



**STRATEGY
RESEARCH
PROJECT**

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The ASCENDANCY OF FIRES

BY

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ABSTRACT

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This paper discusses the selection of a method of fighting for US forces in future conflict. Currently the US military, and the US Army in particular, is adopting a method of war that embraces distant precision firepower over close, combined arms maneuver. This paper addresses these two competing methods of war and postulates the ramifications for the future. The author believes that the U.S. Military -- particularly as addressed in the Army XXI and Army After Next Studies -- is adopting the precision firepower approach to the detriment of a balanced, combined arms capability. The author believes that the force concept of Army XXI and Army After Next should not become a high-tech version of the 1940 French methodical battle.

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The Ascendancy of Fires

"I believe we're at the threshold of a major change for the combined arms team -- **the ascendancy of fires**. What that means is that we, as a nation, will fight conventional battles using firepower of all kinds from longer ranges, much of it indirect -- not eyeball-to-eyeball using direct fire. We'll use long range fires as the spearhead of the attack to the extent that the ground maneuver forces may only need to mop up after the fires. That's a totally different concept of operations. This concept aims at achieving decisive results while minimizing the usual high casualties of the direct fire battle."¹

The US Army has defined its mission as a power projection force that conducts sustained, land combat through the following five elements: dominant maneuver, precision strikes, protect the force, win the information war and project and sustain combat power. The emerging revolution in the accuracy of firepower and the requirement to win future wars quickly, decisively and with *minimal friendly casualties*, is challenging this balanced approach.² Today, some proponents argue that precision strike has ushered in the ascendancy of fires, a new paradigm for ground combat that will transformed the role of precision strikes into the decisive element of land combat power."³

The US Army has historically overwhelmed its enemies "with sheer weight of firepower."⁴ The new precision strike technologies promise to destroy the enemy throughout the breadth and depth of the battle area with long range fires and appear to be a high-tech extrapolation of this old method. High-tech

distant punishment promises to minimize the exposure of friendly forces and win the battle without the requirement to physically dominating the enemy. "The fundamental tenet of the construct is that we not expose our forces to enemy fires any more than we have to."⁵ Proponents of this construct believe that precision strike has created a condition of *interchangeability*, where firepower can substitute for maneuver on the modern battlefield.⁶ In essence, precision strike advocates predict the end of maneuver.

Will precision strike systems obviate maneuver?

This is an important question that will decide the future shape of America's military. The battlefield dynamic of simultaneous attack throughout the depth of the battlefield hinges on detection of enemy location, near-real time reporting of this information, and near-real time engagement by friendly weapons. To make this concept work we will have to grid the battlefield, know the location of every target, potential target and point of interest. Can we afford the cost of an army dominated by a doctrine devoted to precision strike?

If Force XXI is a "forcing function," designed to make the US Army figure out how to design, train and fight a future force, then we need to understand what happens to armies whose doctrine did not balance the elements of combat power. The quintessential example of the value of doctrine and the lure of the promise of the ascendancy of fires is the story of the French Army of 1940.

France 1940

Firepower dominated the battlefields of the WW1, slaughtering an entire generation in the blood-soaked trenches. After the war, reducing casualties became a prime directive for the French military. As a result, the French Army "devoted considerable effort to create the best possible and most modern doctrine. It organized a complex and sophisticated system for considering new ideas and new technologies."⁷ The result of their detailed studies were clear: overwhelming firepower, centralized control, detailed planning and fixed defenses reduce casualties. Enemy penetrations of the defensive line would be slowed, attritted and ground to dust by well placed, overwhelming firepower. In the French Army, the ascendancy of fires replaced maneuver. Highly accurate cannon fire, placed in the concrete and steel bunkers of the Maginot Line, would provide all the elements of victory.

The best minds of the French Army attacked the new battlefield equation with vigor and initiative. Tactics, techniques and procedures were developed to employ new technologies in an intricate system that maximized firepower. The artillery set the tempo and rhythm of the attack and detailed preparation and synchronization was emphasized. The system required that plans leave nothing to chance -- let alone human error -- and the standard of discipline, therefore became rigid.

