MODERNITY AND TECHNOLOGICAL ADAPTATION IN THE U.S. ARMY, 1918-1945

by

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CONTENTS

ABSTRACT

This dissertation studies technological adaptation within the U.S. Army from the end of the First World War to the end of the Second, with particular attention paid to armored warfare. The intention is to view the process from the perspective of the decision-makers who shaped policy, and the soldiers who implemented it. The demands of the strategic environment in the 1920s and 1930s shaped the response of the U.S. Army, and the lack of certainty about the enemy created uncertainty about the mission tank forces would be asked to perform. Lacking a clear mission for much of the twenty years between the wars, tank advocates saw funding go to the Air Corps, who did have a coherent vision of future war, albeit a flawed one. After 1940 American tank organization and design had attention and money, but limited time to come up with a way to defeat the German army. The U.S. Army created not a tank force, but a combined-arms one, and made decisions within the limitations of fighting a war across two oceans that by 1944-45 allowed it to face successfully what had been the most feared armored force in the world in 1940. After 1945, faced with the growing possibility of war with the Soviet Union, soldiers and historians in the west turned to the 1939-1945 experience to provide guidance. The search for lessons to apply to the future obscured the process of adaptation before and during the Second World War. In the aftermath of the September 11 attacks the need to understand the full complexity of military adaptation seems again pressing.

PREFACE

The second half of the nineteenth and first half of the twentieth centuries encompassed an era of dizzying technological and social change in the United States. The changes of this period shaped the decision-makers of the Second World War. The Army Chief of Staff between 1939 and 1945, George Marshall, was born in a world powered by steam engines and lit by gaslight. Marshall, who led the way in creating an army larger than any in the United States before or since, joined in 1902 a force of less than 200,000 men in a country that thought it best to stay out of European wars. When Marshall died, the U.S. was a signatory to the North Atlantic Treaty, requiring that it go to war if a signatory nation was attacked. The soldiers he commanded formed their view of the world in a later period, one where the rapid pace of technological change was an assumed constant. Marshall held a middle ground between tradition and modernization. To understand how the U.S. Army dealt with the challenge of industrial-age warfare in the first half of the twentieth century requires an understanding of the pressures and issues facing not only the professional soldiers who made up the army, but of the civilian world that provided the recruits to fight its wars.

Institutions have lives of their own, and armies are no exception. They persist longer than the individuals who comprise them, but individuals influence the shape of the institutions to which they belong. How institutions and individuals confront change is vital to their common survival, but there are few absolute guidelines for success.

Survival is of crucial importance for military institutions, and adaptation is the fundamental strategy that allows the institution to continue to maintain itself.

Army doctrine grew in importance in American military affairs after the Civil War, an age of small regular armies and large wartime expansions. For some Civil War veterans, doctrine represented institutional continuity since most of the soldiers who fought American wars were not professionals, but citizens serving only for the duration of a national emergency. After the Great War, as after the Civil War, professional soldiers had to categorize their experiences and create a functional doctrine, since a majority of the direct experience of battle exited the Army with the demobilized soldiers. In the late 1930s and early 1940s the Army had to modify its doctrine again in light of developments in armor, airpower, and communications, while at the same time training over eight million recruits to implement that doctrine, in essence innovating under pressure. The pressure stemmed from two sources, one the limited time available before entry into combat, and the other from the need to train an army expanding at well over 100 percent per year. The amount of time available for doctrinal debates after 1940 was reduced by the number of other tasks that the Army had to perform for the expansion, many of them mundane but necessary. Doctrinal formation was of great importance, however, since so many of the Army's junior officers were inexperienced, and doctrine provided one way for them to profit from the experience of others. Decisions made in this context aimed at producing workable solutions at the time, not ideal ones in hindsight.

Adaptation takes many forms, and there is more than one way to deal with change. Military adaptation in the period between 1918 and 1945 took two distinct paths.

In one, what military innovators expected to do with their forces determined the machines they developed: doctrine drove technology. In the other, a more cautious view, what innovators' expectations were limited by their understanding of the technology at their disposal. The American Army Air Corps in the 1920s and 1930s is an example of doctrine driving technology, while the efforts of armor theorists in the U.S. Army represent the other approach. In the decades since the end of the Second World War the optimistic Air Force model has dominated military analysis in the United States. Settling questions of doctrine before turning to capabilities has some advantages, the biggest of which is that it provides a framework for interpreting new developments. For the armor theorists the process was not so easy. While the Air Corps was busy developing a theory of strategic bombing, the Army was experimenting to determine the limitations (and possibilities) of mechanized warfare. While the Air Corps acquired planes in the 1930s, the Army was in the process of figuring out what the optimum characteristics were for various categories of tank. Thus, the Air Corps appeared ahead in the process, but had, as it turned out, skipped the essential step of determining what was possible. The Army wound up, by contrast, looking like it was behind the times and slow moving in a society where newness was an indication of modernness. Nonetheless, it will be argued in the following pages that the Army devised workable solutions to the problems it confronted.

The fundamental tension between optimistic and realistic visions of technological innovation derives from how each model views the role of history. The optimistic vision sees history as providing limited guidance for future action. Conclusions reached in the optimistic model are divested of their historical context in order to be applicable to the future. But historical context is inescapable: guidelines derived from one example do not

necessarily apply to others. Contemporary decision-makers are responsible for understanding their own context, and how it differs from the historical examples to which they turn to for guidance. Restoring an understanding of context is the historian's part of the task.

Yet historical understanding is not immune to misunderstanding either. History is lived forward (without knowledge of outcomes), but written from hindsight, and the knowledge available to the historian often obscures the uncertainty faced by the people the historian studies. Technological optimists make predictions which appear to be borne out with the benefit of hindsight, even if the basis for those predictions was not at all certain at the time. Although it appears to provide better guidance, the optimistic model provides few meaningful guidelines for innovation without the benefit of hindsight.

This project undertakes to highlight the sense of uncertainty that faces historical actors by tracing the way the U.S. Army adapted to industrial warfare over a span of roughly twenty-five years, between 1918 and 1945. Chapter one discusses the twenty years between the end of the Great War and the outbreak of another in Europe. In this period the Army, facing no well-defined threat, had little pressure to answer the questions raised by the last war and was largely content to experiment with limited funds and equipment. At the same time, the generation that came of age after the Great War formed its understanding of technology and society, an understanding it carried when it was drafted to fight the Second World War. The twenties and thirties set the starting line for the American mobilization in 1940. Chapter two views the process of doctrinal formation in the Army between 1940 and 1942, the years when enemies and threats were clear and time was no longer available for leisurely debate. The third chapter picks up

the strand of draftee understanding and examines the attitudes of society toward the military, military technology in particular. Recruits had to acquire their understanding of industrial warfare from experts who were not yet clear on it themselves. Chapter four reintegrates the strands of doctrine and soldier experience as the Army engaged in combat against the *Wehrmacht*, widely perceived as masters of armored warfare at the time. Americans found that their combined arms team was good in its fundamentals, but needed practice and continuous adaptation. Chapter five returns to the problem of digesting the lessons of the last war and applying them to a changed environment. After 1945, the Army's model for melding strategy and technology was obscured by the triumph of the Army Air Corps' technological optimism. What follows is the story of the alternative model as it developed from the end of the First World War to the end of the Second, as the Army adapted to armored warfare.

PROLOUGE

THE CRISIS OF MODERN WARFARE

On the first day of July, 1916, the British Army launched a major offensive in the Somme department of France. After a preliminary bombardment of unprecedented intensity, almost one hundred thousand infantrymen attacked strongly fortified German positions. By the end of the day, nearly twenty thousand British and French soldiers were dead or mortally wounded, and the German defensive lines were still essentially intact. When the autumn rains intervened in November and British commander Douglas Haig finally cancelled the offensive, over four hundred thousand British soldiers were wounded or dead.[1] While the campaign met its minimal goals, the decisive battle for which many in the British command had hoped never materialized. Germans and Allies alike were severely bloodied, but the German trench network remained unbroken. Neither side had fully solved the problem of how to achieve a decisive battle in the age of industrial warfare.

The armies that fought the Great War faced the question of industrial warfare: how could nations best conduct wars in the age of mass production, an age not only of improved killing technologies but also mass armies? The problem persisted after the Great War in 1920: what part of recent war experience was relevant to the future, and what would not be repeated? The debate over what form the "next war" would take

[1] Cyril Falls, *The Great War, 1914-1918* (New York: Capricorn, 1961), 207.

illustrates a fundamental issue in human understanding. How do individuals, organizations and whole societies obtain experience, and then understand, interpret, and translate it into a workable plan for the future? What criteria are useful for critiquing how well a group learns and adapts? Once a lesson is learned, how long does it remain valid? Do changes to the society from which an army comes, or the enemy it is expected to fight, mean that lessons drawn from previous contexts are less valid?

The problems for professional soldiers at the end of the Great War were how to digest recent events and to predict what direction the future might take. Factors that guided them in the past, such as personal bravery and combat prowess, seemed less relevant. Others, such as discipline, were still important but the precise meaning had changed substantially. George Patton, as an officer in the American Tank Corps (with a concept of discipline based around unquestioning obedience and focused on small details indicative of compliance) commented "working with machines has a very disastrous effect on discipline. It seems to run out of men as the oil soaks into them."[2] Patton expressed the tension between the old and new that had been growing in military affairs before 1914, and that had accelerated thereafter. The convergence of technological and organizational factors emerging from the late nineteenth century led to the Western Front experience in the Great War, but also hinted at ways in which future wars might avoid costly stalemates. Saying that generals always re-fight the last war is usually meant in a derogatory manner, but breaking completely with past experience is a difficult thing to do. Even in the case of such airpower advocates as Hugh Trenchard and Billy Mitchell, the past provided examples (albeit negative) to support their respective cases.

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[2] Martin Blumenson, ed. *The Patton Papers, 1885-1940* Volume I (Boston: Houghton Mifflin, 1972), 494.

The armies of Europe entered the Great War aware of late nineteenth and early twentieth century developments in technology. A number of small wars were fought after the introduction of magazine-fed rifles, heavy artillery, and large-scale conscription, but there was uncertainty in the officer corps of European armies after the German defeat of France in 1871 about exactly how events would proceed in the next major conflict.[3] Although many indications of the changes wrought by technology were evident in the Boer War of 1899-1901 and the Russo-Japanese War of 1904-05, these conflicts provided ambiguous guidance. The Boers fought a guerrilla campaign after losing a conventional war, and although they were able to humiliate the British early in the war at sion Kop, they eventually lost to a massive infusion of British resources. The Boer War made plain the dangers of linear rank-and-file tactics against an opponent armed with magazine-fed rifles, but it was not the only example available to military planners before 1914.[4] The Russo-Japanese war saw disciplined Japanese units succeed in frontal assaults against strong Russian fortifications, though only by sustaining enormous casualties. It was unlikely that European (or American) observers would draw from a successful attack the lesson that the tactics employed were a failure. The French, who chose to emphasize the final results, in the process ignored the element of careful staff work in the Japanese attacks, which Michael Howard characterized as "a combination of careful preparation and fanatical courage."[5] Louis de Grandmaison, the French officer

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[3] Eric Dorn Bose, *The Kaiser's Army: The Politics of Military Technology in Germany during the Machine Age, 1870-1918* (New York and London: Oxford university Press, 2001), 16-25.

[4] Thomas Pakenham, *The Boer War,* (New York: Random House, 1979), 268.

[5] Michael Howard, "Men Against Fire: The Doctrine of the Offensive in 1914," in Peter Paret ed., *Makers of Modern Strategy: From Machiavelli to the Nuclear Age (*Princeton, NJ: Princeton University Press, 1986), 518.

most associated with emphasis on morale factors above the technological, wrote that the Russo-Japanese war "in showing that the forced frontal attack is necessary and possible, dispenses with the need for further discussion."[6] In the British army as well as the French, the Russo-Japanese experience counterbalanced the impact of the Boer War.[7]

Technology was only one factor that produced the stalemate on the western front from late 1914 until early 1918: a long series of social and cultural changes also had an impact. The population boom of the nineteenth century had created a larger manpower pool, and the administrative apparatus of some nation-states had grown efficient enough to take good advantage of the larger populations. Mass armies meant selling the war to the public in ways only hinted at in the previous hundred years: every major belligerent had some form of centralized propaganda apparatus. Unleashing public opinion had the consequence of committing more emotional resources to the fight and making a negotiated peace more difficult to attain. When atrocity propaganda was married to public opinion, a negotiated settlement became less likely, since the goal of whipping up enthusiasm to fight was counter to rational discussions of peace terms. For the Entente, making peace with the Central Powers after depicting them as barbarous savages could negatively affect public support for the government, undercutting the purpose of propaganda in the first place.[8] Such pressures only grew as the war progressed; as more families sacrificed for the cause, it seemed more necessary that their sacrifices not have

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[6] Quoted in Jack Snyder, *The Ideology of the Offensive: Military Decision Making and the Disasters of 1914,* (Ithaca, NY and London: Cornell University Press, 1984), 91.
[7] Timothy Travers, *The Killing Ground: The British Army, the Western Front, and the Emergence of Modern War, 1900-1918* (London and Boston: Allen & Unwin, 1987), 43.

[8] J. Lee Thompson, *Politicians, the Press, and Propaganda: Lord Northcliffe & the Great War, 1914-1919* (Kent, OH and London: Kent State University Press, 1999), 198.

been in vain. Inability to resolve the war by negotiation meant that the decision had to come from the battlefield at a time when decisive battles were hard to achieve.

The American experience of the Great War was different from that of the European combatants, in that American soldiers did not have to endure three years of sacrifice but only entered combat on a large scale in late 1917. As a result, the Americans were "fresh" troops in many respects, and although they had difficult battles, their war did not have nearly so profound an impact on the traditional military outlook as the grinding attrition had on the British, French, and especially the Germans and Russians. The American war differed from the start because the Commander of the American Expeditionary Force, John J. Pershing, insisted on training for open warfare, rather than focusing on the trench battles then underway. By emphasizing maneuver rather than frontal assault, the Americans believed they had the answer to the difficulties faced by the Europeans in the preceding years. Pershing's unwillingness to allow American units to be incorporated permanently into the Allied armies by and large insulated the American soldiers from the influence of the demoralizing stalemate that worked on the other soldiers on the Western front, both Allied and German.[9] American losses were also comparatively low, in part because American units were in combat for a shorter period, and in part because they faced a German Army weakened after three years of struggle. When the American First Army attacked the German salient at St. Mihel, the

[9] Some units did serve piecemeal with the Allies, mainly the French, but with the understanding that the arrangement was temporary. Several of these units were African-American: See Stephen L. Harris, *Harlem's Hell Fighters: The African-American 369th Infantry in World War I* (Washington: Brassey's, 2003) 177-9, and Frank E. Roberts, *The American Foreign Legion: Black Soldiers of the 93rd in World War I* (Annapolis: Naval Institute Press, 2004).

Germans were already evacuating the area to shorten their own defensive lines and save manpower.[10]

The eventual collapse of the German defensive network following the Michael offensive of March-June 1918 restored some mobility to the previously immobile western front. AEF headquarters credited its training with the change: by not preparing for trench warfare the Americans overcame it. Pershing emphasized from the start that "the rifle and the bayonet are the principal weapons of the infantry soldier."[11] His order demonstrates a commitment to an ideal of warfare focused around the rifleman and the offensive spirit. That he chose again to emphasize it in his 1920 report suggests that, at least for him, that ideal had been vindicated. Moreover, Pershing stated in an October 1917 order that the

> general principles governing combat remain unchanged in their essence. The war has developed special features which involve special phases of training, but the fundamental ideas enunciated in our Drill Regulations, Small Arms Firing Manual, Field Service Regulations, and other service manuals remain the guide for both officers and soldiers and constitute the standard by which their efficiency is to be measured...[12]

One way for the Americans to face the challenge of ground combat in the age of machine guns and heavy artillery was to conclude that the conditions produced in southern Belgium and Northern France were aberrations, easily overcome by traditional methods allied to a few new techniques. The new was subordinated to the old; the initiative, discipline, and marksmanship of the individual soldier were still the way to win wars, even if first came a period of static warfare, dependent on technology. By isolating his

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[10] In his report, Pershing acknowledged the German withdrawal, but said that the enemy "had been unable to carry it through." John. J. Pershing, "Final Report of Gen. John J. Pershing, Commander-in-Chief, American Expeditionary Forces" (Washington: GPO, 1920), 42.

[11] Order of October 1917, quoted in Pershing, "Final Report", 15.

[12] Ibid., 14.

forces, Pershing kept them ready to fight, but in the long run it led him to the conclusion that major innovation was not necessary. [13]

For many on both sides of the Atlantic the formative view of the Great War was the trench deadlock of Northern France and Southern Belgium, the cruel waste of the Somme, Passchendaele, and Verdun. While there were other theaters of the war, the English-speaking cultural image focused on what came to be called the Western Front. After the end of the war, none of the countries involved was willing to accept the idea that a potential future war would include such a futile loss of life. So soldiers and interested civilians searched for solutions, ways to break the deadlock. Some of these solutions focused around discipline and improved (or different) tactics. One possibility was suggested by the role artillery played in the latter stages of the war. Artillery could be used more effectively if closely coordinated with infantry advances, a tactic that came to be known as the creeping barrage. In the Great War, technological limitations in wireless communication meant that the artillery set a schedule, and the infantry had to follow it, making rapid reaction to changing conditions impossible. Others turned to machines to survive where men alone could not, in essence proposing to use more technology to nullify the baneful impact of previous technical developments.[14]

One such solution was proposed by advocates of airpower, who envisioned leaping over the mud and death of the front lines, destroying from the skies the ability and will of the enemy nation to continue the fight. Although the specific goals of aerial bombing differed from country to country, the fundamental method of solving the problem was technological. Such techniques and technologies might be seen as a

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[13] Pershing, "Final Report," 16.

[14] Paddy Griffith's *Battle Tactics of the Western Front* (New Haven and London: Yale University Press, 1994) profiles how British leaders searched for new tactics in the face of trench warfare.

fundamental break with established military methods, placing all hope on methods that appeared promising but that were also untested. Other innovators accepted the continued need for ground forces but thought there might be some way to reach a decision within the guidelines inherited from the past.

The tank was one of the technological solutions that offered new means to accomplish traditional missions. It focused on the battlefield, and offered the prospect of restoring mobility and providing tangible accomplishments to offset the loss of friendly lives. Aside from the protection provided from machine gun bullets and shell fragments by the armor plate, the tank also addressed the difficulty of moving across no man's land. Artillery fire so churned the ground that men could barely walk across it, and wheeled transport, animal or motor powered, was practically useless. The tracks of the tank (or the wings of the airplane) promised movement over terrain that humans alone could not conquer.

The promise of the tank never materialized in the Great War. The self-laying track was better than the wheel, but it was by no means perfect. In muddy ground tanks faced difficulties similar to the infantry, and the experience at Passchendaele showed the problems tanks faced in moving through mud. The bombardment before the battle destroyed the drainage systems in the area, so that the depth of the mud had to be measured in feet. Tanks foundered just as infantrymen did in such conditions, and almost two hundred British tanks had to be abandoned to the slime.[15] Added to difficulties with mobility, from mechanical failure as much as from terrain, was the early deployment of tanks in too few numbers to make a real difference in the outcome. Officers such as E.D.

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[15] For the problems with mud at Passchendaele see Robin Prior and Trevor Wilson, *Passchendaele: The Untold Story* (New Haven: Yale University Press, 1996), 138, 160.

Swinton, head of the Royal Tank Corps, argued for use only in mass and on the right terrain, but the need to give the home front a victory forced tanks into service as soon as a few were ready.[16] In any case, no single technology, at the stage of development it reached in 1918, solved the problem created by the new defensive arrangements. The lack of clear-cut success or failure for the methods of machine warfare contributed to a debate between the proponents of tanks, airplanes, and those who had reservations, all based on different readings of the same evidence.

The debate between new and old methods of operating and organization was not limited to the military sphere in the early twentieth century. Advocates of the "modern" way of doing things faced defenders of tradition in most spheres of life, including work, leisure, family life, and culture. Few people tried to understand the whole of modernity, preferring to face change on an issue-by-issue basis, but there were a few basic themes. One that recurs in discussions both of industrial life and of combat in the Great War is lack of control by the average participant. Individualism was drained away by the Army's regimentation, and even more so by the impersonal nature of the battlefield, but in the industrial world these trends accelerated. Personal bravery in the face of shelling required endurance without the ability to retaliate. The gunpowder armies that fought early modern European wars also had to endure the possibility of death from enemy artillery, but had some potential to respond to their tormentors, since they could at least see the guns attacking them.[17] The heavy artillery developed in the late nineteenth

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[16] For complaints about using tanks in inadequate amounts, see A.J. Smithers, *A New Excalibur: The Development of the Tank 1909-1939* (London: Secker &Warburg, 1986), 66, and Kenneth Macksey, *The Tank Pioneers* (London, New York and Sydney: Jane's, 1981), 14.

[17] See John Lynn, *Battle: A History of Combat and Culture* (Boulder, CO: Westview Press, 2003), Chapter 4, and Christopher Duffy, *The Military Experience in the Age of Reason* (London and New York: Routledge and Kegan Paul, 1987), 197-214.

century removed the guns from the sight of the infantry. The loss of individual control in warfare was congruent with the stratification of economic life, with smaller business concerns being swallowed up by emerging giant corporations. [18] For the United States these changes were especially controversial, since American rhetoric focused on the potential reward for disciplined individual labor. Extremes of such mythology were Horatio Alger's novels, but the basic idea that members of society ought to be responsible for their own fate underlay much of the discourse on the changes in economic life.[19]

Technology might be responsible for worker alienation, but in the form of the airplane it provided a possibility of renewed individualism in warfare, although here the gap between public perception and combat circumstances (almost always present in any case) widened substantially as the war went on. The pilots of the various air services provided names for public reporting, and their individual exploits made for good copy. The unorganized nature of early air combat allowed for one or two pilots to go off on their own looking for a fight, but by the end of the war air combat had evolved into more regimented forms, using massed formations of aircraft with more clearly defined goals than simply shooting down enemy planes or barrage balloons, and fewer romantic

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[18] See Alfred Chandler, *The Visible Hand: The Managerial Revolution in American Business* (Cambridge MA and London: Belknap, 1977).

[19] Richard Hofstader and Robert Weibe explain the reform movements of the early twentieth century in terms of traditional elites feeling increasingly powerless in the new economic order, Hofstatder in *The Age of Reform* (Reprint, New York: Knopf, 1972) and Weibe in *The Search for Order, 1877-1920* (New York: Hill and Wang, 1967).

illusions about warfare.[20] Still, the Air Corps got better press, a trend that continued after the end of the war.

Both the armored forces and the air corps depended on technologies that were relatively new; the first heavier-than-air flight had occurred just ten years before the outbreak of the Great War, and the internal combustion engine itself was less than thirty years old. The relative immaturity nature of both technologies encouraged speculation about their potential that went far beyond the actual contributions of tanks or airplanes. One factor that limited the technological contribution to the American war effort was the inability of the United States to produce the implements of technological warfare for itself in the Great War. The U.S. air service had difficulties obtaining enough planes for its pilots, and the American tank corps took delivery of just ten American-built tanks by the end of the war, insufficient for its twelve thousand soldiers. Such failures were particularly galling, since the U.S. was the home of the inventor of the modern assembly line, Henry Ford. Ford obtained contracts to build tanks for the AEF, but by the armistice, his factories had turned out only fifteen.[21] Enlisting industry for warfare, something for which there was only one major precedent in the American experience (the Civil War), proved more difficult than drafting soldiers.[22] Neither soldiers nor civilian officials forgot these difficulties.

The American army in the Great War was composed of draftees, a marked departure from the national tradition of resorting to a draft only when volunteers failed to

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[20] James J Cooke, *The U.S. Air Service in the Great War* (Westport, CT and London: Praeger, 1996), 155. See Linda Robertson, *The Dream of Civilized Warfare: World War I Flying Aces and the American Imagination*, (Minneapolis and London: University of Minnesota Press, 2003) for the romanticization of air warfare.

[21] Dale Wilson, *Treat'em Rough: The Birth of American Armor, 1917-1920* (Novato, CA: Presidio, 1989), 86, 219.

[22] See Robert V. Bruce, *Lincoln and the Tools of War* (Indianapolis: Bobs-Merril, 1956).

fill the ranks. Previous drafts were wartime expedients, but Woodrow Wilson's progressive outlook, and the general trend that Ronald Schaeffer identifies toward greater administrative control by the federal government suggested that the draft would facilitate an orderly transition from peacetime to wartime, without the unruly volunteerism of the early days of the Civil War.[23] Wilson wrote a letter that appeared in the *New York Times* on April 20, 1917, arguing for the draft as a way to select soldiers who "can most readily be spared from the prosecution of the other activities which the country must engage in."[24] While demonstrating an awareness of the ties between civil prosperity and military power, Wilson's letter also evidenced faith in the efficacy of rational government planning, and the need to coordinate the activities of the nation from a central point. Wilson's managerial outlook on the need for a military draft contrasted with that of his Secretary of State. William Jennings Bryan enunciated a nineteenth century worldview when he declared in August 1914 (prior to the worst days of the European war), "The President knows that if this country needed a million men, and needed them in a day, the call would go out at sunrise and the sun would go down on a million men in arms."[25] Bryan's ideal soldiers needed courage and republican virtue to fight effectively. Of secondary importance in his view were technical or tactical skills, attributes that even as he spoke were becoming more and more important on the machine-age battlefield.

Bryan's comment belonged to another age in more ways than one; the decision to draft the army from the outset marked a fundamental change in how the United States

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[23] Ronald Schaeffer, *America in the Great War* (New York: Oxford University Press, 1991), 149-50. Political motives, specifically Wilson's rival Theodore Roosevelt's offers to raise volunteer divisions, were another factor.

[24] *The New York Times*, 20 April 1917, 8.

[25] Robertson, *The Dream of Civilized Warfare*, 66.

waged war. Previously, when an emergency called for an expanded army (and the example that loomed largest was the Civil War), units were raised on a local basis, with soldiers serving in units largely comprised of men they knew and commanded by prominent citizens from their area. Such a system had natural advantages, such as the rapid formation of the "primary group" crucial to combat motivation. One drawback of the system, at least from a regular officer's point of view, was that the survivors of such units had to return home and live side by side again, preventing officers from inflicting unpopular punishments.[26] Such a system also reflected the decentralized American government of the eighteenth and nineteenth centuries, and tended to reinforce it to some extent; soldiers in major wars rarely had to serve with outsiders for prolonged periods of time. The 1917 draft suggested that the opposite would be the case: soldiers in any given regiment might come from a variety of backgrounds.

The army that the draftees entered was in gradual transition, suggesting an evolutionary rather than revolutionary dynamic. Innovation in means of transport did not spread instantaneously through the nation, and the military establishment was no exception. The American Expeditionary Force was in a state of partial motorization; there were eighty thousand motor vehicles in service, and two hundred and forty thousand draft animals.[27] The horses required one set of maintenance equipment and fuel, the trucks another. The Services of Supply reported that during the war the AEF took delivery of almost eight hundred thousand tons of fodder (oats and hay were the

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[26] Gerald F. Linderman, "Military Leadership and the American Experience," The John F. Morrison Lecture in Military History, 4 Oct 1988. Combined Arms Research Library, http://cgsc.leavenworth.army.mil/carl/resources/csi/linderman/linderman.asp. Accessed 9 September 2004, 5-7.

[27] Statistics Branch, General Staff Headquarters, Services of Supply, American Expeditionary Forces, "Some Accomplishments of the Services of Supply." Motor transport on 70, animal on 102.

primary categories), and consumed 93 million gallons of gasoline.[28]. The rise of the internal combustion engine was underway, but the transition was a slow process, and in the A.E.F. the two means of conveyance coexisted.

Civilian society was also in flux in this regard, although by 1917 the victory was going to the engine. The motor was perceived by many to represent the future: animals were the past. Even if large numbers of people still used animal power, particularly in agriculture, one of the hallmarks of "modern" was preference for the theoretically more reliable motor over the animal, which got sick, or tired, and had a temperament to deal with. The reliability of the engine fit into the trend of rationalized control exemplified by the draft.[29]

Social and cultural information provides a backdrop to a country's military activity, but when large numbers of men pass through the armed forces, the effect is reciprocal: army life impacts civilian life as well. For example, the U.S. Army's decision to campaign against venereal disease may have contributed to what David Kennedy refers to as the "demythologizing of erotic life" that slowly occurred over the twentieth century.[30] The broad cultural impact of the war is more difficult to measure precisely, especially in America. The European experience, at least in the West, was longer and costlier than the American. The French surrender in 1940 stemmed in part from the massive slaughter at Verdun, and the impact of the war in Germany was severe enough to

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[28] Statistics Branch, "Some Accomplishments of the Services of Supply." Fodder statistics are page 92, gasoline is 103.

[29] Schaeffer, *America in the Great War,* 148.

[30] David M. Kennedy, *Over Here: The First World War and American Society* (New York and Oxford: Oxford University Press, 1980), 187. On the following page Kennedy notes a more trivial change: the Army's decision to issue safety razors affected "the shaving habits of a generation" (188).

produce first the Spartacists (communist rebels), and later the Nazis.[31] In the United States, where fewer than two hundred thousand soldiers died (not all in combat) and victory came within two years of the declaration of war, the impact was not quite the same. Disillusionment eventually came, but it came in a particularly American way, accepting the complaints of agrarian rebels at the end of the nineteenth century about entrenched financial powers and suggesting that this was the real reason for American entry, not the high ideals preached by Wilson's propaganda machine.[32] The soldiers themselves tended not to disavow their experiences to a great degree, as was the case in Europe, but instead usually viewed their service in a positive light.[33] Still, for much of the 1920s and 30s, they expressed the desire not to repeat it. Any thinking about military innovation had to take into account what the composition of future American armies would be. If innovation was to succeed, it had to be acceptable not only to theorists, but to soldiers as well.

The lack of a strong impetus for radical change in the ground forces of the American army meant that in the twenty years before the outbreak of another European war Americans debated without feeling pressure to define exactly what a modern military should look like. How modern an armed service was would prove very important to their performance in the mid-twentieth century. There was no single path to military

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[31] David Mason, *Verdun* (Gloucestershire, UK: Windrush, 2000), 193. It is interesting to note that the disillusionment often associated with the war did not seem to reach Hitler.

[32] For resistance during the war, see Jeanette Keith, *Rich Man's War, Poor Man's Fight*, (Chapel Hill: University of North Carolina, 2004). Arthur Ekirch covers postwar reluctance to institute military training, in *The Civilian and the Military: A History of the American Antimilitarist Tradition* (New York: Oxford University Press, 1956).

[33] Mark Megis and David Kennedy both suggest that soldiers' letters during and after the war reveal perceptions of their experience as useful and necessary even after the fact, in contrast to growing postwar disillusionment in Europe. Kennedy, *Over Here,* 216-230, and Megis, *Optimism at Armageddon: Voices of American Participants in the First World War* (New York: New York University Press, 1997), 199-205.

modernity, just as there was no single path to civilian modernity. That the Great War provided guidance was obvious; what was less obvious was whether the lessons distilled from the Western front would be useful in the next war.

CHAPTER ONE

COMPETING VISIONS OF THE FUTURE, 1920-1939

About two months after the Armistice that ended the Great War, a group of officers from the American Expeditionary Force met in Chaumont, France. Named the Westerveldt board (after its chairman), the group had orders to evaluate the utility of the equipment issued by the army in every area from small arms to artillery transport.[1] Over the next four months the board's seven brigadier generals and Colonels interviewed allied and American generals, examined captured or surrendered German equipment, and visited defense manufacturing plants in France. They issued a final report May 1919, in which they called for a comprehensive program to alter almost every piece of equipment the army issued. Although the majority of their recommendations related to weapons (the board acquired the informal name of "Caliber Board" for that focus), they did endorse the engine over the animal as artillery's prime mover.[2] The experience of war had provided a modernizing impetus, making it certain that the Army and the motor would forge an even closer relationship in the future. Both the civilian and military worlds had faced, and continued to face, similar issues over how new technology would evolve, especially in transport and communications. After the Great War, the Army clearly felt that something had to be done, but the recent collective experience provided few certainties about

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[1] War Department Special Order 289-0, 11 December 1918, cited in Constance McLaughlin Green, Harry C. Thompson, and Peter C. Roots, *The Ordnance Department: Planning Munitions For War,* (Washington: GPO, 1955), 169.

[2] Ibid, Caliber Board Report, 31.

exactly what that might be. Civil society had few certainties either, but different pressures shaped how the Army and civilian worlds embraced modernity.

Understanding the evolution of military technology in the period between 1918 and 1939 necessarily involves understanding what its creators planned to do with it, as well as the intellectual and cultural context of the time. The Great War came at the end of a long process of industrialization and economic concentration in the nineteenth century. The United States came somewhat late to the race, but embraced the promise of knowledge and technology, though not without some growing pains. Ideas of agrarian virtue had trouble fitting into the new industrial society, and these tensions played out in the Populist movement of the 1890s. William Jennings Bryan had been a major champion for the movement, and would emerge as a leading spokesman for the post-1918 religious opposition to modernity's social and cultural consequences. Exactly what form a modern society should take underlay many of the debates of the first half of the twentieth century, and it is no surprise that the military became embroiled in this process. There were no clear answers to many of the questions raised by modernity, but how the debates of the 1920s and 30s played out influenced how the future unfolded. In military matters decisions made in the years after 1918 affected what was possible for the American military establishment to accomplish when war broke out in 1939. Civil society provided a framework for those who came of age after the Great War to judge the success or failure of any particular method or device. To understand the debates taking place between 1918 and 1939, it is first necessary to try to pin down a very elusive thing, the concept of modernity.

Part of modernity was industry, the use of machines to replace human labor. Industrial society itself provided some sharp changes from the long agrarian history of the western world. Although the move toward an industrial society had begun in the eighteenth century, it had taken different forms, varying from country to country, often according to the timing of the change, and the specific forms industrialization took in different cultures. All of the changes had led to upheaval in the nineteenth century, as the fundamental economic structure changed, and the patterns of life and thought shifted in response. These shifts led to the breakdown of certainty, expressed in the words of social critic Karl Marx that "all that is solid melts into air."[3] A hundred or so years later the problem remained: pioneering sociologist Robert Lynd wrote "for the individual it [modern life] is a pattern of extreme complexity, contradiction, and insecurity."[4] Marx and Lynd, although separated by time, sought answers to the same problem, the rapid change that forms one component of modernity. The modern world resisted easy categorization in pre-industrial terms, and so new categories had to be created, with few established guidelines.

Another element of the modern world is the increasing disjunction between the concepts of technological achievement and social or moral progress. William Blake felt the industrial concentrations of his day were satanic, and Marx was concerned that technical progress had the social impact of mechanizing the worker. Even today historians debate the consequences of industrial progress. Contrasting Renaissance

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[3] Karl Marx and Frederic Engles, edited by John E. Toews. *The Communist Manifesto* (Boston, New York: reprint, Bedford/St. Martin's, 1999), 68.

[4] Robert Lynd, *Knowledge for What? The Place of Social Science in American Culture* (Princeton: Princeton University Press, 1939), 105.

understandings of the cost of battle with the literature of disillusionment produced in Western Europe after the Great War, Yuval Harari suggests that the aftermath of the Great War was conditioned by complaints about worker alienation which dated from the previous century, the century of industrial development.[5] Modris Ecksteins offers a causative view in *The Rites of Spring*, arguing that the industrial revolution impacted warfare in the twentieth century in ways more profound than just producing more and deadlier weapons, or even in transferring the dehumanizing process understood to take place in the mills to the battlefield.[6] The culture of industrialization also provided categories for interpreting the experience of warfare, ways for the participants to organize their physical stimuli into a coherent whole, as much as the often chaotic nature of battle allowed.

The change from natural to mechanical rhythms was another feature of the modern world, one ongoing for almost a hundred years by the beginning of the twentieth century. The burden on workers to adapt to the pace of machines was one of Karl Marx's complaints about the first half of the nineteenth century, although the process had moved beyond work by the early twentieth century. Lynne Dumenil suggests that the root cause for the alienation often noticed by nineteenth century observers led to the twentieth century's fascination with leisure and entertainment as places to find satisfaction, rather than at work.[7] Few seriously argued that the underlying economic structure had to be undone, but the problems arising from the industrial world had somehow to be solved.

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[5] Yuval Noah Harari, "Martial Illusions: War and Disillusionment in Twentieth Century and Renaissance Military Memoirs". *Journal of Military History* 69, (Jan 2005): 71.

[6] Ecksteins argues that modernism in art impacted how participants understood the Great War. *The Rites of Spring: The Great War and the Birth of the Modern Age* (Boston: Houghton Mifflin, 1989), xvi.

One aspect of the modern American mind that was prominent in the first third of the twentieth century was the perceived ability of expertise and technology to overcome the problems facing mankind. Advertising was one place where the faith in progress was reflected; praise of Henry Ford's efficiency was another. Yet as promises of future ease and comfort abounded, so too did difficulties posed by the ongoing change in human affairs. The culture of the machine age seemed dystopian to many who were driving the very change; Henry Ford built a pre-Disneyland replica of a small American town in Dearborn, Michigan, just as his factories and autos were fundamentally changing that very way of life. Such contradictions were inherent in the military as well. George Patton rose to his greatest fame riding on tank treads, but he had a neoclassical view of war, absorbed in part from his education in Greek and Roman military writings.[8]

Another part of modernity, both military and civilian, was speed. Economic life and ground warfare before the early nineteenth century largely moved at the pace of muscles, be they human or animal. Then the railroad sped up the movement of people and things to storefront and battlefield, while telegraphs provided faster communications than physically carrying dispatches.[9] Where the rail and the telegraph required a great deal of labor before they were usable, the next generation of communication and

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[7] Lynn Dumenil, *The Modern Temper: American Culture and Society in the 1920s*, (New York: Hill and Wang, 1995), 58.

[8] Patton's education was not atypical in the period of his youth, where he absorbed writings on such figures as Alexander the Great, and wrote that they, not their soldiers, bore the main responsibility for success: "Alexander, not Macedonia, conquered the world...Cromwell, not the roundheads, dethroned Charles." George S. Patton, Jr. lecture, "The Secret of Victory", 1926. Martin Blumenson, *The Patton Papers, 1885-1940, Volume I,* 866. See also Steve E. Dietrich, "The Professional Reading of General George S. Patton, Jr." in *The Journal of Military History* 53, (Oct., 1989): 388-9.

[9] The new technology too relied on paper to connect with the end user, and in many respects the radio system of the Second World War did as well; the files of the 66th Armored Regiment contain hundreds of small pieces of paper with message fragments to be relayed up or down the chain of command, the smell of tobacco smoke still clinging strongly to them. 66th Armored Regiment files, USAMI.

transport technology allowed more spontaneity. Radio transmitters and receivers were more portable than the apparatus required to string telegraph wire, and automobiles had better off-road capability than trains. The modern world began to move faster and faster, and people who wished to keep up had to adapt to the tempo.

Workers especially had to adapt to a more rapid form of production. Henry Ford's production line made automobiles accessible, but the pace for the workers on the line could be brutal. The problems of the machine age did not go unnoticed at the time, although few were flatly opposed to some degree of mechanization. One so opposed was Walter John Marx, whose *Mechanization and Culture* challenged the assumption that more machines were better for the world, and suggested that the opposite was the case. He made explicit the conflict between the competing visions of technological modernity, arguing that the use of mechanical contrivances undercut the independence of the human spirit.[10] Walter Marx also tied the decline of agrarian values to the decline in military prowess (which he viewed in traditional terms), and pointed to the British difficulties in the Great War, when he claimed over half the draftees from urban areas had to be rejected for poor physical condition.[11] Value systems and standards of judgment had to be modified as a consequence of the industrial age, and Walter Marx did not like the way they were headed.

Automobiles were the most prominent area of life in which modernity was equated with the latest technical innovation, in part because of market conditions. Economic change had an impact on how Americans viewed the role of technology in their daily lives. Industrial production in the U.S. in the 1920s reached the point where

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[10] Walter Marx, *Mechanization and Culture,* (St. Louis, Mo., and London, B. Herder, 1941), 193-94.

[11] Ibid.

many who could afford durable goods had already purchased them, just as clothing manufacturers had in the 1850s in Britain.[12] Manufacturers turned to new means to preserve their sales, one of which was color-coordination and fashion in household fixtures.[13] Another, particularly in automobiles, was the promotion of new technical features each year as important improvements. Each year's cars had various improvements, from hydro-static transmissions to leather seats that were meant to distinguish them in an environment where many who wanted a car already had one. Performance characteristics were also advertised without any discussion of the role they were intended to fill.[14] The overall impact was to create a framework of judging technology in terms of newness and performance statistics rather than how well it fit the task at hand.

One technology which profoundly impacted the early to mid twentieth century was the motion picture. Soldiers often commented that the movies did not prepare them for the reality of battle, and even that screen portrayals of combat created dangerous false expectations.[15] Unless American recruits (or draftees, after August 1940) were combat veterans or had an unusually candid relative, one of their potential models for the nature of warfare lay in the cinema. The importance of war films can even be inferred in the negative comments about them; soldiers who complained that the movies got it wrong

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[12] Roland Marchand, *Advertising the American Dream* (Berkley: University of California Press, 1985), 120 and Eric Hobsbawm, *The Age of Empire* (New York: Vintage, 1987), 49.

[13] Marchand, *Advertising the American Dream,* 124-5.

[14] See for example, the Advertisement for Champion Spark Plugs facing page 1 of the 2 May 1938 issue of *Life,* or the advertisement for the "completely new clear through" Studebaker on page 1 of 16 May 1938 *Life*, or the page 1 of the 10 October 1938 *Life*, advertising the new Plymouth "all-silent Auto-mesh transmission".

[15] Peter Kindsvater, *American Soldiers: Ground Combat in the World Wars, Korea, and Vietnam* (Lawrence, KS: University Press of Kansas, 2003), 290.

presumably were familiar with actual combat. Movies became a more important part of American life every year. Roughly forty million people went to the movies every week in 1922; by 1929 that figure had doubled. The Depression reduced movie attendance; peaking at ninety million in 1931, it dropped to an average 75 million weekly viewers in the next decade.[16] While movies were a source of impressions, their accuracy in military affairs was often questionable at best.

How did military technology figure in the war films of the twenties and thirties? The most positive role was reserved for the airplane. Pictures that focused on Great War aviation emphasized the ideas of knights of the sky, and generally avoiding the idea that the war's cost was too high. The same cannot be said of the majority of ground war films, at least until 1941's *Sergeant York* reversed the trend of focusing on the futility of trench warfare. Indeed, the separation is almost total; movies usually either covered the trenches or the skies, rarely both. Numerous movies, most famously *Wings!,* celebrated the daring and skill of the pilots of the Great War, while others decried the waste of the muddy stalemate on the ground, the most notable example of which was the movie version of *All Quiet on the Western Front.* The relative paucity of accurate information about combat and military affairs meant that few in civil society formed conscious standards by which to judge military activity. Military technology was not something about which the average person saw a great deal of information in the 1920s.

