CHAPTER 8

DIRECT AND INDIRECT FIRES IN THE 21ST CENTURY

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> The dogmas of the quiet past are inadequate to the stormy present… As our case is new, so we must think anew, and act anew.
>
> Abraham Lincoln
> Message to Congress
> December 1, 1862.[1]

The recent termination of the Crusader program, coupled with Secretary of Defense Donald Rumsfeld's May 2002 testimony before Congress on his belief that the future lies with air-delivered precision munitions, has called into question the future of the Field Artillery as a branch and the delivery of ground-based fires as a function. The Crusader itself has come to represent the branch—heavy, slow, lethargic, and, although maybe technologically sophisticated, somehow out of touch with how the U.S. military currently fights and how it will fight in the future.

The purpose for this chapter is to demonstrate that the thinking described in the previous paragraph is wrong. A technologically sophisticated Crusader or a Crusader-like system, coupled with advanced munitions and target detection and location capabilities, is not only relevant, but represents a transformation in how the Army could fight and win America's future wars. A Crusader–like cannon, supported by 21st century targeting, digitized sensor to shooter links, global positioning system, and laser-enabled brilliant munitions could provide the United States a capability to fight in a fashion that military organizations heretofore have only dreamed of.

The real time digital fusion of sensor, shooter, and munitions provides the artillery of tomorrow direct fire effects with what used to be indirect fire weapons. The opportunity to engage an enemy from stand-off distances, without having to mass systems in order

to mass effects, and deliver killing blows through the use of either global-positioning or laser-designated brilliant munitions will allow, or possibly demand, the Army to transform the way it fights, organizes, and maneuvers.

The U.S. Army has reached the point where it should consider artillery another ground maneuver system equal, if not superior, to the armor and infantry as maneuver arms. It should give the artillery missions, battle space, and responsibilities commensurate with that newfound status. It must also consider the fundamental reorganization of its maneuver and fires branches and combine them into a new branch identified simply as "combat arms."

In this chapter, the author will describe the potential offered by marrying a weapon with Crusader-like capabilities to brilliant precision munitions and sophisticated targeting techniques. This coupling would provide direct fire-like effects over what have been traditionally indirect fire distances without the risks of direct fire engagements and without the necessity for massing systems that direct fire engagements require. By leveraging this combination of capabilities, the U.S. Army would fight a line-of-sight fight, sometimes virtually, out to distances that at one time were referred to as the "deep battle." Finally, this chapter will address some of the doctrinal and organizational changes required by such a new way of thinking and fighting.

THE WEAPON

Crusader has been a transformational Army system from the beginning of its initial concept development. The capabilities that it will bring to the battlefield transcend legacy, interim, and even Objective Force concepts of operations. It presents an opportunity to fight in new ways. Senator Carl Levin, quoting former Army Chief of Staff Gordon Sullivan, described Crusader's capability succinctly during Secretary Rumsfeld's testimony before Congress in May 2002:

> The Crusader was designed from the ground up to fight in the digital-network-centered battlefield, to exploit information dominance. Its advanced robotic operations and automated

> ammunition-handling systems allow the crew, enclosed in a protected cockpit, to exploit information instead of straining muscles. The advanced composite hull, liquid-cooled gun and mobility of the system elevate the effectiveness of our forces by 50 percent, with a corresponding reduction in resources. Crusader covers an area 77 percent greater than current systems and has a 3-1 advantage in rate of fire.[2]

Unfortunately, the Army initially designed Crusader to fight a Cold War threat on the Western European battlefield. It did not create Crusader with "projecting military force" in mind. Thus, its designers did not face the Objective Force constraint of fitting inside (and within the weight limitations of) a U.S. Air Force C-130 Hercules. Both the artillery branch and the Army as a whole were slow to react to the new operational environment and attempted to draw attention to what this weapon could do instead of acknowledging what it could not. A last minute weight reduction from 70 tons to approximately 40 tons was not enough to save the "white elephant" that then candidate George Bush had targeted for cancellation at his famous Citadel speech.

A comparison with the Army's 40-year-old M109 howitzer system—currently in the "A6" version or "Paladin"—is useful. This comparison is important, because without the Crusader, it is the Paladin that will serve as the Army's heavy artillery for the next 30 years.

Mobility.