To avoid fratricide in a firepower intensive environment everyone had to act according to a detailed, well-rehearsed plan. The French "gridded" the battle area in front of their guns and accepted as certainty the mathematics of destruction. "The attack is the fire that advances, the defense is the fire that halts the enemy" became the motto of the French Army.⁸

The French doctrine that evolved from this intense study was named methodical battle, *battaille conduite*. As laid down by French Army regulations, methodical battle was a step-by-step process of tightly controlled movement and rigid timetables designed to generate the maximum amount of firepower to destroy the enemy. The development of methodical battle "represented the best available thought on what would usually work best on the battlefield"⁹ and came from the strong belief in the decisive effect of "the destructiveness of firepower."¹⁰ The power of ideas is sometimes frightening. Methodical battle not only seized the minds of the leadership of the French Army -- setting their thinking at the pace of their cannon -- it also shaped the procurement of weapons, dramatically altered the organization of the force and set the command style.

By 1940 the French Army was considered a premier, world-class, "well-knit" fighting force "which had devoted two decades to preparing for the possibility of a future war."¹¹ Unbalanced for all the best intentions, the French felt confident that their doctrine -- their system-of-systems -- was the superior method of

warfighting. They expected to fight by their game-plan, "a carefully controlled, highly centralized battle" based on preserving lives by the lavish employment of firepower.¹² The thinking of that time has a curiously familiar ring to it: "the new weapons of greater firepower . . . had made the battlefield much more lethal than in the past."¹³ Under this framework decisive maneuver became merely the ability to move firepower forward.

The Germans, on the other hand, acknowledged the value of firepower, but also understood the necessity for a balance between firepower, mobility and protection. Out of the desperate necessity of their geopolitical and economic position, the Germans selected an asymmetrical approach to make French firepower and twenty years of French preparation irrelevant. In General Erich von Manstein's words: "The aim of the offensive must be to achieve decisive results."¹⁴ In this effort German doctrine played a decisive role:

"German doctrine, in short, emphasized the advantages of one continuous battle, ultimately leading to the complete rupture of the hostile defenses and the defeat of the enemy, while French doctrine accepted the possibility of a successive series of methodical battles. The Germans believed this continuous battle enabled them to retain the initiative and to achieve victory. And this belief existed long before German panzer forces or the blitzkrieg were created."¹⁵

The story of the Battle for France in 1940 is well known. The German attack through the weakly defended Ardennes forest, however, was not a simple drive through the woods by German

panzers. It was a skillful fight by a well-balanced force fighting with a superior doctrine. German infantry, engineers, artillery and close air support were as critical to the French defeat as the fast moving panzers.

The story of the Battle for France is not only the inexorable drive of the tanks supported by shrieking, dive-bombing *stukas*, but the tale of the clash of two diametrically opposed doctrines. The fact is that before the battle, both sides were closely matched -- except in the realm of their ideas. The difference lay in the way the two sides thought about warfare. The French overemphasized the elements of *firepower and protection* while the Germans emphasized a *balanced approach of combined arms and applied firepower, maneuver and protection as the situation demanded*.

"... even in a battle of movement such as the world had not seen before, the Wehrmacht had plenty in hand to preserve what is key to all battle-winning - balance. They had plenty of reserves, plenty of supplies and plenty of flexibility in interpreting the exact form in which operations would develop."¹⁶

In May 1940 the Germans dominated the battlefield, risking all in a determined attack to win decisively. "At all levels the emphasis was on boldness, speed shock action and firepower."¹⁷ Methodical battle dominated the French response. Unprepared mentally to respond to the battle's fast pace, the French Army suffered defeat in only six weeks -- but the battle was decided in the first seven to ten days. "Few defeats have been as

unexpected or as sudden... France simply could not respond to the type of fighting thrust upon her. The resulting debacle swept her from the first rank of world powers."¹⁸

Battlefield Dominance

There are several important lessons from the French defeat in 1940 that are valuable to today's development of the Army After Next concept. The first lesson is the significance of doctrine. "The importance of doctrine has seldom been illustrated as clearly as in the May-June 1940 campaign in western Europe."¹⁹ The French developed a sophisticated, unbalanced doctrine that aimed at preserving French manpower by substituting firepower for maneuver. The French system-of systems was based on the idea of interchangeability embedded in the Maginot Line. Unfortunately, for the French, interchangeability failed catastrophically in 1940.