Before the Great War, military technology was largely the realm of navies, since some manner of man-made vessel was needed even to go to sea, much less fight there.

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[16] United States Census Bureau, *Historical Statistics of the United States, Colonial Times to 1957.* Washington: GPO, 1960), 225. Although 1936-37 came close to regaining the high with 88 million weekly moviegoers, the 1930 total would not be equaled until after the war, in 1946.

After 1920 the Navy continued to be in the news in stories about new construction and fleet maneuvers, but the stories about ships and sailors were joined by stories about air technology, and occasionally, mechanized ground technology. Much of the discussion about tanks after the mid 1930s came from one of two sources: Hitler's rearmament of Germany, or the conflict in Spain. Hitler was an unknown quantity, and the circumstances of the Spanish Civil War usually argued that tanks were of marginal utility. *The New York Times* noted that tanks were not having a great impact in the Spanish Civil War, and *Life* noted that the tanks the Soviet Union provided to the Loyalists in Spain had at first raised the USSR's prestige, but then had the opposite effect as they proved less than useful.[17] Occasional mention was made of military mechanization; *Life* on January 4, 1937 carried a photo of a German half-track in their regular section titled "The Camera Abroad". The caption suggested "In the next war, according to the military experts, the premium will be on mobility."[18] Yet, the emphasis of the photo was on transport, not combat mobility. The soldiers in the picture were in an open-topped half-track, not protected from the deadly environment of the modern battlefield.

The promise of technology extended to all areas of life, even food. Enriched white flour and infant formula were creations of the first third of the 20th century, both promising better nutrition through science. Images of tanks cropped up in these circumstances, too. One heavy tank of Great War vintage even made a small appearance

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[17] See for example, Hanson Baldwin, "Spain's War Gives Edge to Defense; Infantry Still Superior to the Mechanized Forces, European Military Strategists Find", *The New York Times,* June 7, 1937, or Malin Craig, Infantry Supreme in war, Says Craig; China and Spain Show Tank and Plane 'Valuable Auxiliaries' Only, He Holds" December 6, 1937, 1.

[18] *Life*, January 4 1937, 55.

in a 1937 advertisement for Jelke's Good Luck margarine. As AEF soldiers jumped into a German trench with fixed bayonets, a tank rolled over the same trench in the background, all bolstering the claim that "The A.E.F. won its victories on **margarine!**"[19] That a weapon so radical a few years before was now selling synthetic butter suggests that tanks were accepted as part of the symbolism of modern ground combat in the public mind. Moreover, the modern nature of the AEF was demonstrated by the trust in the manufactured product of margarine, rather than the natural (and therefore less uniform and reliable) butter. Improvements through technology were not limited to food, though. A Goodrich Rubber company advertisement from 1937 promoted the company's work on rubber for tank treads, suggesting that metal treads were so noisy that tank crews had to go slowly for the sake of their nerves. Goodrich's innovation, moreover, promised a five-fold increase in speed and durability over all-steel treads.[20]

Tanks appeared as part of news items more often than in advertisements; a Japanese move into a Chinese city might be illustrated by a single tank and rows of marching soldiers, and a story on a German harvest celebration might note that the festivities included a rehearsal for a tank attack.[21] The news coverage of the German takeover of Austria usually noted in passing that tanks and motor vehicles were involved in the event. The 27 December 1937 issue of Life magazine implied a link between Nazism and war machines in an article titled "Christmas in Naziland." The text of the article cited a preexisting German fascination with machines that the Nazis turned to

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[19] *Life*, September 27 1937, 109.

[20] "Over the Top 5 times faster with GOODRICH RUBBER", Life, July 19, 1937, 14. Goodrich also claimed that their new tracks eliminated the danger of warning the enemy with the clanking of steel treads.

[21] *Life*, 25 October 1937, 101.

military aims. One of the accompanying photos conveyed the impression of the re-militarization of German society, as a child rode a toy tank on a department-store display. The tank in question was not a generic model, but an accurate illustration of the *Wehrmacht's* lightest tank, the Panzer I.[22] Tanks (ironically, French-made) were used as symbols of American participation in the Great War by the VFW in its major recruiting drives in the early 1920s, but the tank never seemed to acquire an "American" aura.[23] Tanks were an accepted part of warfare, but not central to how Americans fought, or planned to fight. Aircraft, military and otherwise, did seem to fit more readily the American self-image. The Wright brothers had been American, while the tank was widely recognized as a British invention. There was at least one attempt to marry the two concepts in 1932: the biplane tank involved attaching a set of wings to an armored vehicle, thus realizing the ultimate combination of mobility and battlefield hitting power.[24]

The year 1938 brought a war scare to the world, as Hitler demanded the Sudeten rim of Czechoslovakia be added to his greater Reich. President Roosevelt commented positively on Britain's and France's decision in September to accept Hitler's demands in return for peace in the future, but he also began to prepare the United States for a role in any upcoming conflict. In December 1938, *Life* carried a twelve page discussion of rearmament, with the overall suggestion that the country was woefully under-prepared for

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[22] *Life*, December 27 1937, 60. The illustration immediately below it is of an adult firing a realistic mock-up of a machine gun at the same department store.

[23] *Life* carried a picture of one such drive in a retrospective on the American Legion, undated but implied to be before 1920, with a speaker standing in front of a light tank. 4 October 1937, 32.

[24] Joseph Corn, Brian Horrigan. *Yesterday's Tomorrows: Past Visions of the American Future.* (Baltimore: Johns Hopkins, 1984), 116-117.

war. The opening photo was a view of New York City from the nose of what appeared to be a B-17 bomber, captioned "Bomb-Sight on the Battery". The choice of an airpower lead suggests the editor thought that air emphasis would best reach his perceived audience.

The next photograph went to the opposite extreme on the technological scale, focusing on the standard infantry rifle. Even here the focus was technical, noting the improvements of the M1 Garand over the 1903 Springfield rifle. On pages 46 and 47 the article turned to the problem of mechanization, with a two-page spread on the 7th Cavalry brigade, (Mechanized). The caption cautioned readers that while prior discussion on the subject might have given the impression that machines would make up for the Army's small size, making it a "swift, compact, and terrible Army on Wheels", such was not the case.[25] Henry Luce, the publisher, believed that rearmament was in the U.S. national interest, and the idea that mechanized troops could get the job done with fewer resources worked against his goal. The article suggested that the United States did not want or need mechanized troops in the German mold. The reasons could be traced, ultimately, to the differing strategic situations of the two nations, although that reference was not made directly in the article itself. One underlying assumption was that the United States had time to convert industries to wartime production, thus would be better served by a longer war. The discussion on mechanization argued that such units were useful for sharp advances and rapid maneuvers, but were less useful for steadily taking and holding ground, activities more suited for traditional infantry, and even horse cavalry.[26] Horses themselves were not relegated to the obsolete past, but were still considered useful for

[25] *Life*, 18 Dec 1938, 46.

[26] Ibid., 47.

movement in extremely rough terrain.[27] These views might have come straight from the Army's own manuals, though not the internal discussions of armor advocates. Judging military affairs was becoming increasingly difficult for civilians, and seemed best left to experts, as were the more technical aspects of everyday life. The rise of technical expertise added another set of criteria to discussions about national defense.

Competing experts complicated the interpretation of military affairs. Airpower in particular was problematic, even without reference to competing expert opinions about the efficacy of attacks on civilian populations. A photo in the 30 August 1937 issue of *Life* provides some insight into the difficulties of extrapolating wartime experience from peacetime maneuvers. The photo in question depicted a biplane seeming to strafe a group of soldiers on an open road at Camp Ripley, Minnesota. The headline was "The Army Finds Almost Everything Wrong with this Picture," and the text noted that while photographers liked such dramatic images, they were at odds with how such events would occur in wartime. The Army informed the press that soldiers walking without cover or machine guns would be rare in war conditions, and they would attempt to shelter in the woods near the road.[28] The Army's intent was to offset what it perceived as civilian preoccupation with dramatic images with its own specialized military knowledge. But the case was not closed; not long thereafter a letter from Lt Colonel John Carter, of the 205th Infantry Regiment, appeared in *Life*. Positioning himself as a competing expert, he noted that the plane in question was flying very low, and would not have given much

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[27] The closeness of equestrian life might be inferred from a comment Robert Grow made about his time at Fort Knox, to the effect that there was nowhere better for thinking than while riding a horse. Grow was not sentimentally attached to horse on the battlefield, but it seems he still had some attachment overall. "The Ten Lean Years," 60.

[28] *Life*, 30 Aug 1937, 25.

warning; nor would the ground troops be able to offer much defense since it would be gone just as quickly.[29] Lt. Colonel Carter also tried to establish his credentials as a military expert by suggesting the troops involved were from a headquarters unit, and as such would indeed be lightly armed. In the early 1930s, few possessed the specialized knowledge to approach the problem of modern war, and those who did were often not in agreement about its particulars.

Military affairs in the mid-1930s grew in importance, reaching a climax by the end of the decade. Hearings before Congress in 1934 and 1935 resulted first in the Nye Commission report, which provided evidence for those who believed that financiers and munitions makers were behind American entry in the Great War, and then in a series of Neutrality Acts, which attempted to prevent a reoccurrence of the situation. The nation's faith in machines to bring about a better world had to be tempered, the report noted, with the realization that war machines had not led to "progressive civilization," which was presumably one without the need for arms manufacturers.[30] A series of laws from 1935 to 1939 forbade sales of war materials to either side in a conflict, travel by Americans on belligerent ships, or even transport of weapons to neutral nations for later shipment to warring powers. The Neutrality acts reflected a desire to stay out of war that seemed to resonate with the American public. Throughout 1939 it became clear that Hitler was not afraid to provoke another war in Europe; when he did so on 1 September, 1939

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[29] *Life*, 20 Sept 1937, 9-10. One wonders how the strafing run could do a great deal of damage without remaining over the target for long, and the WWII experience suggests that ground attack planes needed to linger over targets for maximum effect.

[30] The full sentence is "The committee finds, further, that the very quality which in civilian life tends to lead toward progressive civilization, namely the improvements of machinery, has been used by the munitions makers to scare nations into a continued frantic expenditure for the latest improvements in devices of warfare." Report of the Special Committee on Investigation of the Munitions Industry, U.S. Congress, Senate, 74th Congress, 2nd session, February 24, 1936, section IV.

Americans surveyed usually felt sympathy for England, France, and especially Poland, but also did not want to become directly involved. The majority preferred to avoid direct participation with complete neutrality while others advocated material assistance to the allies, so long as that assistance did not consist of American soldiers.[31]

Whatever the positive images of machines and technology in American culture, those ideals were only slowly realized outside the factory floor. The pace of change in the U.S. suggests an evolution toward modernity, rather than an overnight revolution. Although the number of automobiles registered, gasoline consumed, and miles traveled rose steadily from 1900 until 1940, the most dramatic increase in the number of registered automobiles (including trucks) came between 1910 and 1920. There were fewer than half a million registered automobiles in the United States in 1910, and 19.2 million horses. Ten years later the census recorded over nine million automobiles, and a slight increase in the horse population, up to 19.7 million.[32] Animal power and motor power were competing for transport and work as well, but on the farm, motors were gaining faster than in other areas of society. Tractor use on farms rose from about a thousand in 1910 to around a quarter million in 1920, slightly under a million in 1930, and 1.5 million in 1940. In 1924 autos displaced horses in sheer number in the United States, and then the difference was slight, 17.3 million horses compared to 17.6 million autos of all types; including about fifteen million registered passenger cars. By 1930 passenger cars outnumbered horses by over ten million.[33]

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[31] Hadley Cantril and Mildred Strunk, *Public Opinion, 1935-1946.* (Princeton, NJ: Princeton University Press, 1951), 967-8.

[32] Census Bureau, *Historical Statistics*, 462, 289.

[33] Ibid., 284-5.

Automobiles required repair and maintenance. Horses required fodder and harness, shoeing and brushing, but are self-sustaining organisms not requiring external regulation of their sustaining processes. Early in the century there were few specialized auto repairmen; work on autos was often done on an ad hoc basis by someone who possessed a general knowledge of machinery (or metal; blacksmiths occasionally filled the role). Until 1940 the census did not make note of what type of repair work an employee did, lumping together bicycle, radio, auto, railroad and office machine repairmen. Nonetheless the rise is still notable; three hundred thousand repair workers in 1900 increased to over 1.3 million in 1930. By 1940 there were more auto repairmen than there were repairmen of all types in 1900.[34] Mastery of the new technology usually meant individual economic advancement, even during the Depression years. The internal combustion engines which formed the backbone of both mechanized and motorized forces needed attention of a different sort, and an entirely different group of material support, with gasoline and lubricants displacing hay and oats as the primary consumables for the iron horse of the new cavalry. In order to make use of the new technology, a country had to have the capacity to produce the new commodities, and also produce workers familiar with their use so that there would be a pool large enough from which the military could select men who had the potential to be soldiers. The population also needed to be sufficiently technology-minded that the army could reject men (even if they possessed sufficient technical knowledge) if they failed to meet physical or disciplinary standards.

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[34] Census Bureau, *Historical Statistics*, 76-7.

The promise of technology to improve every area of life has long had a place in both American life and imagination. The 1920s and 1930s in particular saw the development of what might be called technological futurism, or even technological utopianism. Predictions for how daily life would be changed in the future by various devices and machines were standard, but the most striking were those centered on the airplane. Joseph Corn's *Winged Gospel* notes the tendency of the most extreme prophets of civilian aviation to appropriate the language of Christian eschatology, from various published evangelists to an elderly African-American Mississippi woman who offered to pay Charles Lindbergh to fly her to heaven and leave her there.[35] Fantastic accounts aside, the airplane became part of the American ideology of individualism in the same way as the auto, promising individual mobility to the masses. Airplanes were promoted as promising freedom in three dimensions, thus solving the crowding and traffic issues created by the industrialized, urban world. The solution was more technology, not less. In these visions technology, far from being incompatible with human freedom, provided a liberating impulse and even fostered a sort of economic democracy.[36] On a practical level, repairmen and shops for automotive technology were more common than those for air technology. Airplanes rapidly became "high" technology, which might be defined as technology beyond the grasp of the average citizen; automobiles were in a similar position in the first decade or two of the twentieth century but became less so as time wore on. Aircraft, despite predictions that they would eventually replace motor cars as

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[35] Joseph Corn, *The Winged Gospel: America's Romance with Aviation, 1900-1950*, (New York: Oxford University Press, 1983), 13. Corn uncovered an example of a more general faith in machines in a letter to Thomas Edison, in which the writer purported to have invented a machine capable of conveying people to heaven, but was afraid to share it with Edison in the fear that Edison would steal it and profit by operating it, leaving the writer to his "earthly struggle."

[36] Ibid., 91.

the transportation of the masses, never moved into the home or the average mechanic's shop.[37]

The image of technology (military or not) in the public eye promised total solutions, not incremental ones. One difficulty with finding reasoned discussions of the role of technology comes from taking the image of technology from advertising, where naturally the claims would be more extreme than in a more disinterested medium. Roland Marchand notes in *Advertising the American Dream* that "Advertising stories do not have unhappy endings; nor do advertising parables preach hard lessons."[38] Such media were unlikely to present a balanced view of the technological approach to solving the various problems of the world, especially not the ones invented for the purpose of selling the advertised product. However, advertising is not the only medium that reflected the influence of technology. The Americans' view of themselves as a nation of machine-lovers and tinkerers was reflected in the mythology surrounding inventors and industrialists, such as Henry Ford and Thomas Edison. The decades between 1900 and 1930 saw a rush of inventors trying to capitalize on the changes taking place in society by filling the new need with technology. The most patent applications for new inventions before 1940, almost ninety thousand, were filed in 1929. Only twice in the preceding decade had the number of yearly applications dropped below eighty thousand, more than double the 1900 total of thirty-nine thousand.[39] Innovation is more than patenting a device or design, however, since many patents did not lead to successful products. The

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[37] Ibid., 110.

[38] Marchand, *Advertising the American Dream,* 227.

[39] Census Bureau, *Historical Statistics,* 607. More patent applications succeeded in 1932 than any other year between 1796 and 1957.

process of innovation is not always fully rational, but relies on a complex interplay between creator and user. However slowly new devices spread, especially during the Depression, the *ideal* of the American as an enthusiastic gadgeteer remained. Charles Kettering, the inventor of the automobile self-starter, also created a rig by which a tractor could be steered by the same reins used for animal plowing. Kettering represented the positive view of the rapid change of modernity, once arguing that "the world isn't finished. Nothing is constant but change. We work day after day, not to finish things, but to make the future better."[40] Thus, even as more complex models operated, the implication was that a useful invention would find an audience, while an unnecessary one would not.

The ability of a government or army to adapt to the changing social conditions of its day was directly related to its ability to prosecute wars effectively. Germany after 1933 was ruled by a party that tried to preserve the technical and economic achievements of the modern era while reverting to the social and cultural forms of another. The movement was modern in some respects, but anti-modern in others.[41] The Soviets were modernists in many respects, although the paranoia of Josef Stalin often went against initial Bolshevik trends. The United States was the example to which the Bolsheviks turned, at least initially, for inspiration in making full use of machines in as many spheres of life as possible.[42] The most difficult issue for the military sphere was what role

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[40] *Life* Oct. 25, 1937, 78. Kettering's invention of an automated biplane capable of dropping a 100 pound bomb had not found an audience with the Army, though given that it was only marginally more effective than an artillery piece and much more expensive this is perhaps a good thing.

[41] For Nazi anti-modernism in the medical field, see Michael H. Kater, Doctors *Under Hitler,* (Chapel Hill and London: University of North Carolina Press, 1989), 38-40.

[42] Rene Fulop-Miller, translated by F.S. Flint and D.F. Tait., *The Mind and Face of Bolshevism*, (London and New York: Putnam, 1929), 41-3.

machines should play in combat. Artillery and troop transport had reasonable civilian parallels, but the battlefield had a different set of standards. To distinguish the two, the terms "motorization" (for transport) and "mechanization" (for combat) came into use, although not without some confusion. The goal of motorization was more or less the same in every nation that adopted it; trucks would be used to save the muscle of the soldiers for combat. The design characteristics of armored machines designed to fight differed a great deal among nations, based on the role intended for them by the army that commissioned them.

Different military requirements and cultures produced different tank designs in the 1920s and 30s. The French, planning for a protracted war on a battlefield of moderate size, focused on survivable tanks without any great concern for attacking the enemy command and control. The French idea of the Methodical Battle was intended to win through sustainable combat power. Panzer advocates in Germany planned not to attack the bulk of enemy forces, because doing so could lead to the long war that the French needed and the Germans feared, based on their experience in the Great War. The Panzer pioneers in German planned to attack the command and control of the enemy army, defeating the nerves rather than the muscles, and avoiding a prolonged war.[43] The Soviets planned for a fleet of tanks that could do both; their Deep Battle concept involved battles of annihilation and swift movement.[44] For soldiers, the speeding-up inherent in

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[43] Robert Citino argues in The *German Way of War: from the Thirty Years' War to the Third Reich* (Lawrence, KS: University Press of Kansas, 2005) that Germany's strategic position (and Prussia's before that) had led German leaders to search for ways to fight short, decisive wars.

[44] For the French, see Eugenia Kiesling. *Arming Against Hitler: France and the Limits of Military Planning* (Lawrence: University Press of Kansas, 1996) For the Germans and Russians see, Mary Habeck *Storm of Steel: The Development of Armor Doctrine in Germany and the Soviet Union, 1919-1939* (Ithaca and London: Cornell University Press, 2003).

modernity appeared as problems of command and control. The modern battlefield had grown in geographic scope, driven by increased weapon ranges and army sizes. A more difficult issue was speed of thought. Information about enemy location, capabilities and intent had to be acted on in much less time than in previous wars. The German response to the problem was to disrupt the process in their enemies, while hoping to maintain their own.

A paradox of mechanized warfare was that mid-level officers in the mechanized age had both more and less freedom. Units could move very quickly compared with their horsed or pedestrian predecessors, but there were more units moving, on a larger geographic scale. The same held true for American business, where previously independent operatives had to report to a central hub more often.[45] The increased number of mid-level decision-makers, be they local managers or Lt. Colonels, reflected the changed needs of the organizations. The change in scope and speed meant that decisions previously undertaken at lower levels of command moved up the chain of command, but that the speed of events might leave higher-level commanders less well-informed. In those circumstances the officer on the scene had to make the decision, hoping it would be retroactively approved.

The increase in communications speed facilitated a shift in command responsibility. Officers widely separated by geography could communicate faster than had their predecessors, and thus what was needed from the mid-level commander was not the ability to act decisively in all situations (although instances arose where that need remained) but to report situations accurately up the chain of command. Thus, the Army

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[45] Chandler, *The Visible Hand*, 413.

was torn between control and initiative; too much control might lead to ossification, while too much initiative from below might upset the strategic plan necessary for overall victory. The new command and economic arrangements were increasingly complex and fragile, leading some to wonder if it would not also be more easily disrupted than their predecessors.

Airpower was the most extreme technological method of attacking an army's nervous system. Its advocates refined their theories after 1918, focusing on attacking the areas that the ground forces protected. Rather than bother with ground warfare, airplanes would strike directly at the heart of a nation, either slaughtering so many civilians that their leaders would sue for peace, or so disrupting the economic fabric of the nation as to render continued warmaking impossible. The very technological complexity of modern economies thus supposedly rendered them more vulnerable to disruption than in the past. The Air Corps, cognizant of its own dependence on technology, naturally looked to deprive its enemies of technological support. In the context of the 1920s and 30s, the promise that the Air Corps held out of winning wars with minimal cost held greater attraction than another ground war, however improved.

While soldiers debated the new shape of battle, the civilian world questioned whether they should fight at all.[46] The situation became so grave that least one officer called for direct confrontation. "The smooth and oily speech of the pacifist," warned Willis Crittenberger in 1925, if it caused the country to be unready to fight, would not put a stop to war, but "invite invasion and subjugation." He also suggested that distaste for war was normal, but questioned whether "the instrumentalities of man are capable of

[46] Arthur Ekirch's *The Civilian and the Military* locates the concern with antimilitarism within the American tradition of opposition to certain forms of state military power, an understanding that had changed somewhat by the mid twentieth century. (194.)

preventing war."[47] Crittenberger opposed the growing idea that having a well-prepared military and an established armaments industry would tempt the nation to go to war. Proponents of such positions disagreed with Crittenberger's assertion that wars were inevitable, instead asserting that preparation for war led to going to war. The nation with the most detailed and comprehensive war plan in 1914 had after all been Germany, widely perceived as the aggressor.

Crittenberger's address highlighted a number of themes in contemporary American military life. One is the need to ready the youth today to fight the wars of tomorrow; Crittenberger was speaking to a military academy commencement. Another was the conception that American wars are defensive, which Crittenberger implied time and again with his warnings against subjugation. Popular prophecies about future wars rarely focused on a decline in influence or relative economic power abroad, since they were less effective motivators. Rather, advocates of preparedness focused upon defeating invaders on the home soil, which could rouse all but the most ardent pacifist. Even so, "prepared" was a term open to wide debate. The growing consensus was that Germany had been too ready for the last war, and had therefore been propelled into it. Even General John "Black Jack" Pershing, hardly a pacifist, expressed the need for some form of arms reduction, tempered by the realization that one nation alone disarming would likely increase rather than limit the danger of war.[48] These cultural currents made full-scale preparation for future wars unlikely. The 1917 draft had not been uniformly well-received. Without the high emotion of wartime, traditional American dislike of

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[47] Willis Crittenberger, Armistice Day speech, Kemper Military School, Boonville, Missouri, 11 November 1925. Crittenberger Papers, USAMHI, Box 3, 4.

[48] *The New York Times*, 30 Dec. 1920, 8.

compelling individuals to military service combined with anti-Prussian rhetoric to defeat a peacetime conscription provision included in the bill for restructuring the army.[49] What had seemed necessary in wartime became objectionable in peacetime, as the nation's mood shifted back into established habits.

The political environment also changed in 1921, when more fiscally conservative leadership intent on reducing expenditures took office. Warren Harding promised a "Return to Normalcy" after the foreign adventures of the Wilson administration. Part of that "Normalcy" meant keeping the United States militarily uninvolved outside the western hemisphere (excepting the brief and small effort to aid anti-Bolshevik forces in Siberia). Interventions in Central or South American affairs were another matter, but hardly likely to involve a major effort comparable to the mobilization of 1917-18. Such limited foreign policy goals also fit well with reducing government expenditure.[50]

The most famous example of the convergence of fiscal restriction, anti-war sentiment, and the belief that armaments caused wars was the Washington Naval Conference of 1921-1922. Here the world's top naval powers met to discuss possible building limits and size restrictions. Whatever the initial expectations of the conferees, the American Secretary of State brought a radical proposal. Charles Evans Hughes opened the conference by declaring that "competition in armament must stop," and offering concrete proposals instead of vague platitudes.[51] The resulting set of treaties set ratios of capital ships and overall tonnage limits, among the major navies, and caps on

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[49] Ekirch, *The Civilian and the Military,* 202-3.

[50] Ellis Hawley, *The Great War and the Search for a Modern Order, a History of the American People and Their Institutions 1917-1933,* (New York: St Martin's, 1979), 60.

[51] Thomas F. Buckley. *The United States and the Washington Conference, 1921-22,* (Knoxville: University of Tennessee Press, 1970), 71.

individual ship tonnage that stood for over a decade. Military expansion in such an environment seemed unlikely, and it in fact took some years before even the Air Corps, the most publicly popular of the Army's branches, could expand rather than contract.[52]

Just as the country began to invest in the military again, the Depression drew attention, and funds, away. Many American armor advocates focused on the budgetary limitations of the interwar period, especially during the Depression. Robert Grow, a cavalry officer who believed in the machine, titled his memoir of mechanizing in the thirties "The Ten Lean Years," and his implied point of view was the norm among his fellow officers.[53] The Air Corps went the opposite direction, focused on materiel, and dismissed any potential difficulties in its zealous advocacy of a technological approach to warfare.[54] Modernizers in the Air Corps and ground forces alike argued that the horse cavalry and infantry were bound by conservative ways of thinking about technology and unable to face the changed reality of warfare.[55] There was a general realization among the officer corps in the twenties and thirties that something had to be done, that the Army had to change with the times. Although the ground forces never adopted any technological doctrine whole-heartedly, neither did they fully reject them either. There was not enough evidence to see a clear conclusion without foreknowledge of the outcome. In this they resembled the mainstream consumer who required time and

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[52] Jeffery S. Underwood, *The Wings of Democracy: The Influence of Airpower on the Roosevelt Administration, 1933, 1941*, (College Station, TX: Texas A&M, 1991), 18.

[53] Timothy K. Nenninger "Organizational Milestones in the Development of American Armor, 1920-40", in *Camp Colt to Desert Storm: The History of U.S. Armored Forces* George F. Hoffmann and Donn A. Starry, eds. (Lexington, KY: University Press of Kentucky, 1999), 48.

[54] David Johnson, *Fast Tanks and Heavy Bombers: Innovation in the US Army, 1917-1945* (Ithaca, NY and London: Cornell University Press, 1998), 228-9.

[55] The bias is present at the source, and appears in the earliest secondary sources on the Armored Force. See Mildred Hanson Gille, *Forging the Thunderbolt*, (Harrisburg, PA: Military Service Publishing Company, 1947), 72, 87, 146.

evidence to adopt a new method or product; airpower theorists and enthusiasts correspond to the consumer always on the watch for something new.

A major obstacle to officers and theorists such as Billy Mitchell in the Air corps and Adna Chaffee in the cavalry was the state of the technologies on which their ideas depended. The prophets of airpower, while claiming all manner of capabilities for their aircraft, could point to the rapid advances being made in the field of aviation and promised that they would continue. Their arguments depended on the audience sharing a faith in material progress. The first generation of writers about technical history shared similar assumptions, and tended to portray the march of innovation as linear, and depending on inventors to hurry it along. Later writers challenge this model, especially for aircraft developments with the argument that technology does not develop in a vacuum, nor do technical specifications always translate directly into real-world effectiveness. [56]

The context for American military development in the years between 1920 and 1939 was that the United States emerged in the most secure position of the major combatants of the Great War. Advocates of preparedness and internationalism were eclipsed after 1920, and remained so for some time. The greatest likelihood of a major new war throughout the period was with Japan, but even that was lessened in the 1920s, only to emerge again after 1931. Throughout the period Mexico remained a source of worry as well, especially under the collectivist government after 1934, which in 1938 seized foreign oil companies.

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[56] Eric Schatzberg, *Wings of Wood, Wings of Metal: Culture and Technical Choice in American Airplane Materials, 1914-1945.* (Princeton, NJ: Princeton University Press, 1999), 44. The idea of technological development as nonlinear also appears in Timothy Moy's *War Machines*, (College Station, TX: Texas A & M University Press, 2001) which deals with the extreme upper and lower ends of the technological spectrum, the Army Air Corps and the Marines.

For American advocates of tank theory, the twenties were very difficult times. The National Defense Act of 1920 dissolved the Tank Corps formed during the war and specified that only the infantry branch could possess tanks, thus suggesting that armor was to perform an infantry support role. George Patton, upon seeing that tanks would not provide advancement for the moment, transferred back to the cavalry. No single figure emerged from the armored corps as a publicizer or as a grandstanding advocate of the new technology, and certainly no armored enthusiast was willing to throw away his career for his vision.

The same was not the case for airpower; Billy Mitchell proved an outspoken prophet of the bomber as the solution to all of America's defense problems. Mitchell famously claimed in 1920 that airplanes could sink any battleship ever built. To this exaggeration the Secretary of the Navy responded that he would happily stand bareheaded on the bridge of any warship Mitchell tried to sink.[57] Mitchell appeared to make good his claim in spectacular fashion when he managed to sink the aging, unmanned, rusting, and immobile German battleship *Ostfriesland* in 1921. Airpower thus laid claim to the strategic heritage of the Navy as protectors of the shores of the United States, a claim that mechanizers of ground forces could not make. Mitchell also martyred himself for airpower when he provoked the administration by accusing the government of negligence and treason following the death of the Secretary of the Navy in the 1925 crash of the lighter-than-air airship *Shenandoah*. By sacrificing himself for airpower, Mitchell embodied the potent symbol of a prophet destroyed for preaching the

[57] The two statements are juxtaposed in an Air Corps instructional text, and in hindsight Josephus Daniels comes off as a fool, and Mitchell looks like a prophet, in spite of his methods being most useful against unmanned ships which were moored in a location known to the attacking pilots. Lawrence Kuter, "Power and Effect of Demolition Bombs," AFHRA file 2482208A-3.

truth to those in authority who did not want to hear it. That was the public image; Mitchell was court-martialed for insubordination, not for advocating aviation, nor was he technically removed from the Army in the wake of his conviction. Such fine points did not seem to matter in the public eye, perhaps because of a general public acceptance of the importance of flight.[58]

Mechanized ground forces could not match the public appearances of the Air Corps, such as the flight of the *Question Mark*, the plane that stayed in the air for seven days in January 1929 in a combination of publicity stunt (part of the refueling took place over the Rose Bowl) and part test of mechanical and human endurance.[59] For the mechanized forces one chance for publicity was a long-distance march of the First Cavalry Regiment to join the Seventh Cavalry Brigade, Mechanized. The War Department directed that around the first of January 1933 the First Cavalry Regiment would replace its horses with machines and become part of the experimental Seventh Brigade. The mechanized detachment of the brigade was based at Fort Knox, Kentucky; the 1st was stationed at Marfa, Texas. Robert Grow and Adna Chaffee, along with the unit's commander, Daniel van Voorhis, decided to use the occasion to demonstrate the mobility of a mechanized cavalry unit. In thirty-one days, six of which were rest days, the unit averaged one hundred and fifty miles daily driving, through December weather. The first day a truck slid down a hill and was lost, but the rest of the unit's trucks survived the trip. The transfer barely registered in the national media. The newly

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[58] For a perceptive account of Mitchell's court-martial and the issues it raised, see James J. Cooke, *Billy Mitchell*, (Boulder, London: Lynne Rienner, 2002).

[59] Thomas Alexander Hughes, *Over Lord: General Pete Quesada and the Triumph of Tactical Air Power in World War Two* (New York: The Free Press, 1995), 36-7. Quesada went on to challenge the strategic conceptions of his fellow airmen and helped further closer cooperation between air and ground forces.

mounted unit departed Marfa on the second of January, out of fear that Congress, which convened the following day, might respond to articles mistakenly suggesting that the nation's oldest cavalry regiment was being disbanded, and stop mechanization. Not all the press on the mechanization of the unit was negative; a Memphis paper suggested that a long age of cavalry had come to an end, and that mechanization would increase the striking power of the cavalry.[60]

Grow's account of the reception in Marfa provides some clues to the mindset of the cavalry. He noted that the officers stationed in Texas were not going back to Fort Knox, but were transferring to other horsed units. As such, he suggested that they were not very interested in the whole business of substituting machines for horses. The enlisted men provided a marked contrast; Grow said that they, "in most cases, were interested and welcomed the change."[61] The difficulty lay not with convincing the soldiers, but with their leaders, for reasons Grow did not elaborate. One possibility was the change in the amount of labor required of the men; horses had to be cared for on a far more regular schedule than trucks, which did not require nightly brushings.

One of the problems of the new "iron horses" was speed. The increased physical speed led to a need for increased speed of thought; one of the abilities crucial to command in an armored unit that was employed so as to take advantage of its mobility was keeping up with developing events. Grow emphasized the difficulty several times in his manuscript "The Ten Lean Years," once recounting an interview with a Little Rock newspaper in which he tried to clarify the misperception that mounting in trucks

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[60] Grow, "The Ten Lean Years," 30-33.

[61] Ibid., 33. Two years earlier, in January 1931, Grow noted is his diary that "we must stop talking in miles and use minutes" (11).

(motorization) was the goal of the First Cavalry. During the explanation, Grow noted "You suddenly find yourself moving at considerably increased speed, you must think faster, act faster, speed up your facilities of observation and get your advance information quicker."[62] Juxtaposing the two comments suggests that finding officers for the new unit presented greater difficulties than preparing the troopers to execute their orders. Officers responsible for directing the movements of the mechanized cavalry had to be able to react faster than any other branch of the ground arms. Cavalry was the fastest of the traditional ground branches, and its tank doctrine reflected emphasis on speed, while infantry tanks developed an emphasis on armor and firepower in support of the foot soldier. Another advocate of mechanized cavalry, Adna Chaffee, made the point more explicitly in 1939 when he argued that "mobility is not effective unless it is continuing. Therefore, prompt and quick decisions must be made; and to develop this faculty one of the greatest difficulties which confronts us is making the mobility of the mind equal the mobility of the machine."[63] In Chaffee's conception, tank commanders would sometimes need to choose the correct course of action before even modern communications could apprise higher headquarters of their situations. Although the infantry conception of armor's role required the tank commanders to act with limited initiative, the proposed tank-supported battle still unfolded at a relatively slow pace, and did not have as a main component such speed of thought.

One constant complaint of mechanizers was the lack of modern technology with which to test their ideas. Although they predicted improvements in automotive technology that could be applied to their mission, they were often unable to experiment

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[62] Ibid., 34.

[63] Ibid., 14.

directly because in the 1920s they had to depend on outdated war-surplus equipment for the bulk of their materiel. The Ordnance Department did work on tank design, but often with no clear mission in mind and rather vague technical requirements, mainly focusing on weight limits. Sometimes these experiments went down blind alleys; the convertible off/on road tank designed by J. Walter Christie was one such technical dead end. The Christie design had road wheels that could function as tires on paved surfaces if the treads were removed, thus allowing for greater speed if good roads were available. Eventually the design proved unsatisfactory; Robert Grow wrote in his diary that the conversion between treads and wheels took too long no matter how well-practiced.[64] Christie's designs were also not particularly battle-worthy. A former designer of race cars, Christie seemed obsessed with coaxing greater speed from his designs, to the point that he never delivered them to the army with any armor attached. Unarmored tanks were capable of spectacular demonstrations of speed and agility, the most famous of which was the so-called "flying tank" picture out of Russia, but were not particularly useful for matching technology to doctrine. Robert Grow again complained that the Christie designs were not built for combat, but as a "mobile 'cradle for an engine.'"[65] Eventually Christie broke with the military, and the picture of the inventor within the Army was one of unwillingness to adapt his designs to real-world needs.[66] Walter Christie was

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[64] Grow, "The Ten Lean Years," 42.

[65] Ibid., 27.

[66] Christie's reputation continues to be poor among armor officers; Charles Bailey dedicated part of his article "5 Tank Myths" in the Sept-Oct 2001 *Armor* to debunking the Christie myth. *Armor,* September-October 2001. Ft. Knox website, http://www.knox.army.mil/center/ocoa/ArmorMag/so01/5tankmyths01.pdf, accessed 25 Oct 2005, 36-38.

associated with the biplane tank idea in 1932, illustrating how out of touch he was with the realities of armored warfare.[67]

Lack of proper machines was not the most critical obstacle facing American armor. Germany and Russia, the two leading innovators in the field of armored warfare, worked out their doctrines based on requirements for the wars they planned to fight well before they created machines to carry them out. German soldiers trained for tank warfare in the 1920s with cardboard tanks fitted over bicyclists. The Russian T-26, which saw action in Spain and even during the German invasion in 1941, was a licensed copy of a British Vickers model (state of the art in 1926 but rapidly surpassed thereafter). Neither country possessed machines capable of fully carrying out the implications of their armored theory in the 1920s or 30s, but intellectual development proceeded.[68] The lack of proper equipment helped the Air Corps turn theory into doctrine without limiting itself to what was possible with the means at hand.[69] German and Russian tankers and American bomber advocates all were possessed of a clear, if sometimes mistaken, vision of what they could and should do. The U.S. army, by contrast, had to plan for such a broad range of possibilities that is was foolish to focus solely on one strategic possibility.

The tension at the organizational level of the military came from the problem of doctrine. Doctrine is the shared understanding that allows an army to function as a unified whole. In the years after the Great War the viability of existing doctrine was

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[67] The US did build a light tank designed to be airdropped in the Second World War, but it was too heavy for the airplanes of the day and still too light to be effective in combat.

[68] Habeck, *Storm of Steel,* 297. Habeck suggests that neither the USSR nor Germany ever fully solved all the technical problems accompanying armored warfare, especially the supply aspects.

[69] Although the Air Corps had a coherent vision of strategic bombing doctrine by the early 1930s, they did not get the planes approaching the technical specifications they desired until the late 1930s, when the B-17 entered production. For the formulation of this doctrine, see Charles Clark, "The Failure of Theory: the Army Air Forces Prepare for World War II" Revised Seminar Paper, the University of Alabama, 2001.

called into question by the war's experience, particularly at the lower levels of command. The younger officers in the AEF, among them George Marshall, were still forming their views on operations when they fought in France, in contrast to their commanders, who already had a mental framework into which they could insert their experiences. The very nature of battle and strategy was uncertain, and until those concepts were unified then a coherent doctrine was unlikely.

The development of tank doctrine was divided between infantry and cavalry conceptions in the United States, while the advocates of strategic bombing gathered at the somewhat misnamed Air Corps Tactical School after 1926. As the thirties wore on the students and teachers (students one year were likely to be teachers the next) worked out a theory involving daylight attacks on industrial targets that would allow the United States to defeat an industrialized enemy rapidly, and at comparatively little human cost.[70] Such claims were exaggerated, but their premise was grand in its scope. Armor theorists were less dramatic; they did not promise a break with the fundamentals of how the nation fought, but rather hoped to employ new methods in pursuit of victory. The role of airpower technology was to change the fundamental nature of strategy, while tanks, trucks, and half-tracks were meant to provide a more efficient operational and tactical ability in carrying out more traditional strategies. Airpower siphoned off funds and interest in the public sphere from mechanization, in no small part because it had a unified doctrine, regardless of its flaws. Advocates of strategic bombing had a product ready for the public, though one with unconfronted difficulties. American tank theorists had not settled on their product, though they were more interested in confronting its difficulties

[70] Robert T. Finney, "USAF Historical Studies Number 100: History of the Air Corps Tactical School, 1920-1940." (USAF Historical Division, 1955), 36-7. The ACTS, while established in 1920, took its lasting name in 1926.

before finalizing it. The larger questions of doctrine and mechanization were not the only difficulties facing the army. Many smaller issues added up as well.

One of the problems which plagued the mechanized forces in the years between 1920 and 1940 was retaining the experts military training created when their expertise had profitable civilian application. While officers struggled with such theoretical problems as mobility, tactics, and firepower they also had to worry about the composition of the forces which they would command. Along with the age-old issue of discipline, dependence on technology meant dependence on specialists of all ranks to use and maintain that technology. In areas without civilian counterparts the Army had to develop those skills in its soldiers. While an ordnance specialist might be able to transfer his military training to the civilian world as a gunsmith, fewer gunsmiths could make a living at the trade than could auto mechanics and radio technicians. Maintenance of automotive equipment was crucial; whatever the theoretical possibilities of movement it offered, if the machines broke down they were useless. Captain John Christmas, the officer who represented the Ordnance branch in the 1928 Experimental Mechanized Force that tested the emerging ideas of armored warfare in Virginia, suggested in his report that relying on the average enlisted man for equipment maintenance was uneconomical. He argued that it was "poor economy to operate a $20,000 tank with a $30 per month enlisted driver when $60 to $72 will secure a driver (pvt. 1st class, 1st class specialist or staff sergeant) who, being an intelligent artisan, will operate the vehicle at a great saving in the cost of operation."[71] Christmas's position may be partially attributed to the contempt of the specialist for the lay user of their equipment, but he also did not think the average

[71] Capt. John Christmas, "Report on Ordnance Equipment and Ordnance Service for a Mechanized Force". Fort Leonard Wood, Maryland, September 27 1928, paragraph IV, 2. Alvan C. Gillem file, box 2, USAMHI.

enlisted man capable of caring for and using complicated machines. Addressing potential sources of technical specialists a few lines later in the report, he noted that they would have to add more members of the unit with advanced grades and pay in order to attract the required men, "because the average type of enlisted man has not the intelligence necessary, nor has the Army time to fully train a soldier in a skilled trade."[72] Christmas seemed to imply that the Army would be better off trying to recruit men who already had such skills, rather than searching within the ranks for them, or trying to impart those skills via advanced training.

Christmas's position was not universal; the field artillery commander of the same force, Major J.W. Anderson, suggested another way to approach the problem of technical skill. Anderson's report proceeded from the basic assumption that peacetime maneuvers and training were "but preparation and training for war," and claimed that Christmas' proposals were peacetime economy measures unsuited for combat operations, and so were "doing less than nothing."[73] The fundamental problem for Anderson was independent mobility. Working within the traditions of his branch, he argued that in horse-drawn armies the field artillery performed the basic care of the animals used as prime movers, and suggested that the motorized army should be no different. Anderson targeted the idea that centralizing maintenance with higher-ranking enlisted personnel within the supply services was a workable system, noting that in a major war those same services would have to depend on "the same Sam Jones and Bill Smith that would

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[72] Ibid.