The Paladin has lagged behind the maneuver forces in its ability to transit the battlefield since the arrival of the Abrams tank and the Bradley fighting vehicle. This has affected the employment of the system, as tactical and operational commanders have had to "echelon" or piecemeal their artillery instead of massing it to keep some fires in the fight. The Crusader would have used the same turbine engine that the Abrams tank will use as a result of its system enhancement program. This would have given the Crusader a 67 kilometer-per-hour road speed, with between 39 and 48 kilometers-per-hour cross-country speed of maneuver. This ability to maneuver on equal terms with the Abrams (as well as out-maneuvering any

other tank system in the world) represented a dramatic increase in capability and could have resulted in significantly new employment concepts discussed later in this chapter.[3]

Deployability.

The lack of strategic deployability has been a common and misguided complaint about the Crusader system. At its current weight of 38 to 42 tons, one C-17 can deliver two Crusader systems at strategic distances. This ability would give the gaining combatant commander much greater firepower than he could get with equivalent lift assets devoted to Paladin artillery systems.

Lethality and Responsiveness.

Advanced targeting and fire control systems in the Crusader would have made it roughly three times more accurate than the Paladin howitzer. Such accuracy would have occurred with the current suite of "dumb" munitions. Couple this accuracy with the precision available in newer munitions, and the accuracy of the Crusader would approach that of direct fire systems. Another factor that would have served to increase Crusader lethality was its liquid-cooled gun tube. That may sound like cannon-cocker gibberish, but the reality is that a Crusader could maintain a sustained rate of fire of up to ten rounds per minute, while a Paladin can only shoot three rounds in the same time. This would enable killing versus suppressive missions. The Crusader's robotic handling system enabled it to shoot its own "time on target" mission, as one weapon could deliver up to eight rounds that land at the same point within four seconds. The ramifications are significant.

The common criticism of the Crusader has been the operational mobility of the system. This criticism rests on the lift limitations of the almost 50-year-old C-130 Hercules, which cannot carry either a Paladin (which the Army will maintain for the next 30 years) or a Crusader. However, two Crusaders can fit into a C-17, the U.S. Air Force's strategic and operational workhorse, and with that one lift, the combatant commander will have the equivalent capability of two batteries of Paladin—which require six C-17s to deliver.[4]

Two additional capabilities give the Crusader a potential as yet untapped. First, because each system has onboard technical fire direction and self-locating capability, there no longer exists a requirement for massing systems or bringing several guns together in a battery. Crusader–like systems would enable Army artillery to mass effects without massing systems. Such a transformational capability would enable artillery to maneuver in the same manner that tanks and Bradleys maneuver, with even greater tactical dispersion.

This potential of operating in dispersed fashion was available with the Paladin, but for a variety of reasons the artillery branch chose not to leverage that capability. Artillery and maneuver commanders were not comfortable with artillery systems roaming the battlefield. Both preferred to keep them in boxes, or, as doctrine came to call them, "position areas for artillery." Although this improved the ability to leverage new capabilities, it did it in a suboptimal way. At times in National Training Center rotations, the scheme of maneuver focused more on how to keep the artillery "out of the way," than in taking advantage of the system's maneuver capability. Imagine a battalion's worth of Crusaders, operating in one- and two-gun sections, dispersed throughout the brigade battle space. The size of an avenue of approach is no longer relevant and the enemy intelligence preparation of the battlefield process just became exponentially more difficult.

At Battle Command Training Program Warfighter exercises, some forward looking maneuver commanders have used artillery better than ever before; nevertheless, they still confined their artillery systems into battery- or at best platoon-sized elements. Some would say that that is more a function of icon management and simulation limitations, but those are exercise controller issues that the Army can fix. Instead, commanders continually missed the opportunities to take advantage of the potential available.

Survivability.

Several features on the Crusader make it more survivable than its predecessor. Its cross-country mobility is one facet, but its ability to dash 750 meters in 90 seconds is an equally significant advantage.

Although this is hardly Abrams-equivalent mobility, it speaks to an ability to get in and out of trouble (the close fight) a little quicker than artillery has in the past. Improved exterior ballistic and non-ballistic protection coupled with a compartmentalized ammunition storage system, enhance passive defense for the crew dramatically. Such units would be less vulnerable to enemy artillery and air due to the dispersion of systems.