The second lesson is that the ability to use the available technology effectively is more important than the technology itself. The Germans had a high degree of **congruence** between their weapons and their method of fighting.²⁰ Their doctrine aided this congruence and was an essential element of victory. A vivid example of congruence is the use of the radio as an information system. Every German tank had a radio. The requirement for radios was demanded by a doctrine that emphasized maneuver and combined arms. Few French tanks had radios, as they

were not as necessary to fight precise, pre-planned, methodical battles.²¹ French agility was as severely hampered by the mindset that doctrine imposed as due to their lack of informational systems.

" . . . the vital role that radio played in the technique of the blitzkrieg . . . was entirely due to the way in which German commanders were prepared to change plans minute by minute in the face of enemy opposition. It is extremely doubtful if such radio contact would have made much difference to the French or the British Army, which had trained to fight in set-piece battles."²²

Thirdly, for all the right reasons, the French tried to reduce warfare to a science based on the mathematics of destruction. The human element was considered secondary in order to mathematically assure victory at minimal cost to friendly forces. Fire support is easily reduced to a science -- processing target information, selecting the target and the engagement system and developing the order to fire -- especially in the age of the micro-chip. The science of methodical battle, however, disregarded the idea that the first requirement in war is decisive action, not just the physical destruction of the enemy's forces. When events cascaded faster than the firepower of methodical battle, the French system-of-systems was paralyzed.

Today, US Army doctrine states that combat power is created by combining the elements of maneuver, firepower, protection and leadership. "Overwhelming combat power is achieved when all combat elements are violently brought to bear quickly, giving the

enemy no opportunity to respond with coordinated opposition."²³
Without maneuver, the most effective precision strike is indecisive. A determined enemy can always endure the fire -- as the British did in the Battle of Britain -- and will eventually develop asymmetrical ways to respond to precision strike forces -- as the North Koreans have with their hardened artillery sites. Precision strikes that are not backed up with a continuous battle of decisive maneuver are merely artillery raids set out to punish, not defeat, an opponent.

Force XXI and the Army After Next

To prepare for the future the United States Army has launched a two pronged attack. The main attack is Force XXI -- which will become Army XXI. The supporting attack is the Army After Next. The Force XXI concept envisions an army that can overwhelm the enemy, win quickly, sustain minimum casualties and loss of material and produce decisive victory -- a tall order for an army that is smaller than the force fielded in 1939.

The central idea behind Force XXI is that digital communications technology will provide battlefield commanders with a comprehensive view of the battlefield. This information dominance will enable units to be can smaller and yet more lethal. Digitization's impact during the exercises was impressive. Spot reports reached the battalion in five minutes as compared to nine under conventional communication means. Spot

reports under conventional means required repeating the message about thirty percent of the time versus only four percent when digitized. Digitized spot reports save time and can rapidly synchronize direct and indirect fires. This provides Force XXI with the ability to shoot quickly and place accurate and overwhelming direct and indirect fire on the enemy.

Digitization generates attack helicopters into the fight faster and makes them more effective killers by providing better enemy and friendly situation awareness. Improved battlefield awareness allows faster digitized command and control. Maps, overlays and orders can be transmitted. Operation orders and especially Fragmentary Orders can be published and distributed in minutes as opposed to hours. In war, these minutes saved can be decisive.

