, is still undergoing trilateral troop trials. Using state-of-the-art radar technology, this system tracks up to 40 trajectories in two minutes and determines the firing positions. With a maximum range of 40 kilometers with a 90-degree sector coverage, Cobra is the first radar that differentiates between guns and rocket launchers. The Cobra targeting data transmitted via ADLER initiates immediate engagement using the most suitable weapon systems.

The *CL 289 Reconnaissance Drone* system has a range of 400 kilometers and can transmit infrared (IR) sensor data in near real-time out to a range of 75 kilometers and take IR and black-and-white pictures.

Fighting with Fires. Tube artillery, with its self-propelled howitzers and a core of FO teams in armored vehicles, is the backbone of fire support. Until recently, preparing firing positions and ammunition resupply constrained operations. Global positioning system (GPS) technology facilitates semiautonomous operations, even in regions with insufficient geodetic data. Vehicle navigational systems that allow the guns to operate semiautonomously coupled with the fielding of the *Multi* logistical truck will improve the operational tempo and availability of cannon fires.

Multi is a 14-ton multipurpose resupply vehicle with a paletized loading system; the German Field Artillery will start fielding its Multi for ammunition resupply in 1999.

The coordinated introduction of the *Leopard 1A5*, a tank modified for FOs, for the first time provides FOs the same night-vision capability and performance characteristics as their armored maneuver forces. This guarantees fire support under all operational conditions.

The artillery will leap ahead with the fielding of the *Panzerhaubitze (PzH) 2000* starting in July 1998. The 52-caliber tube has improved accuracy and a range of 30 kilometers (40 kilometers firing base-bleed rounds). The howitzer has an on-board ballistic computer and a combat load of 60 rounds. The howitzer can stop, fire and redeploy in less than two minutes. Its rate of fire is 10 rounds in the first minute (up to 20 rounds in less than three minutes) followed by the howitzer's conducting an immediate survivability move.

Multi is a 14-ton multipurpose resupply vehicle with a paletized loading system; the German Field Artillery will start fielding its Multi for ammunition resupply in 1999.

General:

- Employ advanced command and control and fire direction assets.
- Access reliable, efficient and deep reconnaissance and target acquisition.
- Contribute to the force commander's determination of the combat situation.
- Create main fire efforts and shift them over long distances.
- Lay barriers deep in enemy territory.
- Independently control areas and coverage with fires.
- Engage targets highly accurately in both close and deep combat.
- Find, identify and engage high-value targets.
- Simultaneously support both close and deep operations.

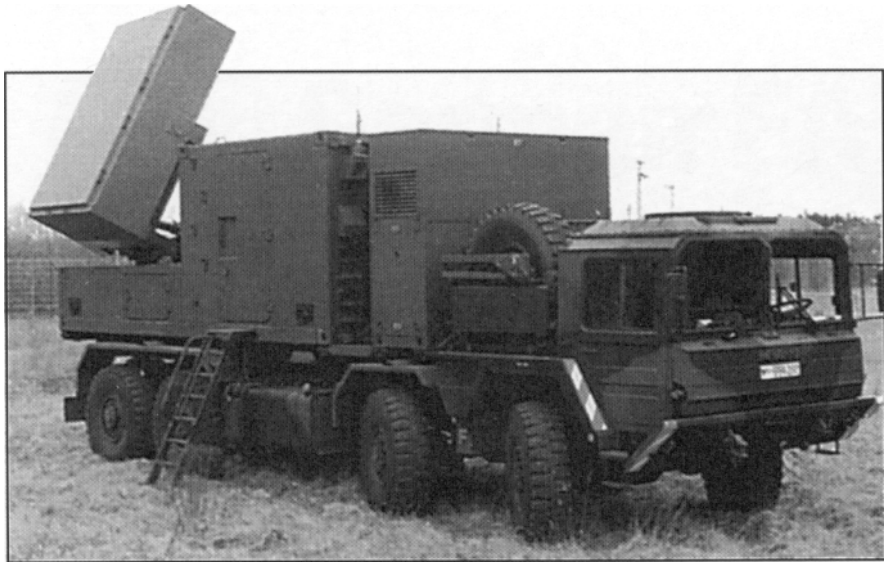
Close Operations:

- Employ high-volume, accurate firepower using armored, mobile and responsive assets.
- Employ enough forward observers with the necessary equipment.
- Fire intelligent munitions.

Deep Operations:

- Execute accurate fires to engage area and point targets of all types.
- Access discriminating target acquisition assets.
- Fire intelligent munitions.

German Field Artillery's Required Capabilities



The *Cobra* counterbattery radar, a joint development by Germany, France and the United Kingdom, is still undergoing trilateral troop trials. Using state-of-the-art radar technology, this system tracks up to 40 trajectories in two minutes and determines the firing positions.

The PzH 2000 requires a driver, gunner and vehicle commander; two ammunition loaders are included in the crew for manual operations, as necessary in combat. The five-man crew operates in an open compartment inside the turret and accesses a variety of capabilities, such as automatic gun laying and relaying, automatic ammunition flow, inductive fuze setting, etc., with a number of backup systems.

With the fielding of the terminally guided *Smart* ammunition in 1999, Field Artillery will be able to engage hard targets precisely. Smart is a sensor-fuzed "smart" ammunition. At an altitude of about 600 meters above the target, the shell ejects two submunitions that detect and identify the target by scanning a circular area during a controlled descent and fire a top-attack penetrator that kills the target kinetically. The submunitions engage only preprogrammed targets, such as main battle tanks at depth, attriting the enemy's armored force before the close battle.

In another significant development, the modular propelling charge system (*MTLS*) for 155-mm howitzers will be available in 1998. Ease of handling and safety of operations as well as steady muzzle velocity capabilities are the main characteristics of the system.

Finally, starting in the year 2000, we'll add time and multi-function fuzes with inductive settings to the latest state-of-the-art cannon ammunition family. They will reduce response times, improve safety and enhance the precision of fires on the targets.

The medium artillery rocket system *(MARS)*, the US-made multiple-launch rocket system (MLRS), remains the hard-hitting weapon for fighting with fires in depth. Designed as an autonomous area engagement weapon, it destroys semi-hard targets and blocks wide areas using the fielded bomblet and mines munitions. After being disassembled into two sections by the crew, the launcher is transportable in two C-160D Transall cargo airplanes.

Shown here is the medium artillery rocket system *(MARS)*, the US-made multiple-launch rocket system (MLRS).

MARS has the potential for significant improvements with developments of an improved launcher and new munitions that can achieve ranges of more than 60 kilometers with precision. Improving MARS capabilities currently is being studied.

The futuristic *Taifun* army attack drone (KDH) is a largely autonomous weapon for engaging key targets in depth. After programming, it approaches the target area, recognizes the targets and engages them independently. It has a tandem-shaped charge warhead with limited fragmentation effects on board and attacks the targets from the top.

Its penetration is 170 kilometers with an endurance of almost four hours. Stationary and moving high-value targets at all degrees of protection are engaged with high accuracy. Development of the *Taifun* is scheduled to begin in 1998.

The *TRIFOM* fiber optical system (LWL-FK) is being developed that has a maximum speed of 700 kilometers per hour and can top-attack targets out to 60 kilometers. The system features maximum suppression of collateral damage and secure target discrimination by the operator. The TRIFOM system is in the predefinition phase and various warheads are being tested.

Conclusion. As a result of current and future procurement efforts, the German Field Artillery will make a quantum leap to join the international "top of the tops." However, because of budget constraints, we won't be able to field the most modern systems to all artillery formations. In the long run, battalions with modernized equipment and battalions with other systems will be employed side-by-side. As they change units, commanders and other battalion leaders will be brought up-to-date on the latest equipment using simulation and simulator-supported training at all levels of command.

With its advanced technology target acquisition, command and control, and weapons and munitions programs, the German Field Artillery operations and tactics will comply with the latest in operational thinking. The German artillery system doctrine will evolve continuously as a significant contributor to the army's operational principles.

Brigadier General Jochen Schneider is General of the German Artillery and Commander of the Artillery School at Idar-Oberstein in Germany. In his previous assignment, he commanded the 32d Mechanized Infantry Brigade, Schwanewede. Among other assignments, he was the Chief of the Army Personnel Branch, part of the Federal Ministry of Defense in Bonn; G1 of the III German Army Corps in Koblenz; Commander of Mountain Rocket Artillery Battalion 82 in Landsberg; and G3 of the 7th Mechanized Infantry Brigade at Hamburg. He commanded two batteries: Multiple Rocket Launcher (110-mm) and Escort Battery (Atomic). General Schneider is a graduate of the Federal Armed Forces Command and Staff College at Hamburg.

Combined Operations and the BCD

by Colonel Bruce A. Brant

If you think joint operations are tough, try joint and combined. That's what a group of fire supporters are part of every day in a unique unit in the Republic of Korea (ROK). The US Army has four battlefield coordination detachments (BCDs), but only one is combined: the ROK-US Combined Forces Command (CFC) BCD located at Osan, Korea.

Although commonly thought of as the highest level fire support agency in the US Army, officially the BCD isn't titled a fire support agency. As stated in *FM 100-13 Battlefield Coordination Detachment*, the BCD's mission is to "facilitate the coordination and synchronization of the Joint Force Air Component Commander (JFACC) [known as the CFACC in the combined BCD] and Army Forces (ARFOR) ground operations."

In Korea, the mission is greatly expanded to coordinate operational fires for the commander of the ground component command (CGCC). This is currently an evolving mission with the creation of the GCC's future enhanced deep operations coordination cell (DOCC), the fielding of an array of automation systems to the BCD and a changing modified table of organization and equipment (MTOE).

This article discusses the mission, organization and operations of the CFC BCD and examines some cultural challenges inherent in its combined operations.

Mission and Organization

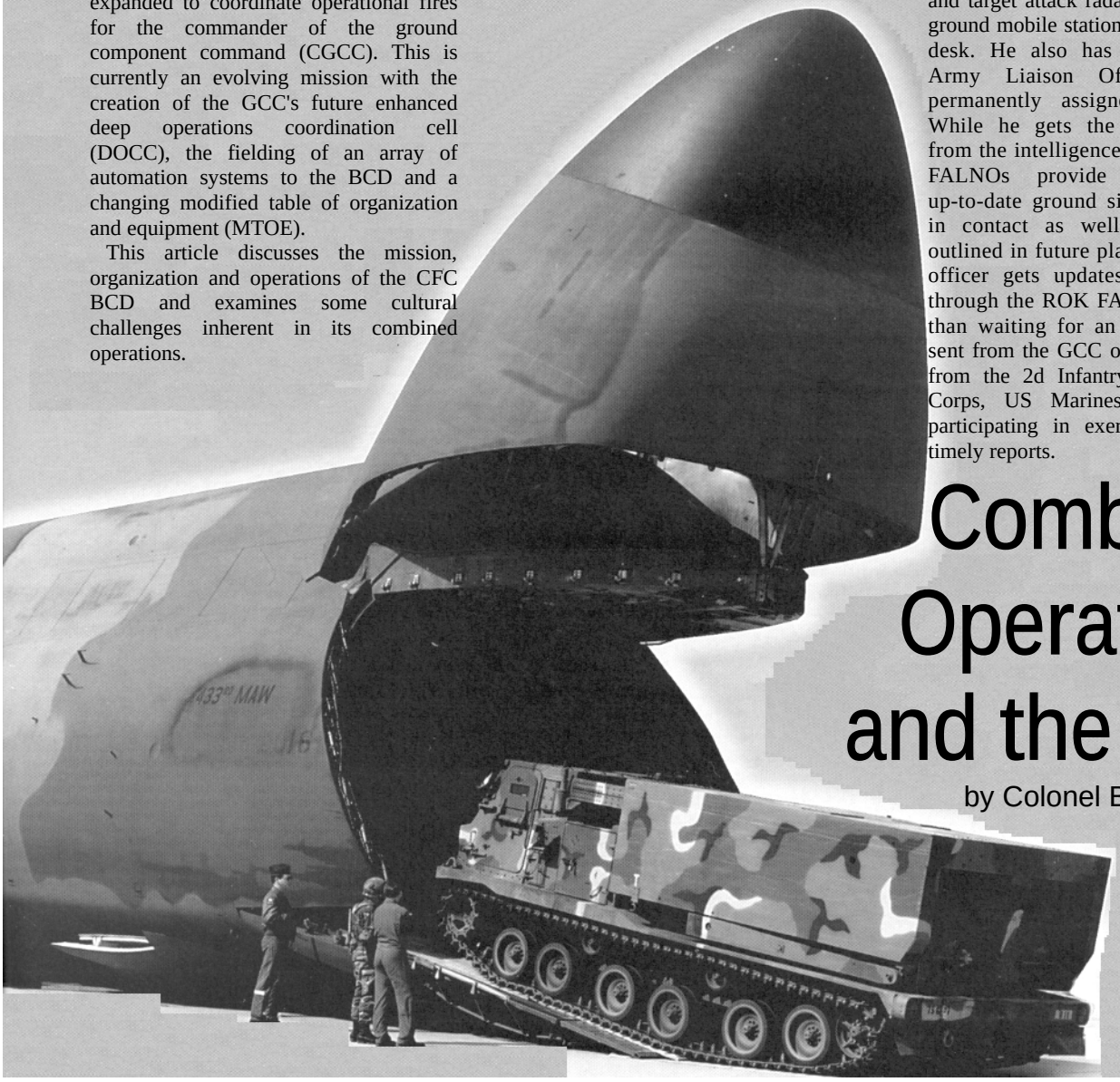
Although the mission statement sounds simple, the BCD tasks are diverse and cover every element or asset of support to the ground commander that flies through the air. These tasks range from targeting to clearing restricted fire areas (RFAs) for Special Forces to coordinating theater airlift for multiple-launch rocket system (MLRS) rocket resupply.

The CFC BCD is authorized 32 Americans and 14 Koreans. It is commanded by a US Field Artillery colonel with a ROK colonel as deputy. The US colonel, like many in Korea, wears three hats: Commander of US forces of the Eighth Army BCD; Chief of the CFC BCD; and Ground Liaison Officer (GLO) for the 7th Air Force.

The BCD operates through four main elements: the operations, plans and intelligence branches and the deep operations synchronization cell. During war or exercises, the detachment expands to well over 100 personnel with augmentees and liaison attachments. Part of the augmentation comes from the 2d BCD, an Army Reserve unit from Anniston, Alabama.

Operations Branch. This branch fights the current battle from the CFACC air operations center (AOC), which is the Air Force's "tactical operations center (TOC)." The operations branch tracks the ground battle for the CFACC and air operations for the CGCC.

The BCD operations officer enjoys what may be the best common operating picture in the area of operations. He is surrounded by the best intelligence systems in the theater. A joint surveillance and target attack radar system (JSTARS) ground mobile station module sits on his desk. He also has three ROK Field Army Liaison Officers (FALNOs) permanently assigned to the BCD. While he gets the top-down picture from the intelligence systems, the ROK FALNOs provide him the most up-to-date ground situation from units in contact as well as the situation outlined in future plans. The operations officer gets updates on the situation through the ROK FALNOs much faster than waiting for an automated picture sent from the GCC or CFCTOCs. LNOs from the 2d Infantry Division, III US Corps, US Marines and other units participating in exercises also provide timely reports.



Given an up-to-date intelligence and common operating picture, the BCD operations officer uses the CFC commander-in-chief's (CINC's) and the CGCC's targeting guidance and high-payoff target (HPT) list to divert assets to targets that might influence the battle. He can do this because of the flexibility of air power and the Army tactical missile system (ATACMS) missions available. For example, during an emergency attack of an HPT, he can instantly clear the congested airspace using his own airspace control element, the US and Korean air force controllers and the airborne warning and control system (AWACS) aircraft. This clears the way to divert aircraft or deep fires in an emergency.

The BCD operations officer uses the integrated tasking order (ITO) to help him determine assets to divert. Normally called the air tasking order (ATO), the ATO is called the ITO in Korea because it must integrate the operations of joint and combined forces: US and ROK Air Forces, Navy and Marine fixed-wing aircraft and sometimes also Apache helicopters, preplanned ATACMS and Special Forces direct action missions. The ITO also contains the airspace coordination order (ACO) that deconflicts airspace and provides guidance to air defense units. This single

Digitizing BCDs

The battlefield coordination detachment (BCD) is primarily a liaison element between the joint force land component commander (JFLCC) and the joint force air component commander (JFACC). The BCD operates within the air operations center (AOC)—an Air Force facility with a significant amount of state-of-the-art automation equipment. Before November 1995, the Air Force was fighting the air war on computer terminals while BCD personnel were using telephones and map boards to accomplish their mission.

When the Chiefs of Staff of the Army and Air Force signed a memorandum of agreement (MOA) in November 1995, among other things, the Army committed to automating its BCDs. Digitizing BCDs became a top priority and the responsibility of the Training and Doctrine Command (TRADOC). Then TRADOC "pinned the rose" on the Field Artillery School at Fort Sill, Oklahoma, and the Depth and Simultaneous Attack Battle Lab became the proponent for BCD digitization.

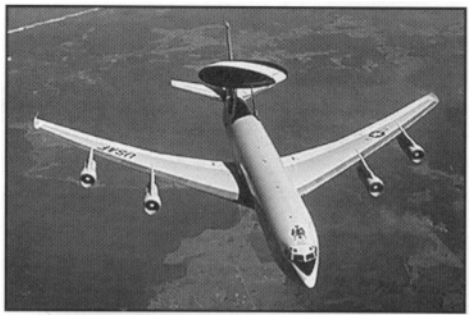
The ABCS Systems. The digitized BCD uses the same systems developed through the various warfighter experiments, the latest at Fort Hood, Texas, in November 1997. The Army battle command system (ABCS) for digitized operations is scheduled to be fielded to the first digitized division in the year 2000 with the Army at large fielded by 2005.

The fielding of the five ABCS systems in the BCDs is best described as a "technology insertion." Those digital systems are the advanced field artillery tactical data system (AFATDS), the all-source analysis system-remote work station (ASAS-RWS), maneuver control system (MCS), air and missile defense work station (AMDWS) and the global command and control system-Army (GCCS-A). (See the figure listing the five ABCS digital systems and the capabilities they bring to the BCDs.)

One of the primary goals of digital systems is to provide near-real-time situational awareness. The ABCS systems share information by exchanging

ABCS System	BCD Support
Advanced Field Artillery Tactical Data System (AFATDS)	The Army's fire support system that can nominate targets for the air tasking order (ATO), monitor the prosecution of the ATO targets and keep Army units informed of their status.
All-Source Analysis System-Remote Work Station (ASAS-RWS)	An intelligence system that generates a "ground picture" of the enemy situation and communicates with supporting military intelligence units, normally all-source control elements (ACEs).
Maneuver Control System (MCS)	A maneuver system that graphically generates a "ground picture" of friendly forces and receives/shares operations plans (OPLANs) and operations orders (OPORDs); it has MS Office software.
Air and Missile Defense Work Station (AMDWS)	An air defense system that graphically depicts friendly and enemy aircraft, receives enemy missile launch alerts from intelligence feeds and executes calls-for-fire to AFATDS.
Global Command and Control System-Army (GCCS-A)	An Army, Marine, Naval and Air Forces system that provides a joint, common operational picture within a theater and tracks aircraft flying against ATO targets.