The Crusader's ability to link immediately into the theater common operating picture on arrival improves its defensive capability as well. This represents a level of situational awareness that is unprecedented in artillery. The improved situational understanding would have allowed the Crusader to operate in environments that were previously considered unsafe for artillery.

Active defensive measures include the ability to fire the mounted machine gun or grenade launcher from inside the vehicle. The added features of a self-contained nuclear, biological, and chemical defense capability, coupled with the fact that the crew never has to leave the cab to conduct resupply of any kind, would significantly improve the survivability of the three-man team (one-third the size of the Paladin crew) in battle.

Sensor to Shooter Linkages.

Today, the standard electronic chain which connects an observer to a weapon is through eight different intervention points, each with the capability to delay the call for fire.[5] With its state of the art communications systems, Crusader can link directly with sensors and eliminate the latency of today's indirect fires command and control systems. Dispersed enemy weapons that also attempt to mass effects instead of massing systems will define the future battlefield. DESERT STORM demonstrated the error of massing systems against the U.S. military. The contrary effectiveness of dispersing systems against American combat power appeared not by mistake in Kosovo. Thus, the ability to support simultaneous mutual engagements directed by separate shooters with long-range artillery fires will be more important in the future than the National Training Center's massed fire requirement of "you have to shoot fifty-four rounds to kill one tank."

The *Field Artillery Journal* noted the sensor to shooter capabilities of the Crusader in March 2002. "Crusader will be able to link directly with a Comanche helicopter, an unmanned aerial vehicle, an M1A2 SEP, or other target acquisition source and immediately bring effective fires. One sensor will be able to direct the fires of up to a battery of howitzers."[6]

These combinations of Crusader capabilities would, by themselves, change the way the U.S. Army thinks and describes maneuver warfare in the future. Couple this new delivery system with new, more capable munitions, and one would get transformational capabilities. Tie in those combined capabilities with a new organizational architecture, and the Army will arrive at the point where it must rethink current doctrine, as well as entirely recast how it plans to fight this thing called the "Objective Force."

The term indirect fire describes a delivery system in which the "shooter" cannot see the target. He must rely on an observer to see the target and direct his fires onto that target. The term "indirect" has also come to incorrectly imply a pejorative lack of accuracy. Field artillery projectiles of the past have relied on massed area fires to provide the effects necessary to "destroy, neutralize or suppress" the target. New munitions, however, are making that concept as irrelevant in the artillery today as the Norden site is to the F-16.

MUNITIONS

Artillery munitions that are capable of "one shot, one kill" are presently under development all over the world. Such munitions depend on either global positioning systems, laser designating of the target or, at the top end, brilliant munitions. Brilliant munitions are munitions able to loiter above a target area and, with great discrimination, independently decide which target is the "right" target, based on preprogrammed target signatures.

The U.S. Army has lived with the laser designated Copperhead round for 2 decades. Although this has generally been given a 90 percent chance of first round hit, the Copperhead remains a high maintenance weapon, in which firers have to consider its limited range (16 kilometers) as well as such artillery specific problems as "angle T," which is a confusing way of describing the relationship

between the shooter, the laser designator, and the target. When planned and executed correctly, this munition could have an enormous effect on the battlefield. Unfortunately, the consistently limited returns led maneuver commanders and shooters alike to default to the area attack of hardened targets.

Most advanced countries have a laser targeting capability similar to or greater than the Copperhead. The Russian-made "Krasnopol" possesses a slightly longer-range munition that has already proliferated around the world.[7] The shortcoming of such weapons, of course, is the necessity of the laser designator to expose himself. Nevertheless, the accuracy achieved generally serves to make the risk acceptable. Given well-conceived tactical positioning and the absence in most adversaries' kit bag of laser warning devices, such weapons remain an effective tool.

Other capabilities to destroy hardened point targets exist in numerous countries at present and are being developed with a post-Crusader sense of urgency in the United States. Raytheon, in recent collaboration with the Swedish company, Bofors, is developing the Excalibur family of munitions.[8] Excalibur is a jam resistant global positioning system-enabled munition, compatible with virtually all digitized artillery systems. This program has received considerable momentum over the last 6 months, as it seems to have captured the fascination of the current Secretary of Defense. Compared to the paltry 16-kilometer range of the Copperhead, Excalibur can attack targets at ranges of up to 40 kilometers with the Paladin howitzer and 50 kilometers with a larger gun tube similar to that of the Crusader.