The Force XXI concept is expected to achieve force coherence through shared knowledge delivered by advanced in weapon systems and information technology. "With a shared common and timely perception of the battlespace, a relatively unconstrained framework--a digital framework--will organize the battlefield and control of operational tempo."²⁴

The Army is well on its way to creating Force XXI, with digital information systems playing a similar role as that of the radio in the blitzkrieg of 1940. In 1940, the "principles of the blitzkrieg were surprise, speed and concentration. All three were interdependent."²⁵ For Force XXI the terms have been changed to

precision strike, dominant maneuver and information dominance. Within the parameters of shrinking budgets can the army maintain the balance that these interdependent principles require? Can we provide the exact, secure and constant flow of intelligence information required for precision strike to work? As one author has hinted, "even satellite observation, modern aerial photography, and more advanced communication would not change matters greatly, as the evidence of recent war has shown. As soon as movement begins, so does the fog of war."²⁶

The mission of Army After Next [AAN] is to determine the future of warfare around 2020 and predict what operational, organizational and informational changes the Army will need then to win on future battlefields. The vision of AAN sees a future army of small, extraordinary lethal and highly mobile units, dispersed to protect against weapons of mass destruction and "able to quickly destroy hidden, fast-moving concentrations of enemy troops."²⁷ Brilliant weapons will increasingly define the nature of war on the ground. Long range, autonomous target acquisition, hit and kill capable brilliant munitions will enhance the ability of maneuver forces by setting the conditions that make dominant maneuver possible. The enemy may see US force maneuvering against them, but will not be able to react in time because of the accurate pin-point destruction of their critical combat capabilities. Precision Strike will pin the enemy to the battlefield while dominant maneuver forces move to decide the

issue. The effectiveness of brilliant munitions, however, is contingent to information dominance. We cannot expect firepower to destroy enemy capabilities with pin-point accuracy if we do not know the exact location of enemy *and* friendly forces.

The reality of 2020, however, may well be painfully different from the dreams of the visionaries of AAN. "The gap between reality and dreams can seem a mile wide, but when it comes to the shortfall in the Defense Department's equipment modernization account, it can be measured in dollars: about \$15 billion a year."²⁸ In addition, it is estimated that Congress may have to trim the \$1.3 billion allocated for defense spending over the next five years by \$55 billion to meet budget requirements.²⁹ Something's got to give, and the most likely candidate will be the high-tech systems of the future force. Today's soldiers may find that the battlefield of 2020 looks surprisingly like battlefield's of today, with many of the same old weapon systems still in use.

What will be important to the changing nature of warfare is what you will not see. The art of warfare is expanding, as new means of conducting war emerge at the dawn of the 21st century. While most soldiers and theoreticians consider this a revolution, it is, in fact, an evolutionary development of the cascading disruption of the 20th Century. It is only revolutionary in a relative sense, especially since few, if any, commanders in the past have had a technological advantage over their opponents in

the methods of dislocating the enemy through manipulation of information.

Interchangeability did not succeed in the 20th Century and the cost of providing a system of systems that will make interchangeability work in the 21st Century is problematical. In spite of the fantastic precise-destructive effects of brilliant munitions, the requirement to maneuver direct-fire to physically dominate the enemy remains. If Force XXI must be prepared to conduct quick, decisive, highly sophisticated operations; also ready to execute limited, possibly protracted operations against low-technology enemies, then battlefield dominance will require forces that possess maneuver, protection, and firepower -- not fire power alone. As a recent Army pamphlet reminds us: "Overwhelming, decisive power is *not solely firepower.*"³⁰

Preparing for the next war is always a riddle. The cost France's pre World War II expenditures dwarf those of Germany. The Maginot line was so costly that "few dared to suggest spending equally vast sums on a newer, more mobile military machine that would have rendered the line obsolete."³¹ The Germans, unburdened with such a massive expenditure searched for asymmetrical means to overcome the brilliant defenses of the French.

The great cost and effort of the Maginot Line forced an imbalance in French military thinking that was codified in their doctrine of methodical battle. To win with mathematical

certainty on the gridded battlefield required huge concentrations of firepower and the creation of the Maginot Line -- a post-World War I "silver bullet" solution to war. The French put their faith in concrete and firepower. The Germans put their faith in training and the maneuver of a balanced, combined arms force.