BCDs are being digitized using the Army Battle Command System (ABCS), which is comprised of the five systems outlined in this figure. The BCDs are the First BCD at Fort Bragg, North Carolina; Second BCD, US Army Reserve, at Anniston, Alabama; Korea BCD at Osan Air Force Base; and US Army Europe (USAREUR) BCD at Ramstein Air Force Base in Germany. (Systems will also go to the Air Force Battle Staff Training School at Hurlbert Field, Florida.)



The Airborne Warning and Control System (AWACS) Aircraft

document ensures a coordinated targeting and attack effort.

The ITO is used as a "play book" by the BCD operations officer and the AOC director of combat operations (battle captain), a US Air Force colonel. Unlike the perception of most fire supporters that the Air Force's ITO is written "in stone," only to be executed as published, at the CFC BCD, the opposite is true. In the AOC in Osan, the Air Force refers to the ITO as the "ITS," the "integrated tasking suggestion." It is a list of assets with missions assigned against the best targets intelligence collectors can produce that meet the CINC's guidance. The BCD operations branch links the intelligence, the attack asset and the CINC's guidance together for timely attack.

Besides the ROK FALNOs and other LNOs, the operations officer has additional assets to maintain an excellent common operating picture. Reporting to him are GLOs and battlefield coordination officers (BCOs). The GLOs are

United States message text format (USMTF) messages. Each system brings unique information to the total system. For example, AFATDS provides the locations of artillery units to MCS, which updates its computer screen with the new information and then shares this with the other ABCS systems. ASAS, once it receives an update from its intelligence source, updates the other ABCS systems with the latest "red picture." Because one of the primary missions of the BCD is sharing situational awareness information with the Air Force, telling the Air Force where friendly and enemy units are located, ABCS systems provide the BCD new capabilities to execute its mission.

Fielding Challenges. Inserting the Army's objective digital systems into the BCDs has created several challenges. First, they must be physically installed on the AOC fiber-optic network. Additionally, AFATDS must exchange targeting data with an Air Force system—the contingency theater automated planning system (CTAPS). It is through AFATDS that Army units submit air support requests in the form of a list of prioritized targets to CTAPS. Once CTAPS generates the final air tasking order (ATO), the ATO is sent back to Army units through AFATDS. The BCDs must be fully interoperable with the Air Force and, simultaneously, capable of external digital communications with deployed Army units.

The First BCD at Fort Bragg, North Carolina, was selected to receive the initial suite of ABCS systems. Data collectors closely monitored the First BCD through a number of exercises to develop the tactics, techniques and procedures (TTP) for a digitized BCD and establish a BCD's objective hardware and software architecture. In addition, hardware required for the BCDs in Korea and US Army Europe (USAREUR) were positioned at the Depth and Simultaneous Attack Battle Lab at Fort Sill to validate the horizontal integration of the ABCS systems in accordance with *FM 100-13-1 Tactics, Techniques and Procedures for Digitized BCD Operations*. The integration team also developed the program of instruction (POI) for teaching the new TTP as part of the six-week new equipment training (NET). Then the Korea and USAREUR BCDs received their equipment and NET on digitized BCD operations in 1997.

Because the Korea BCD did not have AFATDS before its digital automation fielding, additional AFATDS work stations had to be fielded to establish the appropriate communications links. These work stations included maneuver units and selected command posts for the submission of air support requests.

The Korea BCD NET training culminated with a one-week communications exercise where the BCD also had its full complement of external data feeds. For example, MCS receives the combined ground picture by accessing an existing theater data base that contains the most recent locations for US and ROK ground forces. Another example—AMDWS receives data feeds that show the location of aircraft throughout the theater as well as receives intelligence information in the event of a Scud missile launch.

The challenge of fielding digital systems to the USAREUR BCD in Germany was that under different contingencies, the BCD could work with one of two Army force candidates: V Corps or the Southern European Task Force (SETAF). This made the theater integration a little more complex; the BCD had a requirement for digital communications with units in Germany, Italy and Bosnia-Herzegovina.

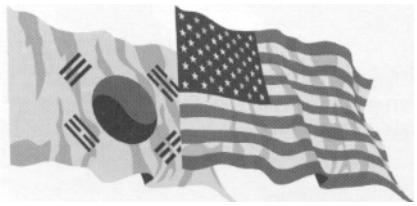
Lessons Learned. Units Army-wide, not just the BCDs, will receive or interface with these systems by early in the next century and can learn from the BCD fieldings. One lesson is that these ABCS systems are complex enough to require highly trained system administrators to keep them running. They also require network engineers to establish and maintain electronic connectivity with dispersed units. The Army's ability to train and maintain the proficiency of these system administrators and network engineers will be a significant challenge.

Software for these systems is continuously in a state of evolution. Before any system's software is modified, it must be tested exhaustively to ensure that interoperability is maintained.

In addition, soldiers of the future must be more computer literate and know how to care for and maintain automated systems.

The technology insertion of ABCS into the BCDs is an Army success story. In less than two years from the time the Army and Air Force signed the MOA, the digitization of BCDs went from concept to reality. By the end of 1998, the last of the four US Army BCDs (the Second BCD, US Army Reserve at Anniston, Alabama) will have its ABCS digital systems. This initiative puts BCD automation out on the Army's-even the joint force's-cutting edge.

MAJ Frank J. Tipton, MI
Military Intelligence Liaison Officer
Depth & Simultaneous Attack Lab
Fort Sill, OK



US Army officers stationed with US fighter wings. The BCOs are the ROK "GLOs," stationed with the ROK fighter wings. The BCO position is a fairly recent addition to the ROK Army.

The GLOs and BCOs pass pilot mission reports and aircraft status to the BCD operations officer. This is important in determining whether a target should be attacked again. Mission reports are normally the first form of battle damage assessment (BDA) the operations officer receives. The BCD intelligence officer in the AOC feeds pilot mission reports through intelligence channels while the ROK FALNOs send the information down to the field armies.

Two other elements in the operations branch are airlift and air defense. The airlift element verifies and coordinates with the Air Force all intratheater airlift support requests from the GCC. Besides coordinating air defense warnings and measures, the air defense element provides the liaison between US Army Patriot units and the CFACC, who is responsible for theater missile defense.

Plans Branch. This branch executes many nonstandard missions for the CGCC. In addition to creating timely war plans, the branch updates target lists via the GCC cell; conducts GCC targeting meetings; serves as the ground order of battle agency for the CFACC; supports the combined targeting board (CTB); and ensures the decisions made by the CTB are executed in accordance with the CGCC's guidance for weaponeering, packaging, etc.

In peacetime, the theater CTB meets almost every month (daily in wartime) to update the war plan. Unlike the theater operational plan (OPLAN), air support war plans are written every year and updated as assets are added or reprioritized.

The plans branch of the BCD uses current daily intelligence to update its target lists. It conducts GCC targeting meetings with fire support and intelligence representatives from the ROK field armies, ensuring new targets are prioritized and targeted to meet the field army commander's need to shape his battlespace. The branch also ensures the field army plans and targeting priorities stay within the CINC's and CGCC's guidance.

Intelligence Branch. After assessing daily intelligence, this branch provides the plans branch with updated targets. During exercises, it ensures the operations branch receives timely targeting intelligence on HPTs and enemy unit locations. Using the all-source analysis system (ASAS) and other systems, the intelligence branch is fully integrated with US national assets as well as theater, Air Force systems and the GCC analysis and control element. It also provides the CFACC the overall enemy ground order of battle.

Deep Operations Synchronization Cell. During exercises, the cell meets with the ACC synchronization cell to ensure long-range plans reflect GCC future operations considerations. These missions might include synchronizing an attack on a specific enemy unit using both air interdiction aircraft and attack helicopters, using intratheater C-130 aircraft to move forces and supplies from ports to the forward line of own troops (FLOT), deconflicting airspace during a simultaneous attack on enemy air defense assets using ATACMS, or putting together an air suppression of enemy air defenses (SEAD) package.

Cultural Challenges

A major mission for the combined BCD is to be the intermediary between services and countries to resolve differences and create the best solution for the theater. The BCD continuously works to improve points of friction and frustration.

The Goldwater-Nichols Law forced US services to work together and develop common doctrine. Although there are still difficulties-mostly due to a lack of education of other service's needs and culture-the US has come a long way in a relatively short time. This is especially true outside the Washington "beltway" in a warfighting theater where the enemy continuously tests the coalition's resolve.

However, Korea's armed forces have no Goldwater-Nichols Law to force joint cooperation. The ROK Army, which historically has been the major political force in the country, is ten times the size of the ROK Air Force. For many reasons, the services are not only uncooperative, but also, at times, hostile to each other.

Service and national culture clashes occur in the CTB. In Korea, the CFC CINC delegated the responsibility for coordinating, synchronizing and integrating deep operations and fires beyond the GCC's forward boundary to the CFACC. He also designated the CFACC as the coordinating authority for all fires between the fire support coordination line (FSCL) and the GCC forward boundary. The CGCC, as the supported commander out to the GCC's forward boundary, facilitates synchronization of maneuver, fires and interdiction by designating target priorities, effects and the timing of interdiction operations within his area of operations. The CFACC established the CTB for the CINC to accomplish the broad targeting functions associated with these joint and combined operations.

The CTB consists of ROK and US colonels from the Army, Navy, Air Force, Marines and Special Forces. It is chaired by the chief of staff of the ACC. During the monthly meetings, each representative fights for assets to support his part of the campaign plan. Usually, problems are resolved by holding up the CINC's targeting guidance and getting everyone's support.

However, the CTB also recommends to the CFACC percentages of missions for air apportionment. Here is where it often gets tense. Each component needs the limited assets to support its objectives. Special operations may need jamming support for an infiltration while the ACC needs the same support in a different area to suppress early warning radars during an interdiction mission. Simultaneously, the GCC wants the same jammers on standby in case there's a major enemy movement where a cross-FLOT Apache strike is desired. The CTB must work out a compromise recommendation for the CFACC to send to the CINC.

Different political and military objectives of the coalition members are also a consideration for the CTB. For example, the main mission of the ROK Air Force is defensive counterair. Their overarching objective is not to allow one bomb to fall on Seoul. Although the city is well within North Korean artillery range, the ROK Air Force views the artillery's proximity to Seoul as a ROK Army problem. The ROK Air Force wants to husband its aircraft for counterair in spite of the fact the US and ROK Air Force air-to-air aircraft could quickly sweep the skies of the North Korean 1960's technology air force.

Korea has purchased US counterbattery radars, bought and now manufactures F-16 fighters and recently announced it will buy the multiple-launch rocket system (MLRS), shown here being fired by the 2d Infantry Division Artillery.

The BCD also must take into account the differences in coalition technology that have significant impact on planning. Assumptions American planners tend to make about capabilities-such as air refueling to increase combat radius-do not necessarily apply to the ROK.

An increasing technological gap is in command and control systems (and not only with our UN coalition partners, but also US units that don't have the digital systems or version of software the BCD has). ROK digital systems are limited and voice networks are slow, creating bottlenecks and inaccuracies in reporting. This is not to say the Koreans do not have a modern force. They purchased US counterbattery radars, bought and now manufacture F-16 fighters and recently announced the purchase of the multiple-launch rocket system (MLRS). As a world leader in electronics and computer parts, the ROK has created its own digital systems, some of which are not compatible with those used by US forces.

BCD personnel must stay proficient on ROK and US systems. Recently, the US fielded the CFC BCD with the five digital systems of the Army battlefield command system (ABCS) as outlined in the sidebar to this article, "Digitizing the BCD." These Army XXI systems bring the BCD to the forefront of digitization and command and control modernization.

Coalition doctrine and training differences also cause a cultural gap. For example, the way each country executes close air support (CAS) challenges BCD planners and operators to determine parameters and under what conditions to best use each country's aircraft. In training, Koreans, as most countries, have trouble with American military agility. Americans sometimes seem to be able to operate based on a commander's intent that sounds suspiciously like "move to the sound of the guns and kill anyone not dressed like you." This causes problems in cultures that want to fight the plan as written.

The Korean forces work hard at trying to understand American tactics, techniques and procedures (TTP). For example, the ROK Army was the first defense force in the world to use a Battle Command Training Program (BCTP) modeled after the US. They also flew almost 300 soldiers to Fort Hood, Texas, to participate as the III Armored Corps higher headquarters during the last III Corps Warfighter exercise. The CINC established theater-level "rock drills" as a forum to develop common tactical and operational procedures.

The CFC BCD is leading the charge to bring about "jointness" to the ROK defense forces and bridge cultural warfighting differences. ROK leaders recognize the BCD as the linchpin in their development of joint procedures. ROK personnel assigned to the BCD are specially selected. They all speak English; most trained in the US in schools, ranging from Command and General Staff College to the Cobra Transition Course and even Ranger School.

All the ROK officers in the BCD are an elite, hand-selected, highly trained group of professionals. Their credibility is very important to the success of their mission. They continuously give classes to the ROK Joint Chiefs of Staff, War College, the ROK version of the US School of Advanced Military Studies (SAMS), branch schools and individual units. Recently, they established a block of instruction on air-ground and deep operations as part of the curriculum at a ROK Air Force school.

A tour with the CFC BCD at Osan is one of the most rewarding in the Army. Many soldiers extend their tours to be able to serve with an organization that has a mission against a real-world threat. Using intelligence capabilities they only may have read about, soldiers in the BCD conduct targeting and planning almost daily to ensure that if North Korea decides to invade, all our combined assets will be used most effectively.

Living and working with 7th Air Force personnel and the Korean members of the BCD is an excellent experience and priceless education. Most importantly, the daily tensions in the theater heighten the sense of responsibility and feeling that each member of the unit makes a major contribution to the defense of Korea, an ally and great country.

Colonel Bruce A. Brant commands the 214th Field Artillery Brigade, III Corps Artillery at Fort Sill, Oklahoma. In his previous assignment, he commanded the Combined Battlefield Coordination Detachment (BCD) in Osan, Korea. He also commanded the 1st Battalion, 319th Airborne Field Artillery Regiment in the 82d Airborne Division at Fort Bragg, North Carolina, and a firing battery in the 41st Field Artillery Brigade at V Corps in Germany. His other assignments include serving as Senior Fire Support Observer/Controller at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana, and S3 of the 25th Infantry Division (Light) Artillery, Schofield Barracks, Hawaii. Colonel Brant holds three master's degrees and is a graduate of both the Air Command and Staff College at Montgomery, Alabama, and the Army Command and General Staff College at Fort Leavenworth, Kansas; the School of Advanced Military Studies (SAMS) at Fort Leavenworth; and the Army War College at Carlisle Barracks, Pennsylvania.

1997 MAGTF Fire Support Conference

by Colonel Lynn A. Stuart, USMC, and
Major Kevin M. McConnell, USMC

In North Carolina, Camp Lejeune's Paradise Point Officers' Club was the site of the 1997 Marine Air-Ground Task Force (MAGTF) Fire Support Conference. The conference was sponsored by Marine Corps Combat Development Command (MCCDC) out of Quantico, Virginia, and the Marine Artillery Detachment out of Fort Sill, Oklahoma, and hosted by the 10th Marine Regiment.

The purpose of the conference was to bring together representatives from each of the MAGTF's elements to identify fire support concerns, develop positions on near-term fire support issues (0 to 10 years) and explore fire support challenges for the 21st century. (See the figure for MAGTF elements.) Army and Navy representatives also attended the conference to provide insights on their services' fire support initiatives.

The keynote address by Lieutenant General John E. Rhodes, the Commanding General (CG) of MCCDC, set the stage for fires in the emerging concept of operational maneuver from the sea (OMFTS), a central theme of the conference. The conference was to ensure fire support systems will be able to meet the demands of the future while maintaining relevance today.

Organized into four broad categories of doctrine, training, equipment and naval surface fire support (NSFS), conference working groups dealt with fire support issues. With senior leaders present to provide guidance, action officers were able to resolve of some issues immediately.

For 15 issues not resolved, the working groups developed *doctrine, organization, training and education, equipment and support and facilities* recommendations for a report to the CG of MCCDC. This article represents the text of that report.

1. Marine Corps Fire Support Road Map Study. The emerging concept of OMFTS, particularly its tactic of ship-to-objective maneuver (STOM), and the realities of the Marine Corps' mandate to be prepared to fight across the entire spectrum of conflict requires careful study as to the fire support capabilities needed. In 1996, Mission Area Analysis 24 and the MAGTF Fire Support Conference recommended a "systems approach" of looking at fire support while recognizing that no single asset can meet all requirements; at the same time, the conference had to consider that budgetary constraints will prevent buying specialized equipment to meet each mission requirement. Competing funding priorities, mission requirements and even personal preferences have caused discord and disunity across the fire support community.

The results of analytical studies conducted by, and for, the Army clearly indicate a requirement for much more artillery than is currently available. But even these modern studies do not account for the revolutionary change in tactics now being pondered by the Marine Corps. Now is the time to commission a study to determine future fire support requirements so the Marine Corps can map out a cost-effective, efficient means to evolve from the fire support doctrine, organization and equipment of today to those required to execute OMFTS in the future.

Support and Facilities: (1) CG, MCCDC, develop a study directive to analyze and report fire support requirements for OMFTS. (2) MCCDC develop and publish a "fire support road map" to chart the evolution of fire support systems to meet future OMFTS requirements while remaining relevance in the interim.

2. Lightweight 155 Preplanned Product Improvement (LW155 P3I). The LW155 P3I research and development (R&D) program is in the Army's FY 00 Program Objective Memorandum (POM). Procurement of the LW155 P3I will compete for funding in the Marine Corps' FY 00 POM. It is currently listed in the "essential" category and should receive funding.

The P3I offers tremendous capabilities, including semiautonomy, on-board navigation, self-positioning and increased survivability. The enhancements are critical to the LW155's ability to support the emerging operational concepts envisioned for the 21st century. A loss in momentum in the R&D effort, while not currently envisioned, could delay the fielding of the P3I components, severely degrading the howitzer's ability to accomplish future missions.

Equipment: (1) Retain LW155 P3I as a POM core item with the basic LW155 Howitzer Program. (2) Link the prioritization of both initiatives together, giving them adjacent, sequential priority numbers.

3. Data Automated Computer Terminal (DACT)/Forward Observer Software Development. DACT is a system that provides many applications to multiple users. DACT fire support software is not being adequately developed or funded. When the advanced Field Artillery tactical data system (AFATDS) is fielded in 1999, the current forward observer (FO) entry device, the digital message system (DMS), will no longer be able to communicate on the fire support networks. It's essential the FO have a digital communications device that can rapidly process fire support planning, coordination and mission data.

Equipment: Procure/develop FO software for DACT before it's fielded to artillery units.

4. Automated Artillery Safety. Artillery gunnery safety computations are fundamental to force protection initiatives during peacetime training exercises. Artillery safety provides reasonable assurance of protection for troops.

In the past, the primary means of computing artillery safety has been through manual computations. Automated systems such as the backup computer system (BUCS) and an automated range safety system have provided a reliable and faster method of computing safety.

The current battery computer system (BCS) software (Version 11) will compute safety for some projectile-propellant-fuze combinations; however, manual computations are still required. Because of differences caused by changes in new firing tables and computational procedures between BCS and other means, there are no automated systems to provide accurate safety data.

With the ever-increasing complexity of algorithms associated with new artillery projectiles, it soon will be impractical–even impossible–to compute artillery safety manually. It's critical the Marine Corps procure an automated safety capability immediately. No safety data program is planned for AFATDS.

Equipment: Incorporate automated artillery safety data computations into the next version of fire direction software fielded in the Marine Corps, either BCS Version 12 or AFATDS, and ensure that all planned software upgrades include a corresponding upgrade in the safety computation.