Excalibur is actually the name for a common delivery projectile that has three variants—a dual-purpose improved conventional munition choice, an armor destroying choice, and a unitary explosive choice. The Army is currently only pursuing the unitary choice for budgetary reasons, but concept development for getting the projectile to the target is the main effort. Once developers have demonstrated proof of concept, expansion into the full suite of munitions would follow.[9]

The Rheinmetall Weapons and Munitions Company has taken this capability one step further. It has developed a "Sensor Fused Munition for Artillery-155" (SMART155) which combines the sub-

20 meter accuracy of the Excalibur with a sensored fuse to enable discriminating attack in the target area.[10] This brilliant capability means the munition can selectively engage the proper enemy system in the target area with no additional action by the firer or observer. The ramifications of this capability are significant. Armies can now depend on collateral damage reduction at dramatic levels and engage heretofore unattackable targets. Enemy tactics such as blending into populated areas to deter attacks on their weapons systems will no longer represent a viable course of action. This extremely accurate munition could select between a school bus, for example, and the multiple rocket launcher parked next to it. At present, the British Army has a major Indirect Fire Precision Attack program, in which its developers are leveraging the Raytheon Excalibur capability with a terminally guided warhead. This would couple global positioning accuracy with laser designation.[11]

The ideal munition for the future fight would be munitions similar to Excalibur (call it Excalibur+) that had the three variants—dual purpose improved conventional, armor destroying and unitary munitions—that were sensor fused, brilliant, and laser capable. This would provide all weather, all situation munitions that would have devastating and transformational effects. The two most significant benefits would be a precipitous decrease in the volume of ammunition required for the same effect and the ability to attack targets accurately that were previously unavailable. Couple this munition with a Crusader-like cannon, and the Army would approach what one might term a revolution in military affairs. Complement this with new acquisition capabilities, and the new systems would represent a true transformation in the "American Way of War" that would rival the development of the rifle, the tank, the aircraft carrier, and the helicopter.

The author's experience in participating in numerous Training and Doctrine Command's "Seminar War Games" is the basis for the three choices for munitions variant. In seven separate exercises during the last year and with numerous battlefield vignettes and simulations, various planners and senior ranking operators attempted to defeat a projected enemy with the "Objective Force." What came to the fore, time and again, was the fact that the most dangerous target set on the battlefield for the Future Combat

System-equipped Objective Force was that of small dismounted regular infantry forces and similarly sized special operations forces or paramilitaries.

Assume a small, well-trained light infantry force is operating in a hit-and-run fashion, covering itself in stealth, much like the U.S. military's special operators in Afghanistan. A precision delivered dual purpose improved conventional munition is the perfect system to attack such a critical target. The charter members of the "axis of evil" (Iran, Iraq, and North Korea) each maintain inventories of over 3,000 tanks and other armored vehicles. Brilliant or terminally guided tank killing munitions continue to be the weapons of choice for that target set. Lastly, as enemies seek sanctuary in cities and bunkers, the Army needs to have the option of a unitary munition that can precisely attack these target sets with limited collateral damage.

TARGETING SYSTEMS

The Unmanned Aerial Vehicle system has been the major targeting development over the last two years. Although the U.S. Navy has more than 23,000 hours of flight time on its Pioneer unmanned aerial vehicles, it has really been the recent experiences in Afghanistan and Yemen that have brought this capability to the front page.[12] The U.S. military has developed unmanned aerial vehicles that can loiter over targets for days at a time, provide real time accurate target location, and immediately assess the effects of fires on targets to assist in reattack decisions. There are over 22 companies in the United States working on the various unmanned aerial vehicles, and the military has benefited from the competition. Choices are available in how long such vehicles can stay in the air, how far they can fly, how high they can fly, how much payload they can carry, the types of acquisition devices on board, and whether the unmanned aerial vehicle needs to be capable of attacking targets itself.[13] Fielding plans in the Objective Force are not complete, but discussions include making available unmanned aerial vehicles at levels down to individual Future Combat System platforms and certainly at the platoon level for local security.