[73] Maj. J. W. Anderson, Annex V, Maintenance and Supply, to accompany Report, 1st bn 6th F.A. (less Btry C), summer of 1928, paragraph 13, page18. Gillem File, USAMHI, box 2.

otherwise be the motor mechanics with an Artillery organization."[74] While a small group of highly skilled soldiers might suffice in peacetime, the expansion of the army necessitated by a major war would reduce the skill level within even the technical services, and they would not be able to provide any better maintenance than Anderson's enlisted men. Anderson answered the question of whether a form of military organization had to be ideal to be effective in the negative, and suggested indirectly that the ends (military success) were more important than the means, in this case perfect performance or maintenance.

Anderson's belief in general proficiency rather than small-scale perfection was reflected in his assessment of his unit's transformation from horse-drawn to motorized artillery, and put his position on the utility of training for motorization within his ranks at odds with Christmas's. His battalion, he reported, converted to motor transport in six months "without any special concessions in personnel. Horsemen have been converted into motor men. Stable Sergeants and stable orderlies into motor Sergeants and mechanics [sic]". While admitting that the level of ability might not be as high in his men as in the Ordnance soldiers, Anderson suggested that it was high enough to fulfill the needs of the unit. [75]

Mechanized forces had problems with technical personnel even into the Depression. In 1937 Brigadier General Daniel van Voorhis, commander of the mechanized 7th Cavalry Brigade, petitioned for more pay for specialists within his regiment, specifically for automotive and radio men. He also noted that the unit was

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[74] Ibid., paragraph 18.

[75] Anderson, Annex V, paragraph 19, page 18.

authorized to have only five specialist-rated enlisted men, and commented that "The inadequacy of this allotment of grades and ratings for the headquarters troop of a mechanized cavalry brigade is so apparent as to necessitate no further comment."[76] By September of 1939 the 7th was commanded by Adna Chaffee, who noted the need for more specialists, especially radio and mechanical, in his lecture to the War College. His solution was to expand the schools at Fort Knox teaching those subjects.[77] Van Voorhis was concerned with maintaining the unit, while Chaffee's proposal reflected the potential need to expand the Army in response to the German invasion of Poland.

But the skills needed to maintain tanks (or combat cars, or motorized artillery) also allowed the soldier to make a decent living as a civilian. During the depression, desertion rates dropped to around 2%, the lowest seen to that point in the twentieth century.[78] The Army offered a sense of security that was difficult to find in the civilian world, but technical specialists were in demand in both places, and here the Army's pay scales were not competitive. Van Voorhis estimated that he needed over five thousand dollars to bring his entire unit up to requisite strength. He also estimated that it was harder to retain trained soldiers than to find intelligent new recruits, but retaining the trained men was a bargain in the long run.[79]

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[76] Daniel van Voorhis, Memorandum, 23 January 1937. Headquarters, Seventh Cavalry Brigade, Fort Knox, Kentucky. Willis Crittenberger files, Box 7, USAMHI.

[77] Adna Chaffee, "Mechanized Cavalry", Lecture, Army War College, Washington DC, 29 September 1939, 33. USAMHI website, accessed 9 March 2003. This document does not seem to be available online any longer.

[78] Edward M. Coffman, *The Regulars: The United States Army, 1898-1941* (Cambridge, MA and London: Belknap, 2004), 312-13.

[79] Daniel van Voorhis, Memorandum, HQ, 7th Cavalry Brigade, 23 January 1937.

The two basic positions of Christmas and Anderson might well be applied to general discussions of military technology. The idea that a particular machine, be it tank, airplane, or firearm, needs to meet an arbitrary standard of technological perfection is one way to approach innovation, but it is fraught with difficulties. One of those difficulties is that the characteristics of a particular piece of equipment are determined by its intended use. Another is more fundamental: does a high degree of technical sophistication automatically translate into military success? The military technology of the mid-20th century cannot be judged apart from the society from which it sprang, in large part because of the number of soldiers that comprised the armies of industrial states. Armies must find soldiers capable of operating their equipment, or at least soldiers who can be trained to a reasonable degree of competence with it. The question came down to how much skill was required. Christmas leaned toward technical perfection. He did not believe that the average recruit, or even the average soldier could be trusted with the military's valuable technology. His alternative meant a smaller pool of technical expertise if the army mobilized for a major war. Anderson took another position, suggesting that his unit was able to maintain and use the same technology effectively if imperfectly. Anderson also suggested that the next war would be fought on the same basic lines as the World War, with a large conscript army.

Before the technical revolution in warfare, problems with equipment were not so evident. The average soldier of pre-twentieth century armies did not have to have a great deal of technological aptitude in order to succeed in battle, but at the same time there was less demand for his skills in civilian life. As such, infantrymen occupied a position roughly analogous to the unskilled laborer. Armies did have need of technical specialists

before the twentieth century, and even before the industrial revolution, in the form of engineers and artillerymen. While both had combat applications, the most technical did not reside at the "sharp end"; they provided conditions for action, but engineers did not fight as would tank and air crews. Machine guns also changed the picture, but their effective use did not require a great deal more expertise than a rifleman's, and arguably less.[80] Christmas worried about how to maximize the new technology, while Anderson worried about how to make the Army most effective, a more productive way of approaching the problem.

The mechanizers had problems offering their vision of how to improve the army as a whole, because American armored doctrine on the eve of the largest peacetime expansion of the armed forces in the nation's history was still divided between the cavalry and infantry conceptions. The vision of armor focusing on mobility reached its highest expression before the formation of the Armored Force in the cavalry, the service most traditionally concerned with mobility, when Adna Chaffee lectured the Army War College's operations section (G-3) on 29 September, 1939. Speaking less than a month after the start of the German armored thrust into Poland, Chaffee provided a brief history of his unit, noting that a permanent American mechanized force existed since 1931, and then discussed the principles influencing the design of the unit's equipment. Though he had not fully absorbed the impact of recent events, Chaffee used the occasion to get his ideas before a wider audience than his mechanized cavalry command. Suggesting that the mission of the cavalry remained unchanged, Chaffee listed six principles of cavalry: mobility, cross-country maneuverability, independence of operation, effective

[80] The British in the Great War debated whether machine-gunners were technical specialists, ultimately deciding that they were not. Denis Winter, *Death's Men: Soldiers of the Great War* (New York and London: Penguin, 1978), 37.

observation, fire power, and shock action.[81] The central characteristic of cavalry for Chaffee, mechanized or not, was mobility. It was to enhance this characteristic that the armored vehicles under his command were armored only against machine gun fire; the cavalry was kept light and fast by "refusing to overweight them with armor plate and heavy guns."[82] Chaffee's idea was not to create new doctrine, but rather to fit machines into the traditional cavalry mission. In responding to those who continued to advocate horsed cavalry, he is reputed to have commented that the cavalry's motto was "through mobility we conquer", not "through mobility on horses alone we conquer."[83]

Mechanized cavalry incorporated the changes in cavalry in the last eighty or so years by including riflemen, who were essentially mounted infantry, in order to add to the defensive power of the unit.[84] Chaffee began the lecture with emphasis on the shortcomings of mechanized elements, noting that repeated experience demonstrated that "tanks alone cannot be used independently."[85] Though protected from machine guns and shell fragments, tanks were blind and vulnerable to artillery when they halted. The mechanized brigade at Fort Knox in the 1930s was experimenting with a form of combined arms warfare, incorporating light armored vehicles and rifle-armed soldiers who fought on foot but moved by wheels or tracks, assisted by air reconnaissance and supported by light howitzers and mortars. Perhaps most importantly, by 1939 the

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[81] Adna Chaffee, "Mechanized Cavalry," 6-7.

[82] Chaffee, "Mechanized Cavalry," 8. The combat cars were armed only with machine guns.

[83] Gille, *Forging the Thunderbolt*, 68.

[84] During the American Civil War cavalry evolved from troopers fighting on horseback to mounted infantry, who used their mobility to get into position but fought dismounted, in no small part due to the increasing lethality of the modern battlefield.

[85] Chaffee, "Mechanized Cavalry," 1.

principal means of command and control was by radio, supplemented by telephone and messenger since radios were still not as reliable as anyone would have liked.[86] Chaffee emphasized the importance of communications in his discussion of the command staff of the brigade, which he characterized as too small, and not able to exercise enough on-the-spot control. The crux of the problem was the speed with which the unit could move; Chaffee worried that the combat cars were outrunning the control of the small staff.[87] The emphasis on mobility was based around the desire to act faster than a hypothetical opponent could react, one way of avoiding the stalemate of the previous war.

Chaffee suggested that American and German ideas about mechanized organizations were very similar, but cautioned that his last reliable figures on the Germans came from the end of 1937, and thus were almost two years out of date, a serious problem when trying to obtain intelligence on non-allied nations.[88] The German armored division on which Chaffee based his comparison had 448 tanks, while current American proposals had only 170. Chaffee pointed out that almost 150 of the German tanks were "of an extremely light type" and were more properly compared to the 100 scout cars employed by the proposed American division.[89] Since the tanks in question were lightly armored Panzer I's, weighing up to 6 tons and armed only with machine guns, Chaffee's comparison was reasonable. He confronted a more difficult problem

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[86] The Experimental Mechanized Force of the late 1920s was much less sure about methods of communication. Cpt. E. Williamson, "Report of the first signal company," 27 Sept 1928, Gillem File, USAMHI, box 2.

[87] Chaffee, "Mechanized Cavalry," 12.

[88] Allied nations were only marginally better; see Thomas G. Mahnken, *Uncovering Ways of War: U.S. Intelligence and Foreign Military Innovation, 1918-1941*, (Ithaca, NY: Cornell University Press, 2002.)

[89] Chaffee, "Mechanized Cavalry," 30.

with the sixty medium tanks employed by the Germans; these he suggested were too slow to form the main striking force of the unit and should be considered as part of the support echelon, an assertion which in the lecture seems to be based on an understanding of technical specifications rather than evidence from the Polish campaign. After subtracting the lightest and heaviest elements of the German formation, Chaffee noted that there was a disparity of about seventy light tanks, which he suggested were the core of an armored unit. The scout cars could not stand up to any degree of opposition, while the mediums were too slow to form an operational spearhead. Although the German formation was larger, and possessed more tanks, Chaffee argued that the American unit was superior, in part because it was more mobile and in part because it was more easily commanded with the increase in the staff he recommended. He also suggested that the American division had proportionately more firepower, with more and better heavy machine guns. Chaffee's desire to maintain mobility makes his emphasis on it an obvious factor, but his subsequent mention of control suggests a desire to avoid cumbersome command arrangements, not just to keep his tanks light.[90]

Chaffee suggested that American tanks were superior to German in 1939; to subsequent readers, used to accounts of the massive Panzer VI (the Tiger) and its ability to shoot entirely through any American tank deployed until almost the end of the war, such a claim sounds ludicrous. To historians who accuse the American armored force of concern with mobility at the expense of armor and gun power, Chaffee's standard of comparison appears flawed, emphasizing categories such as reliability, speed, and range that had more utility getting to the battlefield than fighting there. The tanks being

[90] "Notes of Discussion following lecture by Brig. Gen. Adna R Chaffee, Commanding, 7th Cav Brigade, Sept 29, 1939. Subject: Mechanization', 1. USAMHI website, accessed 9 March 2003. This file seems no longer to be available.

compared in 1939 were lighter on all sides. Germany was then deploying mainly the Panzer II and III, neither of which weighed over twenty tons. The American tanks to which Chaffee referred were of comparable weight and armor, but the Panzers II and III did have a turret-mounted cannon that could fire anti-tank ammunition. The Americans, by contrast, mounted twin heavy machine guns (the Browning .50) that were touted as anti-tank but were unlikely to breach the armor on the Panzer III. Still, the two nations were not very far apart on the technological aspects of their tanks. Both Chaffee and the Germans were concerned with creating a decisive effect before preventing losses. Using technology to end the conflict quickly was better in their minds than using it to protect each tank from all possible harm.

If Chaffee meant that the proposed American armored formation could defeat the existing German one, his claim was on shaky ground technologically, although the soldiers who operated and commanded the tanks were more important than the machines themselves. Given Chaffee's focus on offensive operations it seems more likely that he meant that the American armored division could perform the same role as the German, attacking a semi-modern opponent, or even a modern one, and using speed of maneuver rather than blunt force to defeat the enemy. As with any hypothetical scenario, who the "enemy" is plays a major role in determining the scenario's validity. Against Poland, it seems likely that American forces might have performed well enough had they followed mechanized doctrine, but as with all such musings, such outcomes must remain speculative.

Although the cavalry influence was strongest when tanks were concentrated into armored divisions, the infantry tank school at Ft. Benning had not been idle in the years

after the Great War. Their conception of the tank was not particularly revolutionary; the instructive text from 1938-39 wanted tanks to "to assist the progress of the infantry by overcoming or neutralizing hostile resistance or by breaking down obstacles that check the infantry advance."[91] The tanks under infantry control were operating essentially in the same role as they had in the previous war, as mobile bunkers protected from small arms and shell fragments (but not direct hits from antitank guns or artillery), and limited by difficulties of control and supply. The lessons of the previous war regarding mass were also acknowledged and incorporated; "Tanks are used most profitably in large numbers."[92] The text went on to give a standard of one company of tanks (about fifteen) per infantry regiment in the assault force, and noted that the tanks should not be employed beyond the reach of artillery. The fundamental role of infantry tanks was not to make long, rapid advances or effect major breakouts, but to take a series of closer objectives which could then be secured by their accompanying infantry. The goal was not exploitation, but a continuous advance. Although these principles would not lead to an American blitzkrieg, they laid the foundation for cooperation at the tactical level necessary for the combined-arms team. Emphasis on combined rather than independent action led the text to state that "to maintain maximum efficiency in combat every opportunity should be taken to participate in tactical exercises with foot troops."[93]

Where cavalry-oriented armor used speed to achieve its goal of preventing effective enemy response, the infantry tanks focused on surprise. While part of surprise

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[91] "Tank Combat Principles (Tentative)" The Infantry School, Fort Benning, Georgia, 1938-9, 2. USAMHI, Willis Crittenberger collection, Box 5.

[92] Ibid.

[93] Ibid., 8.

was information control, part was the same as the cavalry conception, speed. On one level speed meant the same in both doctrines: the ability of a unit to be a very long distance away from a previous position in a relatively short time. For the cavalry such moves were made forward, often into enemy territory, while for the infantry the movements involved were shifting units laterally so that an enemy would face a tank attack unprepared. Enemy preparation was an important factor in the infantry tanker's world. "Tank Combat Principles" noted that "A tank attack will be costly if made in a zone strong in unreduced hostile antitank defenses."[94] The role of pursuit and envelopment, for which there was less chance for methodical preparation, was left to the mechanized cavalry, who were more suited to rapid movement without reconnaissance since they were more capable of gathering their own information.

Chaffee was not the only one watching the Polish campaign with interest. The first major popular fascination with armor dates from the Polish campaign as well. The speed of the German victory astounded many, but observers cautioned that neither air nor ground innovators were fully vindicated by the campaign, since the Poles were undersupplied in defenses against them, particularly anti-tank guns. Basil Liddell Hart compared the Germans to their most important prospective opponent, France, for the readers of *Life* in February 1939. Captain Liddell Hart suggested that in the air the Germans outclassed the French somewhat, but that the comparison was much more even on the ground. Noting that the Germans had five mechanized divisions and the French two, and after comparing the relative numbers of both forces overall, he suggested that the French possessed advantages in defense, such as a veteran army. Liddell Hart did not

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[94] "Tank Combat Principles," 14.

make much mention of French armor development, in no small part because it was not central to French doctrine. Poland was easy to dismiss as semi-modern and unprepared for the German attack, a view Germany aided with careful selection of images released. Although some shots of horsed artillery and cavalry in the German forces were released, the image that endured was one of a doomed Polish cavalry charge against advancing panzers. [95]

Whatever the fate of the Poles, the future of the tank and airplane in the American military would be more influenced by how German tanks and dive bombers performed against France. As soldiers watched the events abroad as best they could, the mass of potential recruits and the general public watched too. The long peace was over, but the United States and the Soviet Union had a brief respite, a chance to watch Germany and Japan (and to a lesser extent, Italy) fight before joining in directly. They had an opportunity to draw conclusions from a major war among the industrialized powers, while the British, Germans, and French had only been able to guess, essentially, at the evidence of relatively small wars fought by less than fully industrialized nations (and, in the case of China, mostly unindustrialized.) Their experiences suggest, among other things, that applying the lessons of foreign wars to one's own armed forces is inherently difficult. The lag also led to an initial German lead in combat experience that translated

[95] Stories even circulated of German officers so moved by the bravery of their opponents that they ordered their men to fire low, killing the horses but sparing their riders. Such stories are difficult to credit, for a number of reasons. Later German behavior was not usually so chivalrous, but the most intriguing reason may be Patrick Wright's suggestion that such charges were more a matter of propaganda story than common occurrence. Wright's research in Poland points to Poles trying to counter tank mobility with animal power, but instead of riding into battle they might wait for the tanks to stop for the night and then make dismounted attacks from wooded areas. While such tactics were desperate and ultimately inadequate, they were certainly not the stupid bravery of myth, although they fit neatly into either-or schemes of military reform. The choice was the horse or the tank, and Poland seemed to provide a strong object lesson. Patrick Wright, *Tank: The Progress of a Monstrous War Machine* (London: Faber, 2000), 231-6.

into roughly a half to a full generation lead in some aspects of tank design, especially over the British.

The nature and meaning of the modern world was contested on various levels in the two decades after the Great War. The Air Corps developed a coherent understanding of the new world, and elucidated a coherent if problematic doctrine and obtained funds to pursue it. In the American environment airpower proved a more salable commodity in the years before 1940 than armor. The debate on ground warfare was less certain, being influenced by a longer train of history. Faced with competing visions of modern ground warfare, the Army struggled during the relatively peaceful years to formulate a response. The outbreak of another major war brought more attention, funds, and evidence but no easy answers. The next two chapters will deal with how Americans understood the developments of the Second World War, first in the military adjustment of doctrine to match perceived reality, and then in the world of the civilian and potential draftee.

CHAPTER TWO

MODERNIZING UNDER PRESSURE: THE US ARMY CONFRONTS TECHNOLOGICAL WARFARE, 1940-42.

After German tanks overran France in the spring of 1940, a book by a French armor officer named Charles de Gaulle was published in English translation in the United States and Great Britain. *The Army of the Future* was originally a 1934 meditation on the military policy of de Gaulle's native France, and the necessity of adapting that policy to the machine age.[1] Offering his thoughts on various issues, de Gaulle focused on the requirements machines placed on individual soldiers and armies alike, arguing that "at present, the machine controls our destiny."[2] He noted that the tempo of life, and battle, was now that of the machine, and thus the demands made of prewar planning were higher than ever.[3] Eight years later, a U.S. Army manual agreed that "tanks will impose their rhythm on the modern battle," and that "the many details...of a blitzkrieg imply a long period in which the plan may be secretly prepared."[4] Required by the need for prewar

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[1] Walter Millis, introduction to Charles de Gaulle, *The Army of the Future,* (Westport, CT: Greenwood Press, 1969), 7.

[2] Charles de Gaulle, *The Army of the Future* (London and Melbourne: Hutchinson and Co, Ltd, probably 1940, 39. Pagination is different between this edition and the Millis edited one; hereafter, all references come from the Hutchinson edition.

[3] De Gaulle, *Army of the Future*, 32, 35-36, 49. Preparation was a major theme for de Gaulle.

[4] Military Intelligence Service, War Department: "Special Series Number 2: The German Armored Army" August 10, 1942, USAMHI web site, http://ahecwebdds.carlisle.army.mil:8080/awapps/main.jsp?flag=browse&smd=2&awdid=23, accessed 1 August 2004, 2, 13. the full quotation in then second case is "the many details of the indispensable plans for the development of the 'drama' of a blitzkrieg."

staff planning was the stockpiling of expertise, and the end of the *levee en masse* so favored by the French revolution, or the idea of the mobilized populace symbolized by the Minutemen in America. De Gaulle's proposed army had at its core men made expert in modern military technology and tactics by long service.[5] These men would then act as a leaven for the rapidly mobilized recruits, imparting confidence and routine to men unfamiliar with tanks, artillery, radio, airplanes, and poison gas. Only one of these elements was part of the pre-20th century conception of warfare, and the artillery of previous ages was not comparable to the heavy guns created by modern industry. The Americans had further to go to solve these problems in 1940 because they had seemed more remote in the previous twenty years. New evidence from abroad complicated the situation further, since it was so easily taken out of context. The solution to the industrial battlefield was some degree of combined-arms warfare, but no easy formula existed to determine the proper ration of infantry to artillery, armor, air, and other specialized forces, or how they should work together. The answers that other nations arrived at might not always work for the Americans, something of which George Marshall, appointed Chief of Staff of the U.S. Army the same day that Germany attacked Poland, was aware. The decisions about what form the army would take were largely made by Marshall, and the implementation of those decisions passed through the Army Ground Forces, the army training command, commanded by then-Brigadier General Leslie J. McNair.

The problem facing Marshall was the same that had faced de Gaulle, namely how to apply their previous experiences to a world that was so fluid. With the circumstances

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[5] De Gaulle, *Army of the Future*, 93-94. De Gaulle suspected that six years of training and service would be optimum; longer would dull the senses with routine, and shorter was not enough time to inculcate the habits of veterans.

of the Great War's lessons fading, new decisions had to be made based on a rapidly shifting set of circumstances. The introduction of technical factors into military activity was already a *fait accompli*, but which ones would prove decisive was difficult to know based on the limited amount of interwar combat experience. American soldiers faced additional pressure after 1940 to identify correctly the fundamentals of "modern" warfare. Between May of 1940 and December of 1941, roughly eighteen months, their situation was urgent but still abstract. Even after the United States entered the war, almost twelve more months elapsed before American soldiers engaged the *Wehrmacht*. Although intelligence from abroad grew in importance in these thirty months, it only added to the body of evidence already available in the eyes of careful observers. In light of the continued evolution of German, British, and Soviet armored forces, the difficulties the Americans encountered in solving the problems of techno-industrial warfare appear more as necessary steps in an evolutionary process than a failure of reasoning. Had the U.S. army remained committed to prewar doctrinal issues after its own combat experience suggested otherwise it would indeed be guilty of failure, but a different scenario actually played out: the doctrinal process sped up upon entry into combat. Before that entry, formulation of doctrine based on existing experience was only the first step in a major mobilization process. Common experience ideally led to doctrine, but common experience was in short supply, particularly so since the various partisans of technological warfare had worked separately in the preceding twenty years. Doctrine led to organization, and both were influenced by technological factors that were often as much the result of factors like chance or timing that were not susceptible to rational

control. In essence the U.S. came to the problem from a standing start, where the Germans had been trying to resolve the same issues for twenty years.

The environment in which the U.S. Army formed its doctrine after August 1940 was particularly pressing. The pressures of time meant that institutional expansion and doctrinal formation in the ground forces were near-simultaneous. When German forces overran Poland the U.S. had about 250,000 soldiers in its Regular Army.[6] When the Japanese attacked Pearl Harbor that number had grown to well over 1.5 million, organized into thirty-six divisions, five of which were armored.[7] Expansion after 1940 stretched the Army's capacities at a particularly crucial juncture. For any number of reasons, the preceding twenty years had produced no consensus. The demands of war produced the need for decisions rather than debate because at some point soon, planning would have to be converted into action. The Americans had two experiences of large-unit wars, one in living memory (the Great War) and the other slightly beyond it (the Civil War). In an ideal world their understanding would have already been distilled and then the Army would expand based on that understanding. Such was not the case in the Second World War. For the Army to expand successfully, it had to adjust to the changing nature of warfare. The basic problem was that there was no consensus on the very nature of battle: several competing visions existed. The Air Corps took the view that prior history was useless in understanding the new order, and managed to create a coherent, if severely flawed, doctrine before American entry into the war. The leaders of the armored forces opined that cavalry operations like deep penetrations and

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[6] Kent Robert Greenfield, Robert R. Palmer, and Bell Irwin Wiley: *The Army Ground Forces: The Organization of Ground Combat Troops.* (Washington: GPO, 1947), 1.

[7] Ibid., 161. Table, Ground Forces in the Army December 1941-April 1945.

encirclements, were possible with new technology driving them, and had been trying for the past twenty years to create the framework for doing so. They had been in part hampered by the strategic role envisioned for them by war planning.

Before the recurrence of open war in Europe, U.S. war plans had an abstract quality, although they usually conformed to the general expectation that the U.S. might be compelled again to fight a powerful land-based enemy on the European continent. American war planners before 1940 had to deal with multiple threats, within the framework of a dubious assertion contained in the National Defense Act of 1920 that an army configured to wage major campaigns like those seen in the Great War was suited to all smaller roles as well. The Japanese and Germans, both increasingly likely to become American opponents, were very different armies. An island nation, Japan had none of the compelling reasons to adopt armor technology that the Europeans did. Japanese military technology focused on air and sea elements; their tanks and tank forces remained small by European standards. American planning for war with Japan generally focused on the logistical nightmare that was the Pacific Ocean, and the need for naval-supported amphibious landings.[8] The conditions Western Front of the Great War did not apply when amphibious landings could be used to flank a defensive line, so the need for the tank to restore battlefield mobility was eliminated. Given airpower's willingness to intrude into the Navy's strategic arena, bomber advocates were much more able to provide options for a possible Pacific war than armor theorists, and thus were given more weight in strategic decisions. The ground forces could not lay direct claim to strategic importance in the same sense that the Navy and Air Corps did.

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[8] See Edward Miller, *War Plan Orange: The U.S. Strategy to Defeat Japan, 1897-1945* (Naval Institute Press, 1991) for the full discussion of Plan ORANGE.

The awareness of pressure was a shared component, one that most within the Army could accept. Yet, what shape the mobilized force would take was not a well-agreed upon concept. Positions on technology within the Army ranged from fully modern, expressing faith in the motor as the propulsion of choice, to the occasional reactionary, who refused to accept that animal power was completely outmoded. One of these reactionaries even argued that mechanization was being driven by the public's infatuation with mechanics, rather than any concern with military utility.[9] Awareness of context in that case was linked to a disdain for civilian society that proved unproductive in the long run. If the army got too out of touch, it ran the danger of being unable to communicate effectively with recruits in the case of rapid expansion. For draftees to be imbued with the proper understanding, first that understanding had to be distilled by the professional soldiers.

The situation faced by Marshall, McNair, and Chaffee was one whose fundamentals could be grasped readily. Technological developments had not only increased the destructive potential of military forces, but also the capacity of a nation's industry to supply its armies with the weapons they needed. Within the strength of technological warfare there seemed to be a weakness not present before. As the power of mechanized and industrialized forces grew, so did their needs for various types of ammunition, equipment, fuel, lubricants, spare parts, and replacement soldiers. If that flow could be interrupted, then the affected force might be unable to fulfill its mission. Technology offered a way to attack those weaknesses, at comparatively low cost. The level of the attack varied, but not the underlying idea. Advocates of precision daylight

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[9] Timothy K. Nenninger, "The Development of American Armor, 1917-1940" (M.A. Thesis, University of Wisconsin, 1968), 222.

bombing proposed to interrupt the flow close to the source, analogous to damming the Mississippi river in upper Missouri. Tank theory advocated attacking the enemy rear on an operational level; to continue the analogy, they proposed to dam particular tributaries as the need arose. Both theories often focused on the efficacy of their solutions in material terms, implying that war was a rational activity, and that a prospective enemy would choose to make the rational decision to stop fighting once losses reached unbearable levels, though no one ever calculated exactly what those levels were. Both ground and air theories were also untested by major combat experience in 1940. By 1942 more indirect evidence was available, but no single indisputable consensus emerged.

Although the Second World War in Europe began with the German invasion of Poland on 1 September 1939, for observers in the United States the serious test of German operational methods did not come until the following spring. The Polish campaign had badly disorganized the German Army, and it required some time to sort itself out and also digest the lessons of the invasion.[10] Mechanization in the German army, incomplete as it was, stretched the economic capacities of a nation still essentially on a peacetime footing.[11] The machines used in Poland required repair and replacement, and these tasks took time. Such factors are more apparent in hindsight than to observers at the time, when the *blitzkrieg* seemed to promise rapid and easy victory.[12]

Marshall wrestled with the issue of updating Army organization and training in a short time but with increasing resources. He once characterized the situation in terms of

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[10] Williamson Murray, *German Military Effectiveness* (Baltimore: Nautical and Aviation Publishing, 1992), 230-9.

[11] For the incomplete status of German mechanization, see Richard L. DiNardo, Mechanized *Juggernaut or Military Anachronism? Horses and the German Army of WWII* (New York: Greenwood, 1991), 6-9.

[12] Although much of John Mosier's argument in *The Blitzkrieg Myth* (New York: Harper-Collins, 2003) is faulty, his suggestion that the image at the time was of technological determinacy is a reasonable one. 1-3.

time and money: in the preceding twenty years, there had been time, but no money. In 1940, he had increasingly large amounts of money, but time became the factor he stressed again and again, in speeches and letters, as the most serious limitation on American mobilization.[13] The decisions he reached in this situation demonstrated an understanding of modern warfare based upon the characteristics of the United States and the enemies it faced, rather than an attempt to deduce general principles of warfare. The Army he created had to fight two different wars in two widely separated areas, incorporate changes in weapons and communications, and do all this while introducing the decisions made to a mass of civilians drafted into the armed forces. The armor theorists of the U.S. Army faced a particularly difficult situation since they were obliged to digest secondary German experience and adapt it to their situation. The army the U.S. created was based on American requirements, not German.

Reduced to its essence, doctrine consists of the shared assumptions about the nature of warfare that allow a military organization to operate as a unified whole. The problems that the Army faced of defining the exact nature of modern warfare during the relatively peaceful years prior to 1939 remained, with received experience of a major European conflict added to complicate the situation. The officers of the Armored Force felt this problem acutely, since the doctrine justifying their branch's formation was untried by direct experience. Although the Air Corps had a similar problem, its officers had managed to flesh out its doctrine in the absence of corroborating evidence or

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[13] In several speeches Marshall referenced the problem of time: see his speech to the National Guard Association of Pennsylvania, 13 Oct 1939, in Larry I. Bland, ed., *The Papers of George Catlett Marshall Volume II* (Baltimore and London: Johns Hopkins University Press, 1986) 88-92, speech to the American Historical Association 28 December 1939, (123-7), and speech to the Veterans of Foreign Wars, 19 June 1940, (247-50). He specifically formulated his time/money dichotomy in a memorandum to Captain William Sexton, an assistant secretary of the General Staff, on 22 July 1940 (274).

technical means to accomplish the intended mission by appealing to war-winning potential. Rather than rewrite manuals, the Air Corps needed to acquire enough planes to carry out existing doctrine, although events later forced them to discard or heavily modify several of their basic assumptions.[14]

At the center of the doctrinal debate between 1939 and 1942 was the balance between infantry and technological conceptions of warfare. Armor and air theorists called on recent received experience to make their points, albeit in differing directions. As the German attempt to bomb Britain into submission failed, the advocates of strategic bombardment pointed to the differences between their theory and how the *Luftwaffe* applied its air power. Armor organizers instead modeled themselves on successful German armored units. Both trends bothered Leslie McNair, the commander of the Army Ground forces, who worried about the efficacy of technological solutions to the problems of modern war. McNair took a modified traditional view of war, stressing the need to integrate technology in such a way that units retained flexibility, instead of focusing on a single mission.[15] He also expressed worries that technology would sap the aggressiveness needed for success in combat.[16] Flexibility must be understood in the context of the early 1940s perception of the Great War, and even the image of the final year of the American Civil War, where costly frontal attacks seemed the only way to succeed.[17]

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[14] The fragility of an industrialized nation's economy and the ability of bombers to defend themselves against fighters were articles of prewar planning that died over the skies of German-occupied Europe.

[15] Greenfield, et al., *The Organization of Ground Combat Troops,* 76-77.

[16] E.J. Kahn, *McNair: Educator of an Army* (Washington, D.C.: The Infantry Journal, 1945), 28.

The German role in creating the American force was fulfilled by playing the potential opponent. The Polish and French campaigns established Germany as the foremost army in Europe, a position they held uncontested until late 1941, when the operations they conducted against the Soviets failed to bring victory, a fact not lost on the Americans.[18] Creating an army that could defeat Germany did not mean copying every German decision on weapons and tactics, and General Marshall had to decide how best to use American resources to defeat Germany, not Germany's enemies. There were some similarities between the aims of the two nations; Germany under Hitler relied on quick, decisive campaigns to avoid impacting his citizen's daily lives as much as possible. Roosevelt and Marshall evinced worry that too much stress on the American home front might lead to war exhaustion, though they were not as concerned as Hitler with this issue. A fundamental problem underlay worries in the U.S. about limiting the time spent in the conflict: it would also take time for American industry and the Army to mobilize. Policies outside military control (but in line with strategic realities of the preceding twenty years) meant that the nation was not ready to fight at full strength on the first day of the war.

The early stages of American preparation worried less about aggressive attack and more about the problem of defense, for good reason. The enemy against whom the Americans had to fight seemed to have mastered the problem of exploitation the last war raised. German armored columns had broken through prepared defenses and continued

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[17] The Civil War was still within living memory in 1940: George Marshall, Adna Chaffee and George Patton all had fathers or grandfathers who had fought in that war. Bruce Catton's books on Grant debunking the straight-ahead butcher myth were unwritten in 1940.

[18] Military Intelligence Service, War Department: "Special Series Number 2: The German Armored Army" August 10, 1942, USAMHI web site, http://ahecwebdds.carlisle.army.mil:8080/awapps/main.jsp?flag=browse&smd=2&awdid=23, accessed 1 August 2004, 9-13.

into open country three major times by 7 December 1941 (Poland, France, and Russia). Any army that the U.S. raised had to be able to resist that kind of attack. There were two major schools of thought on how to accomplish this. One was to reorganize so that each division had a high proportion of anti-tank weapons assigned organically, thus each could defend itself against a German thrust. Such a situation was perhaps ideal, but had the effect of diffusing anti-tank weapons throughout the Army and requiring the production of a large number of guns. It had also been the French solution to the problem in 1940, and their experience suggested that diffused guns were not useful against massed tanks. The other solution involved a mobile reserve of anti-tank weapons under central control, to be dispatched to meet any penetration but held aloof until then to prevent them being tied down in local actions. The United States created the Tank Destroyers to meet the problem of German breakthrough, armed with self-propelled guns and the motto "Seek, Strike, and Destroy." [19] These units received the high-velocity weapons and ammunition to destroy tanks, and anti-tank guns were presented by civil and military experts alike as a counter to the blitzkrieg.[20] Defensively, guns could stop a tank attack, although they had little chance for offensive operations as the tanks did.

Although there was little debate among Air Corps officers, the ground forces were split on most major issues. The success of French anti-tank guns in local engagements gave strength to American advocates of the gun over the tank. Guns were much cheaper than tanks, and had fewer issues with training. They also appealed to generalists such as McNair, who believed that the infantryman should remain at the center of any fighting

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[19] Christopher Gabel "Seek, Strike, Destroy: U.S. Army Tank Destroyer Doctrine in World War II" The Leavenworth Papers Number 12, Combat Studies Institute, Command and General Staff College, Ft. Leavenworth, KS, 1985, 1.

[20] See *Scientific American,* January 1942.

formation. Any specialist unit often traded the ability to hold territory for the ability to take it, and tanks were the prime example of this; the commander of the American Tank Corps in the Great War warned in 1920 that "tanks can take anything, but they can hold nothing."[21] Well-placed and commanded anti-tank guns offered a cheap antidote to the Panzer division, though not a perfect one. A German unit attacking near Amiens suffered serious losses from French guns, but the more active German units attacking the Weygand line suppressed French gunners with machine gun and cannon fire long enough to move past them.[22]

The Germans provided a model for air action as well, but a negative one from the standpoint of American theories of precision daylight bombing. German tanks defeated France, but the *Luftwaffe* that had so frightened Charles Lindbergh and Joseph Kennedy failed to defeat Great Britain. German air power even failed to drive the RAF away so that a cross-channel invasion would be possible, though in that aspect the *Luftwaffe* came close to succeeding. Initial German focus on defeating defensive air forces before moving on to other targets accorded more or less with American thinking on the subject. The idea that bombers were relatively immune to ground fire or pursuit attacks contradicted the need to defeat the enemy's air ability first, but unstoppable bomber attacks played a major role in American air doctrine. German area attacks against civilians stepped outside the bounds of what American theorists considered to be the profitable use of bombers. The other *Luftwaffe* mission, clearing the way for a ground

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[21] William O. Odom, *After the Trenches*: *American Army Doctrine, 1918-1939* (College station, TX: Texas A&M University Press, 1999), 55.

[22] Armored Force G-2 Bulletin 163, USAMHI, 3. Bulletin 163 suggested a problem the Americans later encountered. Tanks could suppress defenses well enough, but when they moved on those defenses often regained much of their vitality.

invasion, was anathema to Carl Spaatz, the American bomber advocate who experienced the blitz in London. He wrote in his diary at the time that the "best way to obtain maximum misuse of air power was to co-ordinate with the ground force"[23]

Tanks in the American view were not palliatives or wonder weapons, but an added component necessary for success in the face of new conditions. FM-17, "The Armored Division" admitted that things had changed since the last American combat experience. The manual argued that "Every tactical situation now demands special procedures and a special grouping of troops and weapons. This principle applied in the past to a few such groupings as the advance guard and the outpost but has now been extended to include all formations and all types of action."[24] The principle at the center of the American conception of armored warfare was not tanks alone, but combined operations. Infantry, tanks, and artillery all had roles to play. The exact role of each branch depended on such factors as terrain, composition of the enemy force, time involved for preparation, and the amount (and type) of fortifications present on the other side. In some cases the infantry cleared the way for the tanks, and in other cases the tanks for the infantry. A third possibility involved a true combination of the arms, both attacking simultaneously.[25]

From the point of view of a post-1945 armor theorist, Chaffee failed to make his mark on the overall structure of American doctrine. The center of the American forces in

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[23] Richard G. Davis, *Carl A. Spaatz and the Air War in Europe* (Washington and London: Smithsonian Institute Press, 1992), 51.

[24] War Department, "FM-17: The Armored Force, The Employment of Armored Units: The Armored Division", USAMHI website, http://ahecwebdds.carlisle.army.mil/awapps/main.jsp?flag=browse&smd=1&awdid=1, accessed 16 April 2004, 1.

[25] Ibid., 1-2.

the Second World War was the same as in the Great War, an infantry-artillery team. The intervening twenty years had convinced Marshall that these elements had to be supplemented by air and armor. Doctrine influenced organization, as Marshall dropped proposed tank armies supported by infantry divisions with organic truck transport (called "motorized" divisions) in favor of armored divisions and a system of rotating attachments to infantry divisions of specialized units, such as engineer or tank battalions.[26] A triangular infantry division could be "motorized" without the need for permanent equipment in this manner, given additional offensive firepower by the attachment of tank battalions, or greater defensive power with tank destroyers added. Advocates of mixed-branch formations pointed, with some accuracy, to German reorganizations which added armored components to grenadier divisions.[27] Considerations beyond pure battlefield effectiveness also weighed in the argument over technology and organization. Since the American forces involved had to be shipped across either the Atlantic or Pacific oceans, the space occupied on a cargo ship was a factor in evaluating the usefulness of a particular type of unit. In these calculations the motorized division lost out, because its vehicles occupied roughly the same shipping space as the tanks of an armored division, but it lacked tanks, and thus could not match the presumed striking power of an armored formation.[28] Unprotected mobility did not fit the bill; McNair wanted a balance between mobility and hitting power, and an armored division had similar mobility to a motorized one, but vastly greater firepower.

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[26] Greenfield, et al., *The Organization of Ground Combat Troops,* 66-67, 290-3.

[27] Armored Force G2 bulletin 90, 19 June 1941. USAMHI.

[28] Greenfield, et al., *The Organization of Ground Combat Troops,* 337.

Despite McNair's misgivings about specialist units, he was no blind advocate of tradition. While theorists could speculate, he had the responsibility to make decisions that affected real people. For the Armored Force his decisions were important since they were part of the Army Ground Forces, unlike the Army Air Corps. Armor's legal status was never equal to that of the Air Corps, since only an act of Congress could confer branch standing. McNair imposed his ideas on the Armored Force most directly under its third commander, Alvan Gillem, who lacked the connections that allowed Chaffee and Devers to resist outside regular channels.[29] Though one historian mistakenly described McNair as "Armor's nemesis" because of his concerns about specialized units, the AGF commander did not lack a vision for the role of early 1940s technology in combat.[30] At the core of McNair's vision of war was the rifleman, but a rifleman who had the support of modern technology. From his perspective, independent armored operations ran the risk of accomplishing spectacular battlefield victories but not destroying the enemy's ability to mobilize fresh forces, thus winning battles but allowing the war to drag on. The context of American experience with large-scale war in both the Great War and the Civil War suggested that the defeat of a nation involved more than battlefield victories. Infantry promised to apply long-term pressure of a sort that armor could only hint at, and air had to dispense with altogether. The American conception of war in the first half of the twentieth century was based on the resilience demonstrated by the Confederacy in 1861-65 and Germany in 1914-18, and understood that winning a battle or campaign did

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[29] Charles A. Bailey, "Through Faint Praise: American Tank and Tank Destroyer Design in World War II," PhD. Dissertation, Duke University, 1977, 45. Gillem did not enjoy the direct access to George Marshall that his two predecessors (and McNair) did, and thus exercised waning influence on policy.

[30] Roman Johann Jarymowycz, *Tank Tactics: From Normandy to Lorraine* (Boulder, CO: Lynne Reinner, 2001), 149. Jarymowycz is a former tank officer who dedicated his book to his armored "brothers." (3).

not automatically translate into winning a war. The promises of technological specialists thus appeared fantastical, particularly to General McNair.

Commanding first the GHQ (in 1940) and then moving to its successor, the Army Ground Forces, when it was created in 1941, McNair's job was to create an army that could win the war with the resources he was given. Those resources, great compared to either Germany's or Japan's, were slight when contrasted with the task of fighting both at once. Since shipping was a critical concern, General McNair worried about creating units with the greatest hitting power for the least shipping space. The two were incompatible ends of a spectrum, and the decisions he made were inevitably compromises that satisfied no one but tended to work. When faced with the need to reduce the tables of organization for American units, McNair commented that few commanders believed they had enough troops on hand for their missions, and most thought they had too few.[31] McNair believed that the most important aspect of military organizations was a desire to close with and destroy the enemy, and burdening units with defensive weapons not only meant that fewer could be shipped but that a defensive mentality prevailed.[32]

Along with questions of doctrine and organization, Marshall and McNair confronted the issue of training the men who would flesh out the tables of organization. One fundamental issue of military planning was, as de Gaulle noted, how much time and training was required to make citizens into soldiers. Ever since the time of the American Revolution, debate in U.S. policy over the effectiveness of militia and short-service regulars vs. professional soldiers was common. The standard professional view that only

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[31] Greenfield, et al., *The Organization of Ground Combat Troops*, 315.