5. Mission Needs Statement (MNS) for an Expeditionary Indirect Fire General Support Weapon System. Although the Marine Corps has a memorandum of agreement (MOA) with the Army for multiple-launch rocket system (MLRS) support, the MOA does not *guarantee* support. Currently, the expeditionary indirect fire general support weapons system initiative is below the funding line for POM 00.

Equipment: (1) That the expeditionary indirect fire general support weapons system initiative be funded for R&D in POM 00. (2) That an MOA be established with the Army for R&D efforts to pursue an expeditionary general support weapons system.

6. Development of an MNS for a Highly Mobile, Indirect Fire, Close Support Weapon System. Mission Area Analysis 24 and the 1996 MAGTF Fire Support Conference identified a deficiency in ground-based indirect fire support systems for Marine expeditionary unit (MEU) operations. A ground-based system to provide accurate, responsive indirect fires must be as mobile as the supported force, which is primarily mechanized. It must offer crew-protection on a multi-functional platform.

Support and Facilities: Incorporate this issue into the proposed fire support road map study.

7. Tactics, Techniques and Procedures (TPP) for Fire Support Coordination. The procedures contained in the draft *Marine Corps Warfighting Publication (MCWP) 3-16.2 Techniques and Procedures for Fire Support Coordination* adequately address TTP required by the ground combat element (GCE) to conduct fire support planning and coordination; however, TTP are not well defined above the division level.

Doctrine: MCCDC, Doctrine Division, take the lead in coordinating a Marine expeditionary force (MEF) fires conference and write TTP for MEF-level fire support coordination.

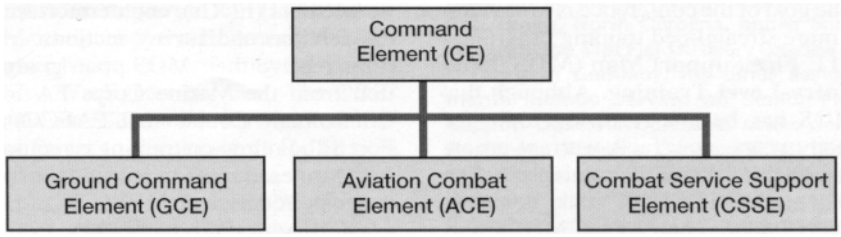
8. Supporting Arms Coordination Center (SACC) Automation. The Marine Corps is automating its fire support command and control capabilities. To provide responsive fire support, coordinate with forces ashore and share in the common operational picture, the Navy requires a fully automated SACC compatible with Marine Corps command, control, communications, computers and intelligence (C^4I) equipment and software.

Equipment: CG, MCCDC request: (1) Naval Operations (OPNAV), Expeditionary Warfare Branch (N85), evaluate the current SACC organization and the impact automation will have on it and coordinate with MCCDC (Ground Requirements Division) and the Marine Corps Systems Command (MARCORSYSCOM) to ensure Navy capabilities are compatible with existing and programmed USMC fire support C^4I programs. (2) OPNAV, N85, in coordination with MCCDC (Ground Requirements Division) and MARCORSYSCOM, evaluate alternatives and determine equipment requirements for automation and over-the-horizon (OTH) communications.

9. Review of Marine Corps Requirements Letter for NSFS for OMFTS, Dated 3 December 1996. The requirements outlined in the letter have provided valuable guidance to the Navy in executing the NSFS program. As OMFTS and naval surface fires have evolved in the past year, the Navy has requested additional guidance to further refine its requirements to support OMFTS. In the process of developing these initiatives, requests for clarification have surfaced from OPNAV, Land Attack Warfare Branch (N86), and the Program Office in the following areas: command and control, target acquisition and weapon systems.

Organization: (1) CG, MCCDC, convene an integrated concept team of all affected parties, to include OPNAV, N85/N86; MCCDC; and Headquarters, Marine Corps to resolve ambiguities in stated requirements. (2) CG, MCCDC, establish a NSFS steering committee to meet periodically to review the status of all NSFS-related programs or initiatives and requirements.

10.Artillery Training and Readiness Manual (Arty T&R Manual). The Arty T&R Manual (MCO 3501.26/PCN 102 033 55200) is an artillery commander's unit training management tool. It contains a training plan that focuses



MAGTF—A task organization of Marine forces (division, aircraft wing and service support groups) under a single command and structured to accomplish a specific mission. The size of a MAGTF varies from a few dozen to more than 100,000 Marines.

Marine Air-Ground Task Force (MAGTF). Regardless of the size of a MAGTF, each consists of the same four elements shown in this figure.

on artillery warfighting tasks—core competencies. It also provides the commander a measure of warfighting readiness. Its purpose is to help battery, battalion and regimental artillery commanders develop, conduct and track unit training.

The manual covers every military occupational specialty (MOS) in an artillery unit, providing a unit training program that encompasses all individual and collective tasks listed in unit-related individual training standards (ITS) and the Marine Corps combat readiness evaluation system (MCCRES), Volume V (Artillery Units).

The ITS and MCCRE systems are up for review, starting with an occupational field front-end analysis scheduled for the third quarter of FY 98. Once the results of the front-end analysis are distributed, the revision of ITS and mission performance standards (MPS) will begin. The changes in ITS and MPS also will affect the T&R Manual.

Training and Education (T&E): MCCDC, T&E Division, provide "train-the-trainer" assistance to Marine Artillery instructors at Fort Sill. The objective is to enable the instructors to expose artillery officers and senior NCOs attending schools to the artillery T&R program before they return to the fleet Marine force (FMF).

Support and Facilities: (1) T&E Division provide T&R articles for the Fort Sill Marine Artillery Detachment periodical, "Eagle, Globe and Blockhouse." (2) T&E Division host a comprehensive subject matter expert (SME) conference of artillery ITS, MPS and T&R subsequent to the front-end analysis. The goal of the conference is to develop a more streamlined training program.

11. Fire Support Man (MOS 0861) Entry-Level Training. Although this MOS has been a recurring topic for many years, new facts warrant an assessment of the 0861 training pipeline and model. The 0861 must consecutively undergo entry-level MOS training at two separate locations—the Field Artillery School at Fort Sill and then Expeditionary Warfare Training Group Pacific (EWTGPAC) at Coronado, California. The following items have stimulated interest in reassessing 0861 training:

- Commandant of the Marine Corps Planning Guidance established goals to reduce training and transit time for entry-level MOS training and reduce the associated temporary additional duty (TAD) and overhead costs.
- Battlefield modernization initiatives will require training 0861 MOS in the initial fire support automated system (IFSAS), DMS, AFATDS, target location designation handoff system (TLDHS), DACT and the precision lightweight global positioning system receiver (PLGR).
- Current NSFS ship availability.
- Shorefire bombardment area (SHOBA) considerations.
- Commandant of the Marine Corps' approval of the Active Duty Force Structure Review, for example, eliminated the air naval gunfire liaison company (ANGLICO) and realigned the division air-naval gunfire platoon.
- The status of simulator development and integration into the 0861 programs of instruction (POIs) at Fort Sill and EWTGPAC.

The USMC Detachment at Fort Sill has developed a POI that retains naval surface fires training and incorporates emerging equipment while eliminating the time and expense involved in conducting follow-on training at Coronado. The conference working group determined there would be no degradation in training as a result of implementing the POI. This initiative does not obviate the requirement for expeditionary warfare training groups to provide NSFS spotter sustainment and other-service training.

Training: MCCDC, T&E Division, approve this proposal and facilitate the consolidation of 0861 training at the Field Artillery School.

12. Marine Artillery Survey Course (MASC). MOS 0844 (Field Artillery Fire Controlman) Marines serve in battery, battalion and regimental fire direction centers (FDCs), countermortar radar sections and survey sections. Marines receive their MOS upon graduation from the Marine Corps FA Fire Controlman Course (MCFAFCC) at Fort Sill. Follow-on training is required for Marines assigned to radar or survey sections. A deficiency exists in the survey follow-on training.

The Army's Field Artillery Surveyors' Course (FASC) is the follow-on course to MCFAFCC. MCFAFCC is seven weeks long and FASC adds an additional nine weeks to the 0844 training pipeline—a total of 16 weeks. However, the operating and Reserve forces do not support FASC because it is tailored to Army Field Artillery survey operations; there is no commonality in survey equipment and concept of survey employment. Therefore, FASC school seats go unfilled, and the regimental artillery training schools must conduct an unsupported MOS course.

The Marine Detachment at Fort Sill has submitted course descriptive data and a POI to the T&E Division to correct the 0844 entry-level MOS training deficiency in survey instruction. In essence, the proposal opts to give up FASC school quotas and recapitalize them into MASC quotas. The proposal reduces training and travel by five weeks, saves TAD costs by approximately $1,300 per student and doesn't increase the training overhead or infrastructure.

Fort Sill's proposal has been informally coordinated with the 08 occupational field sponsor and the Enlisted Assignments Monitor. This proposal focuses on training 0844s (those not assigned to deploying artillery batteries) four times a year with a maximum class capacity of 12 and a minimum class capacity of four Marines. The course capacity is such that quotas also will be available to each of the divisions.

Training: MCDCC, T&E Division, approve the MASC proposal.

13. The Closed-Loop Artillery Simulation System (CLASS) as a POM 00 Submission. Training resources are becoming increasingly constrained. All indications are that ammunition operational and maintenance funds and range availability will become more difficult to obtain in the foreseeable future. The challenge that the Marine Corps fire support community faces is maintaining combat readiness.

CLASS will help close the gap between training requirements and resources. While simulation will not fill the multi-dimensional benefits of live-fire field exercises, it can enhance training and preserve precious resources.

Equipment: That CLASS receive a high priority to compete successfully in POM 00.

14. Target Acquisition (TA), Survey, and Meteorological Officer (MOS 0803) Training Progression. Marine Corps personnel assignment procedures do not provide for assigning trained and experienced artillery officers to critical target information billets.

The targeting process is performed at all force fires and fire support coordination centers (FFCCs/FSCCs). The decide-detect-deliver-assess

With cut backs in funds and access to ranges, the challenge the Marine Corps fire support community faces is maintaining combat readiness.

The Navy's E-6B TACAMO/ABNCP, Photo courtesy of Raytheon E. Systems

targeting methodology is a highly effective but complicated process that relies heavily on the skill and experience of key personnel. Technical innovations in weapon systems and information technology and the expanded tactical capabilities required to conduct OMFTS will place greater importance on effective targeting, while the demanding tempo of maneuver warfare will further complicate the process.

The target information officer (TIO) plays an important role in targeting. Provided to the GCE or MAGTF staff by the artillery regiment, the TIO is the member of the G3 or S3 staff directly responsible for targeting. Today, officers filling critical TIO billets are often inexperienced lieutenants and captains who have had little or no targeting training. Compounding the problem, most aren't retained in the billet long enough to benefit from their experience.

The 1996 MAGTF TA Conference recommended that specially trained and experienced TA warrant officers (MOS 0803) be assigned to critical TIO billets to overcome current training, experience and billet stability limitations. In September 1997, the CG of MCCDC approved the recommended changes to the MOS manual, which describe MOS 0803 as a TA warrant officer. The Marine Detachment at Fort Sill has developed a POI that leverages the Army's TA Warrant Officer Basic Course (TAWOBC). The Marine version of TAWOBC requires no additional resources, consists of joint and Marine-only training and will result in a two-month reduction in training time.

After graduating from TAWOBC, the 0803 Warrant Officer billet and training progression would begin as an infantry regimental assistant liaison officer followed by duties as a battalion survey officer, MEU TIO, regimental survey or meteorological officer and, finally, regimental radar officer.

This training progression proposal efficiently trains 0803s and develops a competent, specialized and versatile targeting officer for the MAGTF commander. The following table of organization modifications provide the personnel to implement this proposal:

- T/O 1101H (Artillery Regiment), Line Number 75: replace the captain 0802 TIO with a chief warrant officer four (CW04) 0803. This adds three 0803s, one in each active artillery regiment.
- T/O 1142G (Artillery Battalion), Line 44A: replace the lieutenant 0802 assistant liaison officer (rarely filled) with a CW02 0803. His primary duties are as the battalion targeting officer with additional duties as assistant liaison officer. This adds 10 0803s, one in each active artillery battalion.
- T/O 5060 (MEU [Special Operations Capable]), Line 00031: replace the 9910 lieutenant with a CW02 0803. This adds seven 0803s, one in each MEU, and provides trained TIOs on the MEU staffs.
- T/O 5060 (Fort Sill), Line 289: replace the 2805 CW04 with a CW05 0803. This Marine will be a targeting instructor for the warrant officer courses.
- Add one 0803 Active Duty CW04 to the 14th Marines T/O. As the force artillery headquarters, the 14th Marine Regiment plays a major role in the MAGTF targeting process.

Organization: MCCDC, Total Force Structure Division, approve the modifications identified in this proposal.

Training and Education: MCCDC, T&E Division, staff and approve the revised TA warrant officer POI.

15. 0811 MOS (FA Cannoneer) Sustainment and Progression Training. The 10th and 11th Marine Regiments conduct artillery section chief courses at their artillery training schools. These schools are 12 to 15 days long and critical to combat readiness and training safety requirements. School overhead is a considerable cost for the regiments. Computer-based training and distance learning initiatives may serve to standardize POIs, provide effective training and reduce the strain on resources.

Training and Education: Leverage distance learning initiatives at every opportunity to provide relevant standardized POIs to support the artillery training schools.

Support and Facilities: MCCDC, T&E Division, determine the viability of formalizing the artillery training schools and providing resources for overhead.

The consensus of this year's conference attendees was the forum provided a valuable means of exchanging ideas and influencing the combat development process. The next MAGTF Fire Support Conference tentatively is scheduled for early summer 1999 at Camp Pendleton. It will follow the established venue of highlighting I MEF unique mission requirements, alternating from I to II MEF by conference highlight and location.

Colonel Lynn A. Stuart has commanded the Marine Corps Artillery Detachment and served as the Senior Marine Corps Representative at Fort Sill, Oklahoma, since September 1995. Previously, he commanded the 14th Marine Regiment in Dallas, Texas. Other commands include the 1st Battalion, 11th Marines and Battery E, 2d Battalion, 11th Marines at Camp Pendleton, California. Colonel Stuart served as the Regimental Operations Officer for the 11th Marines during Operations Desert Shield and Desert Storm.

Major Kevin M. McConnell is the Operations Officer for the Marine Corps Artillery Detachment at Fort Sill. His previous assignment was as a Fire Support Instructor in the Basic Fire Support Branch of the Fire Support and Combined Arms Operations Department of the Field Artillery School, also at Fort Sill. Other assignments include serving as a UN Military Observer in Cambodia; Assistant S3 of the 5th Battalion, 11th Marines (5/11) during Operations Desert Shield and Desert Storm and then S3 of the battalion at Twentynine Palms, California; and Commanding Officer of Battery S, 5/11.

ommand and control during a critical phase of an operation can be greatly enhanced by a battle staff orbiting

TTP for Fire Support from an Airborne CP

by Lieutenant Colonel Albert A. Mrozek, Jr.

overhead in an airborne command and control center. The fire support officer (FSO) aboard this airborne command post (CP) is responsible for coordinating fires for the force on the ground during vulnerable periods of reduced or nonexistent fire support communications connectivity. This situation poses unique fire support challenges, but no published tactics, techniques or procedures (TTP) exist to guide the FSO.

This article covers the mission of the airborne CP, the role and responsibilities of the FSO aboard the aircraft and a discussion of the procedures for processing requests-for-fires. While several commands routinely employ airborne CPs and have developed procedures to fit their needs, this article is based on the procedures used by the XVIII Airborne Corps airborne CP battle staff during forcible entry operations.

Airborne CP Mission

The Airborne CP temporarily can serve as either the primary or an alternate means of command and control during critical phases of an operation. The airborne CP also may enhance command and control by serving as a communications relay between two CPs on land or between a CP on land and one aboard a ship. Contingency forces typically employ an airborne CP to exercise command and control during initial entry operations.

The Air Force acronym "ABCCC," which stands for airborne battlefield command and control center (specific type of aircraft configuration), is frequently used to describe any airborne CP. I use the term airborne CP as a generic term for any aircraft with a command center capability.

Three platforms in the Air Force inventory can serve as airborne CPs: the EC-130 ABCCC, a C-130 or C-141B configured with the joint airborne communications center/CP (JACC/CP) and the EC-135C (used by the XVIII Airborne Corps). Although Army units have used all three platforms in the recent past, plans call for the JACC/CP shelters to be transferred to the Air Force Reserve and for the Air Force to retain exclusive use of the ABCCC.

The Air Force also plans to phase the EC-135C out of its inventory with its capabilities replaced by the Navy's E-6B TACAMO/ABNCP ("Take Command and Move Out"/Airborne CP). The E-6B is an E-6A aircraft modified to accommodate a CP and accomplish the dual missions of serving as an airborne CP and strategic weapons system. The first E-6B was delivered in late 1997.

The Air Force EC-135C used by the XVIII Airborne Corps is a Boeing 707 modified as a command and control platform. The aircraft are assigned to the 55th Wing located at Offutt Air Force Base, Nebraska. The EC-135C has five ultra high frequency (UHF) radios, four high frequency (HF) transceivers, four HF receivers and satellite communications (SATCOM).

When an Army unit uses the airborne CP, additional communications equipment can be installed by the G6 to tailor the communications requirements for the unit and mission. Army-installed communications equipment cannot be connected into the consoles at the battle staff work stations and must be monitored using separate headsets, handsets or speaker boxes. The corps fire support nets operate over a HF radio organic to the aircraft and an Army-installed single-channel ground and airborne radio system (SINCGARS).

Role and Responsibility of the FSO

Up to 14 work stations with communications consoles on the EC-135C are available for use by the airborne CP battle staff. At a minimum, the XVIII

The Air Force EC-135C used by the XVIII Airborne Corps is a Boeing 707 modified as a command and control platform.

Position	Staff Element
Airborne CP Commander	Corps Deputy Commanding General
Battle Staff Leader	Corps Deputy Chief of Staff
G3 Operations Officer	G3 Current Operations
Fire Support Officer (FSO)	Corps Fire Support Element (FSE)
G2 Operations Officer	G2 Operations
Communications Officer	G6
Air Liaison Officer (ALO)	Corps ALO

Figure 1: Battle Staff Organization. The XVIII Airborne Corps mans the airborne CP with the personnel listed in this figure. Staff augmentees and component LNOs (as required by the mission) round out the staff.

Airborne Corps mans the EC-135C with the battle staff listed in Figure 1. Staff augmentees and component liaison officers (LNOs), as required by the mission, round out the battle staff.

The battle staff is seated on the aircraft to allow face-to-face interaction among the airborne CP commander, G2, G3 and fire support coordinator (FSCOORD). An example of the seating arrangement used in an EC-135C is depicted in Figure 2.

The airborne CP FSO is a normally a major assigned to the corps fire support element (FSE). In a forcible entry scenario, he has four principle functions. (1) He monitors the execution of planned pre-assault fires; (2) He coordinates the attack of targets of opportunity during the pre-assault period and immediately after the initial entry until the entry force can coordinate its own fire support; (3) He monitors the fire support situation and keeps the airborne CP commander and battle staff updated; and (4) He advises the battle staff on fire support matters.

Mission Preparation. Mission preparation should be ongoing continuously with the airborne CP battle staff officers compiling and updating battle books that correspond with contingency plans that may require an airborne CP. Preparation for a specific airborne CP mission begins during execution planning when the potential need for an airborne CP is identified, and it ends with movement to the departure airfield for the joint mission brief.