The April 1997 Annual Report to the President and the Congress by the Secretary of Defense, William S. Cohen, emphasized that the first major concept of the new revolution in military affairs is "that long-range precision strike weapons, coupled with very effective sensors and command and control systems will become the dominant factor in future war."³² With insufficient funds to procure new maneuver systems, the US Army has decided to buy a "limited number of new, high payoff weapons."³³ Maneuver systems are paying for the revolution systems and precision strike. In a recent Army After next simulation the following lessons were learned:

"The major lessons learned from the first war game [AAN], held Jan. 27- Feb. 6, was that the United States' increasing reliance on satellites could become a fatal vulnerability. In the war game, set in 2020, Russia launched a nuclear attack in space that destroyed almost every satellite circling the globe, knocking out much of the United States technological advantage in one fell swoop."³⁴

The 1997 Quadrennial Defense Review [QDR], the latest attempt at military reform, was primarily an attempt by the Department of Defense to "insist that rapidly aging weapon systems built in the 1970s and 1980s needed to be replaced."³⁵

Are we in the process of creating an information warfare Maginot line?

Conclusion

The ability to win bloodless victories through firepower alone is a siren's call -- an idea with the best intentions that has, historically, produced bad results. War is a complex event and combat solutions are rarely, purely technological. The ascendancy of fires and the dominance of precision strike in US Army doctrine is a dangerous case in point.³⁶

The aim of our future land power strategy should be the rapid and simultaneous dislocation of the enemy, not his total destruction. Victory through precision strike is too costly and will bankrupt the forces ability to train and negate systems required to dominate the maneuver battle. Dislocation, as shown by the Germans in 1940, can win a decision with minimum bloodshed.

Battlefield Dominance requires balanced forces that possess maneuver, protection, firepower and leadership. In 1918 battles were fought by masses of men and artillery that aimed for the destruction of the enemy's personnel; in 1940 blitzkrieg was waged with mobile units of men and tanks supported by artillery and combat aviation aiming at the destruction of the opponent's combat cohesion as embodied in his command and control; in 2010 battlefield dominance will be generated by small, self-contained

mobile combined arms forces, maneuvering *simultaneously with the support of land, sea and air precision strikes* to rapidly defeat the enemy. The combination of mobile strike forces and precision strike forces will place the enemy on the horns of a dilemma -- killing him with precision strike forces if he ventures out of his defenses, and smashing him with quick moving, lethal maneuver forces that inexorably conduct a continuous battle, disrupting and dislocating the enemy's ability to resist.

Our efforts to discuss Force XXI Operations today are sewing the seeds that will bear the fruit of tomorrow's victories. The simultaneous application of precision strike with dominant maneuver offers the US Army a method to dominate future opponents much as the German Army dominated the French Army in 1940. General Dennis Reimer put it this way:

"For the Nation to be decisive in war, our enemies must be presented with complex military problems beyond their ability to solve. We must maintain an adequate balance between our capabilities to assure that adversaries cannot and will not solve the military puzzle that we pose. Precision strike is important but it isn't adequate. Balance between precision strike and dominant maneuver is required."³⁷

It seems that everyone agrees to balanced forces, but the spending figures point in the direction of precision strike. It seems that with regards to the Army's budget General Otis is right: ". . . in all of modern warfare, the biggest killer on the battlefield has always been artillery. I only see the role of artillery ascending."³⁸

High-tech, methodical battle must not be allowed to shape the procurement of weapons and the command style of Army XXI or the Army After Next. The US Army must avoid the siren call to become dominated by firepower -- as the French did with their doctrine of methodical battle. Army XXI and the Army After Next should not become a moveable fortress, a high-tech version of methodical battle. The most significant problem in warfare today is to produce the correct balance of firepower, mobility and protection to create a force that can apply decisive action. Decisive action in the 21st Century will require precision strike **and** the ability to able achieve dominant maneuver on the battlefield. Our doctrine, training and procurement must reflect a balance where precision guided munitions provide maneuver a greater freedom of movement. Contrary to the wishes of many, the close fight may not disappear from future battlefields. With this in mind, dominant combined arms maneuver, enabled by precision strike, still offers the greatest probability for decisive action in the 21st Century.