[32] Ibid., 316

long-service officers and soldiers had the discipline and expertise for war was propounded by West Point Superintendent Emory Upton late in the 19th century, influenced the Plattsburg movement during the Great War, and remained relevant to the debate between 1920 and 1940 as well. In the age of machines, technical training for soldiers had to be added to the process of creating discipline, lengthening the time required.[33] The problem was that no direct experience existed (in France before 1940 or the U.S. after) to determine how much time was required to turn recruits into modern soldiers. The factor of time was one of the most critical in preparing for war, since there was never enough of it. At Army Ground Forces headquarters during the 1941 Louisiana maneuvers, a banner caught the spirit of the day when it proclaimed "Time is Short."[34]

Time was central to the other main vision of American military service, begun by the minuteman ideal and continued in the armies that fought the Civil War. Expressed in the post-Civil War era by John Logan , the basic premise of this ideal was that Americans could learn the fundamentals of soldiering relatively quickly, and thus obviate the need for large standing professional forces.[35] These two ideas melded in several schemes intended to combine the best of both worlds, such as John Calhoun's 1820s plan for an expandable army, and the National Defense Act of 1920's insistence on maintaining regular units for training purposes. The tension came when military professional ideals

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[33] Eli Ginzburg, James K. Anderson, Sol W. Ginsburg, John Herma *The Ineffective Soldier: Lessons for Management and the Nation. Volume I The Lost Divisions.* (New York and London: Columbia University Press, 1959), 24-28.

[34] Greenfield, et al., *The Organization of Ground Combat Troops*, 9. In the illustration Generals Marshall and McNair examine the situation map of the maneuvers.

[35] John Logan was particularly critical of the professional system, arguing that the experience of the Civil War proved that citizens could become good soldiers. See Russell Weigley's discussion of Logan in *Towards an American Army: Military Thought from Washington to Marshall* (Westport, CT: Greenwood Press, 1962), 127-136.

conflicted with American beliefs about their exceptionalism. While American institutions might not be as unusual as some apologists argued, some factors about the United States differed enough from overseas experience to influence national defense policy.

Geography made the United States unique: when de Gaulle focused on the impact of France's geography on French military policy, the effect he noted was the inverse of the American experience. "The map of France tells our fortune," argued de Gaulle, and that fortune was that the weak Franco-German frontier "lays her open to attack."[36] French policy therefore had no room for experimentation or error, since only a few mistakes would likely lose the war. The U.S., however, was far removed from most of the period's likely areas of conflict. Even in the machine age, the U.S. still had space and time to learn from its mistakes. In the period before the Second World War, there seemed to be no serious mistakes from which to learn. American participation in the Great War was a success that raised concerns about modernization, not a failure that exposed flaws. Although a literature existed even before 1914 of rapid annihilation from the air, the technology of the early 1940s did not support such claims.[37] Recognition still grew among American planners that time might not be available for leisurely full-scale modernization. In the interwar period the time allotted for mobilization shrank, being measured in weeks and days instead of months.[38]

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[36] De Gaulle, *Army of the Future*, 11.

[37] H.G. Wells published *The War in the Air* in 1908, which described an air attack on New York City. Michael Sherry's *The Rise of American Air Power* (New Haven: Yale University Press, 1987) devotes a good bit of space to these fears, which in many respects were the darker side of the hopes described by Joseph Corn's "air evangelists" of the previous chapter.

[38] For Plan ORANGE in 1938, the Army agreed to furnish 20,000 troops for combined arms operations no later than 35 days after mobilization (M-day). Joint Army and Navy Basic War Plan-Orange, Enclosure A,

While the Germans prepared to move westward, General. Marshall ordered the 1st Infantry Tank Brigade to face Adna Chafee's 7th Mechanized Cavalry Brigade in the Louisiana maneuvers May 1940. His intent was to see which model of armor development might prove more useful should the United States be drawn into the European war. In mid-1940 Marshall's move was prudential rather than prescient, trying to look within the American establishment for useful elements to use in a potential war. Umpired war games were the next best thing to actual combat, providing information on which evaluations could be based. Chaffee, well aware of the need for experimental information, enthusiastically organized the challenge. Some features of combat were not duplicated, in particular the limits of reconnaissance. The commander of the engineer detachment of the 7th recalled that before the exercise began, General Chaffee ordered a reconnaissance of the area, in order to discover which bridges would support tanks and which would not. While such easy scouting might not be available in wartime, Chaffee wanted to know the limits on his operational mobility ahead of time. Bruce Clarke, the captain in charge of the engineers, exceeded Chaffee's expectations. He took his command and spent the days before the exercise testing the strength of the bridges and culverts in the area, in some cases by driving a light tank over a bridge to see if it failed. If it did, they recovered the tank and repaired and strengthened the bridge. Upon reporting that all the bridges in the area were passable to Chaffee, Clarke recalled that the general was relieved: "I was scared to death because I couldn't go anywhere. Now we'll win."[39] Chaffee's worry that his force would not be able to use its primary asset,

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12, reproduced in Stephen Ross, *Plans for War: Against the British Empire and Japan, 1923-1938* (New York and London: Garland, 1992), 171.

[39]Bruce Cooper Clarke Oral History interview, USAMHI, Bruce Cooper Clarke Papers, box 9, USAMHI, 31-2.

mobility, was assuaged. Clarke, already an engineer by training, drew from his experiences in the maneuvers the lesson that future armored units would need permanent and organic engineer detachments to provide the conditions necessary for action. The 7th won the exercise, and Marshall set events in motion to consolidate American mechanizers under a single administrative structure, something Chaffee had long sought. In effect Marshall accepted that the tank was part of modern war.

In the aftermath of the successful demonstration of the potential of the cavalry tank and the German defeat of France, on 10 July 1940 the Armored Force of the American army came into existence.[40] Based at Fort Knox, the new arm incorporated Infantry tank officers as well, but in many respects the Cavalry model won the day. Chaffee was the head of the new force, and he was the one who wrote the guidelines on forming the new armored divisions. Having overseen the Mechanized Cavalry, and contributed a good deal to the early days of the Armored Force, Chaffee's influence on how the United States fought the war would be limited to prewar organization. Suffering from cancer, he was ill much of the time in the summer of 1941, and finally succumbed that August.[41] His role in the last weeks of his life was diminished by his illness. Bruce Clarke recalled that very little was accomplished that summer, and while he clearly respected Chaffee, he was relieved when Jacob Devers took over.[42] Marshall's decision to concentrate the tanks instead of parceling them out among the infantry accepted Chaffee's idea that their mission should expand beyond infantry support.

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[40] Palmer, et al., *Organization of Ground Combat Troops*, 56.

[41] Gille, *Forging the Thunderbolt,* 205. On this there seems to be some confusion: Kenneth Macksey notes on page 217 of *The Tank Pioneers* that Chaffee died in 1944.

[42] Bruce Clarke interview, USAMHI, 29-30. Clarke even commented that Chaffee was the best tactician in the Armored force, with George Patton the second-best.

Armor's place in the U.S. Army was ill-defined, and tank officers had to set about expanding the small experimental forces into several armored divisions. The lines of command from the Army General Headquarters (GHQ) to the Armored force were not yet clear, and the new branch was at first given a good bit of leeway to determine their own training and doctrine. Chaffee, and his second-in-command Jacob Devers, faced a difficult task, since they had to create a new force from scratch with no established guidelines. How should the new units balance medium and light tanks? What sort of support units needed to be organic, and what could be attached as needs arose? What command arrangements would best maximize the advantages of tank formations? The newly formed Armored Force was not without evidence of how other armies answered these questions, though none of these sources were without drawbacks. The Axis powers were not uniformly instructive in this case; one special bulletin on Japanese methods in 1942 devoted several pages to Japanese bicycle troops, with no mention of armored operations.[43] The success of the German tanks in defeating the French in 1940 made them the primary inspiration for successful armor operations, although the *Wehrmacht* was hardly willing to share that information widely. The British provided another, and the Armored Force even found some French reports instructive. The G-2 (Intelligence) section of the Armored Force studied what information it could obtain about German technology and methods, disseminating its presumed lessons through regular bulletins. These documents mostly concerned themselves with organization and technique; while some technical intelligence did appear, that mission was also performed by the Ordnance department. When gathering intelligence from abroad, the American army tended to

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[43] "Notes on Japanese Warfare" Military Intelligence Bulletin 10, 21 March 1942, USAMHI website, http://ahecwebdds.carlisle.army.mil/awapps/main.jsp?flag=browse&smd=1&awdid=1, accessed 10 Jan 2006, 14-17.

focus on personnel rather than technological issues, believing that the principles of leadership were less subject to change than mechanical specifications. Personnel issues were knotty enough. The tank-infantry-artillery team was a new and untested concept, and Chaffee had long argued that leadership in armored units required a different set of skills than a comparable position in an infantry unit. The ability to remain calm in difficult situations and execute detailed orders under duress was no longer the prime requisite for an officer. Major decisions had to be reached quickly, with minimal information or direction. The number of supply items for armored units also increased dramatically from the infantry standard, and to the problem of evacuating injured soldiers was added that of recovering damaged machines. Infantry and tanks had to learn how to reinforce each other's strengths and cover each other's weaknesses.

The Americans had done a better job than many nations in understanding German armor theory in the years before the war. American military attaches in Berlin during the twenties and thirties were a competent bunch, and were sometimes allowed to attend German maneuvers that no other foreigners saw. American observers noted German determination to incorporate the modern elements forbidden them by the treaty of Versailles before Hitler announced open rearmament.[44] They also uncovered most of the particulars of German armored doctrine, which became a basis for American organization of their Armored Force. General Chaffee asked the last attaché to speak to the war college about recent German developments shortly after his lecture on mechanized cavalry.[45] Aside from questions about the appropriateness of German methods for

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[44] Thomas G. Mahnken, *Uncovering Ways of War: U.S. Intelligence and Foreign Military Innovation, 1918-1941* (Ithaca, NY: Cornell University Press, 2002), 96.

[45] Ibid., 109.

American needs, the access Americans could achieve decreased after war broke out, and as a consequence they had to react to German developments through the experience of others.

When examining reports on how to organize and operate as the Germans did, information about German experiences in France was especially important, so much so that information published in the German press for propaganda purposes was analyzed for any hints it might yield.. The operational technique of the German forces was the subject of G-2 bulletin 163, issued on December 23, 1941. The U.S. Embassy in Berlin had translated an article that appeared in one of the city's daily newspapers, the *Deutsch Allgemeine Zeitung*. The subject was a tank attack against the Weygand line, south of the Somme River. The American commentary emphasized several points, but the main ideas reduced to reconnaissance, flexibility, and supply. The bulletin's first point emphasized the personal survey of the ground made by the unit commanders involved. German preparations were presented as thorough, in contrast to one of their previous attacks where preparation was slight.[46] Concerning flexibility, the translator noted that apparently there were no fixed unit boundaries, a common feature of American field orders. The idea was that a unit could better accomplish a mission if it did not worry about straying from an arbitrary area on a map. Such tactics raised the danger of friendly fire and loss of control, but the German army could risk them for two main reasons. On the strategic level they had to win quickly, and could accept even heavy casualties at the sharp end if victory followed shortly thereafter. The other reason was that the German army was composed of enough long-service soldiers, both officers and noncoms, that their judgment could be trusted enough to let the reins slip a bit. The problems of fast-

[46] Armored Force G-2 Bulletin 163, USAMHI, 7.

paced operations demanded close contact between commanders and the elements of their units. At one point in the attack both the battalion commander's tank and his adjutant's tanks were trapped by the same obstacle, a ditch too large and deep for the tanks to escape from unaided. The lesson drawn was that leadership from the front was the German method, even with the risks it entailed.

Bulletin 163 also emphasized mass, élan, and speed. The German battalions it discussed at one point overran an artillery unit by ignoring the shell fragments and explosions and driving directly at the French guns, some of which were firing in flat trajectories instead of the normal arc of the large guns. In a description that hearkened back to the Napoleonic era, the German officer described how "a few [French] crews abandoned their [artillery] pieces when they realized how rapidly the foremost tanks in our battalion were advancing toward them."[47] Artillery, which had so dominated the Western front in the Great War, was tamed by speeding tanks. Implied in the emphasis on speed was that fewer, or slower, tanks would not have had the same effect.

G-2 bulletin 148, dated August 16, 1941, examined a German attack near Amiens, on June 5, 1940. The source was an account published in the German *Militater Wochenblatt*, translated by a staff member of the American Embassy in Berlin. The article described the experiences of a platoon commander whose entire unit lost its tanks to French fire. The writer had his own tank disabled but continued to fire his machine gun until his ammunition was expended, at which point he dismounted and took cover with another survivor from another tank.[48] Both the German article and American commentary noted that the reason the entire platoon of tanks was disabled was the French

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[47] Armored Force G-2 Bulletin 163, USAMHI, 4.

[48] Armored Force G-2 Bulletin 148, USAMHI, 3.

tactic of firing on the rearmost tanks in the wedge formation first. The American comment noted that "the attention of attacking tank crews is usually directed toward the front; in this case, the tanks continued to advance without taking special measures against the antitank gun."[49] Although the initial platoon failed to take the French position frontally, its parent battalion managed to outflank the French later that day. The importance of the flanking maneuver over the frontal attack had special resonance for the Americans, who were focused on the potential of the tanks to reduce costly frontal assaults.

The importance of mobility was also underscored in bulletin 163, when two German NCOs stripped their disabled tank of its machine guns and used them to protect wounded members of another tank crew until becoming pinned down themselves by French fire. Just when French anti-tank guns began to find their range, they "were relieved of their predicament by the arrival of German tanks from the rear."[50] The final section of the article focused on the experiences of a non-commissioned officer as he tried to evacuate or repair damaged tanks.

While evacuating wounded soldiers was not usually easy, tank crews faced the additional possibility of being wounded inside a machine not designed for easy access. The Army was well aware of the problem, and in this case used British experience in North Africa as a potential model. In June of 1942, Army Intelligence Bulletin number 17 (Removal of Wounded from Tanks) addressed these problems. The opening statement declared that, ideally, wounded soldiers should be moved only by medically trained

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[49] Armored Force G-2 Bulletin 148, USAMHI, 5.

[50] Ibid. The quote is from the original article, not the American commentary. The exact meaning of "rear" is questionable too; the author does not specify if it was the German rear (and thus the tanks advanced toward the French) or if the tanks came from behind the French.

soldiers, but accepted that this ideal might not be possible in most cases. The unidentified author took the position that centralized care of wounded was preferable, both from morale and logistical standpoints. The command and control argument began with a slightly obvious point, "it cannot be definitely known beforehand where, when, or in what units the majority of armored force casualties will occur."[51] Centralized ambulance control was the method by which aid could most easily be dispatched to those who needed it, although the command level was not specified. The overall idea fit with command and control ideas at the time, suggesting that mobile units under central control could respond as needs demanded faster than ones assigned organically to combat units, which would spend most of their time idle.

Recovering damaged tanks was not as urgent a matter as tending to wounded soldiers, but here the German experience suggested that rapid recovery of machines had its benefits as well. There were numerous reports of German attempts to recover damaged tanks under fire, or even to repair them in place, under the cover of friendly tank fire.[52] While such a policy might seem counter to the tank's goal of reducing casualties, more tanks in action raised the likelihood of a speedy victory, and thus lowered casualties as a whole, at the cost of greater local losses.

Related to the problems of recovery were those of supply. One of the arguments Chaffee advanced for the formation of Armored corps, and even Armored Armies, was the need for supply officers to add to their existing oversight of clothing, food, and

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[51]War Department, "Army Intelligence Bulletin Number 17, Removal of Wounded From Tanks," June 5, 1942, USAMHI website, http://ahecwebdds.carlisle.army.mil/awapps/main.jsp?flag=browse&smd=1&awdid=2 accessed 10 Feb 2003, 2.

[52] Armored Force G-2 Bulletin 163, USAMHI, 8.

ammunition the handling of a large number, in some cases hundreds, of specialized spare parts for tanks and trucks. Fuel and lubricants were also needed in greater quantities than in any other ground organization. Chaffee's main argument for the armored field army was that the Germans had organized in that way in May of 1940. The perception that the Germans had solved all the supply problems relating to mechanized operations turned out to be false, but given the lack of direct American experience, Chaffee had to turn to external sources for evidence. The perception that the Germans had done it was enough to make the Americans believe they could too.

The lack of experience in the American army reflected how few officers had ever directed a large unit, such as a division, in the field. The schools system of the interwar period was explicitly designed to remedy this problem, but they were never a substitute for experience. The Army held a number of maneuvers in 1940 and 1941, trying to learn from simulated combat before having to face the real thing. While the basics of troop handling could be taught in a classroom, eventually the students had to go into the field and do it for themselves. The maneuvers also exposed the myriad problems that operating large armies created, and gave some direct experience on how to confront the Clausewitzian friction inherent in war. Control of movement was not the only concern, and maneuvers included staged combat within a series of guidelines.

The Army developed a set of rules governing umpiring of engagements. Umpires traveled with the units they refereed, observed their progress, and once combat was joined, assessed the numerical and technological strengths of the opposing forces based on formulae in the manual. These formulae reveal Army attitudes toward combat action and casualties on the modern battlefield. Umpires met together to assess the outcome of

the encounter, and victory was awarded based in no small part on the relative strengths of the forces committed. If the encounter was not a draw, the winners would be allowed to advance, and the losers forced to withdraw. The 1941 umpire manual warned that, too often, an attacking force was judged successful with a minimum of effort, even if the two forces were roughly equal in size. The manual warned the "War experience has shown conclusively that a determined defender, well placed, can delay or even stop a greatly superior force."[53] The manual went on to recommend that the attacking force be required to possess superiority in effective strength of at least three or four attackers to one defender in order to advance. In the case of well-sited and entrenched defenders, the manual recommended an offensive superiority of five to one. Although the senior American officers twenty years previously may not have accepted the strength of the modern defensive, the 1941 Army clearly did.

Indicative of Army attitudes in 1941 was the section of the umpire manual on calculating relative losses of attacking and defending forces. Tables in the section on infantry losses against various types of attacking units suggested that two infantry units of roughly equal strengths in combat with one another accrue casualties at the rate of between one and three percent per hour. The tables also indicated that the same unit overrun by tanks could expect to suffer three percent losses per attack, and that a well-led armored unit could attack several times in one hour. Horse cavalry were included in the tables for loss calculation, but at a lower rate than the most severe losses from other infantry. The most severe losses the table provided for were from a technological enemy, but not on the ground. The manual argued that an infantry regiment in march column

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[53] Clyde Hyssong, Umpire Manual, General Headquarters, U.S. Army. February, 1941. Combined Arms Research Library, http://cgsc.cdmhost.com/u?/p4013coll8,149 accessed 16 Nov 2005, 11.

could expect to suffer ten percent casualties from a surprise attack by just nine low-flying airplanes.[54] The possibility of inflicting the greatest damage to infantrymen was reserved for the technological, not the traditional, approach. Even if the Army had not fully worked out the implications of the machine battlefield, it recognized the importance of machines in combat by 1941.

How to defend against mechanized units and what sort of losses tanks would suffer in attacks were uncertain. The anti-tank gun (usually towed) was here judged to be the master of the armored vehicle in certain situations, especially when the tanks were not attempting to overrun the guns directly. The manual suggested loses be assessed as one vehicle per gun per thirty seconds of firing at ranges under 500 yards, and one per gun per minute at longer ranges, if the tanks were not in motion toward the guns. Losses were assumed to be lower if the tanks were attacking the guns directly (since the tanks would close the distance and overrun the guns), and were assessed at a rate *per gun*, rather than *per gun per minute*. The section on tanks fighting other tanks proposed that losses would be related more to strengths of the opposing forces, in inverse ratio of their respective strengths (the smaller force could expect to take losses related to how much smaller it was).[55] Such calculations assumed a rough technical parity, focusing on traditional factors of leadership and mass as decisive. These factors were much less subject to rapid change in the technological age, as tables of armor thickness and gun muzzle velocities were.

The Army maneuvers of 1940 and 1941 did not provide a final solution for pressing doctrinal issues, but did clarify some operational and organizational ones. The

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[54] Ibid., 15.
[55] Ibid., 17.

infantry divisions were in process of reorganizing away from the four-regiment square division to the three regiment triangular, so the handling characteristics of that formation had to be worked out. One of the arguments for the triangular division was that it would be more mobile, needing fewer trucks to move its organic infantry. General McNair's comments on the 1940 maneuvers noted that motor trucks in the table of organization and equipment did not always equal speed in action; in one case he noted that some infantry soldiers spent more time waiting for trucks to arrive than would have been required to march the three miles in question.[56] McNair did suggest that trucks be used when practical to save the energy of soldiers for combat, or to exploit a break in enemy lines.[57]

Fatigue proved especially problematic for mechanized units. Exhaustion might at first seem an unusual problem because machines had been called in to replace muscle power, but Bruce Palmer commented on the problem after the Second Army Maneuvers:

> the maneuvers proved conclusively that the operation of mechanized cavalry in the field makes great physical demands on all personnel, commissioned and enlisted. The vibration, noise, lack of comfort, restricted vision, long hours of driving on roads and off, during daylight and darkness, and constant strain due to the need of being strictly alert whether car commander, driver, gunner, or radio operator, all contributed to a condition of fatigue which must be anticipated and allowed for in protracted and intensive operation. This fatigue was bound to be even more pronounced in the maintenance echelons which were required to work all night as well as throughout the day.[58]

Expectations for mechanized cavalry were higher than those placed on horse units, since the machines were capable of operating after dark, and did not suffer the same exhaustion that horses did. Physical exhaustion was a problem for the soldiers, but Palmer hinted

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[56]Leslie J. McNair, "Comments on Army Maneuvers, 1940," GHQ, 7 Jan 1941, 4. Willis Crittenberger, Papers, Box 5, USAMHI.

[57]Ibid., 4.

[58]Bruce Palmer, "Report of the Armored Force in Second Army Maneuvers," Willis Crittenberger Papers, Box 5, USAMHI.

that mental fatigue was more serious, required in part by the need for constant attention far beyond that of animal transport, which could be reasonably expected not to run off a road or collide with off-road obstacles. The solution for physical exhaustion was better conditioning, an aspect of combat preparation that General McNair well understood. He often repeated his critique that units too often allowed soldiers to ride, even at the expense of supply and heavy weapons support. Still, William Triplett, a participant in the maneuvers, found the emphasis on fitness "asinine" when applied to the clerks and various support staff.[59] McNair's worry should be seen in context of his approach to solving the problem of difficulty of supply for a modern army; paying too little attention to the seemingly small details might have dire consequences.

McNair stressed the lessons learned from the Germans regarding mechanized command, though not explicitly. The officers in Louisiana issued orders that were generally short and clear, he commented, with the notable exception of a corps attack order that ran to three typed pages. The emplacement of antitank guns tended to be passive and dispersed, in contrast to the goal of being mobile and concentrated to react to massed armor at a decisive point. Since in maneuvers ammunition expenditure was theoretical rather than actual, little if any attention was paid to bringing up stocks or evacuation "wounded" soldiers, an aspect of combat that both foreign experience and previous American experience suggested was important in maintaining effectiveness through time.[60]

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[59] William J. Triplett, edited by Robert H. Ferrell, *A Colonel in the Armored Divisions: A Memoir, 1941-45* (Columbia, MO: University of Missouri Press, 2001), 33.

[60] McNair, "Comments on Army Maneuvers, 1940," 9.

The problem with training, even in large-scale maneuvers, was that efforts to replicate combat conditions worked against the goal of informed self-critique because the exhaustion and fear of actual combat interfered with the teaching and learning process. Soldiers wandering in a sleepless haze could hardly be expected to learn or apply their new skills with much coherence, but that was how they would eventually be expected to perform. Mental fatigue was much harder to combat, especially in situations where soldiers might get physical rest but not be able to relax, such as being out of immediate combat but not secure enough to relax vigilance. Too, General McNair complained about the unreal combat situations that were allowed to arise when umpiring was allowed to incorporate a "lack of realism" that "was particularly pronounced with respect to the effect of mechanized vehicles, artillery fire, and aviation."[61] McNair's ideas about realism were not shared by armor officers, whose definition of "real" was still ongoing, or in airpower, where it was firm in the minds of its proponents but few others. Despite their shortcomings, the maneuvers were the last chance to work out these issues before entry into actual combat.

Two American manuals reflected how the American army digested the available information on the eve of its baptism of fire in Operation TORCH in November 1942. The second installment in the Army Special Series, titled "The German Armored Army" was as complete a distillation of German methods in France as was possible at the time of its publication in August 1942. The other was the first iteration of the American response: FM-17, the Armored Force's field manual for the "Employment of Armored Units: The Armored Division." FM-17 later underwent substantial revision, as did the structure of the armored division itself, but the early version presents a snapshot of

[61] McNair, "Comments on Army Maneuvers, 1940," 9-10.

American doctrine in late 1942. It especially should be understood as a crystallization of a moment in an ongoing process, rather than an intended final word on the subject.

"The German Armored Army" began with the legacy of the Great War, arguing that the French after 1918 relied on essentially the methods that brought them to victory in the Great War, while the defeated Germans had to find a new solution to combat in the modern era. The anonymous author argued that what the Germans achieved was not so much a new way of fighting, but the return of ancient principles by means of modern technology.[62] The inability to convert a local success into a general one that made the Great War so terrible was at last achieved by the combination of motor, treads, and armor plate. But technology alone did not guarantee victory. Equally important was the organization of the armored units, and the men who commanded them. The document never once mentioned armor thickness, gun velocity, or other technical factors. Instead, the German success in 1940 was attributed to surprise and secrecy, flexible leaders who commanded from near the front, and a willingness to accept numerous casualties at the decisive point of action.[63] In several places the manual identified speed as the decisive factor for the success of an armored attack: "The speed of tank units results in the conquest of objectives in depth."[64] Speed was crucial to prevent the enemy from maintaining a coherent defense. The manual also stressed the need for overcoming the morale of the resistance with awe-inspiring displays of explosions, noise and shock. Giving the enemy "the impression of an 'apocalyptic' scene" took a place alongside

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[62] War Department, "The German Armored Army," vi. Patton would have agreed.

[63] Ibid., 12, 34.

[64] Ibid., 32.

actually cutting off the material threads binding an army together.[65] Such emphasis was not out of place in an army facing opponents that had never encountered a tank-infantry combined arms attack, and neither Poland nor France had the time to acclimate their forces to tank attacks before their defeat. The American document, though, realized that the German army of 1942 would be the hardest to overawe with tanks and dive bombers. The Germans had not only developed a way to attack with an armored force, but "had studied at leisure the defense against similar attacks."[66] While the American idea was to learn these methods from the Germans, the implication was that the Germans could likely react rapidly to an armored thrust. The Americans had to build a force that could both attack the German army, and survive a counterattack in turn. German expertise in armored operations meant that they would be a more difficult opponent to blitz than the Poles or French. In this conception, victory against the Germans would not come from one brilliant operation, or even one campaign, and configuring American armor to strike a single hard blow might prevent it from sustaining combat power for the long haul that defeating Germany required.

Continuing the theme from the G-2 reports, "The German Armored Army" emphasized that at most levels, Panzer officers commanded from their own tanks in the midst of the attack. In order to stay abreast of rapidly developing situations, each commander relied on an extensive wireless radio network in addition to the evidence of his own eyes. Communication was vital to leading from the front: "Immediate effective action of the command is possible only because of the intensive development of signal

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[65] Ibid., 25.
[66] War Department, "The German Armored Army", 24.

communications in the German Army."[67] Command from the front went hand in hand with an aggressive attitude and an understanding of the overall objective of the operation. The German practice, not isolated to armored units, was to set an objective, and allow maximum flexibility from subordinates in achieving that objective. The characteristics of the German army made this course possible, while in the American it was more difficult. Germany had more professional officers, while the American army had to clean up twenty years of seniority-based promotion within the regular army by firing officers who had stayed the course but were unsuitable for command in combat.[68] The other source of American officers was the National Guard, and while many Guard officers served with distinction, many others held senior posts as sinecures due to political patronage, and were not ready for combat. German methods were not always perfectly suited to American organizational realities.

The German emphasis on the decisive point, which found its way into the American debate as well, was very well suited to war against smaller European states, such as France, Poland, or Denmark. What was not so evident in 1940, but became much more so by the time of American landings in North Africa, was that the *blitzkrieg* was not so well suited for attacking an opponent with multiple centers of gravity, or the time and resources to reconstitute armies lost to the armored thrust. The Soviets, for instance, were also shielded by their slowness in mechanizing their society. "The German Armored Army" commented that "it is apparent that a success comparable to that of the

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[67] Ibid., 20.

[68] General Marshall received complaints from partisans of the National Guard officers who were so cut, but replied that he had been more lenient with them than with Regular Army officers. George Marshall, Letter to Major General Roy D. Keehn, 25 June 1942. Reprinted in *Marshall Papers*, Volume III, 251.

German campaign in the West could not be expected in a theater of operations not provided with such a dense road system..."[69]

The concept of the gun as the primary antitank weapon was based in large part on German organization, including the measures taken by the panzer units to protect themselves from other battlefield technology.[70] Since the Blitzkrieg involved both air and armor attacks the Americans studied German methods of defense against them, but devoted more space to the ground operations of the Panzer division. While flak guns were useful, "a still more important role is reserved to the antitank guns (or "PaK") of the tank-destroyer battalions."[71] In the minds of American armor officers, aggressive forward positioning of German tank destroyer units played a key role in securing the gains made by the armored unit. In some cases it seemed tanks could hold ground, with the cooperation of other types of units.

Anti-tank guns did not possess much potential for offensive action. The role of an armored division, American or German, was primarily to attack. American armor doctrine in 1942 represented temporary consensus, pending refinement in light of further experience and analysis. Still, the manual on the Armored Division gave substantial guidance, some of it very practical. The 1942 Armored Division had at its core two armored regiments, an armored infantry regiment, and three battalions of artillery. Other support and specialized units were included, such as antiaircraft, antitank, engineer, maintenance, supply and medical battalions. The core power of the division came from

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[69] War Department, "The German Armored Army", 12.

[70] The German acronym for anti-air weapons, FlaK (Flieg abwehrKannone) entered the American lexicon after the war, while PaK, (Panzer abwehrKannone), did not achieve wide use.

[71] War Department, "The German Armored Army," 24.

the tank regiments; each had two battalions of medium tanks (armed with antitank guns and weighing over 20 tons) and one of light (armed with light cannon and machine guns, weighing 5-15 tons).[72] The formation had more medium tanks than Adna Chaffee's proposals of only a few years before; German developments in the intervening years were toward heavier tanks and more of them. The state of technological developments between 1940 and 1942 meant that serious problems had to be addressed before any technology could offer a "silver-bullet" solution.

There were two solutions to the various technological problems centered on ground mobility that were widely accepted in 1940. Both represented compromises among competing priorities. Light tanks (usually weighing between 5 and 15 tons) provided cross-country mobility and were effective when the enemy lacked strong antitank defenses, but experience prior to the war suggested that they were vulnerable to even the lightest antitank defenses, and the small cannon most carried made them less effective against fortifications. Medium tanks, weighing from twenty to forty tons, provided more limited mobility in terms of the terrain and obstacles they could cross, although they were more mobile than older tanks of a similar weight. Their operating range tended to be greater than light tanks as well, since they could carry more fuel than their contemporary cousins. Heavy tanks, on the other hand, began to edge into areas where technical expertise was not well developed, and quickly ran the risk of outweighing their horsepower, to say nothing of reducing their ability to cross bridges and other obstacles. The large engines needed to power heavy tanks consumed fuel at an alarming rate for minimal mobility in return. The American M6 design, produced in

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[72] War Department, FM-17, 4.

limited numbers in 1941 and 42 but not thereafter, weighed about sixty-three tons, and could generate roughly 800 horsepower from its engine, giving it a slightly better power-to weight ratio than the Tiger but an inferior one to the Sherman. More critical was its fuel consumption; it took 464 gallons to travel one hundred miles, while the M4A3 could go somewhat farther (130 miles) on less than half the fuel (174 gallons).[73] The M6 had suspension problems and occupied over twice the shipping space of the Sherman. In 1940, the firepower and protection of the heavy tank came at a price in lost flexibility too high for most nations, Germany included, to make them the mainstay of their armored forces. Even by 1942 the development of heavy tanks was not as far along as the appearance of a few breakdown-prone Panzer VI models in North Africa might lead retrospective observers to believe. Medium tanks provided firepower enough, in the understanding of the day, to restore movement to warfare.

The importance of radio communications in German operations made a definite impact on American practice. In wording that could have been copied from the German reports, FM-17 asserted that "Voice radio enables the commander to exercise the force of his personality and to control the actions of his subordinates in considerable detail."[74] Two themes were combined in the emphasis on communication. Most obvious was the role of the commanding officer, who had to impose his will (or personality) on subordinate commanders, and through them, the enemy. The other was the speed necessary for the full exploitation of the mobility that the tank brought to the combined-arms team. Breakthroughs had to be converted into more than local successes to avoid the stalemate of the previous war, and, to accomplish that, the attacker's movements had

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[73] Army Ordnance Department, Catalog of Standard Ordnance Items, Volume I, USAMHI website, accessed 19 May 2003., 20, 24. This document is no longer available online.
[74] War Department, FM-17, 2.

to outpace the defender's responses. Limits on fields of action and unit boundaries restrained the ability of armor to exploit and pursue, so the manual recommended against them, again in line with the Army's understanding of German operations in France.

The demands that armored exploitation placed on commanders were accommodated within the cavalry tradition of officers with an excess of personality, sometimes eccentricity, but the American system was not designed to produce such men. The strong personality ideal also conflicted with the typical stereotype of the bland technical specialist, and seemed to suggest that familiarity with the specifications of armored vehicles was not critical to success in armored combat. If anything, tank officers had to be adaptable so as not to worry overmuch about technical factors.

Flexibility lay at the heart of the American role for armor. Although most American manuals from the period began with disclaimers to use the information contained emphasize as guidelines rather than absolute rules, the purpose of the manual was to instill common understanding, and these two trends sometimes worked at cross purposes. Armored force manuals emphasized that the physical speed of the mounted formation allows it to react to situations faster than a traditional unit, and stressed repeatedly that reconnaissance elements must constantly probe for openings that allowed attacks on the flanks and rear.[75] When discussing the defense of the Armored Division against hostile tanks, the main mission of the tank destroyers was to prevent enemy thrusts to those areas.[76] Defense against tanks was separated from the use of tanks on the offensive in the American army. Initially American anti-mechanized defense focused on guns, properly massed and controlled, as the key to stopping a hypothetical "enemy"

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[75] War Department, FM-17, 9-12.

[76] Ibid., 33.

(German) armored attack. In 1939 the Army's doctrine of anti-mechanized defense envisioned one battalion in each triangular division serving the anti-tank role, with motor transported guns and their own reconnaissance section.[77] The flexibility needed to counter enemy mobility quickly led to the conclusion that most guns needed to be self-propelled, in order to react quickly in combat. Germany and the Soviet Union both used self-propelled antitank guns, although their designs were somewhat different from American armored tank destroyers, primarily in that they lacked traversable turrets.

The role of enemy tanks was difficult to foresee in the combat envisioned by the armored force. If the role of the tank was offense, then it seemed likely that the two opposing tank forces would attack their opponent's weaker spots instead of facing each other directly. When defending against tank attack, for example, FM-17 suggested that smoke and tank destroyers were the best way to repel enemy armor, while the division's tanks moved to attack the enemy support and command functions.[78] One factor that pertained in tank defense was also the capabilities of the tanks involved, and here the manual remained vague, instructing officers to be aware of enemy technical capabilities without specifying what they were. In 1942, the only American medium tank ready for combat in large numbers was the M3, although it was only a stop-gap measure.

The tradeoffs inherent in any tank design manifested themselves particularly in the M3, which saw some service with all three major allies; the British called it the Grant, the Americans the Lee, and the Soviets the "Grave for Seven Brothers."[79] Before the

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[77] Gabel, "Seek, Strike, Destroy," 6.
[78] War Department, FM-17, 32

[79] David M. Glantz and Jonathon House, *The Battle of Kursk*, (Lawrence, KS: University Press of Kansas, 1999), Illustrations following page 196.

Americans fielded any tanks in combat, they supplied them to the British. Given the urgency of the situation in North Africa, Britain needed acceptable tanks rapidly, raising a basic issue with military technology. Designers had to bow to operational pressures, rather than waiting for all the bugs to be worked out of their designs, or an ideal solution to be determined for every issue. Balancing all the issues in a complex machine such as a medium tank involved a number of necessary trade-offs. The allies tended to value standardization and suitability for mass production over continuing to tinker with operating characteristics, and the M3 medium tank is a case in point. When the British envoy arrived in the US in 1940, he wanted American factories to produce British designs which would have increased the difficulty of standardizing a single design. The alternative was a machine, inevitably a compromise, acceptable to both staffs. The current American medium tank, the M2, carried insufficient main armament in its turret to offset the German Panzer IV's 75mm main gun, whose purpose was less antitank than infantry support since it was a short-barreled design. The Ordnance department had mounted a pack howitzer on the sponson of a previous tank for testing purposes, in the days when smaller guns seemed likely choices for a tank's main armament. At the time, no turret design existed that could mount the 75mm gun, and British need was so pressing that the M3 was born. The M3 fulfilled the most basic needs of both services, but work continued on a turret mount for the heavier gun to be used with the same chassis.[80]

With a strange layout by later standards, but with a main gun that could match the Panzer IV, and thick enough armor so that it could survive the encounter with the Panzer IV in most cases, the M3 was a useful compromise, but not an ideal design. Even with its

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[80] R.P. Hunnicutt, *Sherman: The History of the American Medium Tank*, (San Rafael, CA: Taurus Enterprises, 1978), 47. The T5E2 was the previous tank that served as a test bed for the 75.

numerous shortcomings, it was a better protected and more serviceable tank than any in British service at the time, and could be produced in greater numbers. The M3 chassis served as the basis for much of the American armored division's mobility; with its turret removed and a 105mm howitzer mounted it became the M7, a self-propelled lightly armored artillery piece. The M7 could keep up with an armored formation, and presented better protection to its crew than towed field pieces. The M3 also served as the basis for the later American medium tank, the M4. When a turret able to mount the 75mm gun was ready, the main gun was moved into a fully traversable mount. The gun in question had a longer barrel than the German 75mm mounted on the Panzer IV. Although the barrel seemed short by later standards, at the time the M4 was introduced it was an improvement on the tank that formed the mainstay of German armored units. Barrel length is one factor in muzzle velocity, one of the benchmarks by which tank guns were later measured. Higher velocity is more important for armor-piercing fire and accuracy at very long ranges. Lower velocities are more useful for high explosive rounds fired in an infantry support role, a set of targets encompassing almost anything but enemy tanks. Longer barrels also changed the center of gravity of the tank, making it less able to climb or maneuver, especially in already dangerous urban confines. The division of roles in American doctrine meant that tanks got shorter guns, and tank destroyers got the longer, higher-velocity ones. Doctrine based on received experience justified this development in 1942, although later direct experience called it into question.

Unlike war at sea, where the existence of enemy battleships justified the construction of a similar force, in the initial stages of the Second World War tanks were not really intended to attack each other. The practice of referring to the cannon mounted

as the main gun belies the emphasis on the tank's "secondary" armament as its best chance to influence the battle. Given doctrinal emphasis on attacking weakness instead of strength, cost-effectiveness suggested that machine guns provided a cheaper and more effective method of attacking enemy infantry and unarmored vehicles. The Armored Force manual on tank gunnery began not with the problems of direct-fire artillery laying, but the usefulness of each type of armament in achieving the mission. The "main purpose of the tank cannon is to permit the tank to overcome enemy resistance and reach the vital rear areas."[81] Two illustrations on the previous pages gave examples of the use to which machine guns would be put in rear areas. The use of cannon gave tanks an overlap with artillery, and sometimes distracted from the emphasis on the use of machine guns and shock action. Bruce Clarke recalled one such incident in training with the 4th Armored division, when John Wood visited a tank gunnery range. Observing a gunner overshoot his target with the first round, Wood asked the gunner what should be the next step. When the crewman replied that his next shot would hit the target, Wood began to correct him with the artillery model, where the next round should fall short and the third, splitting the difference, would hit. Clarke pointed out that firing a tank cannon was like firing a rifle, with a flatter trajectory and different aiming rules than a field piece.[82] Although Clarke introduced the story with the intent to teach the need for knowledge at the command level, it also illustrates the early difficulties of fusing different branches into a combined arms force. The correct answer in some circumstances was wrong in others. Armored forces were very specialized, and thus were not useful in every

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[81] War Department, FM 17-12 "Tank Gunnery", April 22, 1943. USAMHI website, http://ahecwebdds.carlisle.army.mil/awapps/main.jsp?flag=browse&smd=1&awdid=1, Accessed 11 Nov 2005, 4.

[82] Bruce Cooper Clarke interview, USAMHI, 31-2.

circumstance, despite the claims of armor promoters in the previous twenty years. It was also difficult to accustom older officers to new tactics, and Clarke related that General Wood attended fewer training exercises after the incident. Wood went on to be a good, even great armored division commander, but at the early stages of forging the American combined-arms team even intelligent people had difficulties.

One factor in training for war was integrating all the new soldiers, officers and enlisted alike. Finding enough men who met basic criteria was a difficult problem, but added to it was the oversupply of officers who might perform the daily administrative tasks of the peacetime army well enough, but who were lacked the ability to command in combat. The 4th Armored division's solution to the problem was to transfer the unsatisfactory battalion commanders, but not ask for replacements for them from outside the unit. Instead, promising officers were promoted from within the unit itself, advanced every six months. Promoting officers in this manner produced one of the Army's most famous armored commanders, Creighton Abrams. Solutions of this nature were comparatively rare, since the expanding army's need for officers was severe. Using the cadre system might involve stripping officers from their units and creating new ones around them. While the individual divisions might complain about the practice (and they did, sometimes bitterly) it fits with the general goal of assuring general competence throughout the entire force, rather than having some very good and some very poor divisions. German innovation focused on creating excellent spearhead units, and using the rest of the army as support. American innovation diffused throughout the entire force.

Creating a model for incorporating technology into the Army was only the first step. Once the Army settled on a doctrine for the modern battlefield, the millions of recruits that would carry it out had to be trained to carry it out. The draftees were not *tabulas rasa*, and brought their understanding of technology's proper role with them from civilian society. The interplay between Army and soldier understandings influenced how the soldiers understood their combat experience, so it is to the soldiers that we now turn.