The effect of this observation capability on a Crusader unit is not only that it would make the system more lethal, but it would also

make it more survivable in a high threat environment. Objective Force plans also include a plethora of unmanned ground systems capable of passing targeting data directly to the shooter, while simultaneously populating the common operating picture. Some of these will be small enough to throw out by the handful, while others are larger and sturdier. The reason for including the information about unmanned aerial and ground systems is to acknowledge that the Army has already committed to this capability. Leveraging it in new ways by tying it directly to a shooter represents the way of the future.

Another capability that the Army's success in Afghanistan has highlighted is that of a well-positioned light infantryman or special operator using a laser designator to assist in precisely attacking certain targets. This capability is not new and was used extensively in DESERT STORM with little fanfare. This on-the–ground capability can augment the collection and targeting by unmanned systems and give the ability for more discreet target discrimination.

Finally, the U.S. military has been developing Tactical Exploitation of National Capabilities since before it came up with the acronym TENCAP. It was not until DESERT STORM however, that the Army got serious about the "tactical" part. The Objective Force will be dependent on this tactical exploitation, and the leveraging of targetable data, if not just the improved situational awareness, will make artillery systems even more lethal. Even if the national capabilities are not at sufficient resolution to produce targetable data, commanders can certainly use the information to cross-cue sensors that do provide sufficient resolution for target attack.

NEW WAY OF FIGHTING

These advancements in weapons system, munitions, and acquisitions systems will do no more good than French tanks along the Meuse River in May 1940 unless there is a corresponding systematic change in how the Army fights. This author suggests looking at this notion of change under the rubric of the Doctrine, Organization, Training, Leaders, Materiel, and Soldiers to examine the ramifications.

Doctrine.

It is time to give the artillery commander a maneuver-like mission and his own battle space (zone or sector as appropriate). He could deploy his sensors and then maneuver his weapons in order to have the greatest effect on the enemy. What this suggests is doing away with the close battle, when possible, or the "short knife fight," as the Army's Chief of Staff describes it. With the situational awareness provided by the multitude of sensors in the future force, and with the acquisition systems described earlier, the U.S. Army has the capability to attack targets accurately at much greater ranges, truly exhibiting standoff advantage. Army artillery–based units could have direct fire effects (one round, one kill) at traditional indirect-fire distances. This amounts to "virtual" line of sight combat, combining the accuracy advantage of direct fires systems with the standoff advantage of indirect fire systems. In fact, with Excalibur armor destruction variant, the Army can get to "one round, multiple kills." The Brilliant Anti-tank Munitions Program sponsored by the artillery branch demonstrated this technology which is currently on hold due to budgetary constraints. The traditional sanctuary of reverse slopes, intervisibility lines, and urban areas would no longer be available to the enemy. The artillery maneuver commander would have the ability to mass systems on a given target or establish digital sensor to shooter links with individual sensors and weapon systems in order to ensure responsiveness while not sacrificing any lethality. By giving the artillery commander his own zone or sector, the superior commander gets away from the problems of conflicting battle space management that tries to deconflict terrain (and therefore suboptimizes capabilities) instead of integrating and maximizing effects.

Organization.

The necessary organizational changes could follow the models used in the maneuver community for years. Artillery units need to be imbedded as brigade-sized elements in traditional divisions and be capable of cross attachment, as maneuver forces have operated since the advent of the tank. There will be missions and enemy

situations where the division commander would want to employ a task organized unit of cannons and tanks, or cannons and Bradleys. There will be other times when he will want to employ each of them in a "pure" form. Units need to be trained to easily attach and detach. This requires modular organizations that leave their parent units with the necessary augmentation to accomplish missions independently of parent unit support. The common engine that the Crusader and the M1A2 Abrams would have shared would have been a step in the direction of making the logistic support much easier.

Training.

The mandate to train as a team is self-evident. This includes likely cross-attachment tactics, techniques, and procedures as well as training regularly with the full variety of sensors, shooters, and munitions. It also means leveraging combat system imbedded training built into the Crusader and should be basic to all Objective Force Future Combat Systems. This would enable the crew to train in a realistic environment at greatly reduced costs, using on board training simulators and scenario drivers. In the perfect world, the simulation would be invisible to the crew as they run through their gamut of operational tasks.

Leaders.