End Notes

¹ Glenn K. Otis [General, US Army (Ret.)] "The Ascendancy of Fires, The Evolution of the Combined Arms Team," Interview of General (Retired), Former Commander of NATO's Central Army Group and Commander-in-Chief of US Army Europe. Field Artillery Journal. (Fort Sill, Oklahoma: US Army Field Artillery School, June 1995), p. 18-19.

² Note: The most obvious way to defeat US policy is to dramatically increase the number of US casualties. US policy in the last twenty years has been changed more dramatically, after significant U.S. casualties have been inflicted, than by any other means. Beirut and Somalia are key lessons in point. Employing systems that limit friendly casualties is one of the strongest arguments for interchangeability.

³ Lowry A. West, "Field Artillery in the 21st Century," Military Review, (Fort Leavenworth, Kansas: Command and General Staff College, 1989), pp. 21-21.

See also Major General Fred Marty's comments in "Deep Operations," in Field Artillery, (Fort Sill, Oklahoma: US Army Field Artillery School, April 1993), p. 1.

"The traditional view of ground combat focuses on the close fight. Our organic precision strike capabilities now join air assets in extending the land commander's [LOC] options for decisive victory." p. 1.

⁴ Russell F. Weigley, History of the United States Army, (Bloomington, Indiana; Indiana university Press, 1984), p 475.

⁵ Otis, p. 19.

⁶ Robert R. Leonhard, The Art of Maneuver, Maneuver Warfare Theory and AirLand Battle, (Novato, California: Presidio Press, 1991), pp. 178-183.

⁷ Robert Allen Doughty, The Seeds of Disaster, The Development of French Army Doctrine 1919-1939, (Hamden, Conn.: Archon Books, 1985), p. 5. Hereafter listed as Seeds of Disaster.

⁸ Robert Allen Doughty, The Breaking Point, Sedan and the Fall of France, (Hamden, Conn.: Archon Books, 1990), p. 28. Hereafter listed as Breaking Point.

⁹ Seeds of Disaster, p. 6.

¹⁰ Seeds of Disaster, p. 3.

¹¹ General Franz Halder, the Chief of the German army's general staff noted in his diaries: "Techniques of polish campaign no recipe for the West. No good against a well-knit Army." See Breaking Point, p. 19. see also: Seeds of Disaster, p. x.

¹² Breaking Point, p. 325.

¹³ Seeds of Disaster, p. 3.

¹⁴ Field Marshal Erich von Manstein, edited and trans. by Anthony Powell, Lost Victories, (Novato, California; Presidio Press [English reprint], 1982), p. 121.
Note: General Manstein was responsible for developing the German plan for the Battle of France.

¹⁵ Seeds of Disaster, p. 109-110.

¹⁶ John Strawson, The Battle for the Ardennes, (New York: Charles Scribner's Sons, 1972), p. 12.

¹⁷ Colonel T. N. Dupuy, A Genius for War, The German Army and General Staff, 1807-1945, (Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1977), p. 257.

¹⁸ Seeds of Disaster, p. ix-x.

¹⁹ Seeds of Disaster, p. ix-x.

²⁰ Colonel T. N. Dupuy, Understanding War, History and Theory of Combat, (New York: Paragon House Publishers, 1987), p. 103. The concept of congruence is explained on p. 216-218. In addition Dupuy explains: "The Germans won through a "superior strategy and by applying the Principles of War, an not through better technology or a larger force. . . . no conventional weapon has been as important to battle success as have been the troops employing the weapons . . . and there is not a lot of evidence or logic to suggest that technology will become more important than the troops in future warfare." p. 216.

²¹ As remarkable as it may seem, the commander of the French Army, sixty-eight year old General Maurice Gamelin, considered one of the world's most brilliant commanders in 1939, had no radios and only one commercial telephone line at his headquarters in the Chateau de Vincennes, near Paris. Gamelin said that it the use of radio might give away the location of his headquarters.

By his own admission it usually took forty-eight hours to issue orders from his headquarters. See Len Deighton's Blitzkrieg for more detailed information.