CHAPTER THREE

"YOU CAN TELL I AIN'T NO SOLDIER": CULTURE, DRAFTEES, AND COMPARATIVE MODERNITY, 1940-42

In the 1941 Army maneuvers in Louisiana and South Carolina, reluctant soldier James Oliphant served with the 1st Squadron, 6th Cavalry, though his descriptions suggest that he played the role of an observer in his own unit's activities. Oliphant was a particularly reflective soldier, once relating a "bull session" in which he and another soldier argued over the relative merits of self-criticism, Oliphant favoring it, and reflecting a good degree of it in his letters.[1] In many ways was he a typical draftee; reluctant to volunteer but not unwilling to serve, unfamiliar with the military way of life, and convinced that his outlook on the world was more modern than some of the officers who commanded him. In the end Oliphant was a civilian at heart, beginning one letter by exclaiming "You can tell I ain't no soldier."[2]

If part of "modernity" was assigning a central role to mechanical/technological factors, then Oliphant and the rest of the draftees tended to be more modern indeed. Civilian society envisioned a more prominent role for technology than all but the most convinced airpower advocates, and recruits brought their assumptions with them to their induction centers. While some of the peripheral assumptions faded or were replaced by

[1] James Oliphant, Letter, undated, University of Tennessee Special Collections, MS 1892, Box 7, folder 2.

[2] James Oliphant, Letter, 9 November 1941, University of Tennessee Special Collections, MS 1892, Box 7, folder 2.

training and indoctrination, the core way in which the recruits conceived the role of machines did not alter fundamentally. In turn, their perception of the Army, and its use of technology, influenced how they organized their own combat experience. A recruit who arrived with the wrong understanding of the Army had to first lose his erroneous beliefs before beginning to learn what the Army wanted to teach him. In a period when time was short, any extra steps necessary in training had to be avoided. On the other hand, a certain misperception was to be expected, thus the need for training in the first place.

One misperception relates to the meaning of the word "modern"; in civilian life the word connoted the most up-to-date or advanced. In the minds of the young men who constituted the tank crews the meaning was that their tanks were technically the best in the world. General Patton said as much, after all.[3] Patton's understanding of "modern" had formed over a longer period, and his frame of reference included French Renault tanks of the previous war. By contrast, the half-developed armored vehicles of 1940-42 were a great improvement. Patton's judgment was a backward-looking one, while the recollections of soldiers were inevitably forward-looking.

Two main sources illuminate the contrast between military and draftee visions for the role of military technology. While Army officers debated internally over the role of armor, they conducted a contemporaneous effort to explain their world to the civilians who would comprise their recruits, manufacture their weapons, and provide the social and cultural base for the war effort. Educational materials on this subject ranged form official Army publications to projects undertaken almost entirely by civilians. Most fell

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[3] Marvin Jensen, *Strike Swiftly: The 70th Tank Battalion from North Africa to Normandy to Germany* (Novato, CA: Presidio, 1997), 19.

somewhere in the middle, coming from either former soldiers or civilians who collaborated with serving officers. These attempts to bridge the intellectual gap between two very different worlds offer clues to the mindsets of both. Both worlds worried that economic and cultural modernity in a nation did not necessarily translate to military modernity; the military commentator for the *Detroit News*, S.L.A. Marshall, commented that the preponderance of motors in the U.S. did not necessarily mean that those drivers were ready to operate tanks.[4] The Army concurred, noting that there was no civilian counterpart to some military jobs. "Infantryman" was an obvious military-only occupation, but next on the Army list of specialties without parallel in civilian society was "tank driver."[5] A good deal of effort and worry went into training the soldiers for these jobs. The same level of effort could not be spent explaining them to the public, but the idea that a properly informed public would better support the war suggested that the attempt was a worthwhile endeavor.

The other source is the draftees themselves, who wrote letters, contributed to pre-combat retrospectives on their units and training, and later left memoirs describing the period. While soldier letters in the Second World War were censored, particularly those of enlisted men, censorship only began when a unit had completed the majority of its continental training and entered the POM (Preparation for Overseas Movement) phase of their unit's activation.[6] While trying to determine attitudes toward and motivation for combat, soldier letters may indeed prove less than satisfying, but for determining pre-

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[4] S.L.A. Marshall, *War on Wheels* (New York: Morrow, 1941), 134-5.

[5] Robert R. Palmer, Bell I. Wiley, and William R. Keast *The Army Ground Forces: The Procurement and Training of Ground Combat Troops*, (Washington: GPO, 1948), 8.

[6] Gerald Lindermann, *The World Within War: America's Combat Experience in World War II* (New York and London: The Free Press, 1997), 1-2.

combat attitudes they serve a good purpose.[7]

Studying soldier culture, both materials created by the soldiers and those written about them, has the goal of orienting the historian and reader in the mental landscape of the time, not to attribute a particular point of view to every GI. A case in point might be complaints about Army food, a stereotype often taken as a constant in draftee life. One Knoxville draftee noted in one of his letters to his wife that he enjoyed the food in camp. He could have been trying to reassure her about his well-being (a common motive among soldier correspondents, especially within gender assumptions of presumably more worried mothers and sisters than fathers and brothers.[8]) An alternative explanation is that his culinary experience before the Army might have ranked below what he received by Government Issue.[9] Complaints about Army food might be widespread, but they were not universal. The previous example suggests that sources relating to frames of mind and so on should be treated more as clues than as absolutes.

The cultural modernity of soldiers has two main facets; one is their depiction in wider society, and the other is how they related to the military hierarchy, especially how they viewed its position on the path to the modern as opposed to their own. Neither of these should be taken as absolutes, for cultural sources did not function as a hypodermic, injecting positions into the heads of their recipients. A better idiom might be radio background noise, from which soldiers and civilians alike could choose what to accept and what to reject. Rare individuals possessed unusual or radical positions, but a general

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[7] The sheer volume of letters in the Second World War is daunting, another reason historians of combat eschew them for other sources. In addition to Gerald Lindermann, *The World Within War,* see Peter Kindsvater, *American Soldiers*. xiv-xv

[8] Gene Curry, Letters, University of Tennessee Special Collections Library, MS 1608, Box 1, Folder 17.

[9] Charles W. Hatchett, Letters, University of Tennessee Special Collections, MS 1427, Box 2 Folder 1.

range of understanding existed into which most soldiers fell. The range of soldier perceptions in 1940-42 was somewhat different from its post-combat form. Without direct experience of modern warfare, soldiers had to fall back on categories of understanding they had created in their civilian lives in the preceding decade. Civilian preconceptions shaped the majority of American combatants perceptions, even though American forces entered ground combat against Germany before the U.S. achieved full mobilization. While some Americans formed their expectations and organized their mental framework of how to be soldiers in 1943, and even 1944, the bulk of American forces were raised and training before the North Africa landings in November 1942. As Army training reacted to accumulated battlefield experience, civilian discussions of military matters did as well. Improvements in doctrine were matched by better and more realistic training. Before 1942, however, competing schools of interpretation allowed pre-existing ideas and prejudices to influence the debate to a greater degree. "Modern" warfare often proved difficult to pin down with any predictive precision, and professional soldiers and civilian theorists alike contributed a range of positions from which a recruit could pick and chose his own ideas.

Another important aspect of "modern" warfare was the shift of the burden of warfare from the leaders and soldiers to the entire society. To traditional geopolitical issues like control of territory and trade were added fundamental questions over societal organization that Hitler and Mussolini promised to answer differently from the average American. The war was often phrased as a conflict between individual rights in America and the subsuming of those rights to the state or a great leader in the Axis powers. The Soviet Union was usually ignored or misrepresented in these discussions; only a few had

the forthrightness to suggest the deal with the devil that Churchill proposed.[10] The Second World War was often portrayed at the time as a clash of civilizations. If one accepted this reasoning, the populace thus had to be educated about its role in preserving civilization.[11]

While interested civilians and professional soldiers wrestled with the problems of technological warfare, Washington policymakers wrestled with the problem of too few professional soldiers. Military expansion began over a year before direct American involvement in the Second World War, although preparation had not translated into readiness by December 1941. In August of 1940 Congress passed and President Roosevelt signed into law a peacetime conscription bill, drafting "every male citizen of the United States... between the ages of twenty-one and thirty-six, to present himself for and submit to registration".[12] Roosevelt endorsed the draft reluctantly—only after his opponent in the 1940 election did so, which limited the political damage. Mobilization was a tricky business, and many politicians believed the American public sympathetic to Britain but wary of sending troops overseas again.[13]

Economic mobilization began even earlier, as the President called for increased military production, especially of aircraft, on 12 January 1939.[14] Although the

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[10] In his speech on the German invasion of the Soviet Union, he commented that "if Hitler invaded hell I would speak favorably of the devil in the House of Commons." Winston S. Churchill, *The Second World War: The Grand Alliance* (Boston: Houghton Mifflin, 1951), 370.

[11] See Richard Overy, *Why the Allies Won*, (New York and London: W.W. Norton, 1995), 282-313 for the moral mobilization of the Allies.

[12] 76th Congress, chapter 720, 3rd session, s 4164. The omitted portion of the text in the above quote includes resident aliens as covered by the act as well.

[13] Hadley Cantril and Mildred Strunk, *Public Opinion 1935-1946*, (Princeton, NJ: Princeton University Press, 1951), 967.

production measures of 1940 proved insufficient to meet later demands, they were taken in anticipation of a possible and increasingly probable American involvement in the European war. When considering peacetime mobilization, (a word Roosevelt favored over "draft") the most modern example of mobilization was the American experience first watching, then participating, in the Great War. American policy makers, from Roosevelt and Army Chief of Staff George Marshall down, were determined to avoid repeating the mistakes that they had been too junior to protest, or not possessed of the experience to recognize, at the time. Their draft, of citizens and industry alike, in 1940 was going to be different from Wilson's in 1917. George Marshall's commitment to a citizen army resolved the debate over force structure of the preceding two decades in favor of a position closer to Major Anderson's draftee model than Captain Christmas's specialized force, incorporating technology as much as possible into existing models of organization and training rather than restructuring the entire army around it.[15] Indeed, the state of American culture in the 1930s and 1940s combined with the focus of the Army on broad officer competence in the preceding decades meant that the small army of technical specialists favored by J.F.C. Fuller and Captain Christmas was impossible to create with any speed, nor was it desirable. When asked before December 7, 1941, where American troops might be sent, Marshall responded that they had previously fought in France, Italy, Germany, Africa, the Far East, Siberia, and Northern Russia.[16] A small specialized army would not meet all of America's defense needs.

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[14] Jeffery S. Underwood, *The Wings of Democracy: The Influence of Air Power on the Roosevelt Administration, 1933-1941* (College Station: Texas A&M University Press, 1991.) 137.

[15] Marshall's commitment to a citizen army was a cornerstone of his strategic thought. See Mark A. Stoler, *George C. Marshall: Soldier-Statesman of the American Century* (New York: Twayne, 1989), 70, 144.

Fears over the opposition to mobilization, and administrative problems relating to it as well, were eased in some respects by FDR's New Deal, which increased the size and scope of the Federal bureaucracy. Added to a culture of collectivism that the hard times of the 1930s fostered, these factors produced a much broader acceptance of conscription than Roosevelt feared.[17] The Government had clearly given to the people during the Depression, and few seem to have questioned that they owed the government something in return. The success of both the 1917-18 draft and twenty years of planning also made the draft go more smoothly in 1940.[18] While the general mood was that preparation was a necessary evil, some of the issues of the previous war remained. The conscription law faced attempts to add amendments that prevented conscripted troops from leaving the United States, but these were narrowly defeated in the Senate and comfortably defeated in the House.[19] The new agency created to oversee conscription was carefully labeled to connote careful expertise and to appeal to the ideal of giving something back to the nation: the Selective Service.

Once the Selective Service law passed, to the bureaucrats of the Selective Service fell the task of sifting the nation's eligible men and providing the armed forces with recruits. Processing large numbers of civilians into the armed forces required time, effort, and no small amount of expertise, not to mention a large administrative apparatus. Expertise was not the only factor for the Selective Service, or the Army, to consider in

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[16] George Marshall, Speech to the West Point Graduating Class, 29 May 1942, in Bland, ed. *The Papers of George Catlett Marshall,* Volume III, (Baltimore and London: Johns Hopkins University Press, 1991), 213-4.

[17] Studs Terkel, uncredited interview cited in *"The Good War"* (New York: Pantheon, 1984), 5.

[18] John Whitclay Chambers II, *To Raise an Army: The Draft Comes to Modern America* (New York and London: The Free Press, 1987), 254-5.

[19] Lewis B. Hershey, *Selective Service in Peacetime: First Report of the Director of Selective Service, 1940-41* (Washington: GPO, 1942), 320-2. Senate, 39-32, 25 abstentions, House, 142-88.

choosing how to translate the national law at the local level, however. The tenuous hold that the ideal of the "modern" professional had on the American mind can be illustrated by the form the draft took in 1940. The need to control mobilization rationally, selecting which men could be better used in the armed forces and which needed to remain in their jobs, was the essence of the modern administrative apparatus. The traditions of American politics dictated that the draft boards be staffed by local community leaders instead of federal representatives.[20] Exemptions and deferments were thus placed not in the hands of the dispassionate expert, but the local leader often dependent on community goodwill. The political acumen of the local boards proved useful in getting the process accepted, but worked against the goal of rational selection. Thus, the Army had to be sure that the process it had in place to sort the men as they came into the service could counter some of the deficiencies of the draft administration. The sheer number of men mobilized meant that the Army would have to promote some to lower leadership roles. What the draftee thought about technological warfare would influence the Army in addition to what the professionals had worked out in the preceding twenty years.

Technological warfare was a subject important not only for serving officers, but also for the civilian writer, such as George Fielding Eliot, or S.L.A. Marshall. While Army theorists were limited by worries about practicality, their counterparts in the media had were freer to speculate, often wildly. Retired Brigadier General Marshall was one of the more careful of these authors, usually having a large section in his books devoted to examining evidence from recent campaigns conducted by the Axis and Allied armies. Although his conclusions did not always hold up with hindsight, he operated in much the same manner as the intelligence arm of the Armored Force by collecting and digesting

[20] George Q. Flynn, *The Draft, 1940-1973* (Lawrence, KS: University Press of Kansas, 1993) 20-21.

information to be spread to a larger audience unequipped to gather the information themselves. Marshall was widely published, and was so prominent a military thinker that he later headed the Army's effort to understand soldier motivation.[21] Others were less judicious, less thoughtful, or simply less informed, but all made the effort to translate the military mindset for an audience for whom the Army was not a familiar world. On modernization and mechanization, long-expounded ideas about tinkering and gadgetry now translated to the idea that Americans possessed a particular genius for technological warfare. If Americans widely shared a faith in modernity, then the commentators, and the military had to be explain issues in context of that modernity.

S.L.A. Marshall tried to define the basic features of "modern" war in *War on Wheels.* His serious attempt to wrestle with these problems marked him as a different type of author than those who either gave no thought to the underlying forces in the war, or who treated them as already settled and worthy of no further discussion. Marshall worked within a tradition of military history that emphasized continuity, and in harmony with Army manuals and George Patton suggested that the fundamentals of warfare (based around the idea of the armies of nation-states conducting decisive operations against each other) remained similar, but that there were some new issues raised by war after the industrial revolution. Marshall shared with George Marshall (no relative) and Charles de Gaulle the realization that nations made war on a variety of levels, beginning with the political and economic, then moving on to what was more conventionally called as strategy and tactics.

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[21] This effort produced his most famous book, *Men Against Fire,* which still influences the debate on combat motivation. See Kelly C. Jordan, "Right for the Wrong Reasons: S.L.A. Marshall and the Ratio of Fire in Korea" in *The Journal of Military History* 66 (January 2002): 137-40.

Early mechanizers often focused on operational and tactical concerns, without examining the context within which those factors exercised their influence. That is, they imagined only one variable changing in their understanding of machine warfare, when the entire set shifted. Attempting to understand recent (1941) battles occurring in France, North Africa, and The Soviet Union in a broad context, Marshall noted a blurring of the lines between battles and campaigns, undermining earlier thinkers about mechanization's insistence that machines would save the muscles of soldiers for fighting. The increased range and tempo of operations, Marshall argued, meant that war and battle became more exhausting, not less. The inability or unwillingness of forces on either side to break off contact and withdraw to recuperate gave a marathon quality to war.[22]

There was an economic dimension to the struggle for societies as well, although this was hardly new. As agricultural societies lent their character to their warfare, so the factories of the industrial age had to be turned to producing weapons for their armies. The difference was in the scope of the project. Military-oriented writers in the 1940s focused on the need to involve all sectors of the economy in the war. It was precisely this development that allowed the idea of strategic bombardment to gain any currency in discussions of warfare: bombing factories only made sense if they were important to a nation's war effort. Marshall tended away from single-explanation victory schemes like strategic air bombardment, though he accepted its *logic* of in *War on Wheels* far enough to suggest that it would be undertaken by all the major combatants, though he did not

[22] Marshall was speaking directly of the Soviet front then ongoing, and from that front he began to question the German hold of a special mode of war that gave them a supreme advantage. He even suggested that blitzkrieg put too many eggs into one basket, and that thus Germany was gambling with its future. Marshall's willingness to question German cleverness was somewhat unusual in 1941, when their string of victories was longer than their defeats. Marshall, *War on Wheels*, 28, 180.

expect it to be decisive.[23] The threat of air attack and scope of the struggle suggested that time was indeed short, a theme that the extreme technological warriors in the Air Corps trumpeted after 1940 as they had in the previous years. Here they profited from coverage of the war, which emphasized German use of air bombardment, although in forms radically different from the American concept of precision daylight bombing.

Coverage of the war was just one source of information. Recruits transitioning from the civilian world to the military, often found that two worlds spoke the same words but that they had very different meanings. Something of a cottage industry sprang up publishing books purporting to explain the world of the military to the civilian, draftee, or family member. The "know your army" field of literature is more useful for the assumptions and attitudes expressed than for its stated goal of information, much of which is inaccurate or garbled. There exists no literature explaining the assumptions of the draftee to the professional officer. Such knowledge was assumed, though not always profitably. The Army often co-operated with these authors in an attempt to ensure the information so conveyed was accurate and favorable (when the two conflicted, George Marshall preferred accuracy.)[24] The author of one such work, *Our Army Today*, thanked over a hundred officers by name for their advice and assistance; among them were nine major generals, two lieutenant generals, including Willis Crittenberger (then commanding the Second Armored Corps), and George S. Patton, Jr. (by then famous for

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[23] Ibid., 205-6.

[24] George Marshall, "Informal and Off-The-Record Statement to the American Society of Newspaper Editors, 13 February 1943" in Bland, ed. *The Papers of George Catlett Marshall*, Volume III, 543.

action in North Africa.)[25] Another author claimed to have served as an aide to General Patton, although he got Patton's middle initial wrong.[26]

In the military section of the media, tanks were often portrayed as imposing and threatening, a point of view usually applied to foreign (German) tanks. American tanks and tank crews were endowed with characteristics that fit within American conceptions of themselves as soldiers, such as ingenuity and skill. Brute force was ascribed to the enemy, although the level of sophistication in the argument naturally varied with that of the work. There was also something of a double standard regarding cleverness. Where the author's sympathies lay with the underdog, then the formulation was usually the "brain over brawn" model. When the Axis powers were clever, it was usually interpreted as a sign of deviousness or trickery, especially from the Japanese. In general, writers were reluctant to cede cleverness in the form of technical achievement entirely to the Axis, as when Captain Addison McGhee argued (weakly) in *He's in the Armored Force Now* that "In a few respects the European and Asiatic manufactures may have the edge on the United States as gunmakers, but, generally speaking, our guns are the best that can be put together."[27] American attitudes toward military technology were marked by a split attitude; Germany and Japan were winning and that had to be justified to an audience that expected American technical achievement to be the best. Since that audience was

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[25] Kendall Banning, *Our Army Today* (New York and London: Funk and Wagnalls, 1943), ix-xii. Given the number of soldiers thanked, the number of errors in the book is a bit disturbing. Dates are wrong, technical information is wrong, and the list goes on.

[26] Addison F. McGhee, Jr. *He's in the Armored Force Now* (New York: McBride and Co, 1942), 213. McGhee's incorrect middle initial for George [S.] Patton may give some indication why he was writing books on the Armored Force in 1942.

[27] McGhee, *He's in the Armored Force Now*, 113.

reluctant to believe the Axis to be superior in such "American" areas as gun making, other factors, particularly underhandedness had to be introduced.

Nowhere did the American ambiguity toward technological warfare in general, and armored warfare in particular, show more clearly than in discussions of anti-tank defense. Tanks had an unmistakable association with Germany, and while there was an urge to imitate, there was also an urge to find a uniquely American solution. Here proponents could rely on the Army's belief in tank destroyers as their first line of mental defense against *blitzkrieg*. The tank destroyer appealed to the ideals of frontier warfare that Russell Weigley argues influenced the transition from a peacetime constabulary to wartime army in the U.S. With soldiers as high-ranking as Lt. General Leslie McNair providing the expertise, guns were touted as the main defense against tanks. There was some justification to McNair's assertion that guns, not tanks, killed tanks.[28] Evidence out of France suggested that French organization and tactics, not technology, had failed to stop the German blitz.[29] Though the advocates of tank destroyers were aware of the limitations of mobile guns without significant armor, the enthusiasm of civilian writers sometimes eclipsed this fact. Kendall Banning identified (incorrectly) two mechanized artillery pieces as tank destroyers; the 155mm M12 would "convert any tank or gun that it hits into junk" and the 105mm M7 "may conceivably render tanks obsolete".[30] The original tank destroyer, a half-track with a 75mm gun, was portrayed as a harassing and raiding weapon, able to attack and "scurry away before other enemy tanks can take

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[28] Gabel, "Seek Strike, Destroy," 6.

[29] See Gabel, "Seek Strike, Destroy," 8-9, and Armored Force G-2 Bulletin 163.

[30] Banning, *Our Army Today*, illustration following page 100.

advantage of their lack of armored protection."[31] In the process of preparing the Tank Destroyer for mass consumption in the media, some the subtleties of the debate were lost.

While the experts argued over details of anti-tank gun mobility and control, the Molotov cocktail was another expedient, sometimes touted (especially after June 1941) as able to defeat even the heaviest tanks, implying that the American soldier would more likely be facing such monsters than operating them. The use of the Molotov cocktail for anti-mechanized defense played heavily on the use of ingenuity rather than brute force to overcome a difficulty. Destroying heavy tanks need not involve artillery pieces, aerial bombs, or even mines in the war some authors, especially Lt. Sears (*Mechanizing our Army*) envisioned. The expedient of a glass bottle filled with gasoline, easily manufactured and (according to Sears, delivered,) by individual soldiers, was supposed to destroy the tank.[32]

The idea was simple, and not without some merit; burning a tank would likely disable it. Kendall Banning labeled his illustration of a flamethrower "Bad medicine for pill boxes and tanks", but the flamethrower was not easily created in a pinch by the average soldier.[33] Mixing oil and gas in a breakable container, sealing the neck with a cloth or rag, and igniting the rag created a weapon that many authors portrayed as capable of stopping the panzers, and without much expense or expertise required. *Mechanizing Our Army* made the case for the Molotov: "If a soldier with this homemade grenade can conceal himself until the tank is near him, he can then hurl the bottle against the tank.

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[31] Ibid.

[32] Hugh Sears, *Mechanizing our Army: Close-Ups of its Latest Equipment* (New York: Grosset and Dunlap, 1941), 20.

[33] Ibid.

The flaming bottle breaks, the contents ignite, and the burning fluid seeps into the tank through numerous small openings with disastrous consequences for the crew."[34] Lt. Sears focused on the positive, since by the time a tank was within range of a thrown weapon it was very close indeed, closer than an unaided infantryman ever wanted to see an active enemy tank. Molotov cocktails made an appearance in *Our Army Today*, where Kendall Banning dated them to the Soviet-German conflict in 1941. Calling them "ultra-modern", Banning proceeded to note how the United States had adopted the method as well. If German tanks represented modernity, then the answer was the "ultra-modern", rather than retreating to the pre-modern, and the implication is that the United States was at or near the crest of the modern wave. Banning admitted that the Molotov was only employed "when all other defense methods had failed", but went on to exaggerate the effectiveness of the weapon: "A hit is fairly sure to put a tank out of commission."[35] The Molotov even surfaced in *He's in the Armored Force Now*, with the comment that "the fierce flame gets the crew out in a hurry"[36]

Defeating enemy armor was only one mission of the armed forces; American soldiers were going into combat in tanks, and so that had to be described as well. Armor posed a particular problem of explanation in Army publicity. With tanks, or any technological method, the difficulties multiplied. To the problem of making someone understand the fear and stress associated with combat was added the unfamiliar technological environment. Banning titled his chapter on tank acclimatization "A Hike in a Hell Buggy", presumably choosing the word hike to emphasize the connection between

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[34] Sears, *Mechanizing our Army*, 21.

[35] Banning, *Our Army Today*, 34-35.

[36] McGhee, *He's in the Armored Force*, 195.

the Armored Force and the cavalry of previous days. In his discussion of holdovers in terminology (like sheds instead of garages) Banning suggested that the Cavalry recognized the superiority of mechanical horses over flesh-and-blood and made the rational choice to switch, though "not without a wrench."[37]

Another attempt to explain the Armored Force focused not on the machines, which were in flux and subject to secrecy restrictions, but on the experience of the selectees who went to Fort Knox for training. Captain McGhee claimed some expertise in the field, not least by using his rank on the book's cover, and mentioning his association with the Armored Force inside. McGhee relied on a mix of metaphors to explain the modern ground Army to his readers, possibly worried that neither agricultural nor automotive metaphors would resound fully with them. Focusing heavily on the motorcycles used for scouting and dispatches, McGhee often directly compared them to past cavalry mounts, suggesting in a picture caption that "just as cavalrymen used to care for their horses, Armored Force motorcyclists learn to feed and groom their two-cylinder vehicles."[38] In another instance a tank is the object of the agricultural metaphor, as "a modern blacksmith repairs a tank's shoes."[39] In other places, McGhee fell into the refrain that since American society was motorized, it was much easier for recruits to grasp the principles of mechanized units.[40]

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[37] Banning, *Our Army Today*, 63. The pun on wrench is likely intentional.

[38] McGhee, *He's in the Armored Force,* 89.

[39] Ibid., 108-9.

[40] In one instance he makes the connection a direct one: "Most tankmen, having operated trucks and tractors in civilian life, find it comparatively easy to master the intricacies of Armored Force Vehicles." Ibid, 178.

One of the more intriguing views of war from the inside of a tank was written from the point of view of a competing vision of technological warfare. A tail-gunner in the Air Corps received a demonstration ride in a light tank, and wrote up the experience in a brief article. The article was mimeographed and found its way into the personal papers of the third head of the Armored Force, Alvan C. Gillem. The anonymous author began with the basic assumption that "the Air Force was the Army" and that all other branches were attached to support the fliers, or to disperse Bonus marchers, a role that the ground forces had indeed undertaken in 1932.[41] After enduring the standard speech on the role of the Aberdeen Proving Ground—the site of the demonstration—the visitor was directed to a "smiling Lieutenant" who introduced him to "another smiling young fellow", the actual tank operator.[42] Upon seeing the light tank in question (from his description it was an M2A2, called the "Mae West" because of its dual turrets) the Air Corpsman thought that the machine looked more like a "hybrid farm implement than an insidious implement of modern warfare."[43] In both the case of smiling driver and innocuous armored vehicle, he found, "appearances were deceiving".

Comparisons to the civilian world continued, at least superficially, when the tail gunner entered the tank expecting something like a Sunday drive, a comparison that resonated with a society where automobiles were relatively common, but new enough that driving itself could still be an end in itself rather than just a means to reach a destination. The contrast began immediately, when the tank "took to the weeds like a

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[41] "Tanks?—No Thanks". Anonymous manuscript, Alvan C. Gillem Papers, Box 3, USAMHI. 1. The assumption of the primacy of an author's own branch is common, but particularly so in the Air Corps.

[42] Ibid.

[43] Ibid.

turpentined hound", (another country metaphor) and for the next ten minutes the author claimed that he was unable to tell up from down: "Between bounces and bounds, though, I did get momentarily glimpses of the madly teetering landscape; enough to get a vague, kaleidoscopic impression of the flying mud, choking dust screens and water spray kicked up by the churning wheel mounts of our snorting mount."[44] After comparing the tank to a bronco and a Coney Island roller coaster, the author reported that he put on a cheerful face upon exiting so that the next comrade in line would not be tipped off to the upcoming experience, a point of view more appropriate to Coney Island than preparing for a major war. After all, part of the fun was seeing the next victim unaware of what awaited. After comparing the two primary methods of adapting technology to warfare, the author preferred being a tail gunner in an FB2 to "furnishing the innards for a tin shuttlecock"[45] Banning's writing specifically suggested the opposite; designed for public consumption, his fictional recruit experienced "surprising smoothness" at roughly twenty-five miles per hour, albeit on a highway leading to a maneuver area.[46] McGhee also suggested that the ride was relatively smooth, though not so much from technological achievement as lack of space to bounce around.[47]

Tank crewmen, like bomber crews of fighter pilots, wore specialized additions to their uniform, adapted to the particular technologies they operated. One difference between the standard infantryman and a technological warrior was the difficulty of communicating in the noisy compartments of tanks and bombers. Tankers wore a

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[44] Ibid.

[45] Ibid, 2.

[46] Banning, *Our Army Today,* 66.

[47] McGhee, *He's in the Armored Force*, 40.

specialized helmet that resembled the leather football ones of the era, a metaphor the Kendall Banning chose to extend with a historical reference. In a link to armored cavalry of the past, Banning described the tanker's helmet as a cross between the leather football helmet and "the casque of mediaeval knights", but then put the un-pictured item into context for the less classically educated in pulp science-fiction terms by calling it a prop from a Hollywood "bug fantasy."[48] Searching for metaphors for the uninitiated moved readily from historical example to free speculation, as many views of the future did in the 1940s.

In addition to serving as a consultant in the publicity campaign; the Army created its own posters to advertise various service branches before 1942, as part of the drive to attract skilled and motivated volunteers. Before 1942, volunteers could choose their service branch, an attempt by the Army to compete with the Navy and Marine Corps. These parts of the national military establishment had fewer recruiting problems in the first years of the war, but the Army complained that they were unfairly taking skilled manpower out of the pool before the draft had a chance to reach them. Ultimately, the policy was dropped, over Army concerns about siphoning the best recruits away from combat roles, and the Army stopped giving preferential treatment to volunteers. The poster for the Armored Force is both visually striking and historically interesting. In the background, three medium tanks advance in a line, cannon firing. In the foreground, taking up almost half the frame, is the tread of a fourth tank. On its tracks appear the words "Right is Might", the only words in the main image, while the text at the bottom

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[48] Banning, *Our Army Today*, 65.

encourages interested men to apply at the nearest recruiting and induction station. [49] Aside from neatly encapsulating a basic American assumption about the moral nature of the war, the poster represented a subtle interpretation of the tank's role. The image of tanks advancing across flat, open ground under a clear blue sky, not only tried to entice, but contributed to the image of the tank as solid and protecting. Presenting tanks as "Might" suggested on some level that the soldiers who served in them would be safer than those who marched in the infantry.

The tanks in "Right is Might" were at least the most up-to-date the army had to offer. Lack of time and the need to promote the Army in terms that were likely to reach the general public involved obscuring the improvised nature of the M3 medium tank. Portraying the M3 as a stopgap measure would hardly inspire the crews who went to battle in it, so that tank became, briefly, a symbol of American industrial power and mechanized might. Armored Force publicity photos featured the M3 as a mainstay during the pre-combat phase, and whatever worries armored officers had about the tank stayed out of the public view. One photo, released in April 1942, extolled the combination of "good American soldier and good American equipment" as being ready to cause "a lot of headaches for the Axis."[50] The M3 thus was judged a "good" tank, and a civilian or inductee could be forgiven for concluding that the Army hierarchy was committed to it, although the Army had plans for its replacement before it even entered production. Soldiers who held that perception were likely to lose faith in their leaders if the M3 failed to prove its worth in combat. One member of the 70th Independent Tank

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[49] Stu Graves, "Right is Might" George Marshall Poster Collection.

[50] Photo 65597(79) , FDR Presidential Library Website, http://www.fdrlibrary.marist.edu/images/photodb/23-0234a.gif.

Battalion recalled the shortcomings of their tanks prior to the invasion of North Africa, ending with words roughly to the effect of "the Army knew about this and did nothing."[51]

Another April 1942 photo showed a tank assembly area with a half-track in the foreground and ten or so M3s in the background. The caption was "The irresistible roll of America's mighty new army is already shaping world events."[52] American propaganda rarely used massed infantry to symbolize the nation's power, since that conception appeared to look back to the Great War in light of recent German victories. Although armor was portrayed less often and less prominently than other technological means of warfare, such as bombers and warships, tanks still displaced the infantryman in the depiction of American fighting prowess. Horses, allowable in the previous war's image-making, were rarely seen in official releases. Kendall Banning did discuss animals as prime movers for artillery, but in his photo section the only mule to be seen appeared in a demonstration of gas masks for service animals.[53] The image of the "modern" army differed somewhat from the realities of war at the front, but accurate depictions of combat seemed unlikely to raise the morale of worried relatives. For the soldiers, who would experience combat directly (or vicariously from buddies who were combatants), unrealistic depictions of combat could only promote the belief that no one in the upper echelons had any idea what was going on.

Training also had to be sold to the public as the most advanced (and therefore best) available at the time. The early products of the military publicity mill often

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[51] Jensen, *Strike Swiftly,* 59-60.

[52] Photo 65597(82) FDR Presidential Library website, http://www.fdrlibrary.marist.edu/images/photodb/23-0232a.gif.

[53] Banning, *Our Army Today,* illustrations following p 100.

displayed a certain light-heartedness, even when they technically accurate.[54] One Fort Knox publicity photo had as its subject the training for multiple contingencies that tank crews received, including the possibility of dismounted combat. The training itself was reasonable, and even a bit farsighted, since tank crews did later dismount and fight when their tanks were not disabled, especially in urban environments. One photo from June 1942, used to convey the idea that tank crews were prepared to fight dismounted, contrasted with the utility of the policy. In the photo, the crew of an M3 dismounted their tank, under simulated fire, with weapons that varied from pistols and Thompson submachine guns to a Browning machine gun stripped from the tank itself. On the top of the tank, one crewman crouched—unconvincingly—with a pistol. The photo's perspective and composition suggest a still from a low-budget movie (the sky has an unnatural quality missing in other armor publicity photos), while the poses of the soldiers suggest the movie misconception of combat.[55] A similar photo appeared in *He's in the Armored Force Now*, but with the addition of gas masks and the suggestion that the crew would be armed with .45 revolvers and tommy guns as they dismounted "to engage the enemy on foot."[56]

As time wore on after Pearl Harbor, more advanced American tanks began to appear in publicity devices, most notably the M4. Sherman tanks graced the covers of *He's in the Armored Force Now* and *Our Army Today*, although in both cases the internal

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[54] Paul Fussell's concept of the transition from light to heavy duty is applicable, he misinterprets some of the evidence he introduces to support it. *Wartime: Understanding and Behavior in the Second World War.* (New York: Oxford University Press, 1989), 7.

[55] Photo 65599(2) , FDR Presidential Library, http://www.fdrlibrary.marist.edu/images/photodb/23-0090a.gif.

[56] McGhee, *He's in the Armored Force Now*, 186.

illustrations featured a mix of M3 and M4 tanks. Both covers also featured the tanks in motion, Banning an illustrated version and McGhee a photo (with dust flying off of the treads). Popular depictions of military technology often focused on the American tank's mobility and the accuracy of its gun; the tanks in such a view were usually valuable because they could go more places enemy models, not for their formidable armor or firepower. In artistic renderings the machines were always in motion, never static. The physical motion of tanks, trucks, or airplanes represented forward-looking technology as well.

Discussions of military technology borrowed their relationship to technology from the automobile advertisements of the day, promoting each technical advance as a qualitative improvement for the user. In other words, the newest device with the best numbers on paper was obviously the best, and only the backward thinking could prefer it otherwise. Just as the newest model of automobile was obviously the best, the same was assumed to be true with tanks, without any discussion of the intended role of the machine in question. Combined with a perception of the military as inherently backwards, technical perfectionism led to criticism of Army Ordnance for being insufficiently open to new designs. In November 1940, *Life* magazine published a series of side-by-side firing tests on the M1 Garand, the Army's standard rifle, and a competing design, the Johnson. Rifle marksmanship was something that the average American male was expected to understand, at least in the popular view, so the unfamiliarity of the average citizen with "high" technology that slowed criticism of air and armor technology did not pertain. The Johnson performed better than the Garand under controlled range conditions, and appeared to pass the abuse tests as well, firing after being buried under

dirt, and a variety of other mistreatments. The article ended by asserting that Army Ordnance stuck by the Garand.[57]

Interest in the Garand vs. Johnson story was such that in a later issue the editors of *Life* published five letters responding to the article. The most outraged of the letters questioned why the Army could stand by their rifle in the face of such overwhelming evidence; three other letters agreed in substance with Morris. Only one of the five sided with the Garand, Edgar Hayes—an ROTC member—and his defense pointed out that there was no time to re-tool away from Garands, given the pressure of time.[58] Even Hayes accepted that because the rifle did not appear to be the most technically advanced, it did not appear to be the best weapon.

Children's toys provided another front for discussion of military modernity, with a shot at pacifists thrown in as well. In the holiday shopping season of 1940, *Life* profiled various popular toys, noting that while some "pacifist women" might either keep toy soldiers off shelves altogether, or restrict them to distant historical examples, concerned mothers failed to keep the five and dime stores from stocking contemporary war toys. Noting that "the young American wants to be up-to-date", the article featured a large spread of tin soldiers, complete with tanks and gas masks, which were the "unabashedly modern" toys the youngsters preferred.[59] Henry Luce, *Life*'s editor in chief, held an internationalist outlook that favored American engagement in overseas causes (particularly China), and his impact on *Life's* coverage cannot be ignored.

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[57] *Life,* 18 Nov 1940, 55.

[58] *Life,* 9 December 190, 2.

[59] Ibid., 104.

Pacifists were increasingly ridiculed in the pages of *Life*, and in the toy article women and pacifists were used interchangeably, suggesting that refusal to fight was unmanly.

Depictions of military matters in civilian media suffered the same problem that the Army's doctrine writers did; they were engaged in taking a snapshot of an ongoing process, condensing it into a static form. One of the reasons for their inaccuracy involves the accelerated pace of developments in wartime as opposed to peace. Here some of the perceptions about the Army being reluctant to change had a grain of truth, but only a grain. George Marshall recognized that things had changed since the last war, and in order to compete American forces would have to incorporate the new elements of warfare.[60] In an effort to rid the army of men unfit to command in modern war, Marshall ordered that no officer over the age of sixty could hold a combat command. Marshall used the period before combat to purge as best he could officers who fit the public perception of the "old Army", particularly those from the National Guard.[61] Marshall's policies had to overcome an existing stereotype, since the idea that the older generation was less modern than the younger was firmly entrenched in American culture. A series of advertisements for Sanka decaffeinated coffee employed a strategy of reversal, putting wisdom in the mouths of younger (and in one instance poorer) but better-informed protagonists who informed an elder but not wiser authority figure of the benefits of decaffeinated coffee, particularly the ability to enjoy an evening coffee and still sleep well that night. One ad drew on the perception of the antiquated Army command when a young private overheard a General weeping over the choice between coffee at night and a

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[60] George Marshall, Speech to the Veterans of Foreign Wars, 19 June 1940, in Bland, ed., *The Papers of George Catlett Marshall,* Volume II, 247-9.

[61] Peter R. Mansoor, *The GI Offensive in Europe: The Triumph of American Infantry Divisions 1941-1945* (Lawrence, KS: University Press of Kansas, 1999), 57-8.

good night's sleep. The physical portrayals of the two men involved are indicative of their relative adaptation to modernity. The General was overweight, dressed in an ornate uniform, and wearing muttonchop facial hair. The younger man wore a simple, clean-cut uniform, wore no facial hair, and was fit and trim. The implied image of the elder generation as fat and out-of-touch was not limited to the military. The general image of youth instructing age, and the untutored instructing the learned was a paradigm that entered writings on the military from the civilian world.

Discussions of military matters before Pearl Harbor took place against a backdrop of peacetime articles and features that easily overshadowed war news. 1940 in particular saw the first Presidential campaign for a third term in American history, and even in pro-intervention publications like *Life* did not focus on issues of mobilization, production efficiency, or technological warfare. Even after Pearl Harbor, the Army could not count on recruits who possessed mature and considered opinions on war and soldiering. Although no body of literature explained civilian preconceptions to soldiers, there are sources that illuminate the official view of the recruits. One is the set of seven films produced by Frank Capra for the War Department. Known collectively as the *Why We Fight* series, their express purpose was to explain America's motivations for entering a global war not only to the recruits upon whom the war effort depended, but civilians whose cooperation was only slightly less essential. How Capra chose to make his case provides clues to understanding his audience, albeit imperfectly. That they were even made at all reflects the "modern" impulse to standardize control at the level of highest expertise.[62] While draft boards might be politically necessary, George Marshall worried

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[62]Thomas W. Bohn, *An Historical and Descriptive Analysis of the* Why We Fight *Films* (New York: Arno Press, 1977), 96.

about the varied motivational and public-speaking skills of Army officers.[63] While some might do a creditable job, poor delivery of the material could damage draftee morale, and undercut the national establishment's goals. The Army produced a vast number of training films, on subject ranging from weapons and tactics to preventing VD.

Widely acclaimed as a skilled filmmaker, Capra often focused on the common man's struggle in an often difficult world. He fit well with the conception of the Army as just a bunch of regular Americans, forced by extraordinary circumstances to undertake a course of action they would have preferred to have avoided. Motivation proved easier in the Second World War than the First, in no small measure because of the direct attack on American territory. Support for war with Japan did not automatically translate to willingness to fight Germany, and thus the film series links the worldviews of the Axis powers, and contrasts them unfavorably with arguments about America. Befitting the cultural precepts of the day, technology was not neutral in the *Why We Fight* films, but its aspects were divided between the opposing sides. Germany, Italy and Japan were usually described in mechanistic terms, taking on the negative aspects of the technological and industrial world, while the Allies' use of technology was conceived more as human ingenuity, or adaptability. Such characterizations were consistent with the prewar depictions of the Nazis as perverting the German love of order and machinery, and of contemporary western perceptions of Asian societies.