Leaders in the future force may not have the luxury of being armor, artillery or infantry, or any other branch for that matter. It is time to train combat arms leaders. Whether the leader's unit has a weapon system that has direct fire effects out to 8 kilometers or 40 kilometers, his tasks will not be that different. The artillery branch has trained junior leaders for years to operate everything from a 105-millimeter howitzer, to a 155-millimeter howitzer, to a multiple launch rocket system, and even to Lance or Pershing missiles. After their basic course of instruction, artillery officers usually receive another 2-3 weeks of weapon specific training. Learning this wide range of delivery systems and specific tactics, techniques, and procedures greatly exceeds that which one would expect in the

maneuver force of the future.

The rank structure may have to be reexamined, however. More study on this is necessary, and it is not included in the purview of this chapter. But the question must be answered—is lieutenant the right rank for a platoon leader? How big should a platoon be? If a platoon is capable of providing battery-like effects, should a captain command it? If lieutenant is not the right rank, what are the developmental jobs to prepare a junior officer for future leadership positions?

Soldiers.

Some of the same questions need to be asked about soldiers as were asked about leaders. Are soldier tasks at the weapon level specific enough to demand separate military operational specialties? The answers to these questions are not clear, but the Army will obviously need a much more capable soldier, one who is digitally competent, while simultaneously possessing a "head out of the cupola" like situational awareness. There will be no room for nonwarriors in these units as there will be reduced requirements for headquarters button pushers, coordinators, and other troops.

OPERATIONAL LEVEL IMPACT

This would give combatant commanders a new way to fight and solve some of the traditional problems they face when phasing the entry of forces in theater in the event of a crisis. Today, the commander must choose whether he wants to bring in force protection assets such as long range fires to deny the enemy the use of his anti-access system, or get a "combat maneuver" force on the ground. With this new capability, he can have both. The lift cost of getting two Crusader–like systems on the ground is the same as getting two Paladin batteries on the ground. In return however, the combatant commander would get a weapon system that ties directly into his theater sensor grid, receives common operating picture input, has operational ranges, and is capable of denying the enemy the ability to influence the arrival of follow on forces. Additionally, this new "maneuver force" would be able to dominate greater battle

space while not exposing itself to the risk normally associated with expanded terrain responsibility.

JOINT VISION 2020

"Joint Visions 2010" and "2020" both describe the full spectrum dominance achieved through dominant maneuver, precision engagement, focused logistics, and full dimensional protection.[14] This new way of fighting is directly in line with this new joint vision. Dominant maneuver does not mandate a close fight. It describes a situation where the joint force commander combines precise maneuver and fires to bring his forces to a position of advantage in relation to the enemy. This concept of using sensors, shooters, and munitions in a real time, integrated way leads the Army right down the path to the Objective Force goal of seeing first, understanding first, acting first, and finishing decisively.

OTHER CHOICES

Before investing in this capability, a fair question to ask is "do we already have that capability?" Is another service or branch already farther down the road to possessing the same effect? The three most likely competing ideas of how to dominate operational and tactical battle space are the use of rockets, the use of air delivered precision munitions, and the delivery of those same munitions from unmanned aerial vehicles.

Rockets.

Rockets have massing capabilities that far outweigh those of cannons, but that is not the fight being described here. There are some target sets that are appropriately attacked by rockets, specifically those cases when the commander needs long-range massed area fires against targets for which he does not have accurate (precise may be a better word) target locations. But the maneuver fight in a dispersed environment does not lend itself to massed fires. There are currently no munitions programs being developed in the U.S. military that would provide the precision described above. The

other disadvantage of the rocket system is its lack of tactical agility. A cannon system can change munitions in a matter of seconds. The variety of rounds available, plus the minimal time it takes to change from one munition to another is more consistent with a close fight that is normally being timed in seconds and minutes.[15] Even if a variety of munitions were available in rocket launchers today, it still takes approximately 20 minutes to download one type of ammunition and load another and the inherent inefficiencies in making "variety packs" of rocket pods has heretofore precluded their development. Technology may speed this up, but the time necessary will still be unsatisfactory to meet close fight requirements.

Air Power.