²² Len Deighton, Blitzkrieg, From the Rise of Hitler to the Fall of Dunkirk, (London: Jonathan Cape Ltd., 1979), p. 175-176.

²³ Headquarters Department of the Army, FM 100-5, AirLand Operations, (Washington, D.C.: Department of the Army, 14 June 1993), p. 2-9.

²⁴ TRADOC Pamphlet 525-5, Chapter 3-3, Force XXI Operations.

²⁵ John Strawson, The Battle for the Ardennes, (New York: Charles Scribner's Sons, 1972), p. 10. Strawson goes on to say: "Speed was only made possible by surprise and concentration. Surprise itself was achieved principally by concentration and speed. Concentration could only reap decisive results if in conjunction with speed and surprise it tore open the enemy's front, penetrated deeply behind it, paralyzed opposition, and led to a battle of annihilation. Suddenness, violence, blitzkrieg *schnell* -- these were the very nuclei of blitzkrieg. But there was something more. Once this violent all-destroying thrust had got going, it must never stop until the battle is won. If it halted it would be found, checked and attacked. To maintain momentum, night and day, was everything. The forces engaged must penetrate ever deeper, ever broader, and so bring about the absolute disruption of enemy positions, reserves, headquarters and supplies. The key to it was a never-ending flow of mixed panzer groups constantly supported and supplied by fire power and transport aircraft of the Luftwaffe. Thus the two indispensable agents of blitzkrieg were still Panzer and Stuka. Nor should it be forgotten that each was helpless without fuel." p. 10-11

²⁶ Edward Luttwak, Strategy; the Logic of War and Peace, (Cambridge: Belknap Press, 1987), p. 106.

²⁷ Jeff Erlich and Robert Holzer, "Smaller Units Wave of Future/ 21st Century Fighters Seen Grouped in Lethal, Highly Mobile Bands," Army Times June 1, 1995.

²⁸ Jack Weible, "Cash Scramble Spurred on by Aging Weapons," Army Times, January 5, 1998.

²⁹ Rich Maze, "Military may Have to Shoulder Budget Shortfall," Army Times, January 5, 1998, p. 22.

³⁰ TRADOC Pamphlet 525-5, Chapter 3, Force XXI Operations.

³¹ Noel Barber, The Week France Fell, (New York: Stein and Day, 1976), p. 71.

³² William S. Cohen, Secretary of Defense, Annual Report to the President and the Congress, (Washington D.C. : US Government Printing Office, April 1997), p. 70.

³³ Cohen, p. 251.

³⁴ Sean Naylor, "Force XXI, Army After Next Brought into Focus," Army Times, Jan 5 1998. p. 36.

³⁵ Jack Weible, "Cash Scramble Spurred on by Aging Weapons," Army Times, Jan 5 1998.

³⁶ "As J. F. C. Fuller puts it, 'we see these three principles of war [firepower, mobility and protection] must be combined, that is work together like the parts of a machine.' It took the Israelis three days to realize that reliance on the Bar Lev Line and the invulnerability of the tank was not going to win the Yom Kippur War in 1973 and only a return to a balanced army would counter the threat of the anti-tank guided weapon. Earlier history also supports this view. Hannibal offers an outstanding example of inferior but balanced forces overcoming forces that were both larger and better equipped. He had no new weapon and his troops were inferior in quality and training to the Romans. His amazing string of successes resulted from his ability to use combined arms and then focus on maneuver." See Colonel P. A. J. Cordingley's "Armored Forces and the Counter Stroke," in The British Army & the Operational Level of War, edited by Major General J. G. Mackenzie and Brian Holden Reid, (London: Tri-Service Press, 1989), pp. 97-98.

³⁷ General Dennis J. Reimer, Chief of Staff US Army, November 20, 1996 in an e-mail message relating his comments "The Army: An Instrument of National Power -- Today, Tomorrow and Into the 21st Century," at the 1996 Fletcher Conference on the subject of "Strategy, Force Structure and Planning for the 21st Century."

³⁸ Otis, p. 19.

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