The FSO's preparatory tasks vary depending on the overall mission and role of the airborne CP, but the following tasks are standard when preparing for a forcible entry scenario.

• The FSO collects and (or) prepares the equipment and materials required for the mission. He also updates his battle book (see in Figure 3 on Page 28).

• The FSO discusses the planned pre-assault fires with the component providing the fires. Normally, pre-assault fires are air-delivered, so the FSO coordinates with the air liaison officer (ALO) and JFACC LNO. Key information all three battle staff officers must understand are the targets to be struck and the communications links between observers, command and control platforms and shooters.

• The FSO develops and wargames fire support contingency plans. He includes a plan on how to adapt to losses of pre-assault fires assets and changes to forcible entry times. He develops flow charts or checklists explaining how to execute the contingencies. For example, if the forcible entry is delayed, he must know who he contacts (and how) to coordinate changes to pre-assault fires.

• The FSO compiles a fire support execution checklist. The list is a single document that consolidates critical fire support events and other operational events influencing fire support, such as the weather decision time, drop times and station times for aerial fire support assets. The primary source of information for the checklist is the operations plan (OPLAN).

Other relevant information can be obtained from the headquarters staff. For example, information about station times and refueling times for air assets are available from the ALO or JFACC LNO. The events should be integrated by time and the document should be laid out in an easy-to-read format.

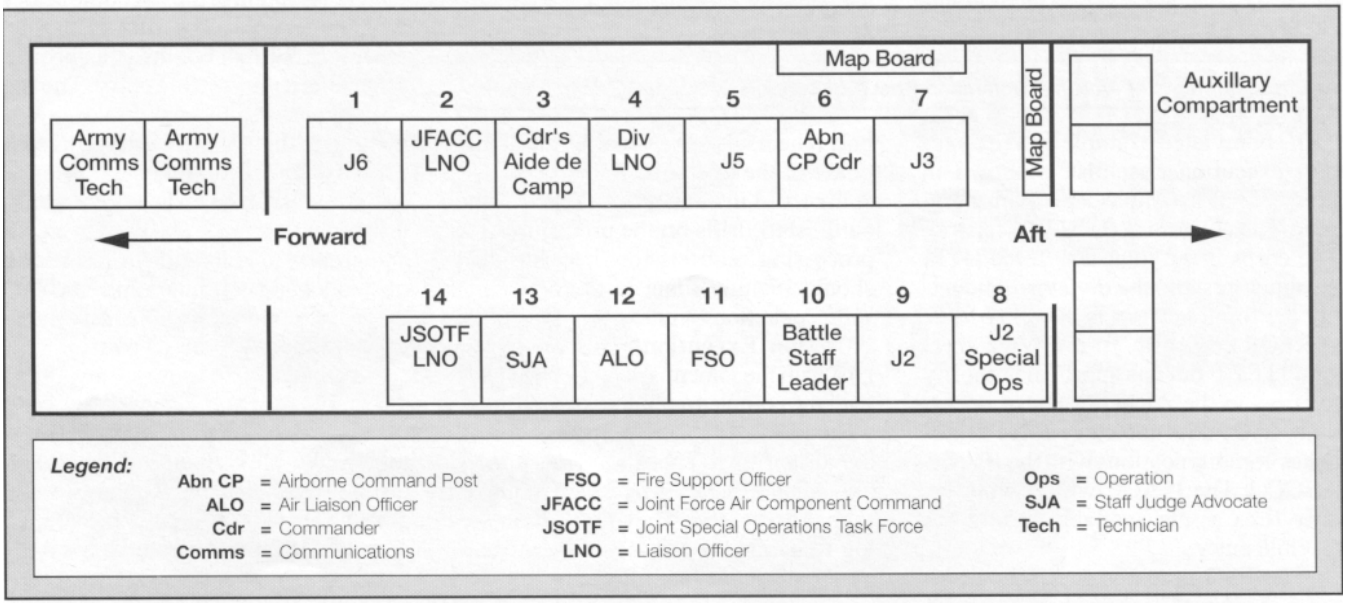


Figure 2: This figure shows the XVIII Airborne Corps Airborne CP designed for the Joint Task Force for forcible entry into Haiti (Air Force EC-135C).

- Fire Support Execution Checklist (Example in Figure 4)
- Target List (Target locations must be identified by both latitude and longitude and UTM coordinates. If limiting collateral damage is an issue, a column addressing the collateral damage risk-high, medium or low-should be added.)*
- Execution Checklist (G3 Plans)*
- Go or No-Go Criteria for Forcible Entry (G3 Plans)*
- Decision Support Matrix (G3 Plans)*
- Mission Statement and Commander's Intent (G3 Plans)
- Sketch of Anticipated Enemy Forces at H-Hour (G2)
- CCIR and PIR (G2)
- Operational Sketches of the AO and Concept for Forcible Entry (G3 Plans)
- Objectives, Endstates and Tasks of Each Subordinate Unit by Phase (G3 Plans)
- Synchronization Matrix (G3 Plans)*
- General Information on Airflow (This includes the number of personnel and heavy-drop aircraft and the time frames for the drops.) (G3 Air or G3 Plans)*
- Communications Reference Sheet (This is a graphic and/or matrix depicting the nets, subscribers, call signs/call words and frequencies.) (G6)
- Time Line for the Aircraft Mission and Seating Chart (G3 Operations)
- Fire Plan (Include conditions under which fires may be employed.) (FSE)*
- ROE Summary (SJA)
- No-Strike/Protected Target List (G5)
- General information on Pre-Assault Fires (This includes aircraft station times for assets; refuel times for aircraft, as applicable; capabilities of assets; and a list of problems that may be encountered along with possible solutions.) (G3 Plans and JFACC LNO)*
- Fire Support Annex from the OPORD
- Tabs with Target Graphics (This includes imagery, description and significance of the target, enemy units and weapons at the target and a discussion of specified collateral damage risk.) (G2)

Figure 3: Contents of Airborne Command Post Fire Support Officer (FSO) Battle Book

An abbreviated example of a fire support execution checklist is shown in Figure 4. The example depicts an operations-other-than-war (OOTW) scenario. The corps is the joint task force (JTF) headquarters and the division conducting the forcible entry is the army force (ARFOR). The airborne CP is the alternate JTF CP but has approval authority for fires in the ARFOR area of operations (AO) until the entry force establishes communications with the JFACC ABCCC. The JFACC will provide the only fires assets available during the forcible entry.

• The FSO prepares for and participates in rehearsals, brief backs and the joint mission brief. As always, fire support rehearsals are critical. If the actual phase of the operation the airborne CP is involved in cannot be rehearsed, the battle staff drills on the procedures for processing requests-for-fire. The drill should include some tasks to test the staff's reaction to unexpected events.

Mission Execution. This phase begins with the joint mission brief and ends with the completion of the mission.

The FSO's first action upon boarding the aircraft is to check the fire support log. All battle staff officers are required to maintain a log. They don't limit the log to actions occurring in their functional areas but log all reports and actions in the airborne CP to stay fully informed of operations. In particular. each battle staff officer tracks every event on the execution checklist.

Prior to takeoff, the FSO ensures the communications panel is set up for the HF net and SINCGARS is operational and secure. Upon release of communications systems to users, the FSO conducts communications checks on both nets.

During the flight, the FSO keeps the battle staff appraised of the fire support situation. The airborne CP battle staff conducts an update over the intercom on a regular basis (i.e., hourly). During these updates, each battle staff member briefs key events that occurred in his functional area since the last update.

The FSO monitors the execution of planned pre-assault fires and coordinates changes as required. He stays abreast of the fire support situation as it develops—targets attacked, any battle damage assessment (BDA) reported, fires assets available and changes to fire support coordinating measures (FSCM).

When the airborne CP is the primary command center, it hands off command and control to the assault CP or another specified surface-based CP after completing the forcible entry. Before going off station, the FSO ensures the fire support personnel at that CP can communicate with all other stations on the fire support HF net

Processing Requests-for-Fire

A forcible entry operations can be can be viewed as having three distinct events that may require the airborne CP to coordinate fires. The first is the pre-assault event that begins at a specified time before the forcible entry. The purpose of pre-assault fires is to destroy or neutralize threats to the entry force and its airlift. The second event is during the airborne assault when heavy equipment drops are occurring. The third event, the actual entry, begins with the insertion of personnel and continues until the entry force has communications established to coordinate fires on its own.

Two sources can request fires during the pre-assault and heavy drop events. One is special reconnaissance (SR) or long-range surveillance (LRS) teams inserted earlier. The second are supporting aircraft. In many cases, these sources will report an observation rather than actually request fires. The airborne CP battle staff assesses the report and determines if the potential target should

be attacked. During and after the entry, observers on the ground from the assaulting force might be a third source for fires requests.

Fire Coordination. Two critical coordination issues affecting fires are compliance with the rules of engagement (ROE) and clearance of fires. To ensure target attack is in compliance with the ROE, a Staff Judge Advocate (SJA) officer should be part of the airborne CP battle staff.

Clearance of fires considerations correspond to the three events: pre-assault, heavy drops during an airborne assault and actual entry. The FSO's principle concern during the pre-assault is ensuring no-fire areas (NFAs) are not violated. During an airborne operation, the AO becomes the responsibility of the assaulting force when the heavy drop begins. From this point on, the entry force clears fires. LRS teams may be able to provide clearance, but in many cases, aerial observers from the entry force have to clear the fires. For example, if AC-130 gunships are providing pre-assault fires and an LNO from the entry force is aboard the aircraft, prior coordination should be made for him to clear fires.

Once the third event, the entry of personnel, occurs, prevention of fratricide becomes the overriding concern. As always, fires aren't delivered until clearance is received from the unit assigned the AO.

Steps in Processing Requests-for-Fire. The following procedures were used in by the XVIII Airborne Corps in its airborne CP in the same exercise as the fire support execution checklist (Figure 4).

1. Because the most likely sources for pre-assault targets of opportunity are SR teams, LRS teams and aircraft crews, the battle staff officers who receive requests for fire are the J2 battle staff officer, the JFACC LNO and the joint special operations task force (JSOTF) LNO.

The battle staff officer receiving a request-for-fire announces, "Fire Mission" and states the net over which the mission is being sent. He then records the date/time group of the request, the location, target description and activity. He loudly announces the target location, description and activity to the battle staff.

2. The FSO reads back the target location and plots it on the map. The J3 battle staff officer verifies the plot.

3. The FSO verifies (and verbally affirms to the airborne CP commander) that the target is in the appropriate component AO and that established NFAs are not violated. He then evaluates the target description and activity against any stated conditions and recommends if the target should be attacked.

Time	Event
H-2	Make weather decision.
H-1	Make decision to launch OH-58D helicopters.
H-:10	Airborne CP assumes responsibility for approving fires in ARFOR AO.
H-:05	AC-130 aircraft are on-station.
H-Hr	Pre-assault fires window opens. (See list of planned targets.)
H+:10	Pre-assault fires end; heavy drop begins. Entry force assumes responsibility for approving fires in ARFOR AO.
H+:20	Personnel drop begins.
H+:30(T)	Communications established with assault CP.
H+3 to H+4	AC-130H refuels; AC-130A assumes coverage.

Planned Targets (ARFOR AO)

Target #	Location	Conditions
AB0001	UTM: ———— Latitude/Longitude: ———	Armed Personnel/Crew-Served Weapons Present
AB0002	UTM: ———— Latitude/Longitude: ———	Air Defense Weapons Present

Legend:

ARFOR = Army Force — **CP** = Command Post

AO = Area of Operations — **UTM** = Universal Transverse Mercator

Figure 4: Example of a Fire Support Execution Checklist

4. If troops or equipment are already on the ground, clearance is obtained from the appropriate unit.

5. The SJA representative observes the plot of the target and evaluates the target description and activity against the ROE. If a potential ROE violation occurs, he states so to the airborne CP commander.

6. If the airborne CP commander approves the target, the JFACC LNO passes the appropriate information to the JFACC ABCCC, which then directs an attack asset to the target.

Conclusion

The events of recent years show that contingencies are arising in areas of the world where the US does not have forces in place. Force projection, to include possible forcible entry operations, may be needed to respond to a crisis.

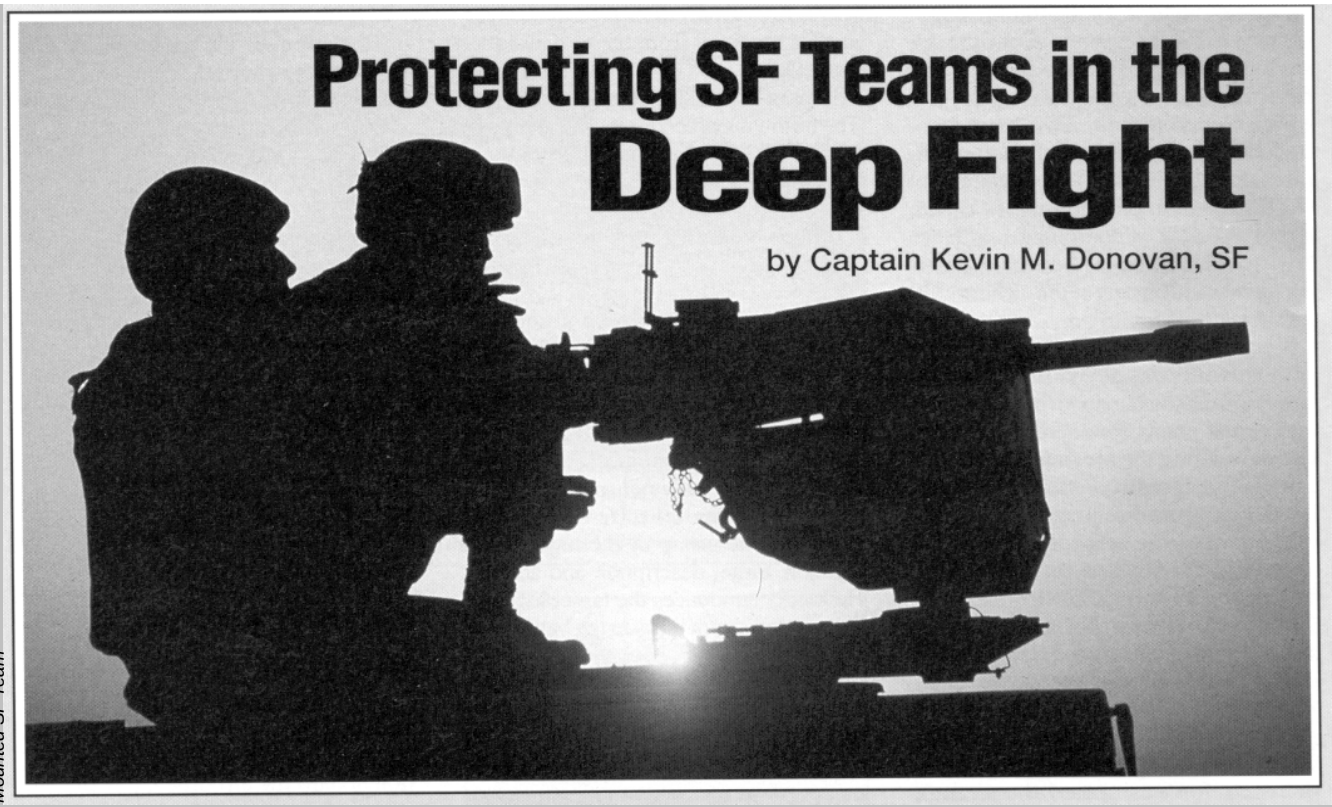
The airborne CP is a proven means of ensuring continuous command, control and communications during force projection operations. One critical function aboard the airborne CP is fire support. In fact, some commands use their airborne CP aircraft principally as fire support coordination platforms.

This article is an example of TTP for fire support from and airborne CP that was devised and tested by one unit, the XVIII Airborne Corps. These TTP begin the process of "filling in the blanks" for airborne CP operations-operations that, predictably, we'll see more of in the future.

Lieutenant Colonel Albert A. Mrozek, Jr., is a Joint Fires and Targeting Observer/Trainer in the J7 in Suffolk, Virginia, as part of the of the US Atlantic Command. He also was the Assistant Fire Support Coordinator of the XVIII Airborne Corps, Fort Bragg, North Carolina, where he served as Fire Support Officer on an Airborne Command Post. Among other assignments, he was an Instructor at the Joint Targeting School in the Fleet Combat Training Center at Dam Neck, Virginia; Executive Officer for the 3d Battalion, 319th Field Artillery Regiment, 82d Airborne Division at Fort Bragg; Chief of Force Integration in the G3 shop of the 2d Infantry Division, Korea; and Commander of Headquarters and Headquarters Battery in the 2d Battalion, 3d Field Artillery, 3d Armored Division Artillery in Germany. He's a graduate of the Command and General Staff College, Fort Leavenworth, Kansas, and holds a Master of Public Administration from West Virginia University.

Protecting SF Teams in the Deep Fight

by Captain Kevin M. Donovan, SF



Mounted SF Team

Deep within enemy territory, two special forces operational detachments alpha (SFODAs) conducted overland infiltrations using desert mobility vehicles (modified high-mobility multipurpose wheeled vehicles, or HMMWVs, with .50-caliber machineguns and Mk-19 grenade launchers mounted on them). Upon arriving at their respective operating areas, the SFODAs conducted split-team, special reconnaissance (SR) activities along threat road networks. From their hide sites, the teams began reporting activities in the objective areas.

Their primary mission was to find, report and target the elusive, nuclear-and chemical-capable SS-1B/C Scud transporter erector launchers (TELs). These short-dwell, mobile launchers are the same systems that plagued the Coalition Forces during Operation Desert Storm in the Gulf War. Designated by the theater Commander-in-Chief (CINC) as his Number-One high-payoff target (HPT), special forces teams were inserted to identify and target the Scuds and coordinate attacks by Army tactical missile system (ATACMS) Block I and IA missiles and USAF "Scud CAP" F-15E attack aircraft.

Located some 300 kilometers from the teams, the Commander of the Special Operations Command (SOC) recommended the joint force commander (JFC) approve restrictive fire support coordinating measures (FSCM) to protect his special operations forces (SOF) in the "JSOA." The recommendation came from nominations from the special forces group commander whose SFODAs planned the missions. Once approved by the JFC, the FSCMs were transmitted to the theater components: air, land and marine. In the land component, the Army's operations and fire support element (FSE) personnel were confused– "What's a JSOA?"

Joint Special Operations Area (JSOA)

During the recent Roving Sands 97 exercise at Fort Bliss, Texas, the two "live" SFODAs were unprotected from Army attack systems used during the deep fight against the threat theater ballistic missile (TBM) force. As part of Joint Project Optic Cobra-a Central Command theater missile defense (TMD) exercise-Army elements participated in this joint exercise to train on the challenging aspects of TMD attack operations.

In a joint and combined environment such as Roving Sands, it's easy to confuse terms and acronyms. Consequently, the "JSOA" was not identified as needing a FSCM and the battlefield geometries were *not* transmitted to the battlefield coordination detachment (BCD), the Army Air and Missile Defense Command (AAMDC), III Corps Deep Operations Coordination Cell (DOCC) and the 214th Field Artillery Brigade via the advanced Field Artillery tactical data system (AFATDS).