The use of air power has certainly become a given in the new "American Way of War." The effectiveness of the world's greatest air force gives the United States asymmetrical advantages that create strategic, operational, and tactical opportunities that this nation leverages to great success. Unfortunately, if doctrine demands that ground forces fight in all weather, 24 hours a day, then doctrine must ensure that they have fires in those same conditions.

Lessons learned from the air war over Kosovo reinforce these thoughts. Benjamin Lambeth, in a Rand study for the Air Force, notes that "While the Serb pillaging of Kosovo was unfolding on the ground, NATO air attacks continued to be hampered by bad weather, enemy dispersal tactics, and air defenses that were proving to be far more robust than expected."[16] Naturally, weather will remain beyond the military's ability to control, but air defenses become a nonproblem in the artillery-centric maneuver fight described here. General Wesley Clark, the overall combatant commander for the War in Kosovo, lamented on several nights of bad weather when "most of the air strikes were cancelled." It was not always the delivery of munitions that was the problem, but the avoidance of enemy air defenses. "The weather in southern Serbia and over Kosovo prevented manned aircraft from flying with enough visibility to be safe if engaged by enemy missiles or to deliver weapons accurately."[17] Again, the capability of the U.S. Air Force is unarguable, but in Kosovo, even with ultra-modern aircraft flying in conditions of virtual air

supremacy, the Air Force was still not able to provide the necessary effects on the ground in a continuous manner.

So, was this weather a European phenomenon? Nothing like that could ever happen in say, Southwest Asia, right? Lambeth offers the analogy of "much like DESERT STORM, adverse weather at the five-week point had forced the cancellation or failure of more than half of all scheduled bombing sorties on twenty of the first thirty-five days of air attacks." [18]

Unmanned Aerial Vehicles.

Operations in Afghanistan and Yemen have recently demonstrated the dramatic capability of an armed unmanned aerial vehicle for all the world to see. The well-publicized results of the attack of the sport utility vehicle on the road in Yemen demonstrated a capability that is transformational in and of itself. Nevertheless, this capability does not serve as a substitute for the force described in this chapter for two reasons. First, unmanned aerial vehicles experience many of the same weather related problems that manned aerial vehicles confront. Secondly, payload restrictions limit the amount of munitions on board. The largest currently fielded unmanned aerial vehicle has a maximum payload of 1,980 pounds. Generally that means it must rearm after firing two missiles such as the ones used in Yemen. There is no doubt that this represents another tremendous asymmetrical capability possessed by the United States. Armed unmanned aerial vehicles need to be fielded and continually developed to take advantage of technological breakthroughs. They are not, however, adequate to serve as the single deliverer of fires for the close fight.

CONCLUSION

The potential exists for a new way of fighting with fires that takes advantage of the capabilities that are currently or soon to be available. First, the delivery system has to be Crusader–like. This means it must have comparable mobility to the currently fielded tank and infantry-fighting vehicle. It must have on board technical fire direction computing and self-locating ability to negate the

requirement to mass as a battery or platoon. It must be capable of firing single system time-on-target missions as well as maintain a ten-round-per-minute sustained rate of fire. It must be survivable in terms of quickness and both active and passive protection systems. Finally, and maybe most importantly, it must be capable of digital sensor to shooter linkages directly to the individual weapon.

Second, the munitions used must be as described as Excalibur+. This means they would be global positioning system enabled, sensor fused, brilliant munitions with at least a 40-kilometer range. They must be capable of terminal guidance using a laser when appropriate. And such munitions must provide dual-purpose improved conventional munitions, armor destroying munitions, and a unitary munition.

Third, the acquisition system must be accurate, survivable, and persistent/loitering. It must have the ability to respond to terminal guidance provided by a laser and capable of digital connection directly to the weapon system, and potentially, to the round in flight. The current suite of unmanned aerial vehicles provides this capability, as do Special Operating Forces using digital radios and laser designators. Both of these capabilities were demonstrated in operational environments over the last 2 years.

The final requirement to implement this system would be a willingness to change the way the Army trains its leaders and soldiers, organizes its units, and looks at ground maneuver problems. Future combat will distinguish itself by paralleling the technological advancements that will be present in society. Some of these advancements enable the military to keep doing the same things it has been doing in the present, only better, faster, and more accurately. When these multitudes of single system improvements are taken individually, they lead to an evolution in the way the U.S. Army fights. It does, in fact, get better, faster, and more accurate. The purpose of this essay is to suggest that by taking each of the individual improvements and using them together to create a systemic and doctrinal improvement, there is a chance for a true revolution in how this nation's military conducts the business of war. The opportunity to couple new weapons, munitions, acquisition systems, and maybe most importantly, the electronic links among them all, presents the Army with the potential to fight in a truly transformational way.