The decision to use German footage in the *Why We Fight* films accepted the self-characterization of the German propaganda machine, providing categories for the soldiers

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[63] George Marshall, Memorandum for General Osborn, 25 October 1942, in Bland, ed. *The Papers of George Catlett Marshall,* Volume III, 411.

to understand their experience.[64] Armor in the films was portrayed as a Nazi invention, adding modern elements to old Prussian militarism. In *The Battle for Russia*, Capra reinforced, probably unintentionally the image of tanks as invulnerable when he described Soviet responses to the German attack. The key to defeating the panzers was to draw them into cities, where the crews could be lured out of their tanks and killed, not destroying the tanks themselves.

The intent of the films was both to inform and to persuade. On the first point they did reasonably well, but by both contemporary and later understanding they largely failed on the second. Soldiers could usually identify the information in the film with a reasonable degree of accuracy six months after viewing, but few who responded to surveys indicated that they were persuaded by the material to change their point of view.[65] Persuasiveness is difficult to judge, but the number who answered the "factual" questions according to the films outlook suggests that they accepted the War Department version of events to some extent. Persuading those opposed to the war proved difficult since the films, particularly the first, suffered from a rather basic outlook; critic James Agee even thought *Prelude to War* insulted the viewer's intelligence.[66] The material in the first film particularly was presented in a very basic manner, which could indicate the Army's low estimate of its recruits' mental capacity. Competing with that point of view is the idea that if exposed to the facts, soldiers would draw the conclusion that the U.S. needed to be in the war, and thus would be more motivated. Rather than presenting

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[64] Richard L. DiNardo, *Mechanized Juggernaut or Military Anachronism? Horses and the German Army of World War II* (New York, Westport, CT, and London: Greenwood, 1991), 109.

[65] Bohn, *Historical and Descriptive Analysis*, 247.

[66] Ibid., 111.

obvious points of view, the films portrayed their argument as fact. In the long run, the outlook given in the films did enter the mainstream understanding of the war, suggesting they were at least partly in tune with their times.

Many of the questions in surveys given by the Army, and indeed the psychological profession in general, in the 1940s were leading, and thus at least as revealing about the mentality of the questioner as the respondent. Questions asked of soldiers suggest that Army commanders were worried at some level about their soldiers' willingness to fight, and in tune with their understanding of American culture, undertook to explain the situation. It was long axiomatic of the American military experience that if soldiers were educated, they would perform their missions better and more willingly, and the *Why We Fight* series fit that paradigm.[67] A well-motivated army was one step closer to victory.

Another step toward victory was getting the right man in the right place in the Army. The 1917 draft was the model in most discussions of the draft in the media, with the general understanding that the 1940 experience was less painful and more rational. Soldier satisfaction was still not assured. The experience of the Great War suggested using some sort of classification system to place soldiers in the proper units, and the psychological methods had greatly improved since 1916. The Army chose to rely on a series of aptitude tests in order to place recruits according to their preexisting abilities, when possible. The Army General Classification Test (AGCT) did not purport to divine intelligence, as had the IQ tests of the Great War.[68] The AGCT measured the more

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[67] Samuel A. Stoufer, Edward A. Suchman, Leland C. DeVinney, Shirley A. Star, and Robin M. Williams, Jr., *Studies in Social Psychology in World War II, Volume I: The American Soldier Adjustment during Army Life.* (Princeton, NJ: Princeton University Press, 1949), 69-70.

limited features of education and aptitude, which were of immediate utility. A recruit who already had a basic familiarity with technology would presumably score well on the test, and thus no time would need to be wasted on remedial training. The mechanical aptitude section of the test bears out the idea of identifying men with basic knowledge rather than testing cultural acclimation or any qualities as hard to pin down as "intelligence". From such basic concepts as the purpose of a rasp to questions on the laws of motion and the use of engine manifolds, the test moved on to spatial reconstruction tests, and eventually onto questions about physics and electrical resistance.[69] The general section of the test did examine more general education, with questions of word meaning and mathematical calculation added to spatial recognition and basic knowledge questions.[70] Soldiers did not always grasp the finer points of education versus intelligence; one later referred to it as his IQ test.[71] Scoring for the test broke the recruits into five categories, labeled with the Roman numerals I to V.[72] A score of 100 was designed to put the recruit in the middle of Class III, and only recruits placing in I or II were to be eligible for officer commissions. The Air Corps refused to take any man with an AGCT score under 100.[73] Of the recruits in classes I and II (those with the

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[68] Determining IQ, or mental age, was in fact expressly *not* the purpose of the AGCT. Palmer, et al., *Procurement and Training*, 6.

[69] War Department, The Adjutant General's Office. "General Mechanical Aptitude Test MA-3" GPO, 1941. 1-24.

[70] War Department, The Adjutant General's Office. "General Classification Test, 1b, Preliminary Form." GPO, 1941. 1-9.

[71] William F. Bopp, "Narrative of the life of William F. Bopp," Typewritten Manuscript dated July 1990. University of Tennessee Special Collections, MS 1881.

[72] Palmer, et al., *Procurement and Training,* 6.

[73] Ibid.

highest scores), the highest percentage entered the Army Air Corps. The next highest percentage went to the Armored Force.[74]

Education proved important to the process of classification and training, and it was something soldiers, especially the comparatively educated ones, realized. While training to be a radio operator for an armored artillery battalion, Harry Liebold expressed his desire for better educated recruits in a letter to his parents. Having moved from Fort Knox to Camp Cooke, he hoped the new recruits would be "locals" (westerners) rather than the "hill-billies" who were his classmates in Kentucky.[75] Liebold intimated that many of the southern recruits had not completed the 6th grade, and thus were unsuited for employment in a radio unit. Soldiers who were not ideal had to be made into the best radio operators (or tank drivers or infantrymen). The time available and number of soldiers required meant that again the Army turned to workable rather than perfect solutions.

Based on the idea that a soldier satisfied with his position would fill it better than one dissatisfied with it, the Army psychological branch surveyed the ranks with an eye to placement and satisfaction. Aside from the standard dislike of combat occupations, the soldiers who expressed the most satisfaction were the ones who had requested their assignment.[76] Attempts to promote the utility of the selection process argued that the individual was not best suited to choose his own service: McGhee especially emphasized the scientific expertise involved in choosing and training men for the tanks, especially in

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[74] Palmer, et al., *Procurement and Training,* 15-16. Much of the official history is dedicated to decrying the policy of shifting high scorers away from ground combat.

[75] Harry Liebold, Letter, 21 February 1942. University of Tennessee Special Collections Library, MS 1881, Box 15, Folder 2. In the same letter he argued that the Indians could have been allowed to keep Utah and Nevada with no great loss to the United States.

[76] Stoufer, et al. *The American Soldier: Adjustment during Army Life, 287-8.*

contrast to the 1917 experience. One passage in *He's in the Armored Force Now!* contrasted the experience of an older draftee (who remembered the Great War mobilization) with the present. The older man recalled seeing a man complete three weeks of Cooks and Bakers school, only to be assigned to shoeing horses upon his return to the unit.[77] McGhee's contrast was on two levels; the more obvious is the updated selection process of the "modern" army, but the returning soldier's mis-assignment no longer existed in the 1942 Army either. The Army had modernized not only the selection process, but the job list as well.

Army placement testing was not a secret, and after the policy of allowing volunteers to choose their branch of service was dropped in 1942, it became important to draftees who cared about where they served to score well on the AGCT. A literature on the subject of test preparation sprang up, emphasizing hard work and diligent preparation over native intelligence.[78] Other factors than simple intelligence were at work, at least according to one contemporary description of the selection process in the Army Air Corps. In *Our Army Today*, Kendall Banning described the process of psychological screening for an Air Corps cadet, from the obvious worries about epilepsy to the dangers of nail-biting. The idea that minor actions betray major problems informs the discourse here as well: "the youth who slouches into the office with his hat on his head, with chewing gum in his mouth and his hands stuffed into his pockets, is not difficult to classify."[79] The argument presents a distinct class bias, suggesting that social adaptation

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[77] McGhee, *He's in the Armored Force Now*, 22.

[78] Anonymous, *Prepare for the Official U.S. Army-Navy Tests*, (New York: Capitol Publishing Company, 1942), 21.

[79] Banning, *Our Army Today*, 145.

relates directly to military suitability, at least to be officers.[80] Part of the bias is based on legitimate factors; in an army pressed for time, men who demonstrated self-motivation and leadership in civilian life were obvious candidates for leadership positions in the military.

The more successful were also likely to be more educated. Valuing education did suggest a bias toward those who could afford college, and against those who could not afford to remain out of the workforce long enough to be graduated from high school. The importance of education was usually explained in the light of time and expediency.[81] The link was often explicit, as in the case of one test-prep booklet that quoted an uncited Army publication that the Army "cannot undertake...a program of training which assumes no background and no foundation of specialized knowledge and skill on the part of the inductees. Our enemies have had several years' head start. We must catch up to and surpass them, not only in material but in trained man power."[82]

The concept of "catching up" to the Axis was prevalent in discussions of mobilization, and tank technology, and at first seems at odds with the assumption of American technical competence. That the U.S. was not ready to fight a land war in 1940 or 41 was unquestionable. Another unquestionable American attitude was the desire to avoid war, and the lack of preparation based on the desire to avoid war preserved the idea of American technical expertise in the face of uncomfortable facts about numbers of weapons produced and soldiers under arms. Reluctance to fight was portrayed as a

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[80] The usefulness of such criteria is questionable in light of the author's prior assertion that pilots were the least superstitious in the Army, which later experience seems flatly to contradict. Ibid, 144.

[81] Air Force study number 2, "Initial Selection of Candidates for Pilot, Bombardier, and Navigator Training," 1943. 21-22.

[82] Anonymous, *Prepare for the Official U.S. Army-Navy Tests,* 2.

positive, in the *Why We Fight* films, and other places as well. Addison McGhee phrased it in terms of growing up: "From time immemorial little Johnny America has played with his tin soldiers in his sandbox...His sandbox has grown until it is as large as the world itself." In this formulation, Americans were possessed of the proper expertise, but had not thought about modern war. The problem then became the proper application of American technical and organizational ability to the problem of wartime mobilization.

Included in the problem of mobilizing was adapting recruits to the structure of Army life. American society in the mid-twentieth century emphasized the theoretical equality of all white men, while usually admitting that differences existed in practice. For the recruits, Army life proved to be an entirely different world from the one to which most were accustomed. One study theorized the African-American men had less difficulty adjusting to Army life, in large part because they did not have the same experience of equality in their world, and were used to situations where they were treated as inferiors.[83] For men who were not used to being ordered about, or doing menial work for which they could see no immediate point, the Army proved to be something of a shock. To the advocates of the labor movement, worried about their economic autonomy, the contrast was particularly vivid, and not welcome. [84] The authority an officer had was uncomfortably similar to what the employer still claimed, and the labor struggles of the 1930s prepared some recruits to resist authority when conceptualizing the Army.

One of the greatest shocks for recruits was the formal discipline of the Army, in which they were expected to show deference to both commissioned and non-

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[83] Stoufer, et al. *The American Soldier: Adjustment during Army Life,* 56, 572.

[84] See George Marshall's response on 13 January 1940 to an editorial in the Journal *Labor* on 9 January, in which the journal complained about the army "caste system, so rigidly enforced". in Bland ed,. *The Papers of George Catlett Marshall,* Volume II, 140-1.

commissioned officers, regardless of their individual perception of the competence of the individual in question. Pressures operated in the civilian world that could prevent men from speaking their minds on every subject, or force them to defer to persons with whom they disagreed, but for most—except for African-Americans—there were rarely formal punishments for not showing proper respect for one's supposed superiors. One anonymous draftee phrased his discontent in historical terms, arguing that the elevation of officers was "obsolete in the 13th century."[85] Others used the word "medieval" to describe the Army system, and even new officers were often surprised at the insistence on discipline. One ROTC Lieutenant, Cortland Basset, responded to a superior's question with a "that's right" instead of a "yes, sir" and was reprimanded. Writing a postcard home, Bassett openly described the incident as ridiculous, suggesting that Army discipline was as likely to produce outward compliance as internalization.[86] The Army's seemingly archaic insistence on rank and deference was often grating to the recruits, contributing to the view that the service was less modern than the rest of society.

Professional soldiers sometimes contributed to this perception, especially when they focused on minute matters of discipline that seemed to the recruits to be indicative of the "spit and polish" preoccupation of the prewar Army. Discipline meant different things to different people, and the soldiers seemed to expect the courtesy offered to civilian professionals such as plumbers or electricians, in that so long as the job was done well behavior was less of an issue. Not all professional soldiers viewed discipline so lightly. While training the 2nd Armored Brigade in Georgia, General Patton circulated

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[85] Stoufer, et al. *The American Soldier: Adjustment during Army Life,* 212-3

[86] Cortland A. Basset, postcard, 24 December 1941. University of Tennessee Special Collections Library, MS 1259, Box 2.

memos complaining that soldiers were committing breaches of discipline on a regular basis, including putting their hands in their pockets when otherwise unoccupied, appearing in public in dirty uniforms, or accepting rides from civilians in nearby Columbus.[87] Patton justified his concern in terms that would later make him famous, that "soldierly pride in his dress and behavior" were the first step in creating soldiers, and with that achieved, "organizational excellence follows easily and naturally."[88] The issue was so important to Patton that he expressed these concerns despite the fact that no soldier under his command had been observed committing the acts he censured, though he suspected "the number of ignorant recruits in our ranks makes it probable that some of our men were also derelict."[89] Although the Army's defenders tried to portray the relationship in terms of patriarchal family structure—McGhee directly referred to a battalion commander as a father, and the officers under him "assistant' fathers—the metaphor did not always convince.[90] When the Major commanding a provisional horse regiment was "captured" in South Carolina in 1941, Oliphant commented that it was "the only [thing] that has happened to make them rejoice."[91]

If recruits disliked deferring to Army hierarchy, they also tended to view the long-service regulars who made up the "Old Army" as not deserving respect. The stereotype of the soldier who needed the comfort of Army routine due to a lack of initiative or

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[87] George S. Patton, Jr. Memo, HQ Second Armored Brigade, 5-6 November 1940. Gillem papers, Box 3, USAMHI.

[88] George S. Patton, Jr. Memo, HQ Second Armored Brigade, 3 September 1940. Gillem Papers, Box 3, USAMHI.

[89] Ibid.

[90] McGhee, *He's in the Armored Force Now*, 36.

[91] James Oliphant, letter, 18 November 1941, University of Tennessee Special Collections, MS 1892, Box 7, folder 2.

ability to compete shaped the draftee attitude toward the service. Oliphant recorded during the South Carolina maneuvers that the stereotype was pretty well justified, given his experience with pointless movement and orders that made no sense given the local context.[92] Even favorable experiences often caused soldiers to invoke the stereotype of the incompetent and mysterious Army: when William Bopp received his clothing allotment after his induction he commented with some surprise that everything fit, and proceeded to describe the food he received at Camp Riley as good, another surprise.[93]

After adjusting to Army discipline and falling into the routine of barracks life, soldiers next had to acquire the specialized skills that would allow them to serve the Army's needs. Specialized training ranged from weapons and tactics to clerical duties. The Armored Force processed about eighty thousand officers and enlisted men through its internal schools between 1940 and 1945, with the greatest emphasis on vehicle maintenance. Between November 1940 and August 1945, seventeen thousand enlisted men and two thousand officers completed the 12-week Tank Mechanics course. Reflecting the needs of the Armored Force for speed and control, the next largest courses were the 12-week Motor (over 14000 graduates) and Communications (12000 graduates).[94] The other needs of the unit could be met with less specialized training; a 75mm gun had similar requirements in a tank turret (or sponson) as it did as a towed piece, and basic infantry skills still pertained if tanks were involved or not. Armored units had to train soldiers mainly in the skills necessary for armored warfare, particularly

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[92] James Oliphant, letter, 22 November 1941, University of Tennessee Special Collections, MS 1892, Box 7, folder 2.

[93] William F. Bopp, "A narrative of the life of William F. Bopp" University of Tennessee Special Collections Library. MS 1881. Bopp's expectations of Army food were met when he transferred to Louisiana.

[94] Palmer, et al., *Procurement and Training*, 315-6.

how to maintain the equipment and coordinate tanks and infantry. Officers completed map exercises (paper problems solved by issuing orders instead of moving actual units) and live maneuver exercises as well, all on a smaller scale than the more prominent maneuvers the Army conducted. Soldiers learned how to be tank crewmen, a speciality Addison McGhee titled "Armoraiders", a term he appears to have invented himself.[95]

Tanks in particular demanded new skills of their operators. Within the interior of a moving tank, communication among crew members became problematic. Even more so was communication between commander and driver, in an environment where noise and vibration made conventional voice communication impossible. Heat proved another concern, especially in desert conditions. Recruits had to be acclimated to their new environment before they could learn to operate as a unit. Training competent tank drivers was the first step, but then they had to learn how to coordinate their actions with other tanks. General Patton worried that the 2nd Armored Brigade was not making enough progress operating as a unit, citing "too much individual tank driving"[96] The first step in creating a citizen army was creating individual soldiers, but those men had to be trained to act as a unit, a more difficult step. The rapid expansion of the Army caused problems for training, especially given the cadre system. As units approached the end of their training, the Army stripped them of some experienced personnel to provide the core for newly mobilizing units. The cadre system was damaging not only because it stripped experienced soldiers from units, but also limited the time units spent together.

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[95] McGhee, *He's in the Armored Force Now*, 11. McGhee is possibly the only writer to use the term.

[96] George S. Patton, Jr. Memo, HQ Second Armored Brigade, 3 September 1940. Gillem Papers, Box 3, USAMHI.

Training soldiers was complicated by the fact that they carried into the army their civilian understanding of warfare, and did not always wilt before the superior expertise of their trainers, particularly when they perceived them to be "old army" types not worthy of respect. The perception of the Molotov cocktail's effectiveness bothered Colonel Triplett, then with the 13th Armored Division so much that he staged some tests with existing tanks and discovered that the average homemade Molotov would not generate enough heat or flames to do more than annoy even a light tank.[97] Triplett was an angry debunker of civilian myths, often seeming to be personally insulted by incorrect information or assumptions. On another occasion he complained of the influence of popular depictions of gun fights in western movies. In such depictions the shooters often took cover behind rocks, which Triplett noted only added another source of danger from the rock chips that near-misses kicked up.[98]

The way in which soldiers examined their training after its completion but before combat provides some keys to how they understood their journey from recruits to soldiers, if not veterans. The 11th Armored division produced a Walt Disney studio-aided pictorial review of its training phase that suggested how much of their cultural conceptions of modern warfare remained on the eve of their participation. Aside from a back page consisting of Donald Duck and Peg-Leg Pete in classical Greek armor, the front piece of the pamphlet connected the classical warfare of chariots with the modern tank force; a charioteer with the division's shoulder patch on his shield topped the list of units and authors. The writers were largely non-commissioned officers and enlisted men, presided over by a Lieutenant as the project editor. With no high-ranking officers

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[97] Triplett, *A Colonel in the Armored Divisions*, 2-3.

[98] Triplett, *A Colonel in the Armored Divisions,* 26.

involved there is a good chance the pamphlet represents the views of the average soldier to a strong degree. Claiming that the techniques of war in the mid-20th century were "as modern as a Broadway sign and as swiftly changing in application," the review emphasized the training of the unit, focusing on "modern" elements, noting particularly the emphasis they received on tank-infantry cooperation. The publication noted that the training of tanks in infantry tactics, and the reverse, rather than creating confusion, explained the purpose of the armored division. In this aspect the soldiers were on-target, since the combined arms concept was at the heart of the armored unit.

In other respects the officers who wrote the 11th Armored Division review resorted to standard clichés to explain their training. In one instance, they accepted that the average American male was conversant with mechanical elements and engine technology in general, and thus picked up the mechanized training easily. On the subject of marksmanship, they matched the standard formulation of a nation of rifle marksmen to counter the perception of Axis superiority, specifically in the field of sniping. The review asserted that Americans were more effective than Axis in precision shooting, being in the "American Sergeant York tradition."[99] Again, reluctance to cede dominance to the Axis had to contend with the reports from the first two years of the war.

Maneuvers, from the soldier's point of view, were not always as useful as their officers perceived. For recruits with no experience of combat, the maneuvers largely seemed exercises in boredom and tests of foraging skill. James Oliphant spent most of his time in his letters complaining about the adjustments of living outdoors. In the Carolina maneuvers Oliphant wrote that his cavalry unit was testing the last chance for

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[99] 11th Armored Division pictorial review, University of Tennessee Special Collections Library MS 1881, Box 8 Folder 2.

the horse on the modern battlefield, and that the outcome was expected and accepted by all but the troop commander, a very old-school cavalryman. Indeed, in the unit photo Oliphant preserved, the Major in question, named Rogers, is the only one wearing traditional cavalry dress; the rest are in more standardized uniforms.[100] Nevertheless, the Charlotte *Observer* ran an article quoting "brass hats" as favoring a mix of horse and mechanized cavalry; Oliphant reacted to the article with disgust since his own unit had been held in reserve the entire time.[101]

In the November 1941 South Carolina maneuvers, roughly a year before the Americans went to North Africa, the 2nd Armored division slipped around the 11th infantry division's defenses around Columbia and headed toward Chester. Elements of mechanized cavalry were deployed to stop them, and Oliphant's horse cavalry was ordered to try and slip around the enemy rear and attack the supply train. Horse units obviously could not stand up to tanks on the tank's terms, but the idea was to see if horse cavalry could set the terms of the engagement, and demonstrate at least some marginal utility. From Oliphant's perspective, the whole thing seemed like "a good way to eliminate horses early in the game."[102]

American soldiers brought with them concepts about technology, war, and the relationship between the two. The first group of draftees from 1940 took just over two years to adapt their understanding to the one the Army tried to create in them before

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[100] Oliphant, letter 30 November 1941, and picture. University of Tennessee Special Collections, MS 1892, Box 7, folder 2.

[101] His exact wording is "Now, more than ever, even more than after Louisiana, am I disgusted about the whole thing." James Oliphant, Letter, 27 November 1941 University of Tennessee Special Collections, MS 1892, Box 7, folder 2.

[102] James Oliphant, Letter, 10 November 1941. University of Tennessee Special Collections, MS 1892, Box 7, folder 2.

entering battle against the Axis partner acclaimed for technical proficiency, Germany. Under the corrosion of combat circumstances many of their ideas broke down, not an uncommon occurrence in any war. Of interest to the historian of the United States Army in this context are precisely what concepts survived, and how the influences of Army training and preexisting cultural orientations survived the ultimate test of military preparations. The citizen army carried many of its society's precepts into battle, using them as guideposts to understand the new world in which they found themselves. The next step in the process was combat; the soldiers were trained, the army had a doctrine to test, but most importantly, time had run out. General Marshall understood the pressure to get American soldiers into action against Germany; aside from the strategic considerations, "a democracy cannot fight a Seven Years War."[103] How the Army adapted to combat was conditioned, but not determined, by the years between 1940 and 1942. The next two and a half years provided a new body of evidence, but before that evidence could be interpreted, it first had to be experienced. Faith in technology meant that that the individual soldier should emerge from combat unscathed; few really thought that they would become a casualty. This expectation sowed a seed for later disillusionment, and a consequent basis for judging the technology with which the soldiers were supplied.

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[103] The reference was actually to the need to get into combat against Japan, but the same pressures operated with regard to Germany as well.

CHAPTER FOUR

"WE HAVE GOT TO LOSE SOME OF THEM": COMBINED ARMS IN COMBAT

In November 1944 Bruce Cooper Clarke left Combat Command A of the 4th Armored division to take over Combat Command B of the 7th, and was promoted to Brigadier General shortly thereafter. Clarke recalled that when he arrived at his new command's Belgium headquarters, its tanks were covered with sandbags and logs, expedients that one officer told him were to protect them against German *Panzerfaust* anti-tank rockets. Clarke asked how many tanks the division had lost to the weapon, and upon being told "none", ordered the tanks stripped of their extra protection, arguing that "we have got to lose some of them."[1] Clarke accepted that war meant casualties, and argued that excessive fear of taking casualties prevented units from accomplishing their mission. He also drew from his combat experience that speed mattered in tank operations. A slow tank—weighted down with extra protection—was incapable of accomplishing the exploitation mission envisioned for it, and a formation so weighed down would have comparable difficulty. Clarke drew these conclusions from his combat experience; the soldiers of the 7th, in action since August, understood their combat experience from an understandably different perspective, more concerned with individual survival than institutional success. The difference between these points of view laid the groundwork for different evaluations of American combat performance in the Second World War. Differences in perspective, from civilians in the U.S. and draftees in Europe,

[1] Bruce Cooper Clarke interview, 52. .

sowed the seed for reinterpretation of wartime experience. Although combat was (and is) perceived as the ultimate test of any military theory, organizing one of the most chaotic experiences in which humans engage into a coherent lesson is not an easy process. Accumulated combat experience during the Second World War added examples to both sides of the debate over the role of armor rather than settling the most important questions about the role of technology on the battlefield. Combat also tested the institutional ability of the U.S. Army to adapt its training and organizational procedures based on reports of the direct experiences of American officers and enlisted men. Marshall and McNair now had access to much more first-hand information than they had in the period 1939-42. Acquiring information on which to base decisions was for both leaders, with their eyes fixed on the road ahead, the most valuable byproduct of the combat experience.

Combat in Europe exposed the different approaches that the German and American armies took toward technological development. The eventual outcome of combat in Europe suggests that the army the United States created in the Second World War was the correct one for the enemy it faced. Specialist forces could assist, but if the bulk of the enemy army was composed of infantry, then evaluation of American force structure should be based on how well the American combined arms team dealt with that element. At the height of German mechanization, panzer units comprised only about ten percent of the German army. In 1939, with six years of open preparation, five of the German Army's fifty-one divisions were mechanized.[2] Germany continued to create armored units at a ration of 1 in 10; in 1944 the German training system produced over

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[2] War Department, Technical Manual TM-E 30-451 "Handbook Of German Military Forces", (Washington: GPO, March 1945), I-41.

three hundred infantry and thirteen tank replacement battalions.[3] The U.S. Army recognized that even by 1945, "Despite the important role which has been played by specialized branches of the German Army, the infantry has been and remains today the foundation for most German operations."[4] While German planners lavished equipment and training on Panzer and SS units, an elite within the German state, aside from these units, the German Army was essentially the same as it had been in the last war. Most German soldiers marched on foot and were supplied by horse-drawn wagons for the entire war. American technology overall differed from German in focusing on a broad range of attributes. German technology in several cases needed elite operators to get the most out of often temperamental machines. The Me-109 and Panzer VI both were impressive in the hands of experienced crews, but displayed marked operational difficulties in the hands of operators new to them. The Me-109 was very difficult to land, and the Tiger was prone to mechanical difficulties unless the crew constantly made adjustments.

American designs, for the most part, took into account factors ranging from crew comfort and ease of use to how suitable a design was for mass production, and how much shipping space it occupied. American technology often achieved results beyond what simple comparison of technical details suggested because of the ability of American soldiers to get the most out of their machines in the context of the U.S. Army combined arms theory of the Second World War. The overriding goal of adopting armored formations was to break the stalemate of the previous war, and for the most part, American combined arms tactics succeeded in this aspect. Their contribution to reduced

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[3] Ibid., I-66.
[4] War Department, "Handbook of German Military Forces", II-12.

casualties was more indirect than direct, shortening the war rather than protecting every individual soldier. Although American doctrine might not be "sophisticated" by later standards, it was good enough to win the war, which was all its creators asked of it.[5]

Every American soldier and all his supplies, from tanks to boots, had to be shipped across the Atlantic before military force could be brought to bear against the enemy. But by 1944 Germany was falling back on its supply lines, making those of the Allies that much longer. As a consequence the logistics of land transport had to be added to decisions about trans-Atlantic shipping space, and the whole equation resolved in order to make intelligent decisions about American force composition for the entire war. Once planners decided to include a particular a piece of equipment, especially something as large as a tank, shipping enough units to replace it completely meant taking space away from soldier replacements and supplies. Major changes in equipment would echo down through the force structure, since units would take time to receive and integrate the new items. When the Army did decide in some cases on major equipment changes, such as the shift away from M5 to M24 light, and M4 to M26 medium, tanks, the threshold of evidence for making these decisions was necessarily high, since major changes in equipment brought the most important factor governing American strategy into effect: time. Worth noting is that the time between the German encounter with the T-34 and the arrival of the Panther design was longer than the American encounter with the Panther and the arrival of the M26. The war was over in the latter case, but the Americans reacted slightly *faster* to the shift toward heavier tanks than did the Germans. They came to the race two years after the Germans, and caught up, for the most part, by the end of

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[5] Robert M. Citino in *Blitzkrieg to Desert Storm: The Evolution of Operational Warfare* (Lawrence, KS: University Press of Kansas, 2004) holds American tank theory in World War II to the postwar standard of how well it dealt with enemy tanks. More on this in the next chapter.

the war.

Comparisons of technical details suggest that the U.S. Army was not complacent about the visible trends in tank design toward heavier machines with thicker armor and higher-velocity guns, but adapted within limits of a doctrine that stressed flexibility and operational mobility over individual tank fire-power. Charles MacDonald, historian and Second World War infantryman, suggested that while the need for higher-velocity guns for the M4 was obvious from combat experience by the end of 1944, what was not so obvious was whether the decision to stay with the medium tank was correct.[6] Tank design had to balance three main factors: crew protection, mobility, and firepower, all of which were related to weight. The three are related in a complex way, not always perceived by some critics. For example, more armor on a tank increases crew protection, but also adds weight to the tank, decreasing its operational mobility by stressing the engine, requiring more frequent maintenance and replacement. Increasing weight also restricts the mobility of individual tanks to ground of greater hardness and lower slope. Engine technology and space requirements in the Sherman chassis meant that maximum power that could be extracted from and engine that would fit into the tank was reached at around 500 horsepower. Addition of more armor would only decrease the tank's mobility further. Mobility was key in American concepts of war at the time, but from the operational-strategic perspective, not the tactical. Formations had to be able to shift to meet an enemy attack, and also have the endurance to operate on the offensive in such a way as not to allow the enemy time to recover or reorganize. American forces did not always meet these goals, but did so enough to win.

Time for preparation ran out in November 1942, but for the decision-makers who

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[6] Charles B. MacDonald, *The Siegfried Line Campaign* (Washington: GPO, 1984), 620-1.

did not know when the war would end, and indeed whose choices influenced that date, time was always a factor. Governing the organization of the U.S. Army was the idea that the more time American forces spent in combat the more casualties they would incur. Any attempt to improve technology thus had to be measured by whether it would lengthen the war and result in an increase in losses. A shorter war could mean fewer casualties as well, but none of the methods that promised a shorter war had yet been tested. No American planner seems to have entertained seriously the idea that casualties could be reduced to zero. Indeed, public statements from sources as varied as the editorial cartoonist Dr. Seuss and mobilization planner Robert Patterson suggested that the American public needed to learn to sacrifice in order to win the war.[7] Technology could reduce losses, but General McNair warned that the essence of the war was killing the enemy, which, he omitted saying, applied to the other side as well.[8] Getting American soldiers into position to do the killing of which General McNair spoke required a vast logistical apparatus, one that was not easy to reorient quickly, even with good reason.

After almost two years of concentrated preparation, the United States Army engaged the ground forces of the European Axis powers in combat in late November 1942. Although the American strategic goal was to invade Europe and bring German armies to battle, domestic pressure to engage the enemy, material limitations, and British unwillingness led to a peripheral attack on Vichy French possessions in North Africa. At

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[7] Richard H. Minear, *Dr Seuss Goes to War: The Editorial Cartoons of Theodore Seuss Giesel* (New York: The New Press, 1999), 220, and Keith Eiler, *Mobilizing America: Robert P. Patterson and the War Effort, 1940-1945* (Ithaca, NY: Cornell University Press, 1997), 129.

[8] Armistice Day Speech of 1942, referenced in Kahn, McNair*: Educator of an Army*, 8. McNair caused a controversy with his rather forthright comments about what American soldiers would be facing.

this point American officers and enlisted men alike were exposed to combat firsthand, and began to accumulate experiences, reflect on them, and draw conclusions about the validity of their doctrine, training and technology, a process of reflective self-improvement that continued through rest of the war. Process was the key concept: as information came in from the battlefield, it was the job of the planners of the Army Ground Forces to make sense of it, and suggest necessary changes to doctrine, training, equipment, and procedures. The operational flexibility pursued by General McNair now met the ultimate test of military organization, combat, and emerged with some particulars altered but with its fundamentals vindicated.

Assessing how well American planners adapted to techno-industrial warfare in the mid-twentieth century rests on the record American forces amassed in combat. The U. S. Army faced two foes that posed different challenges. The war against Germany meant large-scale ground combat operations on the European mainland. The war against Japan was fought over a much larger theater with smaller concentrations of soldiers, though the invasion of the home islands would have had more space for armored operations. Armored warfare as a possible replacement for an infantry-centered doctrine was an issue against the German-Italian Axis. Strategically, Japanese naval power meant that any invasion of Japan first had to capture a string of naval bases across the Pacific. On the tactical level, the islands of the Pacific did not present the same potential for stalemate that the north European plain did, since defensive positions could be circumvented by amphibious landing, or bypassed altogether. The best role that tanks could play in such circumstances was infantry support, bringing protected guns (and flamethrowers) to sites of particular resistance.

Japanese Army theory also placed little weight on tank operations, and as a consequence their tank design stalled in the late 1930s, when armor was thinner and guns smaller. Japanese anti-tank guns were dangerous to American tankers, but never inspired the same fear as their German counterparts. Japanese tanks were comparatively rare, and when encountered were not difficult to destroy. The War Department was aware of the broad outlines of this situation, and consequently training publications focused on Japanese soldier motivation and jungle fighting.[9] One picture from the Pacific theater illustrates the gap between American and Japanese armor. Likely a posed shot, the photo featured an M4 with a Japanese light tank placed on the hull behind the turret, almost as a sort of trophy.[10] The technological gap was greater between the Japanese and Americans than between the Americans and Germans, suggesting that while technical specifications are not in themselves an indicator of victory, there is a sliding scale. The technology that a force employs need not be superior to its opponent's in all cases, but to fall too far behind is to risk disaster. Appreciating that even vast tank superiority would not have saved Japan, American soldiers based their understanding of technological warfare (before and after the fact) on their encounters with German armor.

There were two main phases to American combat operations in and around Europe. The first began with the Operation TORCH landings in Morocco and Tunisia in late 1942, and continued through the summer and fall of 1943, when the Allies invaded Sicily and Italy, continuing the peripheral strategy favored by the British. In North

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[9] See "Notes on Japanese Warfare" Military Intelligence Bulletin 10.

[10] "Pfc. N. E. Carling stands beside the medium tank "Killer" on which is mounted a dead Japanese light tank. Kwajalein Atoll. February 2, 1944." Corbis.com, image NA002001. Accessed 14 Aug 2006. See also Robert M. Nieman and Kenneth W. Estes, *Tanks on the Beaches: A Marine Tanker in the Pacific War* (College Station, TX: Texas A&M University Press, 2003)

Africa visibility was longer, in some cases far longer, than the effective ranges of the anti-tank guns involved. The distances involved meant that mechanized forces were the only way to operate with any effectiveness, and logistics assumed the major limiting role on both Axis and Allied operations.[11] In Italy the situation was reversed; the terrain limited observation, and provided advantages to the defenders that produced two stalemates that the Allies only broke at great cost.[12] The Italian theater continued to be active until the end of the war, but after summer 1944 the main American effort was focused on the northwestern Europe campaign, which consumed the majority of American resources and attention until the German surrender in May 1945. The European theater offered the greatest chance for Armored operations to be important, even decisive, because of the relatively compact geographic area, dense transportation net, and direct access to Germany. Each phase differed in how geography, supply, replacement and strategic imperatives impacted operations, but both provided experience that had to be collected, passed up the chain of command, and analyzed. Conclusions drawn from that analysis then influenced decisions to modify policy.

The time required to interpret and analyze overseas experience, disseminate the resulting conclusions throughout the Army, and make changes to the industrial program that supported the war effort meant that the direct combat experience that units had accumulated in the invasions of Sicily and Italy took time to reach back to units still training. The first time that distilled lessons influenced the organization of untested

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[11] Rick Atkinson, *An Army At Dawn: The War in North Africa, 1942-1943.* (New York: Henry Holt and Company, 2002), 247-8.

[12]See Douglas Porch's argument in *The Path to Victory: The Mediterranean Theater in World War II* (New York : Farrar, Straus and Giroux, 2004), xiii-xiv, that the usefulness of the theater lay in seasoning American soldiers.

troops for and conduct of operations was the northern European campaign, after D-Day. The landings in Normandy were conducted by soldiers who had been training either in the U.S. or England since their induction into the Army.[13] The success or failure of these troops was dependent on how well the Army could learn from the problems it faced in its first year of combat. The overall experience was one of trial and error, a process of seasoning that seems unavoidable in the transition from untested to veteran armies.

The armies that faced each other in North Africa were roughly equal in technological terms. Hints of future problems surfaced when American units encountered the Panzer VI (nicknamed the Tiger), which weighed almost twice the M4's roughly 33 tons, and mounted an 88mm dual-purpose gun behind ten centimeters of frontal armor.[14] The Tiger in 1942 was in the early stages of production and development, and few were sent to the German forces in North Africa.[15] American observers, while noting that the Mark VI was a dangerous opponent, perceived that it had a number of weaknesses when used on the offensive, based on reports that Tigers encountered in North Africa were reluctant to move without an armored car screen, or to close with Allied positions, necessary when attempting a breakthrough. Tigers in the early stages were also mechanically unreliable, requiring an experienced crew to operate them efficiently. Although the Tiger had formidable frontal armor, its sides and rear

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[13] There were exceptions; the 1st Infantry division and the 70th independent tank battalion had seen combat in Tunisia and Italy, but these were not the norm.

[14] The Tiger, according to contemporary American statistics, weighed 62 tons loaded for combat, and had an engine rated for 642 horsepower, giving the Mark VI a ration of ten hp per ton, the worst of any German tank. The Panzer IV had between 12 and 13 (depending on the variant), the Panzer III roughly 15, again slightly different for each model. The American M4, by contrast, began operational life with a ratio of 12 hp per ton, and progressed rapidly toward about 15 hp/ton in the M4A3. The M3 had about 11 hp/ton. All calculations taken from the Catalog of Standard Ordnance Items, and Handbook on German Military Forces.

[15] Tigers were deployed first to the Soviet Front in 1942, and to North Africa in early 1943. Handbook of German Forces, VII-83.

were substantially more vulnerable, and their crews in North Africa showed a reluctance to expose their expensive and temperamental machines with aggressive tactics.[16] The Mark VI's technical superiority came mainly when it could engage an enemy tank at long range with the 88mm main gun it mounted, a prospect more likely to occur for a defending force than one in the Allies' situation of trying to take back occupied Europe (or North Africa) through offensive operations.

The most numerous German tanks in North Africa were the Panzer III and IV, which did not have the limitations of the heavier tank.[17] All in all, the German tank forces possessed a slight technical advantage, though the American tank's reliability meant that its operational endurance had the potential to be greater, if the vehicles were properly maintained. American tanks could keep the pressure on an enemy longer than German designs could have in the same situation. No tank deployed in large numbers proved decisive, and even the Panzer VI was not a war-wining weapon. Although German tanks had a slight edge in a hypothetical tank-versus-tank frontal engagement, American designs in North Africa, if not perfectly equal in combat terms, could hold their own.

In anti-tank guns the Germans had one major advantage, the 88mm anti-tank/anti-aircraft gun, deployed both as a towed weapon and mounted on the Panzer VI. Designed to reach high altitudes, the 88's muzzle velocity was quite high for weapons of the time,

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[16] Gillie, *Forging the Thunderbolt*, 242.

[17] The heaviest German tank deployed in large numbers in North Africa was the Panzer IV, in variants that weighed about 25 American tons, as opposed to the M3's 30 tons and the M4's 33.[17] The Pz IV had a 75mm main gun, as did the two American medium tanks. The later versions of the Pz IV had a longer-barreled 75mm, allowing for slightly longer range and penetrating power, but the American tanks had slightly thicker frontal armor. Still deployed in large numbers, though slightly less numerous than the Pz IV, was the Panzer Mark III. The Panzer III, depending on the variant, had between 1.5 and 2.5 inches of frontal armor, and a 37mm or 50mm main gun, weighing about 22 tons. Handbook of German Forces, VII 78-79.

higher than the American equivalent, the 90mm anti-aircraft gun.[18] The penetrating power and accuracy of the "88" became legendary in the American army, to the point that a later survey suggested that it was the German weapon most feared by American infantrymen.[19] Bill Mauldin captured the sentiment with a cartoon in which an interrogator informs a GI "I'll let you know if I find the one wot invented th' 88".[20] The most numerically common German anti-tank gun in North Africa was not the 88mm but the 50mm. These were smaller, easier to conceal, and dangerous at short ranges, which an attacking force would eventually have to reach. The 50mm was replaced later with a 75mm gun, and the "88" was never the most numerically predominant German antitank gun. Still, it occupied the minds of American soldiers. The penetrating power of the 88 should not be underrated; the Americans rated it able to penetrate 130mm of armor (sloped at thirty degrees, which doubled effective protection) at 1500 yards.[21] In the minds of American tankers, that translated to four inches, easily thicker than any armor on the M4. It was also thicker than the armor on the Panzer VI.

Given that there were comparatively few 88mm, compared to 50mm, antitank guns, and the relative parity of tank designs, the deciding factor when American tanks went into combat was rarely technical, rather, it was the level of seasoning of the crews. American tank crews were less experienced, and often rushed into ambushes set up by

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[18] The 8.8 cm had a muzzle velocity of 3700 feet per second with armor-piercing ammunition, (Handbook of German Forces, VII-35) while the American 90mm gun topped out at about 2700. (Catalog of Standard Ordnance Items, Volume III, 531)

[19] Samuel A. Stouffer, Edward A. Suchman, Leland C. DeVinney, Shirley A. Star, and Robin M. Williams, Jr., *The American Soldier: Combat and Its Aftermath*, (New York: John Wiley & Sons, reprint 1965), . 232-5.

[20] Bill Mauldin, *Bill Mauldin's Army*, (Novato, CA: Presidio, reprint 1983), 159.

[21] War Department, Handbook of German Military Forces, VII-37.

German anti-tank guns. Lt. Col L.V. Hightower, the executive officer of the 1st Armored Regiment, 1st Armored division, described the German tactic of making a demonstration with light tanks just outside of range, so that pursuing tanks would be drawn into the range of heavy 88mm guns. Attempting to flank those guns then drew the tanks into ambushes by shorter-range guns.[22] Combat Command B of the 1st Armored division reported in June 1943 that contrary to aggressive pre-combat training prescribing various clever methods for reducing anti-tank guns, "the AT gun is to be avoided and only attacked as a last resort".[23] Losses were too high when attacking well-emplaced guns with tanks alone. Tanks turned out to be relatively fragile, vulnerable to well-employed antitank guns and artillery. The tank destroyer as it existed in North Africa was unable to search out and engage enemy armor, because the lightly-armored half-tracks of the Tank Destroyer command were best employed defensively, where they could be protected from direct fire until opening fire themselves. The Tank Destroyer arm was useful at the operational level for providing flexibility to respond to an armored attack, but mobility proved less useful for individual tank destroyers in tactical engagements.