From the definition found in *Joint Pub 3-05.3 Joint Special Operations Operational Procedures*, a JSOA is "A restricted area of land, sea and airspace assigned by a joint force commander to the commander of a joint special operations force to conduct special operations activities." The key word is "restricted." In Field Artillery speak, a JSOA is a no-fire area (NFA).

JSOAs come in all sizes. They are selected based on the criteria for each mission, and the size of the JSOA is determined by the mission requirements. For an unconventional warfare mission, the JSOA must be large enough to protect the SFODA and its resistance force (guerrilla force) and resistance infrastructure. Similarly, a TMD special reconnaissance mission where mobile recon over a large desert area is required (such as in Roving Sands), the JSOA must be large-some 25 to 100 square kilometers.

On the other hand, a direct action (DA) mission against a point target or a line of communication (LOC) special reconnaissance mission requires a relatively small JSOA, perhaps one square kilometer.

A JSOA can have more than one SFODA. The JSOA can be divided into sectors for each SFODA to operate in.

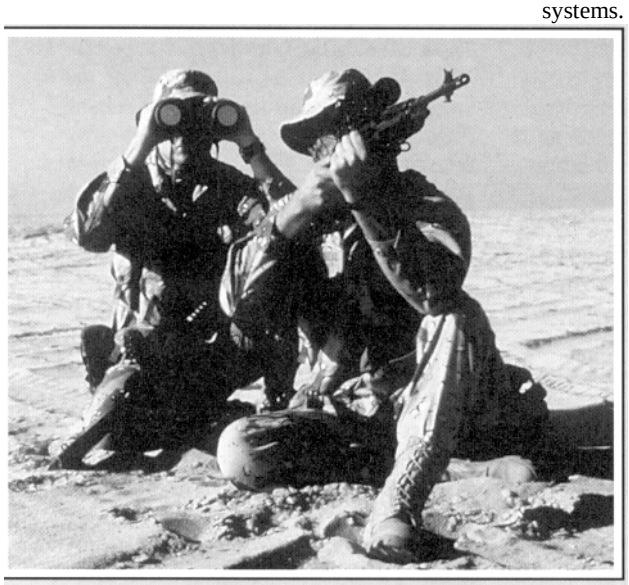
Clearing Fires in a JSOA

The Army soon will have an organic weapon that can reach out to approximately 300 kilometers (ATACMS Block IA). Couple the capabilities of this developmental missile with USAF aircraft and Army aviation that has greater attack ranges, and the Army's area of interest will undoubtedly encompass areas where SOF operate. Clearing fires in those areas is not only essential to protect the SOF, but also to ensure critical targets are attacked in a timely manner.

When the area of interest of a conventional force commander encompasses a JSOA, coordination must occur to identify SOF mission requirements and synchronize supporting special operations with conventional combat operations. Coordination with the establishing FSCM authority is achieved via liaisons.

The SOC uses two types of liaisons to coordinate with conventional forces of the other components. For the USAF, the SOC forms the special operations liaison element (SOLE) located inside the joint air operations center (JAOC). For the Army, the special operations command and control element (SOCCE) supplied from the special forces group is with the ARFOR (Army or corps headquarters). In lieu of a SOCCE, the corps special operations coordinator (SOCOORD), an organic staff element in the corps G3, can provide a link to SOF operations. These elements deconflict SOF operations with the operations of the conventional force.

With the speed required to attack the time-sensitive Scuds, knowing exactly where the SOF are located in near-realtime speeds the clearance of deep fires. With mobile forces in a JSOA, keeping track of them deep in threat territory is a constant, resource-intensive endeavor. To aide in tracking SOF activities during Roving Sands 97, the SOF teams carried a system called Grenadier Brat.



As evident by the initial insights coming out of Roving Sands, SOF detection of TELs resulted in successful attacks by Army ATACMS and USAF aircraft. SOF teams provide the Army timely, accurate targeting information in an area where deep-looking, reliable sensors are at a premium.

SOF Grenadier Brat

During Roving Sands, the Army tested the Grenadier Brat, a visualization system for beyond the forward-line of own troops (FLOT) that helps SOF commanders visualize the deep battle and track SOF teams. Grenadier Brat is an eight-inch "box" that is a beyond-the-line-of-sight reporting and targeting system that leverages national, theater and tactical systems. It provides near-real-time tracking and removes the burden of voice reporting. Special forces, rangers, long-range surveillance units (LRSUs), Army aviation and air assault units are potential users. During Roving Sands 97, the two live SFODAs from the 5th Special Forces Group and Army AH-64s Apache helicopters from the 101st Airborne Division were equipped with Grenadier Brats.

The Grenadier Brat transmitter is the heart of the system. It broadcasts at preset intervals in spread spectrum, low-power digital bursts. This ensures a low probability of interception or detection.

The broadcast of the prototype Grenadier Brat transmitter tested in Roving Sands has various components. The transmitter receives global positioning system (GPS) time and location and incorporates it with unit identification and an operations code (OPCODE). The transmitter has 1024 OPCODEs that can be pre-programmed before a mission is performed. The OPCODEs are messages sent back to commanders monitoring the mission. For example, OPCODE 37 might mean: "Request Resupply."

The broadcast is packaged into a digital burst and transmitted via satellite to a ground processing station. From there it is injected into the Tactical Receive Applications Program/Theater Intelligence Broadcast System (TRAP/TIBS) network for worldwide broadcasts. Any unit with a tactical exploitation of national capabilities (TENCAP) receiver can track the equipped unit.

The Grenadier Brat broadcast can be displayed on an Army Battle Command System (ABCS) screen, accessible to Field Artillery units via AFATDS. This capability provides the commander worldwide coverage to track his deep assets without fear of compromising them.

As evident by the initial insights coming out of Roving Sands. SOF detection of TELs resulted in successful attacks by Army ATACMS and USAF aircraft. SOF teams provide the Army timely, accurate targeting information in an area where deep-looking, reliable sensors are at a premium.

To ensure SOF teams can continue to provide this valuable targeting information, FSCMs need to be correctly emplaced to protect them from fratricide.

Captain Kevin M. Donovan, Special Forces, until recently was the Special Operations Force Advisor at the Depth and Simultaneous Attack Battle Lab, Fort Sill, Oklahoma. Currently, he is a student at the Psychological Warfare and Civil Affairs Course at Fort Bragg, North Carolina. He commanded two Special Operations Detachment Alphas (SFODAs): Operational Detachment A 322 (Mounted) and Operational Detachment A 325 (Scuba) in the 1st Battalion, 3d Special Forces Group (Airborne) at Fort Bragg and deployed on Operation Restore Democracy in Haiti and two joint exercises for training to Tunisia. His previous assignments include serving as S3, Special Weapons Officer, Platoon Leader and Fire Direction Officer (FDO) in the 1st Battalion, 36th Field Artillery, 17th Field Artillery Brigade, part of VII Corps in Augsburg, Germany.

AFATDS and Fire Support in a Multinational Environment

by Captain Michael A. Ascura

Unquestionably, the majority of military operations in the future will be multinational. US artillery units may be called upon to support or command artillery forces from other countries.

Synchronizing fires on the combined arms battlefield is a challenge. Synchronizing fires in multinational operations-Desert Storm in the Gulf and those in Bosnia-adds another dimension to an already difficult challenge.

The Army's primary system to meet this challenge, the advanced Field Artillery tactical data system (AFATDS), is being fielded across the Army today. It provides tools to plan, execute and synchronize fire support both in the national and multinational environment. AFATDS will be the first Field Artillery system that, by design, will seamlessly interface with digital fire support systems of other countries—will provide digital interoperability.

Artillery Systems Cooperation Activities (ASCA)

We identified specific design requirements for AFATDS by participating in the ASCA program. The ASCA is an organization that officially began in 1991 after a series of staff talks between Germany and the US in 1977, and the United Kingdom and the US in 1979. As a result of these staff talks, agreements among the three nations were established for each country to design a software interface that would provide technical and tactical interoperability between any two nations. The ASCA goal is to develop a common interface to avoid the possibility of multiple interfaces that would result from the separate bilateral efforts.

Bilateral discussions between France and the US began in 1991. In 1993, France became an official member of ASCA. In December 1997, Italy became the fifth and newest member of ASCA.

The five active member nations and their artillery command, control and communications (C^3) systems include: the United States with AFATDS; the United Kingdom with the Battlefield Artillery Target Engagement System (BATES); Germany with the *Artillerie Daten Lage Einsatz Rechnerverbund* (ADLER); France with the *Automatisation des Tirs et des Liaisons De l'Artillerie Sol-Sol* (ATLAS); and Italy with the *Sistema Informatico de Reggimento di Artiglieria* (SIR). Each country is responsible for developing its own fire support C^3 system and interface device.

The objectives of the ASCA program are to: (1) Accommodate the different command and control procedures of each nation; (2) Apply the full scope of communication and automation security across the interface; and (3) Establish an interface that would accommodate national hardware and software. ASCA's intent is to accomplish these objectives without additional requirements for personnel or interoperability training among the nations.

Since its creation in 1991, ASCA member nations began to develop procedures and requirements that clearly define the parameters of the interface. These procedures and requirements are outlined in several ASCA documents: the Common Tactical Concept (CTAC), Common Tactical and Technical Interface Requirements (CTTIR), Common Technical Interface Design Plan (CTIDP) and Common Interface Operating Procedures (CIOP).

For conflict involving mutual fire support in a multinational environment, the ASCA intent is to establish a single primary communications interface between any two countries. There would be no other digital interface between the countries. Because of this concept, the interface is found only in fire direction centers (FDCs) or fire support elements (FSEs) at the battalion level and higher echelons.

Messages in Common. CTIDP defines more than 30 fire support-related messages that can be implemented for use on the ASCA interface. The messages include: ammunition fire unit (AFU), artillery target intelligence (ATI), fire mission (FM), meteorological (MET), modification (MOD), nonnuclear fire planning (NNFP), support (SPRT), system (SYS), and nuclear, biological and chemical (NBC). These messages don't change the way any nation conducts its fire support business.

The message formats support automated fire planning and fire mission processing among the four participating nations. Each nation agreed to implement 12 basic ASCA messages (referred to as the "common level of implementation") plus additional messages as national funding levels and operational priorities permit. This level of implementation supports the basic needs for conducting fire support operations on a

multinational basis. The messages permit participating nations to digitally exchange battlefield information.

Communications Interoperability. The communications link among the five nations is standard wire lines. Each country has implemented its own tactical modem. However, using CTIDP as a standard reference, each country is able to meet the wire line electrical signal characteristics.

AFATDS uses the tactical communications interface module (TCIM) as its digital interface. The device follows the communications specifications and tactical modem requirements outlined in the CTIDP.

TCIM is a lightweight communications processor that is used internally in the lightweight computer unit (LCU) and externally on the transportable computer unit (TCU) or ultra-spare computer unit (UCU). Using wire line adapters connected to the TCIM, AFATDS can communicate with the other countries' systems. The TCIM serves as the tactical modem for the system.

A future ASCA goal is for the ASCA nations' digital systems to communicate via radio. Work is underway to provide communications links using standard VHF-FM combat net radios.

ASCA Live-Fire Demo

In November 1997, ASCA and the German Artillery School hosted an interoperability demonstration in Idar-Oberstein, Germany. The exercise conducted over a period of six weeks involved artillery units, contractors and civilian engineers from France, Germany, the United Kingdom and the US. (Italy did not participate in this demonstration.) The exercise culminated with a four-nation combined live-fire exercise on 13 November 1997 in Baumholder, Germany.

AFATDS Transportable Computer Unit (TCU)

The objective during this exercise was to achieve digital interoperability by establishing and disestablishing a link with each country, exchanging database information, executing different command and support relationships and conducting fire mission processing. AFATDS, ADLER, BATES and ATLAS completed three of the four tactical missions: general support (GS), general support reinforcing (GSR) and reinforcing (R). Direct support (DS) missions are not conducted among the ASCA nations.

The figure outlines the different interoperability capabilities and messages resident in the ASCA systems. These capabilities will allow each country to command and support a different country and simultaneously attack targets across a shared boundary. The combined live-fire exercise demonstrated these relationships.

The orchestration of fires was overwhelming and downright exciting. The European fire support community marks this significant event as a major victory in the area of digital interoperability. However, significant challenges still remain.

Challenges Yet to Overcome

Although the interoperability demonstration was successful, there are still some constraints within the ASCA organization. One constraint is the difference in the development of each nation's system. Each country is nationally funded and responsible for developing its system. ASCA's ability to interface digitally with all systems complying with all requirements depends on the developmental time line of each country.

Another constraint involves the difference in national tactics, techniques and procedures (TTP). It's virtually impossible for different nations to have identical operating procedures and functional capabilities when using different C^3 systems. For example, some countries use the command "Check Fire" to stop a fire plan. US national TTP does not allow a unit to Check Fire a fire plan, only by targets.

Each country does business in its distinct way, but our cooperative efforts allow us to progress beyond the procedural barriers. The ASCA messages go a long way toward overcoming these differences. Nevertheless, many national restrictions remain. It is the goal of the ASCA program to minimize the number of restrictions.

AFATDS continues to evolve with technology and periodically is modified based on changing requirements and available resources. AFATDS software is scheduled for release each year until the year 2001. This will allow our soldiers to receive AFATDS functionality in the field quicker.

Achieving digital interoperability will allow multinational operations to deliver swift and massive fires on tomorrow's battlefield. This interoperability enhances our ability to fight and win a decisive battle as a member of a multinational coalition force.

The future looks promising for the international fire support community and AFATDS. Currently, ASCA consists of five countries. But "on deck," Norway and the Netherlands participate as observers.

Membership in the ASCA program is sure to increase as other countries recognize the importance and benefits of digital interoperability on the battlefield. AFATDS with its versatility and multi-functional capabilities, one day, will be the link to digital interoperability with our international fire support partners.

Captain Michael A. Ascura, Acquisition Corps, is the Advanced Field Artillery Tactical Data System (AFATDS) Hardware Testing and Fielding Manager for the Training and Doctrine Command (TRADOC) System Manager for AFATDS (TSM-AFATDS), Fort Sill, Oklahoma. In his previous assignment, he was the Commander of C Battery, 2d Battalion, 80th Field Artillery in the Field Artillery Training Center, also at Fort Sill. Among other assignments, Captain Ascura was the Chief of the Operations Cell at the Joint Readiness Training Center (JRTC), Fort Polk, Louisiana; and Assistant S3 for the 4th Battalion, 82d Field Artillery of the 42d Field Artillery Brigade, also at Fort Polk. He is a graduate of the Materiel Acquisition Management Course, Fort Lee, Virginia; and the AFATDS Command and Staff Course and Operators Course, both at Fort Sill.

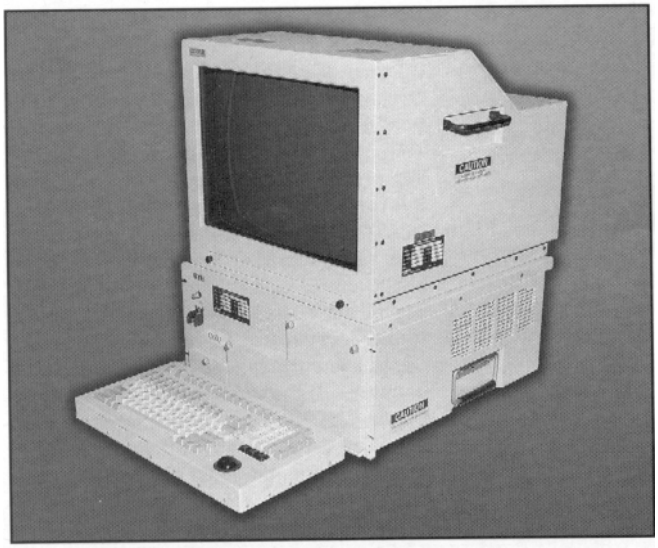
AFATDS Update

The focus of this update is the FY 1998 and FY 1999 fielding schedule for the advanced Field Artillery tactical data system (AFATDS). Since the fielding of the tactical fire direction system (TACFIRE) in 1977 and the initial fire support automated system (IFSAS) in 1992, fire supporters have entered a new dimension of fire support operations with AFATDS.

First fielded in 1995, AFATDS has gone through many technical and operational tests, international interoperability tests, Army warfighting experiments (AWEs) and fieldings to selected divisions, corps artilleries, battlefield coordination detachments (BCDs) and Army-level fire support elements (FSEs). Since the Division AWE at Fort Hood, Texas, in November 1997, the AFATDS team has gone to great lengths to identify and develop new functional requirements. The goal is for AFATDS to incorporate these requirements by the year 2000.

AFATDS Hardware/Computer Upgrade. AFATDS consists of three basic computer designs: the transportable computer unit (TCU), the ultra-sparc computer unit (UCU) and the lightweight computer unit (LCU). The TCU comes with a 4 GB hard drive, 208 MB of RAM and 125 megahertz while the UCU comes with a 9 GB hard drive, 256 to 400 MB of RAM and 200 megahertz. The LCU is a ruggedized Pentium lap-top computer. AFATDS has two types of operating systems: common hardware software 1 (CHS 1), which the TCU and LCU have, and common hardware software 2 (CHS 2), which the UCU has.

Currently, all Army units fielded with AFATDS have the TCU with CHS 1 (see the figure). During FY 1999, the Army is tentatively scheduled to replace the TCU systems in all the units listed in the figure as "Fielded to Date" with UCU systems and CHS 2. All units being fielded AFATDS in FY 1998 for the first time (as listed in the figure) will receive the UCU with CHS 2. The LCU is scheduled for a 2-GB hard drive upgrade in FY 2000.



The Ultra-Sparc Computer Unit (UCU)

Units Fielded to Date

1st Cavalry Division (1995)
4th Infantry Division (Mechanized) (1996)
2d Infantry Division (1997)
I Corps Artillery (1997)
III Corps Artillery (1997)
V Corps Artillery (1997)
3d Army FSE (1997)
8th Army FSE (1997)
BCD, Korea (1997)
BCD, Germany (1997)
BCD, Fort Bragg (1997)
Enhanced DOCC, Korea (1997)
CP-Tango, Korea (1997)

Tentative FY 1998 Fielding Plan*

XVIII Airborne Corps Artillery (Mar 1998)
82d Airborne Division (May 1998)
101st Airborne Division (Air Assault) (Aug 1998)

*These units will receive UCUs and CHS 2.

Legend:

BCD : Battlefield Coordination Detachment
CHS 2 : Common Hardware Software 2
CP : Command Post
DOCC : Deep Operations Coordination Cell
FSE : Fire Support Element
UCUs : Ultra-Sparc Computer Units

AFATDS Hardware Fielding Schedule

AFATDS Software Fielding Schedule. In October 1997, AFATDS 97 successfully completed the Limited User Test (LUT) at Fort Sill, Oklahoma. AFATDS 97 software is scheduled for release in April 1998. For units already fielded AFATDS, the Communications and Electronic Command (CECOM) AFATDS New Equipment Training Team (NETT) will conduct five weeks of "Delta" training on the new AFATDS hardware and software-training that focuses on the difference between the old and new software.

Units or individuals with questions or comments should forward them to the Training and Doctrine Command (TRADOC) System Manager–AFATDS (TSM–AFATDS) at Fort Sill, Oklahoma: commercial (580) 442-6836 or 6837 or DSN 639-6836 or 6837. Email: afatds@usafas.army.mil. For general information on the program, see the Program Manager–FATDS' Web Page: www.exit109.com.