Having direct fire effects from indirect fire distances provides the U.S. military the opportunity to organize its forces to maximum advantage. Now is the time to drop the distinction between armor, infantry, and artillery and simply call these forces "combat arms." Now is the time to drop the distinction between the "line of sight" fight and the "virtual line of sight" fight. There should be no such thing as "indirect fires" any more; all fires are direct. Such dramatic changes demand new ways of conducting warfare. The Army must seize these new ways, organize itself to take advantage, and thus be in position to maintain its status as the world's premier ground force.

ENDNOTES - CHAPTER 8

1. Eliot Cohen, *Supreme Command*, New York, 2002, p. 213.

2. Senator Carl Levin, "Testimony by Secretary of Defense Donald H. Rumsfeld on Crusader Artillery System before the Senate Armed Services Committee, transcript," May 16, 2002; available from *http://www.defenselink.mil/speeches/2002/s20020516-secdef2.html*; Internet, accessed December 16, 2002.

3. Charles C. Emerson, Jr., "Crusader: Hammer for Today, Forge for the Future," *Field Artillery,* March-April 2002, p. 43.

4. The discussion is limited to lift requirements for the weapon systems. There would be additional requirements for the support structure of the batteries, but the comparison per weapon system is the focus as that weight is what led specifically to the cancellation of the Crusader program.

5. There are many different ways that this chain is calculated. One way for a call for fire to be processed is for it to go from the observer to a Company Fire Support Officer to a Task Force Fire Support Officer to a Brigade Fire Support Officer to a Battalion Fire Direction Center to a Battery Fire Direction Center to a Platoon Fire Direction Center to the actual weapon that will fire the mission. Each of these intervention points can stop the request and analyze it, thus adding more time to the process. The suggestion articulated here is that there are some circumstances where a direct link from the observer to the delivery system may be more appropriate. With the Crusader and the described acquisition and digital links, we could do this . . . at the speed of light!

6. Emerson, "Crusader: Hammer for Today, Forge for the Future," p. 45.

7. Walter L. Williams and Michael D. Holthus, "Krasnopol: A Laser-Guided Projectile," *Field Artillery*, September-October 2002, p. 30.

8. David C. Isby, "Excalibur Becomes a US-Swedish Programme," *Jane's Missiles and Rockets,* July 1, 2002, p. 1. Available from Jane's Information Group, accessed February 7, 2003.

9. Richard Hansen and John Halvey, "Excalibur, XM982 Program," briefing slides, 6th International Cannon Artillery Firepower Symposium, June 21, 2000.

10. Christopher F. Foss, "UK Company Develops 155mm Guided Artillery Ammunition," *Jane's Defense Weekly,* November 20, 2002, p. 1. Available from Jane's Information Group, accessed February 7, 2003.

11. *Ibid*.

12. Program Executive Office, Strike Weapons and Unmanned Aviation Public Affairs Department, Press Release Number: EPEOW200204081, "Pioneer UAV Dedicated onto U.S.S. Missouri," April 8, 1992; available from *http://uav.navair.navy.mil/pioneer_home.htm*; Internet, accessed February 7, 2003.

13. "Unmanned Aerial Vehicle Endurance, Payload, Weight and Altitude Capability," May 27, 1999; available from *http://uav.wff.nasa.gov/capabilities.html*; Internet, accessed February 7, 2003.

14. Joint Chiefs of Staff, "Joint Vision 2020," Washington, DC, June 2000, p. 3.

15. This phrase has been used at the Field Artillery School over the last couple of years in various forums. It was originally conceived by retired Colonel Sam Coffman during a discussion of the subject, "why cannons?"

16. Benjamin S. Lambeth, *NATO's Air War for Kosovo,* Santa Monica, CA, 2001, p. 27.

17. Wesley K. Clark, *Waging Modern War,,* Cambridge, MA, 2001, p. 212.

18. Lambeth, *NATO's Air War for Kosovo,* p. 37.