Comparisons of medium tank statistics do not tell the entire story; the 1st Armored Division in North Africa had more medium tanks than light, but only barely. The light tank concept proved fairly resilient in pre-combat American armor theory, although German antitank gun development rendered light tanks useless except for reconnaissance. The American M5 weighed about 16 tons, carried a 37mm cannon and a few machine

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[22] Headquarters, Armored Replacement Training Center,"Tankers in Tunisia," 31 July 1943, 20. Lt. Col. Hightower also thought that outside of 1200 yards the 88mm could be safely ignored by medium tanks. CMH staff ride on Kasserine Pass, Appendix 4.

[23] Combat Command B, 1st Armored Division, "Reports on Combat Experience and Battle Lessons for Training Purposes, 10 June 1943," CMH staff ride on Kasserine Pass, Appendix 4.

guns. A fast and mechanically reliable tank, the M5 proved popular with its crews in the U.S. because it was easy to drive. In combat its mobility proved no substitute for heavier armor against the German 50mm antitank guns. Technical developments with medium tanks, particularly in engine power, meant that they could keep up with the light tanks anyway, and provide better protection.

Near-technical parity did not save the Americans in North Africa from an embarrassment at Kasserine Pass, where in early February 1943 a German armored task force broke through an American position and headed for the rear of the Allied forces. On the night of 18 February 1943, a mixed American force of infantry, armor and tank destroyers from the 1st Infantry and 1st Armored divisions under the command of Colonel Stark (of the 26th regiment, 1st Infantry Division) noticed German forces entering the pass and determined that an attack was imminent. Over the next two days a German thrust at Sbiba Gap to the east was stopped by American artillery fire, and both sides shifted their attention westward to the Kasserine area.[24] There the mixed-arm American force, faced with long odds and lacking experience, lost cohesion as some units retreated in disorder on the 20th. Soldiers abandoned positions and equipment in situations that later experience would have shown to be salvageable.[25] The Allied response was to create an *ad hoc* formation out of available resources, under the command of a British officer, Brigadier Cameron Nicholson, who took control of all units south of Thala, a town at one of the northern exits to the pass. By the end of February the pass was in Allied hands again, in part due to the resilience of American divisions, in part due to Allied air and

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[24] Atkinson, *An Army at Dawn,* 392.

[25] George F. Howe, *Northwest Africa: Seizing the Initiative in the West* (Washington: GPO, 1957),

artillery, and in part due to German logistical weakness.[26] The ability of Allied units to reorient in a relatively short time was in part based on a willingness to improvise, and in part on the technological mobility afforded by motorization and mechanization. The flexibility General McNair sought gave the commanders on the scene the ability to respond quickly, shifting fresh units into the fight and creating new command arrangements from the building blocks available.

In the German campaigns of 1939, or 1940, a breakthrough such as Kasserine would have meant victory, as a tactical success was converted into an operational one. Against the Americans and British this did not happen; Allied commanders reacted quickly enough, and their forces were sufficiently mobile, to place well armed defenders in the way of the German attack and inflict enough losses at an acceptable cost to turn it back over the next few days. Against an enemy that had studied armored warfare, even imperfectly, penetration and exploitation were not as easy as they had been against slower-moving and slower-thinking French formations in northwest Europe. The Americans and British were prepared to fight a mental battle at the same speed as the Germans, with forces equipped and commanded to move at the pace of the motor. The toll on the Allies was heavy, though, since they lost a large amount of materiel and suffered more casualties than they inflicted.[27] The 1st Armored division consolidated the 2nd and 3rd battalions of its 1st Armored Regiment temporarily, and the division as a whole suffered about 1400 battle casualties out of the encounter.[28] Later operations were more successful, and by May 1943 the Axis were confined to a relatively small defensive

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[26] Atkinson, *An Army at Dawn,* 384-5.

[27] Howe, *Northwest Africa, 477.*

[28] Roughly ten percent of its overall strength according to Howe, *Northwest Africa*, 477.

perimeter around Bizerte and the Cap Bon peninsula. Bizerte fell around 8 May, and the last Axis forces in North Africa surrendered on 13 May 1943.[29]

The North African campaign provided a great deal of raw experience to soldiers and commanders alike. Officers quickly learned they had to focus on tank-infantry cooperation, account for a whole range of factors affecting artillery, and to invest heavily in preparation, the single most important factor in the success or failure of operations. Careful preparation affected armored operations more than many had previously realized; one lesson drawn in North Africa was that a well-prepared attack against an alerted enemy was better in most cases than a hasty one mounted in order to achieve surprise.[30] Prewar musings on surprise did not take into account the amount of work necessary to ensure that one's own troops were not surprised by the attack as well.

General McNair's concept of the specialist-supported infantry was tested in North Africa, and found to have some problems. Although the core concept proved sound, the particulars required refinement. Cooperation between the arms was still unsteady, good in some times and places and poor in others, often depending on the competence or personality of the officers involved. Even when the ground arms had their act together, problems remained with air-ground cooperation. There were few precedents for how to coordinate air attacks with fast-moving ground forces, and the reluctance of Army Air Fore officers to take orders from ground commanders exacerbated the situation. Tactical air operations as the U.S. Army understood them in 1942-3 had two major functions, observation and attack. The 1st Armored Division characterized the Air Corps performance of the observation mission as "worthless until the latter part of April

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[29] Howe, *Northwest Africa*, 662, 665.

[30] "Training Lessons from the Tunisian Campaign," 41-42. CMH staff ride on Kasserine Pass, Appendix 4.

[1943]", and even then complained of the difficulty of getting a specific request filled, or getting the information in a timely manner when the flyover request was granted.[31] The combat side of the Air Corps mission went somewhat better, with air and artillery operating well under central control around Kasserine pass to slow or halt the Axis attack. After that, the 1st Armored Division complained that the tactical air command "minimized close support mission requested by ground troops."[32] The Air Corps had an institutional reluctance to use its planes in tactical roles, since its officers had argued from the early twenties that they needed to be independent to accomplish their mission. When inter-branch competition combined with inexperience, operational problems followed naturally.[33]

Losses of equipment in North Africa were high, due in no small part to inexperience. Even when the losses were from enemy action, destroyed tanks did not always translate into entire crews killed or wounded. American profligacy with equipment did not necessarily equate to wastefulness with soldiers' lives. The soldiers were aware that most crew members survived from a disabled tank; one commented that his unit was losing one or two men (out of five) every time a tank was lost.[34] In context of the Great War experience, and the American domestic political scene, spending machines was better than spending men. In the preparatory stages of the German operations around the Kasserine Pass, the 1st Armored Division lost 44 tanks (crewed by five men each), 59 half-tracks (crewed by one) , and 26 artillery pieces on 14 February

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[31] CCB report, 4.

[32] Ibid.

[33] David N. Spires, *Patton's Air Force: Forging a Legendary Air-Ground Team* (Washington DC and London: Smithsonian Institute Press, 2002), 8-10.

[34] Headquarters, Armored Replacement Training Center,"Tankers in Tunisia," 33.

1943, at Sidi bou Zid.[35] Personnel losses, while feared very high in the immediate aftermath of the battle, eventually amounted to six killed and thirty-two wounded, with a further one hundred and thirty-four missing, most of whom were later reunited with their units.[36] The event was traumatic enough that the 70th Tank Battalion history mentioned it years later, even though the unit was not directly involved, inflating the number of tanks lost to 90, and the attackers to Tigers and 88mm guns.[37] Tiger tanks did participate in the attack, although they were less than a tenth of total the strength of the attacking German armor.[38] Panic-stricken Allied soldiers might mistake every German tank for a Tiger, but they were extremely uncommon in actual occurrence.

The reports up the chain of command at the time provided the raw data on how well or poorly the American war effort was going, and in North Africa the M4 appeared to fill the role of a multi-purpose tank for which it had been designed. After-action reports that formed the basis of casualty reports passed up the chain of command did not justify calls from a few combatants to alter the Sherman design radically, or replace it altogether. Without the benefit of hindsight or viewed in the postwar strategic context, issues of armor thickness and gun penetration were important, but were counterbalanced by the paucity of heavy anti-tank guns in German defense forces and the relative balance of casualties. The Americans did perceive problems in North Africa, but these related to troop inexperience, not technology. The 1st Armored Division's after-action reports noted problems with poor choice of concealment, inattention to digging shelters, and

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[35] Howe, *Northwest Africa*, 415.

[36] Ibid.

[37] Marvin Jensen, *Strike Swiftly*, 59.

[38] Estimates are that the Germans had about 200 tanks of types III and IV, and "11 or 12" Mark VI. Howe, *Northwest Africa*, 406.

failure to place anti-tank mines quickly after taking a position, all before mentioning that soldiers were complaining that the 75mm towed anti-tank gun was inadequate. The report recommended a "heavier caliber, lower silhouette" gun to replace the 75 as the solution best available quickly.[39]

It was not easy to up-gun a tank since increasing gun tube diameter and length within the context of the tank design increased weight and changed the center of gravity of the tank; in some cases the entire turret had to be redesigned to maintain stability. Weapons that killed tanks were not limited to guns which fired a hardened projectile that used kinetic energy to penetrate armor. The U.S. also attempted to make a genuinely portable anti-tank weapon, which culminated in the 2.25 inch rocket launcher that eventually became known as the "bazooka." The rocket did not rely on speed and weight for destructive power, but took advantage of the Monroe effect.[40] The warhead had a hollow cone inside, which focused the blast into a jet capable of penetrating more armor than a solid charge of similar weight. The drawback to shaped-charge rockets was their relatively short range, making them a weapon of last resort for the infantry.[41] The bazooka was issued to armored units in North Africa in early 1943, but as a new weapon with which few soldiers had any experience. The forces at Sidi bou Zid, for example, set their training program for the unfamiliar weapon to begin on the same day that the

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[39] CCB report, 3.

[40] The Monroe effect had been discovered in 1911, and a Swiss "inventor" named Henri Mohaupt tried to sell the Ordnance Department a grenade he claimed had a new explosive but was in fact a shaped charge in 1939. The increasing size of enemy tanks is mentioned as driving the decision to adopt the shaped charge. Green, et al., *Planning Munitions for War,* 213.

[41] For airborne units, the bazooka was a much better solution that the M22, an abortive attempt at an airmobile tank. The M22 was too heavy for the Airborne (8 tons) and too lightly armored (1 inch) to survive against any ground-based anti-tank guns it encountered. Catalog of Standard Ordnance Items, Volume I, 10.

German attack occurred.[42] The effect of the bazooka on enemy forces was negligible in North Africa, though more from American unfamiliarity with the weapon than from any inherent flaw in the concept.[43] There were small problems in the design, but these were changed based on field reports.

Technological feedback was not the only information to come out of North Africa. Aware of the green status of all but a handful of American troops, Jacob Devers, commander of the Armored Force, tried to distill important battle experiences and distribute them to the soldiers still training in the U.S. In an attempt to collect the experience of armored soldiers in North Africa, Brigadier General T. J. Camp conducted a series of interviews of combatants, mostly from the 1st Armored Division, in April and May 1943. The interviews were distilled into the Army publication "Tankers in Tunisia," and published in June 1943. Gathering information for doctrinal changes was less visible to the average soldier, and took longer to enter the world of the combatant, but published experiences could help spread the tips and tricks of veterans to recruits within the Armored Force. The interviewees ranged from Lt. Colonels to Sergeants, all of whom had been in combat, several at the Faid engagement around Sidi bou Zid. The interviews sometimes gave conflicting information; one officer attributed to the German 88mm gun an effective range of 1200 yards, but an enlisted man gave a figure of 3000 yards.[44] Overall, the interviews did not demonstrate any great concern with the technology employed by American forces, though there was a strong preoccupation with

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[42] Martin Blumenson, in , Charles E. Heller and William A. Stofft, eds. *America's First Battles, 1776-1965* (Lawrence KS: University Press of Kansas, 1986), 247.

[43] Green, et al., *Planning Munitions for War*, 329.

[44] Lt. Colonel Hightower was more precise, arguing that medium tanks should ignore the 88 outside of 1200 yards, while Sgt. Neal of the 1st Armored Regiment warned that the 88 would knock out a tank at 3000. Headquarters, Armored Replacement Training Center,"Tankers in Tunisia," 22, 39.

the German 88mm gun. The Panzer IV did not cause the same degree of fear as the 88, although it was an opponent worthy of respect. One Sergeant told an involved story about a one-on-one duel with a Panzer IV, in which both the American and German tank failed to destroy the other with the first shot and fell to maneuvering for better firing position.[45] The two tanks were clearly perceived as equals by the storyteller.

General McNair visited the front in North Africa to observe the formations he helped create, and although he had no combat experience himself he recognized the fragmentary nature of battle, and declined to yield on a point of organization or equipment simply because a field officer disagreed with him.[46] Combat officers rarely had the emotional or intellectual distance to look beyond their immediate situations with any great clarity. When they did, they often displayed a degree of tunnel vision, assuming their perspective to be representative of the overall situation. McNair faced the difficult job of sorting through these reports and discerning which changes were necessary and which might unbalance the forces deployed. At the center of the army concept Marshall and McNair favored were building-block units that could have specialist units attached to allow them to fulfill a variety of missions. Changing too much in favor of one element, such as antitank defense, ran the risk of taking away from the other elements, making the unit less able to carry out other missions.

Before any organizational changes based on combat experience could filter up and back down the chain of command the units in North Africa invaded first Sicily, in July 1943, and then Italy that September. Invading Italy was not the second front promised to the Russians and in line with American strategic thinking; it was instead a

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[45] Headquarters, Armored Replacement Training Center,"Tankers in Tunisia," 36.

[46] Greenfield, et al., *The Organization of Ground Combat Troops,* 273.

continuation of the British peripheral strategy which had led to the invasion of North Africa in the first place. The pressure of logistics intruded upon "pure" discussions of strategy in summer 1943. The landing craft needed for the full-scale invasion of France were not ready, but enough were in place for a smaller-scale landing in the Mediterranean. The most experienced American troops were in North Africa, and rather than using sealift capacity to move them back to England the Allies could try to remove one of the Axis powers from the war. The Italian campaign was not without any justification, but it always had strong potential to turn into a strategic dead end.[47] Italian geography favored anyone who could hold the passes in the two parallel mountain ranges running down the center of the peninsula, although Allied command of the seas offered the prospect to offset this. Beyond the problems posed by the north-south ranges was the barrier of the Alps. Far from being the "soft underbelly," Italy did not offer the best route to Berlin.

The first step toward Italy (and clearing the Mediterranean sea lanes) was the island of Sicily, which the Allies invaded in July 1943. The island fell relatively quickly, with the majority of operations finished within the same month. Difficulties with inter-branch cooperation did lead to many of the island's defenders escaping, when the Army Air Force proved unable to prevent the crossing of the strait of Messina. The 2nd Armored Division participated in the landings on Sicily, and then drove to Palermo in the days following the invasion. The summary report of the division's activities submitted by its commander Major General Hugh Gaffey in August of 1943, made no particular mention of tank vs. tank engagements. The first day of the landing saw a German

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[47] Albert N. Garland and Howard McGraw Smith, *Sicily and the Surrender of Italy* (Washington: GPO, 1965), 13-14.

armored force attack the beachhead, but the artillery of American units repulsed them.[48] More serious to the conduct of armored operations than German tanks (which were relatively few) were enemy anti-tank guns. On 22 July, near Palermo, the division encountered a series of well-placed and concealed German antitank guns, protected by Italian infantry positions. While the tanks and artillery of the 2nd exchanged fire with the German guns, some tank crews dismounted and flanked the guns using hand weapons. At the same time, the division's mechanized cavalry began to search for routes around the defensive position.[49] Tank crews in this case fought as dismounted cavalry, in a situation where the tanks were a liability in the assault phase because of their tendency to draw fire. When the objective was geographic (a city in this case), the ability to find alternate means of approach diminished, forcing the attackers to confront defensive positions directly. Such difficulties provided in hindsight a precursor to the problems of fighting in Northwest Europe, and illuminate the limitations of much of the prewar armor theory, which rarely took into consideration operations in specific locations.

The losses that the 2nd suffered in Sicily bore out the trend from North Africa of losing fewer men than machines, and in Sicily the division produced good results for its losses. The 2nd Armored division had 56 men killed between 10 and 25 July 1943. Two hundred were wounded seriously enough to require evacuation, and fifty men who were wounded remained with the division. The division was unable to account for thirty-two men, and five were captured by the enemy.[50] For this price, the 2nd captured over sixteen

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[48] Operations, Second Armored Division, April 22-July 25 1943, page 5. Combined Arms Research Library, http://cgsc.cdmhost.com/u?/p4013coll8,8, accessed 12 Oct 2005.

[49] Operations, 2nd Armored Division, 8.

[50] Operations, 2nd Armored Division, Inclosure 10.

thousand enemy soldiers, ninety-five trucks, eighty-three artillery pieces, forty-two tons of small arms, seventy-five hundred tons of ammunition, and over half a million gallons of low-octane fuel (suitable for ground but not air use).[51]

The Italian campaign proved frustrating for those who extolled tanks as solutions to all the ills of modern warfare. In mountainous terrain tanks lost much of their potential to restore mobility to ground warfare, and machinery in general often seemed defeated by the hills. Supply was sometimes carried by mules, in areas where trucks or jeeps could not go. Independent armored operations under such circumstances proved difficult, although there were some tactical compensations. The 70th Tank Battalion reported that in Sicily that if they held high enough ground their light tanks were capable of destroying any German tank by firing on the lightly armored turret roof. The limited elevation of the enemy main guns meant that the Americans were reasonably safe from return fire if properly placed.[52] On the whole, however, tanks were designed for fighting on open and flat ground, where they held out the promise of breakthrough operations. In Italy they were unable to fulfill that role, and instead wound up in infantry support. One improvement that did occur was the greater coordination of tanks and infantry below the divisional level; the 88th Infantry division reported great success in coordination with the 752nd and 760th tank battalions.[53]

In Italy the Americans also faced the first serious threat to the rough technical parity of the preceding campaign. The feedback loop that based decisions about

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[51] Operations, 2nd Armored Division prisoners, Inclosure 10, materiél, Inclosure 11, 1-2.

[52] Jensen, *Strike Swiftly*, 68.

[53] John Sloan Brown, *Draftee Division: The 88th Infantry Division in World War II* (Lexington, KY: University Press of Kentucky, 1986), 150.

technology on combat lessons operated for the Germans as well, and their tank designs were changing to match conditions they faced in the far more dangerous war against the Soviet Union. When Germany invaded Russia roughly two years prior to the Allied invasion of Sicily they found their tanks dangerously lightweight against the Soviet T-34, unable to destroy it except at very close ranges. The heavier Soviet KV-1's frontal armor resisted fire from German anti-tank guns at any range.[54] The Panzer III was entirely outclassed, and the Panzer IV needed substantial gun and armor upgrades to get back into rough technical parity. The Panzer IV models deployed in summer 1941 mounted a 75mm gun with a short barrel, which meant that they were suitable more for infantry support than anti-tank engagement. More serious for the Germans was that their 37mm and 54mm antitank guns (available in larger numbers than the tanks) were inadequate against the Soviet threat.

Technological superiority came at a very high price for the German Army. The Panzer V tank was the German response to the T-34. Nicknamed the Panther, the Panzer V had a 75mm long-barreled gun (to outrange the T-34), sloped frontal armor (another feature copied from the T-34), and the widest treads of any German tank. The wider tread meant lower ground pressure per square inch, and thus that the tank could maneuver on softer ground. The Panzer V also had a very high silhouette and many mechanical difficulties, in no small measure because of how quickly the design entered production. While the Allies were preparing to invade Sicily, German forces launched their last major offensive on the Soviet front, armed with their new tanks. More Panzer V tanks were lost due to mechanical failure than due to enemy action, and the offensive as a whole was a

[54] In 1941 units equipped with the 88mm were issued mostly anti-aircraft ammunition, with a small reserve of anti-tank shells that proved quite useful. Ian Hogg, *Tank Killing: Antitank Warfare by Men and Machines* (London: Sidgwick & Jackson, 1996), 79-80.

disaster for the *Wehrmacht*. The Germans had delayed the attack so that the new technology would be available allowed the Soviets to learn of the coming offensive and prepare a massive trap around the city of Kursk, with six major fortified defense zones through which a German attack would have to pass.[55]

Although most of the Panzer Vs produced went to fight the Red Army, some were sent west, and the Americans encountered them for the first time in Italy. Italian geography and limits on German production meant the Germans did not send massed formations of Panthers to Italy. The short-barreled 75mm American guns could not penetrate the Panther's frontal armor at long range. The side armor was a different matter; the Sherman could penetrate it at over 1500 yards.[56] The few Panthers and Tigers deployed in Italy did not prove the decisive factor, and armor on all sides could not furnish the sort of spectacular operations of the earlier days of the war.

The build-up in Great Britain absorbed the majority of American soldiers and equipment mobilized in the Second World War. A cross-channel attack also fit best with the American perception that wars were decided when armies came to battle and one defeated the other. By spring of 1944, the invasion was ready, or as ready as it was going to get in the framework of a coalition war where one partner mistrusted the other two. The Soviets had been promised an Anglo-American invasion of France in 1942, when they were desperately close to defeat. By the spring of 1944 the Red Army was poised to go on the offensive across the entire eastern front, raising a strategic situation unpalatable to the other Allies. If the Soviets defeated Germany without substantial help from the

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[55] Glantz and House, *The Battle of Kursk*, 64-5.

[56] The M61 75mm APC projectile was rated for over two inches of armor penetration at 1000 yards Catalog of Standard Ordnance items, 515) while the Panzer V had an inch and a half of side armor (40mm, Handbook of German Forces, VII, 82)

West, then they would be in a position to dominate the postwar continent. A true coalition had to defeat Germany to preserve the postwar balance of power in Europe.

The events of the sixth of June had many moments of high drama, particularly among the Rangers at Omaha beach and the scattered airborne units trying to hinder German communication and reinforcement. The overall story of the day was a successful landing, and the allies began the transfer of men and machines to France. The terrain in Normandy favored the defense since hedges had been growing for centuries by 1944, and required demolition teams or modified tanks to breach them.[57] The modification of tanks was a point of difference between the American and British armies, with the British experiments focusing on survivability and the Americans on mobility. For the invasion of Normandy Major-General Percy Hobarth, commander of the 79th British Armoured Division, modified a series of British tanks with minesweeping attachments, various drums and flails designed to clear a path through obstacles. American modifications the their tanks involved making them amphibious, first able to swim ashore from landing craft within reasonable distance of shore, but with the potential to treat rivers more as an obstacle than a barrier. The Americans were more concerned with taking the fight to the enemy, while the British had to husband their manpower and resources more carefully. More than technical changes had been made by the Americans, though. Organization changed for Normandy as well.

Acting on reports of command difficulties from North Africa, in September 1943

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[57] The story of the modified tanks is one often used to credit American innovation; a sergeant took discarded steel from German obstacles and created an attachment that allowed a tank to drive through a hedgerow, and the American command responded to the stimulus from below and passed the device throughout the army. The story is told in Bradley, *A Soldier's Story*, (New York: Holt, 1951) and Michael Doubler, *Closing with the Enemy How GIs Fought the War in Europe, 1944-1945* (Lawrence, KS: University Press of Kansas, 1994), 44-46.

the Army reorganized all but the 2nd and 3rd Armored Divisions, reducing their overall size and increasing the proportion of infantry. The 1st Armored division experience was one factor in the reorganization; their June 1943 report suggested removing the regimental level headquarters since the tank battalions were the largest unit used with any regularity in North Africa.[58] The new divisions had at their core nine battalions of combat troops: three tank, three infantry, and three artillery. Engineer, signal, medical, anti-air, ordnance, quartermaster, and a mechanized cavalry company made up the rest of the division's table of organization and equipment, all supporting the core battalions. Instead organizing the battalions into regiments, as in the Infantry divisions, the reorganized armored division increased the number of combat commands to three, A, B, and R. The composition of these commands was intended to be floating rather than fixed, so that the units comprising a Combat Command could shift depending on the mission. Combat Command R was intended as a reserve, so in essence two commands would fight, and one would recuperate in an effort to sustain combat power. Flexibility was incorporated into the command structure, although in some divisions the combat commands were not rotated, and became regiments in essence. The 5th Armored division permanently associated tank and infantry at the company level, in an attempt to foster cooperation between the arms.[59] The 4th, by contrast, changed the combat commands constantly, using CC R to repair machines and rest men; Bruce Clarke argued that this maintained morale and performance since time in combat was limited, allowing the soldiers to look forward to something of a break.[60] A soldier from the 4th later agreed,

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[58] CCB report, 2. The regimental staff was to flesh out the existing Combat Command headquarters.

[59] Bruce I. Gudmusson, *On Armor* (Westport, CT and London: Praeger, 2004), 142.

suggesting that every three days or so a combatant could look forward to a brief but welcome respite.[61] It turned out that the same Infantry and Tank battalions often worked together in the 4th, but permanently associating them would have reduced the flexibility to work with other units that Clarke sought.

In the first weeks after the invasion, American, British and Canadian forces faced a difficult battle in the hedgerows, where the Germans could contest almost each individual field. Allied tactics adapted to the conditions of a war of position, maximizing advantages of firepower, air support, and coordinating infantry with specialist support from tanks and engineers. Reports from the hedgerow fighting in Normandy did not highlight the Sherman as a liability; on the contrary, the power traverse of the M4 combined with the hedgerow terrain and armor tactics to secure a small advantage for the Americans. The German Panzer V moved its turret by hand, causing a slower response time if a target not directly in line of the gun wappeared. American tanks had electrical traverse, which meant that a full traverse of the turret took about a minute on a Panther, as compared to about fifteen seconds on a Sherman.[62] If American tanks burst through hedgerows where the Germans had prepared an ambush, speed of traverse was not an issue, but American methods of breaching hedge positions reduced that possibility. Engineers would breach a nearby row, and allow movement to the sides and rear whenever possible, going around prepared positions. In the event of a target appearing in an unexpected place, American tanks were better prepared to shift aim rapidly.[63]

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[60] Clarke Interview, USAMHI 50-51, 56.

[61] Raymond A. Shipley, Rutgers Oral History Interview, http://oralhistory.rutgers.edu/Interviews/shipley_raymond.html, accessed 24 August 2006.

[62] Hunnicutt, *Sherman*, 546.

Despite some successes, the combined-arms divisions still lacked the airpower necessary for victory on the modern battlefield. Although a few aircraft were assigned to the Armored Divisions, they were intended for artillery observation, not combat.[64] Close air support was counter to the prevailing trend in airpower thinking, which argued that airplanes were so different that their operations had to be controlled independently to achieve full effect. Not all AAF officers felt that way, although the ones who did were usually in higher command positions than those interested in tactical air support. In this case the critical factor was personality rather than organization; if an Army Air Forces commander believed that close support was a viable mission then cooperation was likely. Major General Elwood Quesada, commanding the IX Fighter Command, was one such officer.[65] Although several AAF Generals who were concerned solely with strategic operations attended the army school at Ft Leavenworth, "Pete" Quesada came away with a broader concept of what was required to conduct a successful war. Upon transferring his operations to northern France, Quesada's command was assigned to support Omar Bradley's First Army. Since the First was for several weeks the only American army operating on the Continent, Quesada controlled its air support.[66] When the Third Army became operational, Major General O.P Weyland took command of its air operations, and he followed Quesada's lead in many respects.[67]

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[63] Doubler, *Closing with the Enemy,* 50.Electrical vs. manual traverse was a smaller issue at longer range, where the German tanks did have more advantage.

[64] Edgar F. Raines, Jr. *Eyes of Artillery: The Origins of Modern U.S. Army Aviation in World War II* (Washington: GPO, 2000), 79.

[65] Hughes, *Over Lord,* 82.

[66] Ibid., 144.

[67] Spiers, *Patton's Air Force*, 68.

Pursuit of a breakout from Normandy led to the use of heavy bombers in a tactical role, over the objections of some in the Air Corps. The tanks the Americans created were not well suited for breaking through prepared defenses without incurring enormous losses, and airpower promised a better way.[68] In late July 1944, as the number of men and machines crammed into the Normandy beachhead neared a critical point, the heavy bombers of the Eighth Air Force were ordered to saturation bomb the German defenses in an attempt to create a breach that the ground forces could exploit. Miscommunication and human error led to some bombs falling in American sectors, killing soldiers preparing for the assault, and Leslie McNair as well. McNair had gone to observe the operation, as he had in North Africa. Bomb fragments killed him along with some newspaper reporters, even as the force he had shaped was on the verge of going from a war of position to a war of movement. The German counterattack fell at Avranches, and Allied mobility enabled Bradley to shift forces and stop the attack. Part of this mobility resulted from air superiority. Control of the skies allowed the Americans to operate in daylight and forced the Germans to operate only in darkness or bad weather. The number of tanks destroyed by aircraft at Avranches was exaggerated, but the fighter-bomber's influence on American mobility was not.[69]

Although some critics later suggested that there were no American "blitzkriegs", (and that consequently the Americans lacked the ability of earlier German commanders) the period of operations immediately after the breakout of Normandy had all the hallmarks of an American-style blitzkrieg on a grand scale. It was at this point George

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[68] A.J. Smithers, *Rude Mechanicals: An Account of Tank Maturity During The Second World War* (New York: Hippocrene, 1987), 189.

[69] Mark J. Reardon, *Victory at Mortain: Stopping Hitler's Panzer Counteroffensive* (Lawrence, KS: University Press of Kansas, 2002), 293-5.

Patton made a name for himself, dashing across France, first turning west to clear Brittany to the port of Brest, a decision that struck many, then and later, as strategically cautious.[70] Even so, Major General Robert Grow took the 6th Armored Division on a dash to Brest that moved so fast he had to designate supply dumps in advance of the division's current position for the Quartermaster units to keep up.[71] Although the 6th proved unable to surprise the defenders and carry the city, its rapid movement did cut Brest off from further reinforcement. The commander of the 4th Armored Division, Major General John Wood, spent the same period trying to turn VII Corps' policy away from a westward move to an eastward pursuit. The Third Army (and by extension, Patton), received a great deal of press for its dash across France, and by late August the Allies demonstrated that they could move faster than the retreating Germans.

The possibilities of combined arms were again demonstrated in the 4th Armored Division's operations around Arracourt in September 1944. Bruce Cooper Clarke was at that point the commander of Combat Command A, while Creighton Abrams commanded the 37th Tank Battalion. Clarke was in the habit of directing his command's movements from an L4 artillery observation plane, taking advantage of radio contact and personal reconnaissance. On 15 September 1944, he and his pilot were flying over the town of Arracourt when they noticed a number of vehicles in the town. After counting over two hundred and fifty, Clarke, radioed Abrams that "the French don't have 260 vehicles in this part of the world", and directed him to "go in wide open and shooting."[72] Abrams'

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[70] General Clarke, an engineer by training, pointed out that acquiring Brest as a supply base was pointless, since it was not a sea-level port. Just before the city fell, the Germans destroyed the locks, and the port only resumed operation after a long repair process. Clarke interview, USAMHI, 281.

[71] Martin Blumenson, *Breakout and Pursuit*, (Washington: GPO), 379.

[72] Clarke interview, USAMHI, 40.

tanks captured the German headquarters responsible for the defense of the entire sector, so disorganizing the defenders of the nearby city of Nancy that when the 35th Infantry Division took that city, Clarke recalled that they went in "with a band playing."[73]

The Germans did not let the capture of Nancy pass without response, and their counterattack on 19 September suggests the dangers of analyzing armor battles by comparing tank statistics and declaring the one with thicker armor and a bigger gun the "best." Tank employment and leadership on both sides were factors as well. On the morning of the 19th, a Panzer brigade with 56 Panzer V's attacked Combat Command A of the 4th Armored Division. The attackers were, in the words of one officer, "timid" in their tactics, not willing to press boldly in the face of American fire, and without infantry support in any substantial numbers.[74] The formation had recently been assembled from the remains of several decimated German units.[75] The tanks (and tank destroyers) of CCA destroyed forty-three of the attacking tanks, for the loss of eight Shermans and three tank destroyers, in combat that was so close that "at times it was difficult to employ artillery support."[76] At close ranges the advantages of the Panzer V were nullified, especially in a confused melee where the Germans could not always present their tanks' frontal plate to their opponents. Used in defense, the heavier German tanks were more formidable; the day after repelling the German attack Combat Command A had to halt an attack because of dug-in Panzer VI tanks covering the route of advance.[77] Eventually the

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[73] Clarke Interview, USAMHI , 41.

[74] Collected After Action reports, September 1944, 4th Armored Division. USAMHI.

[75] Christopher Gabel, "The Lorraine Campaign: An Overview, September-December 1944", 17. Combined Arms Research Library, http://cgsc.cdmhost.com/u?/p4013coll8,378, accessed 24 August 2006.

[76]Collected After Action Reports, September 1944, 4th Armored Division, 7-8. USAMHI.

Combat Command bypassed the position, continuing the advance. In the armor battles around Arracourt, the 4th destroyed almost three hundred enemy tanks, for a loss of about thirty of its own tanks, and a few tank destroyers.

The key to combined arms operations, at least as the Americans conducted them, was communication.[78] General Quesada recognized that his pilots had to communicate with the troops they were supporting, but tried to minimize the difficulties faced in previous campaigns with misunderstandings between ground and air landmarks. He placed trained pilots as ground observers, riding in tanks equipped with radios to enable them to talk directly to the incoming pilots. The idea was that a pilot should have a better idea of what landmarks looked like from the air, and thus be able to guide the supporting planes more clearly.[79] The success of the Third Army and Weyland's XIX TAC suggests that this line of reasoning worked, but it was not the only model. The command flexibility of the American Army allowed the 11th Armored division to try another route, using its artillery observation planes for close reconnaissance, particularly for the armored columns.[80]

Communication was enhanced by mobility, since information, particularly about enemy dispositions, was only useful if it meant that units could reach the right place at the right time. General Clarke explained in the 1970s that he considered one of the tank's most important weapons to be its tread, by which he meant the ability of the tank to move

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[77] Ibid.

[78] In *Red Storm on the Reich,* (New York: Scribner's, 1991) Christopher Duffy suggests that the Soviets achieved similar results through rigid timetables and top-down control in their combined arms assaults. (330-1).

[79] Hughes, *Over Lord*, 183-4.

[80] 11th Armored Division G2 report, 30 May 1945, University of Tennessee Special Collections Library, MS 1608, Box 15, Folder 28, 1.

around enemy strong points and attack their support network.[81] In the same interview Clarke suggested that the important firearm on the tank was not the artillery piece mounted as the "main" gun, but the machine guns. Accounts of field augmentation of the Sherman often focus on attempting to thicken its armor; when the 4th "acquired" (by means unmentioned) a shipment of aircraft .50 machine guns, the division's maintenance battalion mounted one the new guns on the turret of each tank on the commander's hatch.[82] Clarke recalled that the machine gun provided active protection from the *Panzerfaust* anti-tank rocket; upon observing suspicious activity, or even a suspicious terrain feature, he advised tank commanders to fire a burst with the .50 gun to distrupt any potential rocket launch. Clarke also believed the machine guns enabled his command to destroy far more enemy materiel than an infantry division could have destroyed.[83]

The function of the armored division as conceived by Marshall and McNair was not to defeat enemy armored formations, but to attack the regular units that made up the bulk of the German Army. The Armored Force planners designed American armored divisions in the Second World War to bypass areas of stiff resistance and to try to disrupt enemy coordination and control. In some respects these tactics were the descendants of the infiltration tactics used toward the end of the Great War, but employed on a large scale. One disadvantage of the American model was that it could not stand against enemy armor without high losses. Bruce Clarke asserted that such encounters were

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[81] Clarke Interview, USAMHI , 62.

[82] 4th Armored Division After Action Reports, March 1945, 4th AD papers, USAMHI The aircraft .50 caliber guns would fire a seven-round burst and the shut down, to prevent overheating.

[83] Clarke Interview, USAMHI, 65.

comparatively rare, and used a naval analogy, referring to the infrequency of battleships fighting each other.[84] Clarke's analogy suggests that American difficulties with heavy German tanks were only part of the picture of combined arms warfare in the Second World War. An enlisted man from the 4th Armored Division made a similar comment while complaining about the 75mm gun on the Sherman being inadequate to defeat heavy German tanks; most of their encounters were not with enemy armor.[85]

The record of the 4th Armored Division gives some indication of the capabilities of American combined arms units. In November of 1944, the 4th lost two hundred and twenty men killed in action, another eight hundred and five wounded, and thirty-eight unaccounted for at the end of the month. The division also lost thirty-six medium tanks (out of two hundred and sixty-eight), ten light tanks (out of seventy-seven), and two M18 tank destroyers. For these costs, the unit killed an estimated fifteen hundred Germans, wounded almost a thousand, and captured more than a thousand. Even if the estimates of the enemy's losses were inflated by a factor of ten, the 4th removed more soldiers from German units than were lost from its own. More concrete were the statistics of German equipment captured or destroyed; 56 German tanks (five Panzer V and five Panzer VI), eight self-propelled guns, twenty-five 88mm guns, 42 anti-tank guns of smaller caliber, and various other German vehicles and weapons.[86] Casualty figures such as these, especially combined with the speed of the American advance, were evidence of success, not failure, and suggested that the armor model that the United States favored was

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[84] Clarke Interview, USAMHI, 225.

[85] Raymond A Shipley Interview 5 November 2004, http://oralhistory.rutgers.edu/Interviews/shipley_raymond.html, accessed 22 August 2006.

[86] Collected After-Action Reports, 4th Armored Division Papers, USAMHI.

working.

Although American tank forces were not intended to fight other tanks, particularly the heavier German models, circumstances sometimes forced them to do so. In the mainland European campaign German tank forces operated mostly Panzer IV and V models. The Panzer IV models produced in 1944 had thicker armor and a bigger main gun than those that had been deployed in North Africa, but they still had roughly the same powerplant, making the new variants slower because an engine designed for a tank weighting 22 tons had to move three extra tons. The most serious German tank threat to American tanks was the Panzer V, which was deployed in roughly the same numbers as the IV (674 Panzer IV's and 514 Panzer V's were deployed in by OKW West in June 1944).[87] The Panther production model by mid-1944 had worked out the automotive problems of the previous years, and was a much more reliable tank. The Tiger caused great consternation and damage when it appeared, but with fewer than one hundred fifty deployed in France on D-Day they were rarely encountered.[88] Reports also suggested that the Tiger design had mechanical problems that meant only an experienced crew could exploit its full potential.[89] With more and more experienced tank crews dead on the Soviet front, fewer were available for mobile operations against the Americans. Tigers were best used as mobile fortifications, rather than in the exploitation role that German tanks had fulfilled in 1940. Dug-in Tigers were vulnerable to airpower, something of which Allies had a preponderance in 1944.

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[87] On the eve of D-day the Oberkommando West had 674 Panzer IVs and 514 Panzer Vs. Harrison, *Cross-Channel Attack*, 241.

[88] There were roughly 130 Panzer VI tanks in Normandy, three special battalions and ten tanks assigned to the Panzer *Lehr* Division.

[89] Handbook Of German Military forces VII-83.

Although the Allies could withstand the *blitzkrieg*, they did not seek to replicate Germans operations of 1940 in Normandy, in no small part because the Americans were able to operate on a much larger scale. Two main factors prevented the full employment of American forces in the exploitation role. The first was logistical; after a relatively slow start in breaking out of the *bocage* in Normandy, the Allies advanced faster than any of their projections suggested would be possible; within three months after the landings, Allied forces were over two hundred miles ahead of the envisioned advance.[90] These successes did not win the war, and then supplies of gasoline ran low, hindering operational mobility in the motorized as well as mechanized portions of the Army.[91] General Clarke recalled one instance early in the 4th's famous dash across France when he was assured by a Quartermaster officer that his tanks would have sufficient fuel. When the tanks ran dry, Clarke decided that the risks of strapping 50-gallon drums of gasoline to the tanks were less than the dangers posed by an immobilized formation.[92]

On a higher command level, Patton, argued that his group should be given all available fuel supplies for a dash to Berlin in an effort to shorten the war dramatically by toppling the Nazi government. There were compelling operational reasons to deny this request, most obviously that if all Allied mobility were concentrated along a single narrow axis then German armored resources could be funneled to defending that axis, which would also be open to flank attacks. Even more compelling was that to conduct this sort of deep penetration meant diverting fuel away from much of the rest of the army, reducing it to foot speed. Always facing the possibility of a German mechanized

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[90] MacDonald, *Siegfried Line*, says they were at D+330 on D+97. (11).

[91] Roland G. Ruppenthal, *Logistical Support of the Armies Volume II* , (Washington: GPO), 194.

[92] Clarke interview, USAMHI, 67.

counterattack, Eisenhower chose to apply his power over a broad front for both offensive and defensive reasons.

Postwar criticism of Eisenhower focused on his decision to deny the requests of both Montgomery and Patton. Instead of a narrow thrust at the German capital, Eisenhower advanced on a broad front. The guiding factor in this decision was political, although a broad advance did maximize Allied superiority in men and equipment by forcing the Germans to resist along the entire front with fewer resources. Giving resources disproportionately to either national force also ran the risk of exacerbating the friction between American and British strategic aims. At the operational level, it meant that the Armored Divisions were "leashed" by more than logistical constraints, rarely able to operate the way some prewar theorists had suggested.

One of the key differences between the German and American offensives in the Second World War was the speed with which the follow-on infantry formations could move behind the tanks. In their offensives early in the war, the Germans moved at essentially two speeds: mechanized and foot. The Americans were able to transport even their regular infantry units by motor power. When this model worked it worked very well, allowing rapid consolidation of gains or shifting resources to meet an unexpected threat. It also allowed the entire American Army to move forward so long as the fuel held out. Where Germany had a small combined-arms team supporting an infantry-based army, the entire U.S. Army in Europe was a combined-arms team.[93] The U.S. force was centered around the capability of its infantry units to meet specific threats by attaching specialist units, and the Americans could create more of those units, particularly tanks, than the Germans could.

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[93] Overy, *Why the Allies Won*, 224-5.

American tankers were aware of the threat posed by the increasing size and power of German designs, and spent a good deal of time worrying about how to neutralize the Panzer Vs and VIs when they did appear. The easiest method was to call in air support, but the fighter-bombers were not always available. American armor-piercing shells were unlikely to penetrate the frontal armor of the Panzer V or VI at ranges beyond 700 yards, but there were other alternatives. Bruce Clarke and Creighton Abrams ordered the tanks under their commands to travel with a white phosphorous round loaded. The aiming characteristics of the WP meant the chances of scoring a hit on the first shot were increased, and the chemical properties of the round meant it would trickle down into the crew compartment of the tank, burning as it went.[94] Even if the tank was not permanently destroyed, few crews remained in a burning tank for long.