CPT Michael A. Ascura, AC
AFATDS Hardware Test and Fielding Manager
TSM-AFATDS, Fort Sill, OK

NTC Wits & Wags

The following are actual quotes from the Wise and Wags at the NTC during various unit rotations. They were carefully recorded by Lieutenant Colonel Thomas D. Houston, Field Artillery Battalion S3 Trainer at the National Training Center (NTC), Fort Irwin, California, from 1993 to 1996.

The Wise

•**Wolf 07 [Senior Fire Support Trainer]:** "The only reason a direct support battalion exists is to provide artillery fires when and where the maneuver commander wants them to kill as many of our enemy as efficiently as possible."

•**Brigade Commander:** "Fire support is not impossible...it's just hard work."

Commander, Operations Group (COG): "An obstacle not covered by fire is not an obstacle...it's simply a distractor."

•**COG to Players:** "The fundamental doctrine for the Krasnovian [opposing force] is that brute force and ignorance will win every time. Your job is to prove him wrong."

•**Company Commander:** "Well, Sir, Field Artillery is not that important at the company/team level."

Brigade Commander's Response: "Is that right...well, how many tanks and Bradleys are in this brigade at the NTC?"

Company Commander's Answer: "54 tanks and 54 Bradleys."

Brigade Commander: "How many tubes do we have in support of us?"

Answer: "With the reinforcing battalion, 48."

Brigade Commander: "OK, how many tanks and Bradleys are in the lead task force in a movement-to-contact?"

Answer: "48."

Brigade Commander: "How many tanks and Bradleys are in the lead company team of that TF?"

Answer: "14."

Brigade Commander: "And how many tubes in support?"

Answer: "Still 48, Sir."

Brigade Commander: "So, we have 14 tanks and Bradleys with 48 tubes of artillery in support with enough ammunition to take out an MRB [motorized rifle battalion]....Tell me, again, why Field Artillery isn't important to the company commander?"

The Wags

•**Wolf 07:** "A bad day in the desert is infinitely better than the best day at the Pentagon."

•**Fire Support Coordinator [FSCOORD]:** "Why do I have a TOC [tactical operations center] when I always have to tell *them* what's going?"

•**FSCOORD:** "You are telling me that all three batteries are ready to fire...how many are *really* ready?"

•**FSCOORD:** "This is moving too fast to command and control at the TOC...Put the BCs [battery commanders] up on the fire net so the brigade commander and I can tell them where to move."

•**Battalion S3 in his TOC:** "Somebody turn *down* that FM fire support rehearsal! We're trying to figure out the scheme of fires for tomorrow."

•**Brigade Commander:** "*Don't* bring up fires in this rock drill. We're trying to rehearse the maneuver plan."

•**Battalion Commander:** "Pull your convoy over so I can chew your ass."

•**Wolf 07 to Brigade Fire Support Officer (FSO) O/C:** "What is the FSCOORD *thinking* right now?"

FSO O/C Answer: "Sir, I can't tell because he has his helmet on."

•**Scout Platoon Leader:** "I've been out here 'surveiling' for three days...when are we going to *kill* something?"

•**S2 Talking to Scout:** "What element are you looking at—the CRP, FSE or AGMB?"

Scout in Response: "Sir, I'm not sure what those letters mean, but if you can hold on for a second, I'll ask them when they drive into my position."

•**Brigade FSO to Combat Observation Team (COLT) Sergeant:** "Your mission is simple. Take your GVLLD [ground/vehicular laser locator designator] and, beginning at dark, conduct a dismounted infiltration for 14 kilometers and get into an OP [observation post] before daylight. Find the CSOP [combat surveillance observation post] and destroy it with Copperhead. Then find the southern MRC [motorized rifle company] and destroy 50 percent of it. Once you've done that, then adjust the smoke for the lead task force and transition that mission to the task force FSO. Then find the combined arms reserve and destroy it before it moves. Next, look for the RAG [regimental artillery group] and suppress it. Once you've done all that, give me a call, and we'll refocus you."

•**COLT Adjusting Smoke for a Deliberate Breach:** "I can't see my smoke round to make an adjustment...the obscuration in the target area is just too thick."

•**COG:** "If the OPFOR is pulling into your chow line in the BSA [brigade support area], a great brigade deep fight doesn't mean very much."

Deep Strike MLRS DS to the Light Division Aviation Brigade

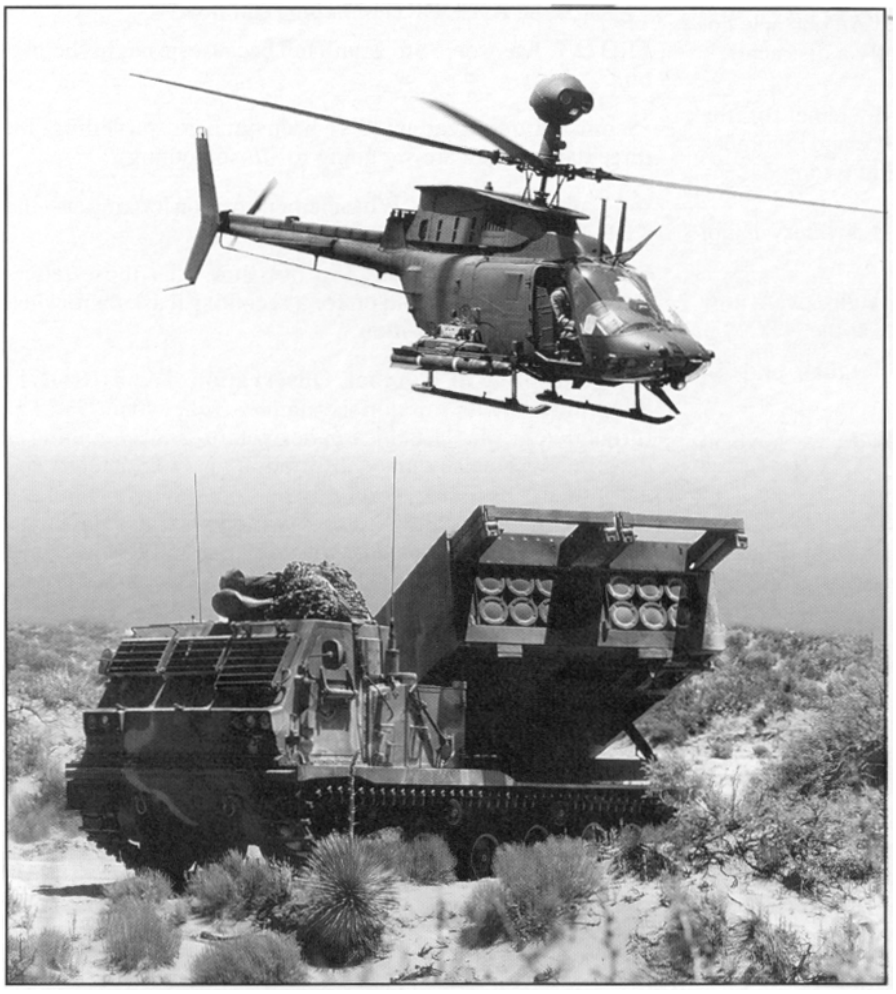
by Captain Shannon D. Beebe

A recent deployment of the 101st Airborne Division (Air Assault), Fort Campbell, Kentucky, to the National Training Center (NTC), Fort Irwin, California, served as the training ground for the Army's new light-heavy task force. For the battalion headquarters employing simulated multiple-launch rocket system (MLRS) launchers, this rotation provided a test bed for the initial concept development of a deep strike, sensor-to-shooter architecture for the light division. As the concept is further developed, it could prove a very effective means of employing the high-mobility artillery rocket system (HIMARS) to be fielded to the light divisions in the next century.

The results of these initial trials were significant. We discovered MLRS works very effectively in a direct support (DS) role on the light forces' battlefield.

Our goal was to leverage the deep sensing capability of the OH-58D Kiowa Warrior aerial scout helicopter and the deep strike range of MLRS into a DS role during the first phase of the operation: setting the conditions.

The process starts with the synthesis of suspected enemy high-value targets followed by the OH-58D observer confirmation of the targets which, in turn, leads to MLRS fire missions. The aviation-artillery sensor-to-shoot team concept facilitates the maneuver commander's ability to engage the force on his terms and shape his battlespace for follow-on operations.



Filling a Need

The ability to strike deep, disrupting the enemy's battle rhythms well in advance of the actual engagement, is an advantage MLRS brings to the light forces. Attacking the enemy deep at crucial times can change the battlefield calculus in the friendly force's favor.

With the advent of the light-heavy brigade combat team (BCT) and the future fielding of HIMARS to the light divisions, the question arises: How does the light division commander make the most of this extended-range artillery without taking observer assets from the close fight?

The light force has limited sensor assets. Light divisions have no unmanned aerial vehicles (UAVs), no organic scout platoons (found only at the battalion level) and no combat observation lasing team (COLT) assets. (The COLTs are brigade-level assets for shaping the brigade's close battlespace.)

The division has one long-range reconnaissance detachment (LRRD). Although highly trained and capable of serving as deep observers, the LRRD teams must remain undetected and move as little as possible to survive. This limits their coverage area.

Applying today's doctrinal employment procedures, commanders must ask hard-hitting questions. Is it worth the risk of infiltrating sensor assets with limited mobility deep in enemy territory, risking them again during exfiltration? Is there another less risky, yet effective way to shape the full depth of battlespace? The answer to the second question is, Yes.

MLRS DS to Aviation

By using the OH-58D to acquire high-value targets–command and control nodes; petroleum, oil and lubricant (POL) dumps; logistics areas and forward

arming and refuel points (FARPs)–and linking them to DS MLRS units, the maneuver commander can violently strike the opposing forces with minimal risk to his units.

At first glance, aviators might think the goal is to return to Vietnam-era aerial observation using the OH-58D. This is not true. To give this multipurpose platform the sole mission of observing a target would be a waste of resources. The intent is to task this valuable asset dynamically.

For example, one OH-58D mission is to reconnoiter a route for an Apache strike. If signal intelligence (SIGINT) reports high volumes of communications traffic believed to be a brigade command post and a suspected FARP along the recon route, the OH-58D *could* be tasked to destroy them. But, *should* the OH-58D (or other aerial assets) be tasked to destroy these targets and, perhaps, jeopardize its primary mission? On the other hand, should this intelligence be brushed aside as insignificant for the aviation mission? Neither.

With deep strike artillery DS, the aerial scout only needs to confirm or deny the target, send back a refined grid and continue on with his primary mission. With a real-time accurate grid and the enormous area fire MLRS provides on soft targets, there's no need to "observe" rounds on the target. Static observation under such circumstances wastes time and unnecessarily imperils both man and machine.

The Aviation-Artillery Linkage

The best method to link the aviation sensors to the deep strike artillery as shooters is via a liaison team. With a liaison team organic to the MLRS battalion positioned in the aviation brigade headquarters, missions called in by aerial scouts can be processed immediately and sent to the MLRS battalion.

The liaison team not only brings MLRS expertise to the aviation brigade, but also the ability to process fire missions seamlessly. The lightweight computer unit (LCU) of the liaison team can talk to the LCU of the MLRS battalion, and the fire mission can be processed directly and quickly to the launcher.

As OH-58Ds go 20 to 30 kilometers beyond the forward line of own troops (FLOT), MLRS must be pushed well forward on the battlefield—many times beyond the FLOT. The advantage is that the faster fire missions are received, the faster they can be executed and the less time the launcher is exposed. But there is a caveat; a security force must protect the launchers while they complete the mission forward.

How it Worked

During Rotation 98-02, the 101st Aviation Brigade requested MLRS in direct support during the setting-the-conditions phase of one battle. The MLRS liaison team moved to the aviation brigade headquarters with associated equipment: single-channel ground and airborne radio system (SINCGARS) and an LCU with initial fire support automated system (IFSAS) software. The equipment was linked directly to the aviation brigade fire support element (FSE). The aerial scouts called in fire missions though the aviation brigade to the MLRS battalion.

We tried the link two ways. In the first attempt, we took fire missions from the OH-58Ds and passed them directly to the MLRS battalion. The OH-58D has SINCGARS-the LCU of the MLRS battalion can communicate with the OH-58D. Although this link worked, we had problems. When a fire mission goes directly from the aerial scout to the MLRS battalion, certain fields in the LCU software must be changed before the fire mission can be sent to the launcher–for example, the call-for-fire has to be changed to translate rounds to volleys. This wastes time. Also, a lack of understanding of the desired effects versus the MLRS capabilities required a few radio transmissions to clarify. This added even more time to fire mission processing.

A better linking method was to send the fire missions from the OH-58D to the aviation brigade via the MLRS liaison team and then on to the battalion. The liaison team transmitted properly formatted fire missions and resolved any technical or tactical issues, allowing the battalion to seamlessly process the mission. We placed the liaison officer (LNO) with the aviation FSE and sent the fire missions through him, eliminating the need for many questions.

The Next Step

Developing the aviation-artillery deep strike option for the light forces will take some open-mindedness on the part of both the artillery and aviation communities. Some in the artillery community will point out that MLRS, according to our doctrine, cannot be DS and will cite the seven inherent responsibilities of artillery–specifically the lack of observers. This is the only one MLRS cannot fulfill. Aerial scouts dynamically tasked accomplish this.

The aviation community, although more receptive to the idea, still fear the OH-58Ds slowly will become aerial observers and not allowed to use their other capabilities–not the intent of the employment tactic.

To further refine this sensor-shooter architecture, commanders of both communities must develop exercises focusing on this link-both hands-on and simulated–and incorporate the architecture's training and experimentation into existing exercises, including at the combat training centers (CTCs).

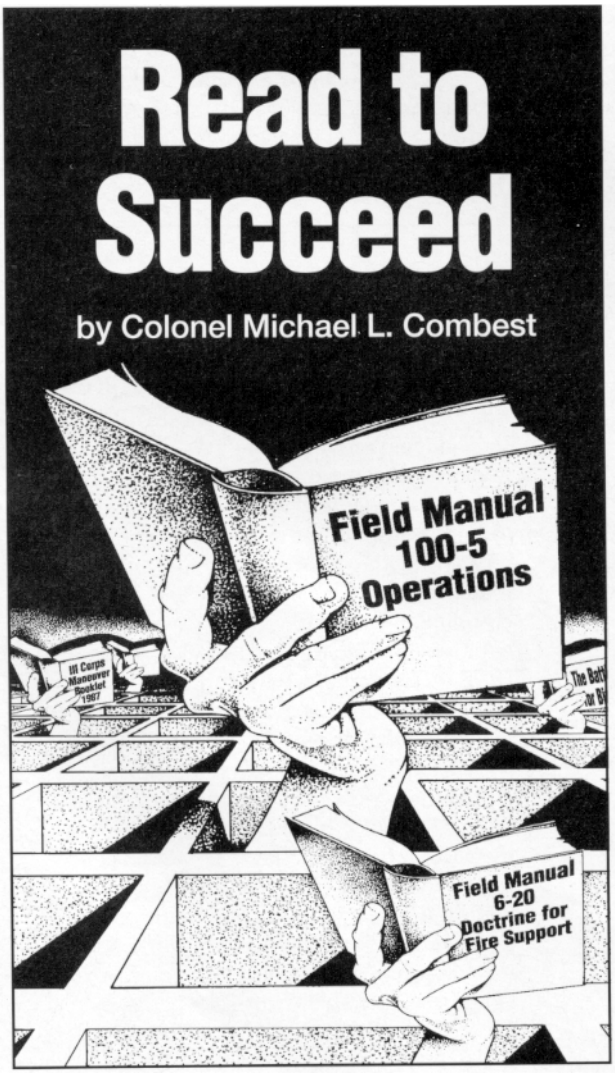
During the 101st Division's rotation at the NTC, the aviation-artillery deep strike architecture was a resounding success. Using this architecture, the maneuver commander can shape battlespace on his terms across the depth of the operation. This preserves combat resources for the current operation, but more importantly, for continued rapid violence in future operations.

The benefits of further developing this deep strike concept promise to be enormous.

Captain Shannon D. Beebe is the Assistant S3 for the 3d Battalion, 27th Field Artillery Regiment (Multiple-Launch Rocket System), XVIII Airborne Corps, at Fort Bragg, North Carolina. The battalion will receive the High-Mobility Artillery Rocket System (HIMARS) prototype in the spring of 1998 for testing and experimentation. Captain Beebe also served on the joint staff with the 1st Battlefield Coordination Detachment (BCD) at Fort Bragg, working on the Army After Next Joint Warfighting Project. He is a graduate of the Joint Air Officer Staff Course at Hurlburt Field, Florida, and the Space Applications Advanced Course at Peterson AFB, Colorado. **The author wishes to acknowledge Major Gerald Pokorski, 101st Aviation Brigade Fire Support Officer, and his staff members Sergeant First Class Timothy Lincoln and Chief Warrant Officer Two Frederick Hardy for their contributions to this article.**

Read to Succeed

by Colonel Michael L. Combest



Here is a remarkably simple, yet oft ignored truism. If you want to be a master of your trade–best qualified for promotions, schooling and command–you've got to apply brain grease and *study* your profession. You've got to read to succeed.

For too many officers and NCOs, professional education starts and stops in the classroom. Too many regard the formal instruction they receive at their basic and advanced courses as sufficient. It isn't. Indeed, formal military education is only one leg of the professional education triangle, the others being unit experience and self-study. No soldier can remain legitimately competitive—best qualified—if he or she ignores any leg of that triangle.

This article is not about establishing a reading program. It's about success. The very little reading recommended will contribute quickly and significantly to improving your level of performance. How? By providing essential knowledge. And knowledge is power. The more knowledge you have, the better decisions you can make. Your judgement will be an informed judgement, not just one based on hunches.

And you don't have to make expensive mistakes to learn important lessons. You can, as Bismarck once noted, learn from the experience of others rather than suffering through your own or have your troops suffer through your own.

Here then are 10 works, with previews, that every artilleryman ought to read and digest. Except for the first two, they are in no particular order.

1. ***Field Manual 100-5 Operations.*** This is the Army's fundamental doctrinal statement. As such, it is the source of all of our operational doctrine, including fire support. You don't need to know this manual cold, but be familiar with it.

An easy way to become familiar with the manual is to scan it twice and then read it in chunks. Don't spend more than an hour scanning it; all you're doing is discerning the thrust of the manual, discovering the principal points and getting a feel for how it's put together. Try to do the two scans about a week apart.

After you've scanned the manual, read the most interesting parts first. There's no need to read it in chapter order.

Because the Army expects to publish a new FM 100-5 sometime in late spring, be sure to read the latest version, or at least the final draft, not the 1993 FM 100-5.

2. ***FM 6-20 Doctrine for Fire Support.*** This is a fire supporter's Bible. Know it cold. Keep FM 6-20 and a highlighter in the bathroom. Know how many principles of fire support planning and coordination there are (13). Be able to list and explain each of them and how they relate to one another. Know how many principles of organizing Field Artillery for combat there are (five). Know the four basic tasks of fire support...etc., etc., etc.

Read this manual repeatedly, small chunks at a time. Discuss it. Take it apart and put it back together again. Use it.

The Army expects to publish a new edition of this manual soon. Study the final draft, dated June 1996, rather than the 1988 edition.

3. III Corps Maneuver Booklet, 1987. (This booklet may be difficult to find. Ask around; a lot of folks have copies.)

This may be the best tactical primer produced in the US Army in the last 40 years. It's as sound today as when written. It is a "must-read" for every armored artilleryman.

This booklet contains nothing but practical principles, sound advice and rules of thumb for conducting modern mounted warfare. A typical example:

• *Fire support units will maneuver between supporting positions at the direction of the Corps and Division Artillery Commanders, avoiding conflict with ground maneuver and providing support for decisive ground and air engagements. In doing this, they will sometimes have to maneuver outside of the zone of their supported unit to deliver effective fire. Artillery maneuver will have to be as carefully planned and coordinated as other maneuver during the attack.* (Page 45)

• *We must plan and train to retain some artillery as part of Corps and division attack forces. The doctrinal prohibition against retaining artillery with initially uncommitted forces stems from the defensive outlook which dominates most training.* (Page 14)

4. The Battle for Bird. S.L.A. Marshall. New York: Warner Books, 1989. 206 pages. $3.95 (This book is out of print and may be difficult to find.)

This small book by S.L.A. Marshall is as good a narrative of a battery defense as there is. It describes the extraordinary story of how a two-battery firebase repelled a determined three-battalion ground attack by North Vietnamese regulars in December 1966. The book is ideal for use as a platform for officer or NCO professional development (OPD or NCOPD) on battery defense. The lessons are obvious to even the most casual reader. For example:

Lesson: Artillerymen, don't neglect your individual and crew-served weapons.

• *He swung the M-60 machinegun around to rake the rooftop [of the bunker], figuring that this was the thing to do in any case. The trigger did not respond; the weapon had jammed. That*

left it mainly to Sergeant Skipper....He tried to fire, but the M-16 jammed, too. The replacement soldiers tried to do what they could with such weapons as they carried....Trying hard, without exception they had malfunctions all along the line....Jennings looked the guns over. He could not free his own M-60, and he hastily tried all four of the M-16s that had blocked, but he could not get them to fire. (Page 79)

Lesson: Don't count on personnel shortages disappearing when you go to war.

• *The light battery [B/2-19th] had an authorized strength of 83 enlisted men and three officers. Present for duty was a total of 46, including three officers. The heavy battery [C/6-16th] approximately matched that strength, counting three hands less.* (Page 24)

5. ***War as I Knew It.*** George S. Patton, Jr., Boston: Houghton Mifflin Company; The Riverside Press Cambridge, 1947. 425 pages, $16.95.

A true classic, this book contains the personal views and lessons learned of one of our most successful combat leaders. The advice he offers in this work is largely as practical and relevant today as it was when first published 50 years ago. Like *The Battle for Bird*, this book is an excellent platform for OPDs and NCOPDs. Typical entries include:

• *In carrying out a mission, the promulgation of the order represents not over ten percent of your responsibility. The remaining ninety percent consists in assuring by means of personal supervision on the ground, by yourself and your staff, proper and vigorous execution.* (Page 398)

• *Haste and Speed: There is a great difference between these two words. Haste exists when troops are committed without proper reconnaissance, without the arrangement for proper supporting fire, and before every available man has been brought up. The result of such an attack will be to get the troops into action early, but to complete the action very slowly.*

Speed is acquired by making the necessary reconnaissance, providing the proper artillery and other tactical support, including air support, bringing up every man, and then launching the attack with a predetermined plan so that the time under fire will be reduced to the minimum. At the battalion level, four hours spent in preparation for an attack will probably insure the time under fire not exceeding thirty minutes. One hour spent in the preparation of an attack will almost certainly insure time under fire lasting many hours with bloody casualties. (Page 349)

A tip. Read the three annexes at the end of the book first. They are a good condensation of the book at large, and they provide a backdrop for the rest of the book.

6. The Rommel Papers. Edited by B.H. Liddel Hart, New York: Harcourt, Brace and Company, 1953. 545 pages. $16.95.

This, too, is a compendium of one of history's premier warriors. Written by one of Patton's principal nemeses, this work provides a great counterbalance to Patton's *War As I Knew It.* A couple of examples of the lessons include:

• *I have found again and again that in encounter actions, the day goes to the side that is the first to plaster its opponent with fire. The man who lies low and awaits developments usually comes off second best....Observation of this rule, in my experience, substantially reduces one's own casualties. It is fundamentally wrong to simply halt and look for cover without opening fire, or to wait for more forces to come up and take part in the action.* (Page 7)

• *Accurate execution of the plans of the commander and his staff is of the highest importance. It is a mistake to assume that every unit officer will make all that there is to be made out of his situation; most of them soon succumb to a certain inertia. Then it is simply reported that for some reason or another this or that cannot be done-reasons are always easy enough to think up. People of this kind must be made to feel the authority of the commander and be shaken out their apathy. The commander must be the prime mover of the battle and the troops must always have to reckon with his appearance in personal control.* (Page 226)

General George S. Patton, Jr.

When reading both Rommel and Patton, be on the lookout for artillery comments and observations–they are many. Comparing and contrasting the attitude of these two warriors toward fire support makes an excellent vehicle for you to improve your understanding of how to apply fires.

7. ***Battle Leadership.*** Captain Adolf Von Schell, Fort Benning-Columbus, Georgia, 1933. 95 pages. $3.00.

This virtually unknown work is a masterpiece. Written in 1930 by a German infantry lieutenant of World War I, it is a volume of practical, well-reasoned observations concerning combat leadership and training for war. Two examples:

• *As leaders be careful both in sending and in receiving reports [in training]. At the commencement of a war, ninety percent of all reports are false or exaggerated. Learn in peace as you prepare your map problems, field exercises, and war games, to give false or exaggerated reports; otherwise, your subordinates will become accustomed to accepting all information they receive at its face value.* (Page 17)

• *...one of the most difficult things we have to do in war is to recognize the moment for making a decision. The information comes in by degrees. We never know but that the next minute will bring us further information that is fresh and vital. Shall we make a decision now or shall we wait a little longer? It is usually more difficult to determine the moment for making a decision than it is to formulate the decision itself.* (Page 49)

8. ***On War.*** Carl Von Clausewitz, Princeton, New Jersey: Princeton University Press, 1976. 717 pages. $19.95.

This is a classic, but it isn't easy reading by any stretch of the imagination. In fact, one can't just read Clausewitz and glean the important lessons he offers. His book is a "meal" that must be eaten in small bites and digested by discussion and examination with the process repeated routinely.

But the payoff is well worth the effort. More than any other theorist (with the possible exception of J.F.C. Fuller), Clausewitz has shaped the US Army's approach to warfare. This book contains both the theoretical underpinnings of Army doctrine and practical advice to the practitioner of the military art.

Field Marshal Erwin Rommel, "The Desert Fox"

Of particular interest—and the easiest to read—are Chapters Three through Seven of Book One, the discussions of "Military Genius," "On Danger in War," "On Physical Effort in War," "Intelligence in War" and "Friction in War." Here are some examples:

• *Everything in war is very simple, but the simplest thing is difficult. The difficulties accumulate and end by producing a kind of friction that is inconceivable unless one has experienced war....The conduct of war resembles the workings of an intricate machine with tremendous friction, so that combinations which are easily planned on paper can be executed only with great effort. Consequently the commander's free will and intelligence find themselves hampered at every turn, and remarkable strength of mind and spirit are needed to overcome this resistance. Even then many good ideas are destroyed by friction, and we must carry out more simply and modestly what in more complicated form would have given greater results.* (Page 119)

• *As a rule most men would rather believe bad news than good, and rather tend to exaggerate the bad news. The dangers that are reported may soon, like waves, subside; but like waves they keep recurring, without reason. The commander must trust his judgment and stand like a rock on which the waves break in vain. It is not an easy thing to do. If he does not have a buoyant disposition, if experience of war has not trained him and matured his judgment, he had better make it a rule to suppress his personal convictions, and give his hopes and not his fears the benefit of the doubt. Only thus can he preserve a proper balance.* (Page 117)

9. ***My Early Life, 1874-1904.*** Winston Churchill, New York: Simon & Schuster, Inc., 1996. 368 pages. $14.00.

This is more a heady tale about the early career of a distinguished cavalry officer and world leader than a gold mine of lessons learned, but it is a very valuable read. The reading is easy, the tales are exciting and the lessons that do emerge are wonderfully insightful. Witness the following:

• *In one respect a cavalry charge is very like ordinary life. So long as you are all right, firmly in your saddle, your horse in hand, and well armed, lots of enemies will give you a wide berth. But as soon as you have lost a stirrup, have a rein cut, have dropped your weapon, are wounded, or your horse is wounded, then is the moment when from all quarters enemies rush upon you.* (Pages 191-192)

• *Let us learn our lessons. Never, never, never believe any war will be smooth and easy, or that anyone who embarks on the strange voyage can measure the tides and hurricanes he will encounter. The statesman who yields to war fever must realize that once the signal is given, he is no longer the master of policy but the slave of unforeseeable, and uncontrollable events. Antiquated War Offices, weak, incompetent or arrogant commanders, untrustworthy allies, hostile neutrals, malignant fortune, ugly surprises, awful miscalculations—all take their seats at the Council Board on the morrow of a declaration of war. Always remember, however sure you are that you can easily win, that there would not be a war if the other man did not think he also had a chance.* (Page 232)

10. ***We Were Soldiers Once...And Young.*** Lieutenant General Harold G. Moore, US Army (Retired) and Joseph L. Galloway, New York: Random House, 1992. 412 pages. $15.00.

No, there aren't a whole lot of lessons that leap off the page of this great "sweaty-palm," action-packed account of the 1st Cavalry Division in the Ia Drang Valley in 1965. And if you accuse me of putting this on the must-read list because it's the "flavor of the month," you're right. But that's the point. You ought to read it because it *is* the flavor of the month.

For about a year, one couldn't go anywhere in the Army without someone bringing up this book. All discussions seemed to eventually turn to it. So, if you want to be a part of the professional discussions that your contemporaries are engaged in, read what's hot. Don't be the guy left standing outside the circle with a Gee-I-wish-I-knew-what-they-were-talking-about look on your face. Besides, if the majority of the Army leadership is reading a work, its probably got a lot going for it.

Ok, that's the list. Now a few points about how to attack these works and get the most out of them. First, don't hurry. There's a year's worth of reading here, even if you hustle. But don't. Take your time and be deliberate. Your goal is to glean useful information out of these works, not just read them. That requires patience, thought and discussion.

Point Two: If at all possible, read these as part of a small group. Don't assign the entire book for a reading, and then get together and discuss it once. You'll end up discussing the book, not the lessons. Take two or three chapters at a time, review them over a lunch hour or something equivalent.

Point Three: Get started. You have time to study your trade. Plenty of it. You probably don't have the time or energy to digest 100 to 200 pages at a single sitting, so try reading in 10- to 15-minute increments. You'll discover you can easily find two or more hours a week to gain important professional knowledge a bite at a time.

And the knowledge you gain is good for you (will help you get ahead), is good for your soldiers, and is good for the Army.

Colonel Michael L. Combest commands the 75th Field Artillery Brigade, III Corps Artillery at Fort Sill, Oklahoma. In his previous job, he was the Chief of the *FM 100-5 Operations* (1998 Edition) Writing Team at the Combined Arms Center, Fort Leavenworth, Kansas. He also commanded the 6th Battalion, 8th Field Artillery, 7th Infantry Division (Light) at Fort Ord, California; and C Battery, 1st Battalion, 3d Field Artillery, 2d Armored Division at Fort Hood, Texas. In other assignments, he was the G3 Plans and Deputy G3 of the 6th Infantry Division (Light) at Fort Richardson, Alaska; S3 and Fire Support Officer of the Egyptian/Saudi Liaison Team in Operations Desert Shield and Storm; and Chief of the Field Artillery Branch at the Total Army Personnel Command, Alexandria, Virginia. He is a graduate of the School of Advanced Military Studies (SAMS) and a War College Fellow in Advanced Operational Art Studies, both at the Command and General Staff College, Fort Leavenworth.

Altitude Separation:

TTP for Artillery Fires and CAS

by Major Donald L. Barnett

Although Army and Air Force manuals provide guidance for integrating air and ground fires using altitude separation, they lack comprehensive tactic, techniques and procedures (TTP). To mass the fires of artillery and close air support (CAS), fire supporters and airmen need to understand artillery trajectories and fixed-wing aircraft attack profiles and know how to separate them laterally and by altitude. One alternative is to "turn off" the artillery during CAS–which is what the enemy would want.

This article addresses artillery computational and aircraft final attack control procedures to deconflict the simultaneous attack of targets by CAS and artillery. The key to safe altitude separation missions is the fire support officer (FSO's) and air liaison officer (ALO's) understanding the principles of altitude separation.

The procedures outlined in this article are for only one of four informal airspace coordination area (ACA) methods and are not are viable for *all* CAS attacks. Army *FM 6-20-40 Fire Support For Brigade Operations (Heavy),* Air Force *MCM 3-1 Volume 8 Forward Air Controller* and *Joint Pub 3-09.3 Joint Tactics, Techniques and Procedures for Close Air Support (CAS)* all contain good discussions of airspace deconfliction methods. However, none of these manuals outline a clear set of procedures for executing altitude and lateral separation.

FM 6-20-40. Page A-21, includes some guidance on using vertical and horizontal safe separation distances; otherwise, the technical procedures for determining safe separation distances are not in our artillery manuals.

In addition, the guidance given in FM 6-20-40 requires the use of the single restricted final attack heading (FAH)-the most dangerous restriction for a fighter. The TTP in this article provides more flexibility.

Although these procedures are for altitude and lateral separation, they also apply to all types of air attacks using altitude separation. The procedures mirror those used at the Marine Corps Air-Ground Combat Center (MCAGCC) at Twentynine Palms, California.

Altitude and Lateral Separation

At first glance, these procedures may seem complicated, but with practice they can be executed quite easily. The basic idea is to: (a) Develop attack zones for the aircraft to ingress and egress through; (b) Compare the attack zones to the artillery trajectory; (c) Determine altitude restrictions above or below the trajectory within the attack zones and (d) Translate those into safe "stay above" or "stay below" altitudes for the air crew.

Components of a Trajectory. Review the sample artillery trajectory in Figure 1. The figure uses common ballistic terms to show the elements of a trajectory. Understanding the trajectory is critical to understanding the relationship between indirect fires and aircraft flight profiles.

You also must understand the situations that require deconfliction. Three types of simultaneous attacks may require altitude and (or) lateral separation to mass fires: artillery and CAS attack the same target, artillery attacks a target beyond the CAS target and CAS attacks a target beyond the artillery target.

When thinking of the three attack situations, consider the flight profile of the

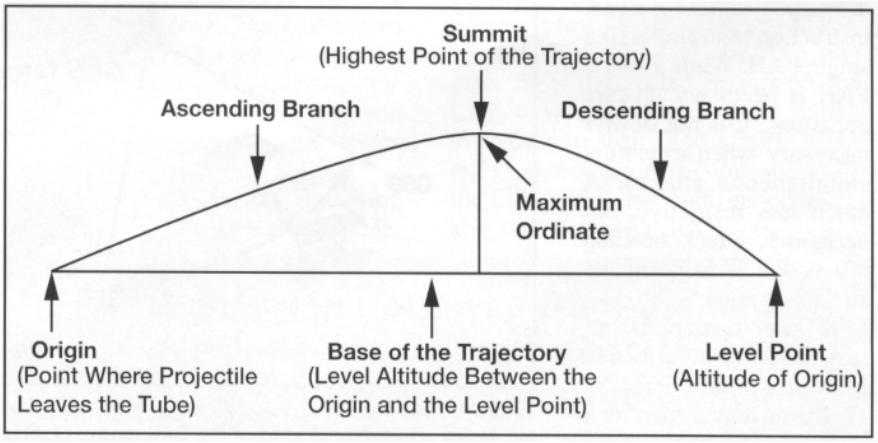


Figure 1: Elements of the Trajectory. The maximum ordinate is the highest point along the trajectory-the difference in altitude (vertical interval) between the summit and the origin.

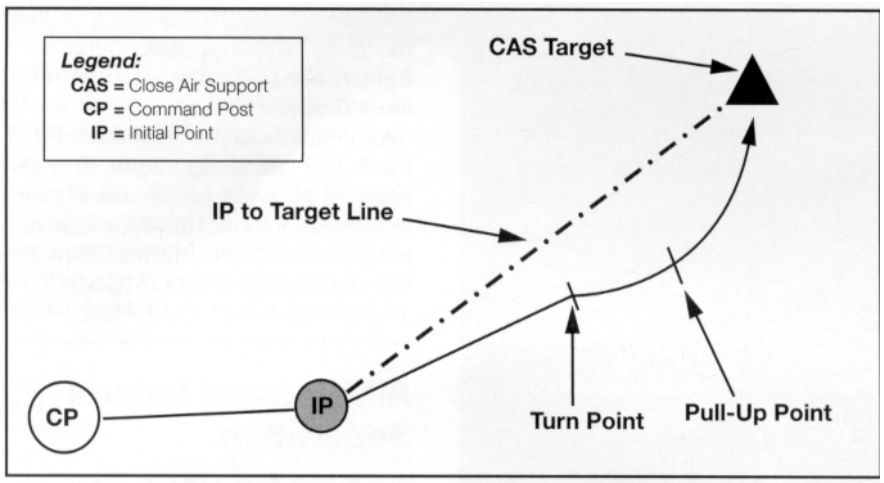


Figure 2: Elements of a Low/Very Low Attack Profile. Note: The CAS target symbol is a triangle (Joint Pub 3-09.3); do not confuse this with an observer symbol.

aircraft in relation to the artillery trajectory (or multiple trajectories). Do not focus solely on the relationship of the CAS target to the GTL. For example, even though the CAS target may be beyond the artillery target, the aircraft ingress or egress routes may cross a GTL.

CAS Attack Phase. Consider the CAS attack profile example of a low to very low altitude attack shown in Figure 2. A low altitude attack is one of the most difficult flight profiles for a pilot. In a low approach, the pilot has little time (literally seconds) to acquire the target, adjust his flight profile, release ordnance and return to a low-egress tactic. A similar profile is flown during medium- and high-altitude CAS attacks, except the pull-up point (PUP) is replaced by a maneuver to initiate a dive. (For a more in-depth discussion of fixed-wing CAS tactics, see Joint Pub 3-09.3, Chapter V.)

The most restrictive (and dangerous) ingress or attack instruction to an aircraft is a single FAH. While a single FAH is necessary on rare occasions, it is not *always* necessary when executing simultaneous attacks. A much less restrictive, *but necessary,* attack heading instruction is to designate an "attack zone."

For laser operations, attack zones are described in Joint Pub 3-09.3, Page V-17. But an attack zone for a simultaneous attack need not be as restrictive as a laser attack zone. Attack zones are used in simultaneous CAS-artillery attacks to: increase troop safety, provide the fighter pilot options for attack headings, help deconflict the attack from the adjacent unit's GTLs, help compute over or under attack altitudes and help the final controller acquire the aircraft.

An attack zone consists of all the headings enclosed between two attack headings, and these two headings intersect at the target. In other words, the attack zone looks like a cone with its apex at the CAS target (see Figure 3).

Figure 3 is an example of an attack zone that uses the attack headings 350 and 050 to define its limits on both sides. Note: When identifying the attack zones for the ALO or pilot, always name headings clock wise: the first heading relative clockwise to the second. The pilot will know his "cone" in Figure 3 is from 350 clockwise to 050, as indicated by the arrow.

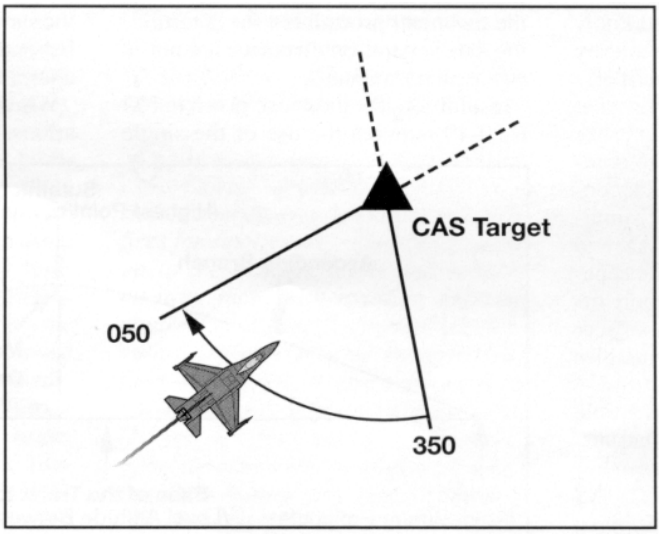


Figure 3: An Attack Zone Example. The attack zone forms a clockwise cone with its apex at the CAS target. Fighters ingress and egress within these two final attack headings (FAHs). The Marines refer to this as an "FAH Cone."

Now combine Figures 1, 2 and 3 into Figure 4, which shows an artillery GTL, a CAS attack profile and an attack zone. Figure 4 shows artillery engaging a SEAD target beyond the CAS target with the CAS aircraft employing a low to very low ingress tactic. Notice the CAS target is not on the artillery GTL, but the aircraft must cross the GTL.

Also notice in Figure 4 that the fighter will ingress the attack zone "offset right" of the initial point (IP), the target attack line. Offsets left and (or) right allow the pilot space to maneuver his aircraft during the attack while staying clear of GTLs or enemy air defenses.

Calculating SA and SB Altitudes. The FSO and ALO can deconflict the airspace in Figure 4 by executing the following TTP steps. These steps determine the stay above (SA) and stay below (SB) altitude restrictions.

Step 1. Plot the target(s). If the artillery and CAS aircraft will attack the same target, then only plot the single target. Otherwise, plot both the artillery and CAS targets.

Step 2. Draw the artillery GTL. Plotting the GTL is essential to the construction of the attack zone in relation to the artillery trajectory. For planning purposes, determine the likely range, charge and vertical interval (VI) for the artillery mission. The VI is the difference in altitude between a firing unit and its target. (Later, during execution, the FSO must calculate the trajectory with the accurate charge, range and VI data from the fire direction center, or FDC.)

Step 3. Draw the attack zone. Ensure the left and right attack headings are extended (drawn) to intersect the GTL. In Figure 4, the attack zone was extended to the GTL based on the 350 and 050 attack headings and the intersecting points are labeled "PT 1" and "PT 2." Note: Make the attack zone the least restrictive possible, and use five-degree increments for the headings.

Step 4. Determine the ranges from the battery to the points where the attack headings cross the GTL. In

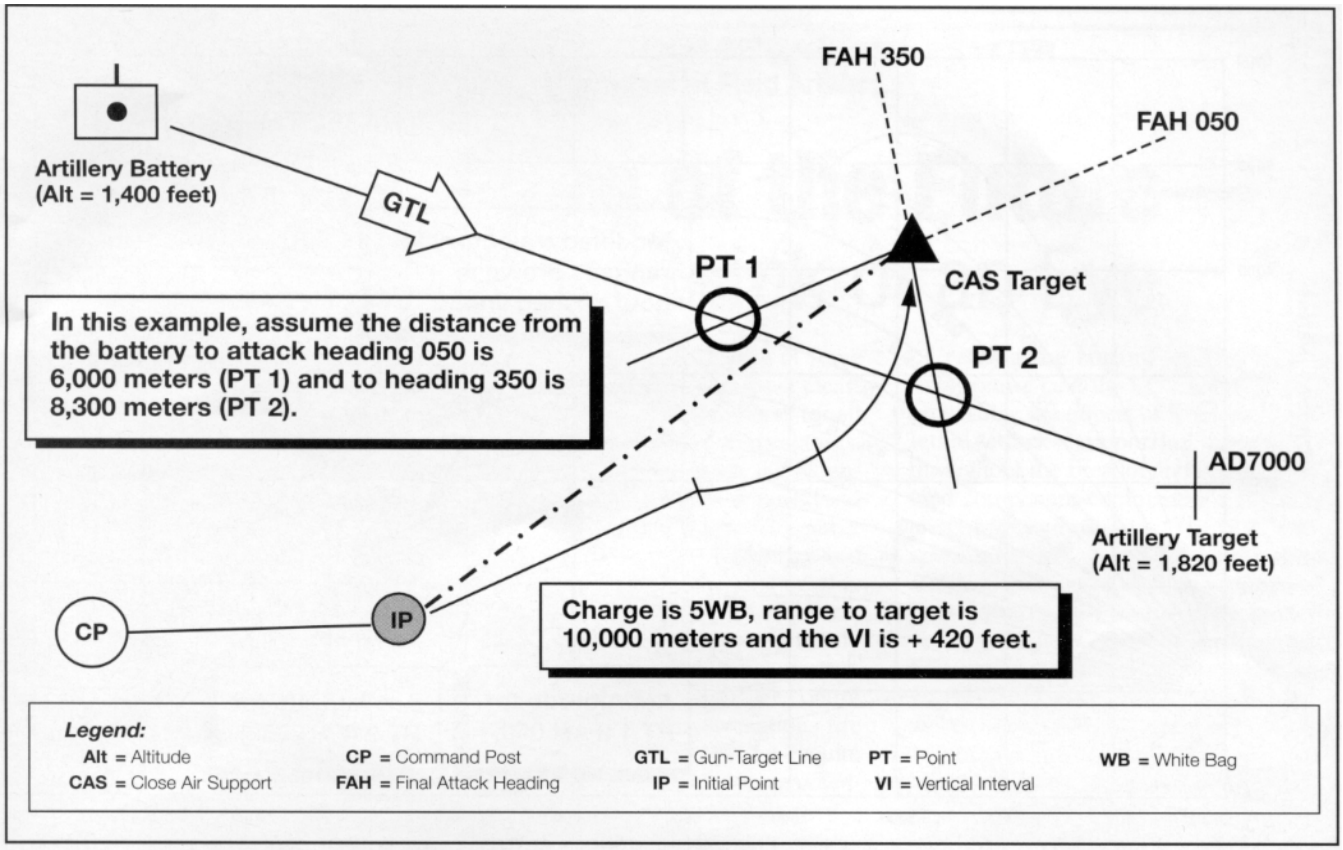


Figure 4: Example of an Integrated Attack Profile, Attack Zone and Artillery GTL. The artillery is firing suppression of enemy air defenses (SEAD), and the CAS aircraft is employing a low to very low ingress tactic.

Figure 4, measure the distances from the battery to PT 1 (in this example, 6,000 meters) and PT 2 (8,300 meters). Those ranges are used in conjunction with the appropriate tabular firing table (TFT) trajectory chart to determine the SA and SB altitudes.

Step 5. Determine the trajectory arc to achieve the artillery target range from TFT trajectory chart for the weapon system/projectile family and the charge the firing unit will use. (In the example, a 155-mm howitzer is firing high explosive projectiles with a charge of 5 White Bag–see Figure 5 on Page 44.) In the TFT, find the arc that will achieve the range to target. Use the preexisting lines on the chart or "pencil in" a trajectory arc to achieve the range to target. In Figure 5, the "dashed" trajectory line drawn on the trajectory chart for the example calculations illustrates how to adjust the arc for the range. Note: The FDCs for M109A6-equipped units must verify that all guns will fire the same charge.

5a. Calculate the SA Altitude. Determine the highest point on the trajectory encompassed by the attack zone. If the attack zone only crosses the ascending or the descending arc of the trajectory, then the SA altitude is calculated using the attack heading that crosses the GTL closest to the summit. Figure 4 is an example of an attack zone that only crosses the descending arc of the trajectory; so PT 1 is used to derive the SA altitude because it is closest to the summit.

Determine the arc altitude on the trajectory chart in Figure 5 at PT 1 (2,100 meters). Then convert the arc altitude from meters to feet by multiplying the trajectory altitude by 3.3. In this example, the SA altitude is 6,930 feet. Note: If the attack zone encompasses the summit of the trajectory, then use the maximum ordinate as the SA altitude.

5b. Calculate the SB Altitude. Determine the lowest point along the trajectory arc at which an attack heading crosses it. In Figure 4, PT 2 represents the lowest point. Determine the arc altitude on the trajectory chart at PT 2 in Figure 5 (1,300 meters). Then convert the arc altitude from meters to feet by multiplying the trajectory altitude by 3.3. In the example, the SB altitude would be 4,290 feet. Note: If the attack headings intersect both the ascending and descending arcs of the trajectory, then you must use the lower of the two points for the SB altitude calculation.

Step 6. Add a safety buffer to the SA/SB altitudes. The TFT trajectory chart reflects standard conditions. Therefore, you must compensate for nonstandard conditions occurring (weather, ammunition and muzzle velocities) by adding a 1,000-foot buffer to the arc altitudes derived in Steps 5a and 5b. Add 1,000 feet to the SA altitude and subtract 1,000 feet from the SB altitude computation. Add or subtract this 1,000-foot buffer immediately after you convert the trajectory altitude from meters to feet. In the example, the SA altitude is 7,930 feet and the SB altitude is 3,290 feet. Note: Check with the Army or Air Force headquarters in your command for specific safety criteria used for deconfliction.

Step 7. Adjust the altitude by applying the VI to both the SA and SB arc altitudes derived in Steps 5 and 6. A target that is "above gun" (i.e., the battery altitude is lower than the target altitude) will produce a positive VI value; a target "below gun" produces a negative VI. Always add a positive VI to the SA/SB altitudes and subtract a negative VI value from the SA/SB altitudes.

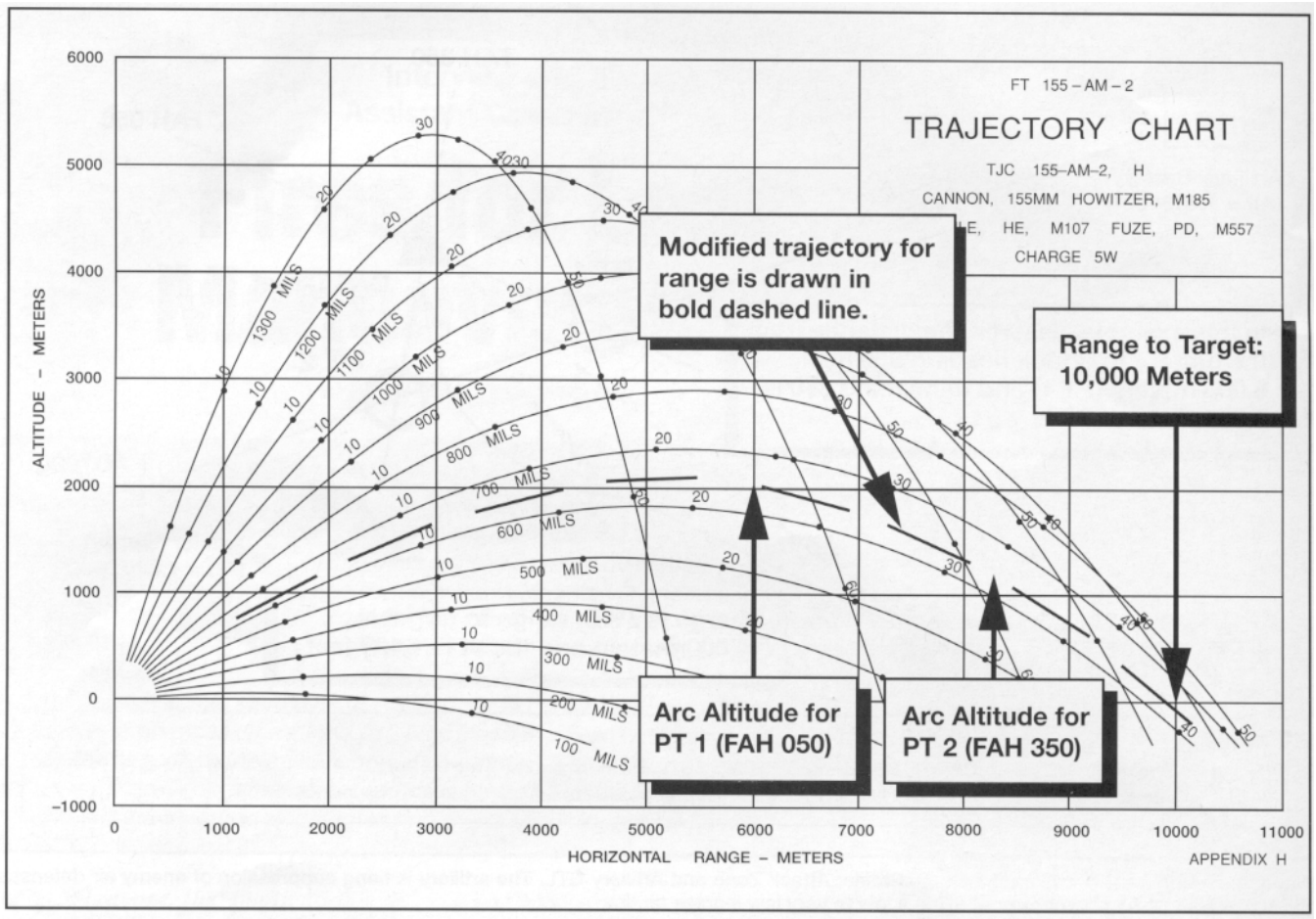


Figure 5: Trajectory Chart for the Example

In the example, the battery's altitude is 1,400 feet (Figure 4) and the target's altitude is "above gun" at 1,820 feet, making the VI +420 feet. Therefore, you add +420 to both the SA and SB altitudes: SA is 8,350 feet and SB is 3,710 feet.

After applying the safety buffer and the VI, express the SA altitude up and express the SB altitude down to the nearest 100 feet. In the example, the SA altitude is 8,400 feet and the SB altitude is 3,700 feet.

Step 8. Convert the altitude to feet "mean sea level" (MSL). The altitude sums derived in Step 7 yield SA/SB altitude values expressed as feet "above ground level" (AGL). The ALO must ensure the SA/SB altitudes given to his pilot are in feet MSL. The FSO or ALO determines the MSL by adding the artillery target altitude in feet to the SA/SB altitudes. Then the feet MSL can be expressed (rounded off) to simplify them for the air crews. In the example, the SA altitude is 10,300 feet MSL and the SB altitude is 5,500 feet MSL.

Figure 6 outlines the example calculations for the procedures in this article.

	SA Alt	SB Alt
• Charge	5 WB	
• Range to Target	10,000m	
• Ranges to PT 1 and PT 2	6,000 m	8,300 m
• TFT Chart Altitude	2,100 m	1,300 m
• Conversion Meters to Feet	x 3.3	x 3.3
• Arc Altitude Feet AGL	6,930 ft	4,290 ft
• Safety Buffer	+1,000 ft	-1,000 ft
• Vertical Interval	+420 ft	+420 ft
• Subtotals	8,350 ft	3,710 ft
• Altitude Restrictions (Feet AGL)	**SA = 8,400 ft**	**SB = 3,700 ft**
• Target Altitude (Feet MSL)	1,820 ft	1,820 ft
• Altitude Restrictions (Feet MSL)	**SA = 10,300 ft**	**SB = 5,500 ft** (Expressed)

Legend:
AGL = Above Ground Level
Alt = Altitude
ft = Feet
m = Meters
MSL = Mean Sea Level
PT = Point
SA = Stay Above
SB = Stay Below
TFT = Tabular Firing Table
WB = White Bag

Figure 6: Example of Determining the Ordinate. Using Figure 4 and the trajectory chart in Figure 5, assume the data listed in this figure was derived for the attack.

Figure 7 summarizes the steps in calculating the SA and SB altitudes for altitude and lateral separation to deconflict the simultaneous attack of targets by artillery and CAS. Although these procedures don't address every ordnance (i.e., air burst munitions), aircraft type (F-16 versus A-10) and attack profile (low versus high) combination, they provide the foundation for viable, safe deconfliction of Army and Air Force attacks.

1. Plot the target(s).
2. Draw the artillery GTL.
3. Draw the attack zone (FAH cone), ensuring the attack headings are extended far enough to intersect the GTL.
4. Determine the ranges to the attack headings from the battery location.
5. Refer to the appropriate TFT trajectory chart and determine the are that will achieve the artillery target range. Follow the arc to the ranges from Step 4 and determine the arc altitudes at those points. Calculate the SA/SB altitudes. Arc altitudes are converted from meters to feet by multiplying them by 3.3.
6. As a safety factor, add 1,000 feet to the SA altitude and subtract 1,000 feet from the SB altitude
7. Add a positive VI or subtract a negative VI to each sum (from Step 6). This altitude value is expressed in feet AGL.
8. Convert the SA/SB altitudes from feet AGL to feet MSL by adding the artillery target altitude to them.

Legend:

AGL = Above Ground Level
FAH = Final Attack Heading
GTL = Gun-Target Line
MSL = Mean Sea Level
SA = Stay Above
SB = Stay Below
TFT = Tabular Firing Table
VI = Vertical Interval

Figure 7: Altitude and Lateral Separation Steps

Altitude and lateral separation has long been one of the informal ACA methods for the fire support system to use to deconflict aircraft and fires, but we have not adopted standard TTP for implementation. The Army, Air Force and Marine Corps could make significant improvements in CAS execution and integration by adopting common TTP, moving the services toward better joint interoperability. Perhaps this article will be a start.

Major Donald L. Barnett is a Doctrine Author on the Division Team in the Combined Arms Doctrine Directorate, Command and General Staff College, Fort Leavenworth, Kansas. In his previous assignment, he served as the Brigade S3 and Brigade Fire Support Officer (FSO) Observer/Controller (O/C) for the National Training Center's (NTC's) Live-Fire Operations at Fort Irwin, California. His other O/C experience includes Combat Service Support Trainer for the Fire Support Division at the NTC. In addition, he was the Battalion FSO for both the 1st Battalion, 69th Armor, and 4th Battalion, 66th Armor in the 3d Infantry Division (Mechanized), Germany. Major Barnett commanded Service Battery, 5th Battalion, 18th Field Artillery, part of the 75th Field Artillery Brigade at Fort Sill, Oklahoma.

First AC Commander of ARNG Battalion

Lieutenant Colonel John R. Hennigan became the first Active Component (AC) commander of an Army National Guard (ARNG) battalion in October 1996. His unit, the 1st Battalion, 141st Field Artillery at Jackson Barracks in New Orleans, Louisiana, is direct support (DS) to the 256th Separate Infantry Brigade (Mechanized) and has M109A5 155-mm self-propelled howitzers.

In his first annual training (AT) in June 1997 at Camp Shelby, Mississippi, Lieutenant Colonel Hennigan's biggest challenge was to provide good, realistic training. He learned a lot during AT:

"There's a certain mental agility National Guardsmen have that they don't get credit for. In the Active Component, we always go to the same training site with the same people. But in the National Guard, one year training will be at Camp Shelby and the next could be Fort Polk [Louisiana] or Fort Hood [Texas]. So there are always new issues to resolve, such as land management. For instance, five artillery units trained at Camp Shelby at the same time-that requires a lot of coordination and cooperation. Also, in National Guard AT, units come from all over the country and train together. For the Guard, these types of challenges are 'business as usual.'"