At the institutional level, Army Ordnance explored ways to allow existing weapons to achieve greater penetrating power against the German tanks. One solution was to harden the armor-piercing shell nose, and add more propellant the round, but the higher bore pressures produced wore out the gun tubes faster, limiting its effectiveness. Another option was to upgrade the main gun on the M4 from a 75mm short-barreled to a 76mm with a longer barrel. Longer barrels meant that the expanding gases spent more time confined behind the projectile and thus imparted more energy to it. The higher-velocity shot had greater penetrating power, and the Ordnance catalog listed the M79 armor-piercing shell fired from the 76mm as able to penetrate 3.2 (about 80mm) inches of face-hardened armor sloped at 20 degrees at a range of 500 yards, but it was still

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[94] Clarke interview, USAMHI, 64. After the repulse of the German counterattack in September 1944, Clarke recalled that Abrams's men drove most of the "destroyed" German tanks off the battlefield.

insufficient to breach the frontal armor of the heavier German tanks at that range.[95] Army Ordnance at Aberdeen proving ground worked on adapting the 90mm gun for the Sherman, though no model was ever deployed.

The best-performing antitank variant of the M4 was not an American design at all, but a British adaptation called the Firefly. It mounted a British 17-pounder gun with a higher muzzle velocity and better penetration than even the American 76mm. But production decisions already made meant that shifting to a British design of gun and ammunition posed the potential for serious delays. Not enough 17-pound guns were available, and retooling American facilities to produce them would have taken time.[96] The same factors operated to keep the British gun out of the turret as they did the American 90mm; there was no need to risk serious production delays in mid 1944 to rush these weapons into the field.[97]

The 90mm gun did get into combat on the M36 tank destroyer, but field tests of 90mm ammunition suggested that the Ordnance Department was incorrect in its range and penetration calculations. The 703rd Tank Destroyer Battalion, after receiving the M36, fired a series of test rounds against two captured Panzer V tanks, and 150 and 300 yards. At 300 yards the rounds did not all penetrate the crew compartment, although the first shot would have disabled the tank's drive mechanism had it been operating.[98] At 150 yards the rounds penetrated, but that range was closer than American gunners would have liked. The report concluded that trying to target the enemy tank's flanks was still

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[95] Catalog of Standard Ordnance Items, Volume 3, 527.

[96] Ruppenthal, *Logistical Support of the Armies,* Volume II, 241.

[97] Bailey, "Faint Praise", 146-7.

[98] Inclosure 3, After Action Report of 3 Jan 1945, 703rd TD battalion, 3rd Armored Division papers, USAMHI.

advisable even with the new gun, although if frontal engagement proved unavoidable the best tactic was for several guns to engage a single enemy tank, "hoping for at least one penetration."[99] The report also suggested that higher-velocity ammunition, not increased gun bore size, was the preferred means to gain greater penetration.[100] Bore size comparisons are misleading in any case: the gun on the Panzer V was a 75mm, although with a more powerful charge and longer barrel than the 75mm Sherman.

One area in which most German and American designs alike needed upgrading was their tread width. Wider treads spread the tank's weight over a larger area, and thus enabled it to travel on softer ground than a tank of similar weight with a narrower tread. Early German designs had narrow treads, but the Soviet front experience with mud forced the Germans to mount wider treads on the upgraded models of the Panzer VI and IV, while the Panzer V took from the T-34 design very wide treads. The American M4 began with narrow treads as well, likely due to the same inexperience that drove German designs in the 1930s. Fortunately for the American tankers, problems with treads were more easily fixed in the field than problems with armor or guns. Army engineers developed a track extension based on existing parts that widened the Sherman's track by as much as four inches, and could be added to existing tanks without replacing the tread entirely.

As concerns about the Panther and Tiger filtered back to the Army Ground Forces and the Ordnance Department, the M4 underwent a series of upgrades, while the light tank M5 was slowly replaced with the M24. The 75mm gun on the M4 was replaced in new production models with a long-barreled 76mm, the engine was upgraded for greater

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[99] After Action Report of 3 Jan 1945 703rd TD Bn.

[100] Ibid.

horsepower, and in some cases the armor was thickened. Independent tank battalions supporting infantry divisions expressed concerns about the shortcomings of the M4 in the assault role, so Ordnance created the M4A3E2, with twice the armor of the standard model.[101] The final variant of the Sherman, the M4A3/76(W) HVSS, had improved suspension, a 76mm gun with muzzle brake, and improved armor. All of these threatened to reduce the effectiveness of the tank in roles other than tank killing, especially since the available ammunition for the 76mm did not include a good high explosive round, or a smoke round at all.[102] By the end of the war, about 40% of the M4 tanks in the European theater were production models with the 76mm gun.[103] The 4th Armored Division took steps to retrofit their older tanks from damaged 76mm variants, welding extra armor over ammunition and gasoline storage areas, and salvaging 76mm guns to install in undamaged older tanks.[104]

The M4 was modified in other ways, with the aim of reducing crew casualties when the tank was penetrated. One of the great complaints about the Sherman was its propensity to burn when hit, a fact most soldiers seemed to attribute to the tank's gasoline engine. Ordnance determined that the greatest cause of fire was in fact the ammunition stored in the crew compartment, and developed wet storage as a solution. The rounds stored for ready use were surrounded with a jacket filled with water, antifreeze, and a

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[101] Hunnicutt, *Sherman*, 548. The M4A3E2's thicker armor added about five tons to the design (compared with the M4A3/76(W) HVSS, but with four inches of frontal armor and seven on the gun shield. The frontal plate was still vulnerable to the 88 at over 1500 yards, but other antitank weapons had to be closer to effect a penetration. Troops usually referred to the M4A3/76(W) HVSS by its experimental production number, M4A3E8.

[102] Hunnicutt, *Sherman*, 206. The 75mm high explosive round had almost a pound and a half of high explosive, where the 76 had about eight-tenths of a pound.

[103] Ruppenthal, *Logistical Support of the Armies*, Volume II, 458.

[104] Collected After Action reports, 4th Armored Division, February 1945.

"proprietary trade substance," an anticorrosive agent called "Ammudamp."[105] The idea was that a fragment that would set the ammunition alight would first puncture the jacket, and the liquid would drain, extinguishing the fire. Of course, if extra rounds were stored outside the water jackets the added protection could have little effect.

The Americans did not ignore developments in tank design, but responded with steps that were consistent with logistical constraints: adding armor and replacing guns and ammunition took less shipping space than new tanks. By late 1944, however, the Sherman design was approaching obsolescence. The Ordnance department had been working since the outbreak of the war on a heavier replacement for the M4, although the technical issues with the project were not solved in time for the production model of the tank to have an operational impact on the war. The M26 corrected most of the M4's problems; the design had a lower silhouette, thicker armor, a bigger gun, torsion-bar suspension and wider treads. One major problem remained, and was even worse in the new design: the M26 had the same engine as the M4, but weighed about ten tons more, greatly reducing its operational and tactical mobility. Production began in November 1944, as soon as the technical drawings were ready.[106] The decision was also made to continue producing the Sherman until the M26 was ready for full-scale production, and then to shift shipping to the heavier tank.[107]

Tactics altered as well in response to heavier German tanks, and here the Americans and Soviets developed the same tactics independently of one another. The Panzer V's advantage came while it was outside the effective range of Allied guns. One

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[105] Ibid., 261.

[106] Bailey, "Faint Praise", iv, 143.

[107] Ruppenthal, *Logistical Support of the Armies,* Volume II, 242.

response when encountering the Panzer V was to close with it as quickly as possible, trying to get close enough to effect penetration. Another was to try to maneuver for a flank shot against the weaker side armor. Although to the American crewmen getting closer to the enemy might sound like madness, an after-action report from Combat Command A of the 4th Armored Division summed up the situation: "when terrain conditions permit maneuver (which they did not during this period) our tanks with greater speed, power traverse and Gyro Stabilizer are able to close with German tanks and destroy them."[108] Even in unfavorable terrain, the command had 44 killed and 380 wounded for 520 Germans killed and 301 taken prisoner. The tank losses were more lopsided, 24 American and 18 German.[109] The advantages German armor possessed in a hypothetical tank versus tank duel were nullified by real-world conditions. Through the summer and fall of 1944, American forces held their own against the retreating Germans, but the most serious test of American armor theory came in December of 1944.

The "Battle of the Bulge" was the first time that American tank technology and organization was seriously questioned in relation to heavier German tanks employed, briefly, in the operational offensive. Not long after Brigadier General Clarke joined the 7th Armored Division the Germans launched the Ardennes offensive (16 December) in a desperate attempt to cut off the western invaders from their supply lines and so gain breathing room to fight the Soviets.[110] Clarke and his new command found themselves defending St Vith's railroad junction against the largest concentration of German armor the United States had yet faced. The Germans concentrated tanks in strength for the

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[108] CCA, After Action Report, 12 Dec 1944, 5. 4th Armored Division papers, box 1, USAMHI.

[109] Ibid., 6.

[110] Hugh M. Cole, *The Ardennes Offensive: The Battle of the Bulge*, (Washington: GPO, 1965), 2

Ardennes, in numbers like those of their 1940 and 1941 offensives. The German attack force was also slowly and carefully concentrated, moving at night and going so far as to forbid open fires for cooking to preserve secrecy. Surprise, not technology, was the major factor in German success. The best remaining German tank forces were concentrated against, by chance, relatively green American units, particularly the 106th Infantry Division.[111] The American resistance in the Ardennes is often, rightly, credited to the fighting capabilities of the GI also revealed a weakness in German technical decisions. The panzers could penetrate a hastily prepared front line with relative ease, but when the time came for exploitation, they were prevented from following up their initial success by American units pulled from other sectors and thrown into their path. Numerous factors contributed to this outcome, but the tradeoffs for heavier armor and thicker guns were among them. In the Ardennes Allied mobility at the operational level proved more important than German firepower at the tactical. Allied ground forces also reacted quickly and effectively, preventing the Germans from exploiting their initial success. The 4th Armored division was not in combat on the 16th of December, allowing it to pivot north and relieve Bastogne. The last major crisis for American armor had passed.

American tank units saw combat in every major American theater of war; it was accepted by the time of the North African landings that some degree of armored warfare would be necessary to win the war. Although prewar decisions limited the range of choices somewhat, adaptation continued to be necessary. Reducing casualties was one reason behind the creation of armored units, but success on that front is difficult to judge.

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[111] Bruce Clarke paid tribute to General McNair when he said he thought McNair would not have certified the 106th as combat-ready. Clarke Interview, USAMHI, 282.

No answer can be absolute, since the number of mathematically definable variables in combat situations is so great as to give one pause, even without considering intangible factors such as morale and exhaustion. Still, some rough attempt at crunching numbers sheds some light on the situation.

The chances of surviving combat in an Armored division were higher than in an Infantry division. The U.S. Army lost about six thousand Sherman tanks in the European theater.[112] The Sherman had a crew of five, so if every tank lost meant the crews were casualties as well then the number of battle casualties in the armored division tank battalions and independent tank battalions would be about thirty thousand. The Armored Force reported total battle casualties of slightly over 6800, 5770 of them in the European Theater of operations. The Mediterranean area had 310, China-Burma-India had one, and the Pacific 730. Of the total, about fifteen hundred were either killed in combat or died of their wounds later.[113] The armored divisions as a whole suffered about sixty-two thousand battle casualties, of which about thirteen thousand were killed or died as a result of the wounds they incurred.[114] Almost twenty-nine thousand Air Corps enlisted men and twenty-two thousand officers died in the same period. [115] In the European Theater, only the Third Armored Division suffered close to 100% *battle* casualties (with over 9000); the next hardest hit division was the 4th, with about three thousand fewer

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[112]J. Ted Hartman, *Tank Driver*,(Bloomington and Indianapolis: University of Indiana Press, 2003), xiv.

[113] Office of the Adjutant General, "Army Battle Casualties and Nonbattle Deaths in World War II", 1 June 1953, Combined Arms Research Library, http://cgsc.cdmhost.com/u?/p4013coll8,126. accessed 24 August 2004, 112. These figures are for enlisted only; Officers in these units were not assigned to the Armored Force and blend into other casualty lists

[114] Ibid., 80.

[115] Ibid., 48.

casualties.[116] The 4th Armored division reported more enemy tanks destroyed than it lost in most of its after-action reports, and further reported that for every tank lost the crew casualties (killed and wounded) averaged 1.5.[117] The 3rd Battalion of the 66th Armored Regiment, 2nd Armored division, lost about as many tanks as it destroyed in July and August of 1944, but suffered fewer soldier casualties than it reported inflicting, in some cases far fewer.[118]

Thirteen infantry divisions in the European theater suffered more than one hundred percent battle casualties, with the hardest hit (the 4th Infantry) reporting more men killed in combat than the battle casualties of all but six American armored divisions (the 1st, 2nd, 3rd, 4th, and 7th.)[119] Paraphrasing Christopher Duffy's comment on the Red Army, it was better to be in a tank than outside of one.[120] Within the Armored division, chances of surviving were better in the Tank Battalions than the Armored Infantry Battalions.[121] About 35 percent of Armored Force personnel surveyed in 1943 said they would continue to serve in their current position given the choice, versus 11 percent in the infantry who gave that same response, suggesting that the soldiers were aware of the

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[116] Battle Casualties, 84. The 3rd had the "heavy" organization, and so had more soldiers overall than the "light" armored units.

[117] After Action Reports, 4th Armored Division Papers, USAMHI.

[118] 66th Armored Regiment Reports, USAMHI.

[119] The Fourth Infantry reported 4900 battle deaths. Without listing each of the Armored Divisions in the same theater, the highest among those with fewer casualties was the 6th, with about 4600, and the lowest the 16th, (which barely saw combat) at 32. Battle Casualties, 84.

[120] Duffy, *Red Storm on the Reich,* 351.

[121] In the 12th Armored Division, the Armored Infantry Battalions had over 500 killed in action, while the Tank Battalions had about 175. The 68th Tank Battalion of the 6th Armored Division had 84 men killed in action, while the 50th Armored Infantry Battalion in he same division had over two hundred. Figures from lists of the dead included in veterans rosters, published for the 12th in *Hellcats: the 12th Armored Division in World War II* (John Ferguson, State House Press, Abilene Texas, 2004, pages 125-141) 6th Armored figures from websites 68th Bn, http://www.super6th.org/tank68/tank68_8.htm, accessed 3 August 2006, and 50th AIB at http://www.50thaib.org/index.php?id=kia, accessed 3 August 2006.

casualty ratios.[122]

Combat soldiers, particularly draftees, viewed their wartime experiences differently than the high command. Many viewed inefficiency or waste within the Army as indicative of inability or foolishness at all levels, and more than a few resented the Army's handling of their particular cases. There was a strong belief that the German Army was better equipped, trained, and commanded than the American, so much so that the Army's survey efforts asked leading questions very much concerned with the soldier's assessment of the enemy. To the influence of prewar German propaganda proclaiming German military superiority was added the influence of the *Why We Fight* films, designed to make the soldier understand that defeating Germany would not be easy. Nazi propaganda was undoubtedly more effective in the years before 1943, when the German tide still appeared to be rising. In particular, German tanks seemed to create feelings of inferiority; one soldier said of an unspecified German tank that it sounded like it had a Ford V8 (a reference equating smooth-running engines with better power), while the M4 had a Ford V8 and sounded "like a P-47 taking off."[123] The P-47's radial air-cooled engine did not sound like advertising suggested a car engine should sound.

The German tanks that caused the most fear among American soldiers were not the most common in the German Army, or encountered regularly, but their impact seems to have been disproportional to their actual numbers. Praise for enemy equipment was not limited to tanks; soldier remarks ascribed superior German design to everything from

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[122] Palmer, et al., *Procurement and Training*, 49.

[123] Peter Schrivers, *The Crash of Ruin: American Combat Soldiers in Europe during World War II* (New York: New York University Press, 1998), 69.

sub-machine guns to antitank rockets to mess kits and gas masks.[124] These statements fit into the media image that the Third Reich's propaganda tried to create for itself. Much American coverage as well focused on German engineering and technical superiority, though from a negative perspective, arguing that Prussian-style militarism was a perversion of German love of machinery.

Soldiers in armored units, particularly in the independent tank battalions, often disagreed with the official point of view that a tank's main role should not be anti-tank. Some questioned the wisdom of the doctrine, while others attributed it to callousness or ignorance of their commanders of the situation on the ground. Soldiers focused on the encounters they had with enemy tanks and guns, often bitterly. Tank battalions attached to infantry units complained that their operational mobility was limited, and thus they could make less effective use of the Sherman's advantages in that area.[125] They believed a tank unit attached to an infantry division had to participate in the sorts of frontal assaults that an armored division could avoid. Their definition of mobility was as it applied to their individual tanks, a definition that civilian conceptions of armored warfare accepted. Advertisements relating to tanks back on the home front focused on the ability of individual American tanks or tank destroyers to fire and evade return fire. One for GM emphasized the individual mobility of the M24, a light tank used only for reconnaissance.[126] To the soldiers who operated them, this was an unacceptable trade. Commenting to a reporter, one enlisted man argued that while he kept hearing that his

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[124] *The Crash of Ruin,* 70.

[125] William B. Folkstead, *The View from the Turret: The 743rd Tank Battalion in World War II,* (Shippensburg, PA: Burd Street Press, 2000), ix, and Jensen, *Strike Swiftly*, 203, 246.

[126] *Life*, 5 Feb 1945, 5. The setting is tropical, rather than European.

tank was more mobile, the enemy tanks could "turn on a dime."[127] The mobility in question was divisional and corps mobility, not the maneuverability of individual tanks.

As the war wound down and the Army moved east, they came into increasing contact with their soon-to-be erstwhile allies, the Soviets. The Americans were not always complimentary of their temporary allies, but the Red Army dominated American military thinking, policy, and doctrine for the next forty-six years. A complicating factor arose from the techno-industrial mobilization of the Second World War that changed the calculus of land warfare as well. The rise of atomic weapons meant that armies like the ones that defeated Germany were vulnerable because of the very thing that gave them their power, their numbers. Just as combined arms warfare matured, (in both the U.S. and U.S.S.R.) the context, the rules of the game, changed. It was from the old evidence, however, that both sides had to draw their examples for the future.

Strategic context matters when evaluating the success or failure of military operations. The German Army, depleted by years of war and drawing on a smaller resource base than the Allies, placed its hopes in maximizing its manpower with technology, but was unable to translate that ability into operational victory. The Americans and Soviets, with larger resource bases, made choices that allowed them to win without placing the same sort of emphasis on technological design. German choices led to more powerful guns and thicker armor on fewer tanks, a direction that proved unprofitable for them in the long run. The Allies had workable technology, though not the top of the existing technological range (even the T34 was for a time outranged by the Panther) but more importantly they had the operational ability to drive from the Volga and Normandy to Berlin. Allied operational success was possible because of two variants

[127] Cited in the Hanson Baldwin article "American Tanks, Part I" *The New York Times*, 18 March 19485, 8.

of combined arms warfare that were quite different in execution. The Americans emphasized communications and flexibility, while the Soviets focused on careful preparation and rigid execution. The strength of the American combined-arms team lay in airpower, while Soviet forces had stronger tank forces, both technologically and operationally. Both proved successful against the Germans, so much so that the Allies won. Part of what they won was a rivalry between the U.S. and U.S.S.R. that endured for four and a half decades, with the two armies that crushed Germany between them emerging as the most likely opponents in the next round of large-scale ground warfare.

CHAPTER FIVE

LESSONS LEARNED, CONTEXTS OBSCURED: MILITARY TECHNOLOGY IN PRACTICE AND HISTORY AFTER 1945

General Henry H. Arnold warned in 1945 that there would be no time to prepare (as there had been in 1939-1940) when the next war began. "Robots" he warned, could "pass our shores unannounced" and start the war on any American street.[1] National survival depended on being prepared at the outbreak of war. For Arnold, and many others, history was no longer a guide; by 1945 the factors that influenced American strategy had changed so much that past experience was no longer useful. The service most equipped to deliver an atomic attack had the best chance of safeguarding American security. Again laying claim to the strategic role Billy Mitchell had outlined in 1921, the Air Force achieved independent status in 1947, and received a lion's share of military procurement contracts in the next decades, even preventing the construction of the aircraft carrier *United States*. The Army did not claim the same strategic role as the Air Force and Navy and thus was relegated to near obsolescence by military pundits who heralded an age of "push-button" warfare and nuclear attacks.[2] An additional feature of

[1] Michael Sherry, *Preparing for the Next War: American Plans for Postwar Defense*, 1941-45 (New Haven and London: Yale University Press, 1977), 19.

[2] Hanson Baldwin "The Atom Bomb and Future War" *Life*, 20 August 1945, 17. Baldwin accepted that the ground army might need to occupy territory, but that they would become "an army of moles", going underground to escape the effects of the atomic bomb (19).

the new age was that the historical profession tended to see the problems of modern warfare through the same lens as the military.

The system of combined-arms warfare that evolved in the American army during the Second World War struck a balance between technological perfection and strategic constraints that worked for the time and place it was created. Hindsight has not been kind to the American technological effort before 1945. In *Camp Colt to Desert Storm,* George Hoffman concludes that the U.S. Army failed to be ready for the Second World War, and had to fight Germany with insufficient doctrine and machines.[3] Although written doctrinal statements often stressed the need for flexibility and adaptation in the face of real-world conditions, "be flexible" is hardly a comprehensive vision of military operations. Postwar studies of American armored doctrine were written at a time when the foundations of doctrine were more widely agreed upon, based on the experience of the Second World War. Historians have suggested that Chaffee, McNair, et al., failed to reach the "correct" postwar or even wartime positions because of failures of imagination or reasoning, or that they reached basically correct positions but were stymied by reactionaries in the hierarchy above them.[4] McNair and Marshall are ambiguous figures in these analyses, often being portrayed as both forward-thinking and reactionary at the same time. Historians have trouble fitting McNair, a self-conscious pragmatist, into one category. Roman Jarymowycz suggests that he was permanently biased against armor, yet Bruce Cooper Clarke spoke highly of him in his postwar recollections.[5]

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[3] George Hoffman, "Army Doctrine and the Christie Tank, in *Camp Colt to Desert Storm.* Hoffman and Starry, eds. 131.

[4] See Russell Weigley, *Eisenhower's Lieutenants: The Campaign of France and Germany, 1944-45* (Bloomington: Indiana University Press, 1990), 14-22, Johnson, *Fast Tanks and Heavy Bombers*, 220-227, and Robert M. Citino, *Blitzkrieg to Desert Storm*, 114-115.

Much of the writing on American mobilization for the Second World War came after the economic expansion that followed the war, when automobiles and radios became universal. Many forgot the period of intermingling between animal and machine power that lasted well into the 1930s, and came to believe in the perception of the inevitability of the triumph of mechanical power over the less modern animal. The authorization of a cavalry division in 1941 is sometimes used as an example of how backward the United States was, how its leaders were captives of the past.[6] Statements by the chief of the Cavalry, John Herr, on the dangers of giving up the horse also depict the Army as out of touch, and are used by historian to that end.[7] Skepticism about the efficacy of untried methods is healthy and reasonable when observing events forward, but that skepticism often emerges as backward-thinking and foolish in hindsight. Continuing the cavalry example, the decision was not a commitment to the past but a hedge against future uncertainty; at the same time, more than five armored divisions were in various stages of training, with more on the way. General Marshall argued in 1939 that the Army should hang on to a few horses, not for massed cavalry charges but to ensure that the skills necessary to maintain animals were not lost.[8]

Writers in the postwar period often operated on the understanding that existing doctrine was correct, and then looked for the earliest evidence that might have led to the conclusion that most eventually came to accept. David Johnson in *Fast Tanks and Heavy Bombers* thus dates the need for a replacement for the M4 to mid-1944, when complaints

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[5] Jarymowycz, *Tank Tactics*, 260 and Bruce Cooper Clarke, interview, USAMHI, 31.
[6] V.R. Cardozier, *The Mobilization of the United States in WWII: how the Government, Military, and Industry Prepared for War* (Jefferson, NC: McFarland, 1995.), 78.

[7] Johnson, *Fast Tanks and Heavy Bombers*, 136-7.

[8] Testimony to the House Appropriations Committee, 1939, in Bland, ed., *The Papers of George Catlett Marshall,* Volume II, 111.

about the tank's main armament surfaced in the Normandy campaign.[9] Even one of the more careful investigators of the problem, Charles Bailey, describes as a missed chance the suggestion that then-head of the Armored Force Alvan Gillem made in early 1944 to equip the M4 with a 90mm gun.[10] Gillem's proposal appears farsighted in retrospect, but on the evidence available at the time seemed to risk unbalancing the M4, trading more weight for a gun that was not necessary in most circumstances. Doctrine needs to be viewed as an ongoing process, not a set of rules that make success inevitable. One or two voices proclaiming what later came to be viewed as orthodoxy cannot form the basis for complete changes of equipment. The implication of most writers is that doctrine or equipment should have been changed when potential problems appeared, while the fact of the matter is that operational data provided no clear consensus to Marshall, or McNair during the Second World War; they did not possess the benefit of hindsight.

The second issue reflects a problem with historical writing in general. The weight of accumulated experience has a great deal to do with how we order our world, for better or worse. Military leaders face a particularly difficult version of this problem, since a major organizational or doctrinal change may involve more than lost time and money, or wasted effort. If the military establishment is charged with guarding the nation, then failure to implement a correct policy has dire implications, since so much more is at stake than in most professions. Arguments for radical changes in the nature of warfare after the Great War were not well-grounded in experience, and unmodified versions of prewar ideas did not survive the war in very many instances. The American army was clearly concerned with the implications of the modern world, technological and

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[9] Johnson, *Fast Tanks and Heavy Bombers*, 192-5.
[10] Bailey, "Faint Praise," 146-7.

organizational, in the years between the First and Second World Wars, and by the standards of their contemporaries they did a good job of adapting, without placing all their faith in any single method to achieve victory.

The American experience in the Second World War should be viewed in the context of the First, not the Cold War that came afterward. The U.S. Army adapted successfully to the changing realities of ground warfare in the Second World War, but historical writing has not always reflected this. William O'Neill rates the Sherman tank a failure, and the decision to continue producing it shameful.[11] David Johnson argues in *Fast Tanks and Heavy Bombers* that internal factors contributed at least as much as financial difficulties to the failure of the American Army to adapt to changing technological realities. Handicapped by conservatism, Johnson argues, and focused on competency rather than brilliance, the ground forces were not technologically minded, and did not have machines in place at the outset of the conflict.[12] Professional soldiers and historians alike returned to the Second World War to support their case for their vision of army organization, and in the midst of their own adaptation lost sight of the process. American Cold War strategy emphasized technological superiority as the best counterbalance to Soviet power, and thus since 1945 technology in war has been elevated above discipline, doctrine, and organization, in comparing military forces.

Even as the United States was fighting the Second World War, the Army began gathering information to improve its understanding in all areas from planning and logistics to battlefield performance. Probably the most famous work resulting from the

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[11] William O'Neill, *A Democracy at War: America's Fight at Home and Abroad in World War II* (New York, London: The Free Press, 1993), 350-2

[12]Johnson, *Fast Tanks and Heavy Bombers*, Former tank officer Roman Jarymowycz complains that the American adoption of tank technology equal to the Germans in the Second World war had to wait until the introduction of the M1 Abrams in the 1980s. Jarymowycz, *Tank Tactics*, 317.

project was S.L.A. Marshall's *Men Against Fire*, in which the author argued for a fundamental reorganization of combat forces down to the level of the individual rifleman.[13] Marshall's credibility has come under fire in the last few years, but his influence on the immediate postwar period is undeniable.[14] Marshall wanted the army to adopt his vision of proper command and organization, and he made use of questionable historical examples and reasoning to get his point across. The model of history Marshall, and many lesser known historians, practiced involved finding information to support conclusions already drawn. The institutional product of the Army historians, the Official History of the Second World War, was intended to improve performance in the next war, a war that remained undefined for only a short time. In this environment the exercise of military history had a very definite purpose. History became the collective memory of the Army in a way that it did not for American society as a whole, by distilling the experience of the largest force ever fielded by the U.S. into a form useful for future instruction. Doctrinal formation reflected the common understanding that the Army wanted to be able to pass on to its next generation of recruits. The Army had to preserve the military experience of the Second World War in an institutionalized form to retain combat efficiency through time. The practice of mobilizing a large army from the civilian population meant that those men would go home as soon as the war was over, and their experience would be lost.

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[13] Marshall believed that pairing riflemen at the squad level would promote primary group cohesion, allowing the individual to fight more effectively.

[14] For recent critiques of S.L.A. Marshall, see Peter Mansoor, *The GI Offensive in Europe: The Triumph of American Infantry Divisions, 1941-1945* (Lawrence, KS: University Press of Kansas, 1999), 257-62, and Kelly C. Jordan, "Right for the Wrong Reasons: S.L.A. Marshall and the Ratio of Fire in Korea" , *Journal of Military History* 66, (January 2002): 135-62.

From the perspective of the Great War, the American army in the Second World War was successful in spending the lives of its soldiers for a desirable result. From the perspective of the next war, casualty rates needed to be lowered, since the expectation was that the enemy would, unlike the Germans, possess overwhelming strength. The most likely place for the "next war" was again in Europe, but against a former ally. Concerned with defeating the numerically superior Red Army, the United States Army searched for possible ways to counter such a threat. The most obvious solution was also the most dangerous; if Soviet armored columns moved west, they would provide tempting targets for atomic weapons. Aside from concerns from allies about the use of nuclear weapons over friendly territory, the Soviet response could well prove devastating, especially when the USSR acquired nuclear capacity. The nuclear option had considerable attraction, since the Red Army in 1945 excellent tanks in addition to numbers. Its primary operational tank was the up-gunned T-34/85, and these were deployed in staggering numbers; Soviet tank production eclipsed American in the Second World War, though by a narrow margin. Western observers also glimpsed the IS-3 heavy tank in the victory parade in Berlin, though it had not played a decisive role in the war itself. The IS-3 mounted a 122mm main gun capable of destroying any tank in the world at a range of over a mile, and could endure most return fire at anything but suicidal ranges. In addition to good equipment, Soviet armor theory embraced the exploitation role for armor. Its commanders in the last months of the war proved adept at penetrating fixed defenses and then committing tank forces to deep penetration attacks. The Germans had done similar things in the early days of the Second World War, but never on the scale that the Soviets did in 1944 and 1945. On V-E day there were six Soviet

Tank Armies operating in Europe, forming the spearhead of the Red Army. Even after demobilization, the American estimate was that the Soviets could muster about three times the total force of the western nations in Europe, with the equivalent of twenty-five armored divisions as part of the force.[15]

The ability to move a formation long distances and play havoc with enemy infantry and support networks now counted for less than the ability to stop a combined-arms attack from an opponent with many high-quality machines and the resources to sustain an offensive. In any future conflict between the American and Soviet armies, American planners assumed that the Soviets would renew their drive west, attempting to seize the remainder of Europe by direct force, though more as a way of securing their flank in an attempt to overrun the Middle East, their main objective.[16] One postwar plan worried that fighting the Soviets in Europe was a losing proposition, but one that would be "extremely difficult to resist" due to political pressures.[17] Purely "military" factors before 1949 suggested operations through the Mediterranean or Middle East to weaken the Soviet periphery, but there was an air of unreality to such plans. To maintain an alliance with Europe and thus draw on European resources required fighting the Soviets there. After the North Atlantic treaty of 1949, retreat from Europe was no longer an option. The western Allies now found their situation very much like the on the Germans had faced after 1943: defense against the Soviet tide. Since Soviet tanks outnumbered their NATO counterparts by a margin of five to one, the ability to destroy Soviet tanks

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[15] JPS 789, in Stephen T. Ross and David Alan Rosenberg, *America's Plans for War Against the Soviet Union, 1945-1950* Volume II (New York and London: Garland, 1990)

[16] JIS 267/1/"F", 9, in Ross and Rosenberg, *America's Plans for War Against the Soviet Union,* Volume I.

[17] JPS 789, 18

was substantially more important than the ability to destroy their German predecessors.[18] The 1949 revision of Field Manual 100 reflected these concerns, displaying more interest than the 1939 version with how to counterbalance superior numbers with discipline, equipment, and surprise.[19]

Technology, in its broadest sense, provided the West with a way to counterbalance Soviet numbers and willingness to devote large amounts of resources to military production. In this context, the argument ran, reticence toward a new form of technology was dangerous, since it was in technology that the American advantage lay. Historical examples were turned to this end: S.L.A. Marshall argued that "as great a soldier as U.S. Grant was slow to realize the revolutionizing effect of the rifle bullet upon tactics."[20] Others took the Civil War argument further, castigating the Union chief of ordnance for not adopting the metallic-cartridge repeater for the infantry, estimating that the war could have been won sooner with the new technology.[21] In the Atomic Age, winning the war quickly was of greater priority than ever before.

The Americans sought to recreate a body of wartime operational knowledge with peacetime maneuvers, a difficult proposition at best. To fight the Soviets with ground forces required re-interpretation of the body of experience obtained in the last war, and doctrine was the first step in understanding the wartime experience. In order to be effective it had to remain somewhat vague; the specifics changed often enough that

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[18] Oscar C. Decker, "The Patton Tanks" in Starry and Hoffmann, eds., *Camp Colt to Desert Storm,* 320.
[19] For example, contrast the sections on the offensive in the 1939 and 1949 manuals (paragraph 100, page 21 in the 1949 manual, paragraph 413, p128 in the 1939 manual.) The 1949 version refers more regularly to neutralizing superior numbers with other factors.

[20] S.L.A. Marshall, *Men Against Fire: The Problem of Command in Future War* (Reprint, Gloucester, MA: Peter Smith, 1978), 19.

[21] Bruce, *Lincoln and the Tools of War*, 106-9.

manuals that delved too deeply into them had to be changed with them. Training was thus elevated in importance from its role in the 1920s as a way to spread field, if not combat, experience. In 1947 the Army institutionalized a permanent Aggressor force, designed to provide a theoretical framework for realistic (or as nearly realistic as possible) field exercises. The Aggressor force went through a number of permutations, from a proto-fascist nation founded by Martin Borman and others in northern Spain to an approximation of the Soviet-dominated Warsaw pact forces. The manual for the Aggressor forces reflected a mix of observed features of totalitarian regimes and Army complaints about American organization in the recent war. For example, the Aggressor republic maintained classification of all citizens in varying degrees of readiness for military service, but also did not make the mistake that the Army Ground Forces perceived in American war experience of assigning the lower-classified soldiers to the infantry.[22] The Aggressor force had an overall force structure based around Second World War ideas and equipment. In an attempt to impart a faux realism to the exercises, where many of the targets American trainees faced in their maneuvers were in fact American equipment, the manual explained that equipment left behind or sold in Europe was presumed to make up the initial bulk of Aggressor equipment. Aggressor forces operated first in Spanish and then in Esperanto in an attempt to give soldiers experience fighting an enemy who communicated in an unfamiliar language.[23]

The doctrinal and organizational process continued, and the Army reorganized itself in the aftermath of the war based on its recent experience. The tank became the

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[22] Department of the Army, FM 30-102 "Handbook on Aggressor Military Forces", June 1947, 5.

[23] The Army had to create a manual solely for Esperanto, an attempt at an artificial, universal language. Department of the Army, FM-30-101-1, "Esperanto: The Aggressor Language", 10 February 1964http://ahecwebdds.carlisle.army.mil/awapps/main.jsp?flag=browse&smd=1&awdid=1.

primary anti-tank weapon of the armored forces, and tank units were incorporated into infantry units at a ratio of one company per infantry battalion. The post-war infantry division thus moved toward being an infantry-heavy combined arms unit. The postwar armored division had infantry companies attached to the tank battalions, making them a tank-heavy combined arms force.[24] No arm alone could expect to survive on the battlefield, or accomplish a broad array of missions, and so tanks and infantry came into a closer relationship.

More than direct American experience drove army reorganization. Faced with circumstances very similar to those Germany had confronted in the Second World War, the Americans began to lean more heavily on their former enemies for information. German generals were eager to restore their fortunes, (financial, political, and military), and generally cooperated with the Allied debriefing program. They tended to place the blame for their own defeat on external factors, most often Hitler's interference, the tremendous material superiority of the western allies, and the numerical superiority of the Soviets.[25] The explanation was not that Germany was eventually outfought on every level, but that superior German tactics and technology were overwhelmed by large numbers of semi-inept opponents. Such explanations carried a great deal of weight, coming from "expert" sources; after all who was better placed than the enemy commander to explain the German loss? As a consequence, the German understanding of the proper role of technology crept into postwar armor discussions. The Army studies did not uncritically accept that the German way of operating was automatically better

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[24] Department of the Army, FM 17-33 "Tank Battalion", (GPO, September 1949), 2.

[25] James A. Wood, "Captive Historians, Captivated Audience: The German Military History Program, 1945–1961" in *The Journal of Military History* 69 (January 2005): 127.

than theirs, and in fact an early conclusion drawn from German decisions about technology was that too much modification of designs was counterproductive, and in fact tended to "weaken the fighting power of armored units."[26] The experience being distilled was drawn mainly from the German experience fighting Soviets, since the Americans were preparing to do just that.

One solution to the problem of large-unit armored warfare in the second half of the twentieth century was the main battle tank (MBT). While the specifics differed from nation to nation, all were heavily armored and equipped with a high-velocity large-bore cannon designed to destroy another MBT with the first hit. Aiming systems were improved to ensure that the first shot fired would result in a hit. The MBT evolved into a highly-specialized tank killer, with the role as machine gun platform or direct fire artillery support in the combined arms team taking secondary positions. As engine technology provided increased horsepower for less weight, armor thickness and gun weight could increase without immobilizing the tank. One of the lessons that the American military establishment learned from the Second World War was that developing new weapons in the machine age took time, time that seemed no longer available in a world of nuclear-armed bombers and intercontinental ballistic missiles. On the conventional front, the Soviet decision to maintain large armored formations after the end of the war meant that if the U.S. meant to exert influence on European affairs it would have to find some way of countering that force.

Tank destroyers, the 1942 American solution to the problem of massed armor, disappeared in the aftermath of the Second World War, when the Army recommended

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[26] U.S. Army Historical Study 104-7, "German Tank Maintenance in World War II", (GPO, June 1954, Reprint, 1982, 1988), 28.

that the tank's main gun be the primary anti-tank weapon on the battlefield.[27] In many respects the tank destroyer concept survived in the guided missile. The anti-tank rocket grew in importance in plans after 1945, threatening the future of large-scale armored operations.[28] *Panzerfaust* rockets had been very effective in the last stages of the war, and the development of guided missile systems in the late 1950s and early 1960s raised serious doubts about the continued relevance of tanks on the battlefield. Missiles were substantially cheaper than the tanks they were intended to destroy, so much so that they could be diffused throughout a formation and retain effectiveness, which the anti-tank guns of the 1940s could not. Whether to build any new tanks at all was also questioned in the nuclear age. The very characteristic that gave tanks their claim to decisiveness made them vulnerable to the nuclear weapons. Tank advocates since E.D. Swinton and J.F.C. Fuller had argued that tanks were wasted unless employed in mass, but an armored column offered a tempting target for an atomic attack if conventional means proved inadequate to stop it.

For several decades after the end of the war the Army found itself again in the situation it had been in the 1920s and 1930s, with some important differences. The worst-case scenario was clear, but the actual fighting that the Army did for forty years was in limited, peripheral wars where their "big war" experience was of limited value. Small wars again provided contestable evidence for the new military situation. The 1950-53 conflict in Korea tested American and Soviet designs from the previous war against each other, in more than just tank-on-tank encounters. The North Korean forces

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[27] General Joseph Stilwell chaired the board that recommended that the tank combine both the offensive and defensive roles split to the Armored and tank Destroyer forces in WWII. Philip L Bolté, "Post-WWII and Korea" in *Camp Colt to Desert Storm,* Starry and Hoffman, eds., 220.

[28] JIC 374/1, 5, in Ross and Rosenberg, eds., *America's Plans for War with the Soviet Union*, 1945-50, Volume I.

initially deployed about 150 T-34/85 tanks, which turned out to be very resistant to American 2.5 inch rockets and 75mm recoilless rifles. A number of late-model Sherman tanks (M4A3/76 (W) HVSS) and M26 Pershing tanks were rushed to the combat zone, but participated mainly in infantry-support operations. American control of the air prevented the enemy from massing tanks in any major numbers, and after the front stabilized around the 38th parallel, strategic considerations prevented the United Nations force from massing its armor and attempting the sort of breakout that characterized operations in the previous war.[29]

Korea did provide the ability to test the tank guns capable of destroying an enemy tank on the first hit that evolved in the last years of the Second World War. A study of the limited number of tank-on-tank combats in Korea determined that American crews fired first and hit with that first shot far more often than their opponents, and that as a consequence, American tanks destroyed about 16% of the enemy tank force deployed in the mobile phase of the war (1950).[30] The Army commissioned two studies of tanks in the antitank role in the Korean situation, aware that while the situation was not exactly a microcosm of the potential situation in Europe, it did provide a combat experience from which some lessons could be drawn.

One of the lessons of Korea was that there were roles for armored vehicles aside from the main battle tank. With the enemy unable to deploy armor *en masse*, tanks intended as MBTs found themselves providing fire support and cover for infantry forces. Work was begun in the aftermath of Korea on armored vehicles that could transport

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[29] Bolté, "Post WWII and Korea", in Starry and Hoffmann, eds., *Camp Colt to Desert Storm*, 251.

[30] A.D. Coox, "U.S. Armor in the Antitank Role, Korea, 1950.", Operations Research Office, Johns Hopkins University, 2 July 1952, 2.

troops, and even provide direct fire should the need arise. While none of the designs from this period is operated by the U.S. military today, the M113 platform continues to be upgraded and used by numerous American clients. The role continues with the M2 and M3 Bradley vehicles fulfilling it. One armor writer sees armor evolving back toward a wide range of designs intended to fill specialized roles, rather than a single main design attempting to fulfill several. Vietnam accelerated this trend, since the enemy there provided few opportunities for armored exploitation in the method of the second world war. Lighter armor did provide useful force protection, since the enemy were often the ones to initiate combat.[31]

The most important change that Vietnam wrought in the American military system was to dry up the manpower flow that the Army had enjoyed since 1940. The end of the draft played a major role in elevating the idea that technology must, as opposed to could, reduce losses. Before 1972 the requirements for crew protection were important, but after it they became vital. The all-volunteer force meant that the pool of replacements for skilled crews was smaller, and thus the crews had to be preserved in the field. One way to do this was to reduce the number of soldiers in the tank crew, and the MBT-70 project attempted that path. Bruce Clarke, by that point retired, commented that this attempt to increase sustainability actually undercut it in areas outside actual combat. Clarke pointed out that the maintenance demands and daily living tasks of an armored unit in the field were high, and that expecting three men to do it all would be

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[31] See the description of the battle of Ap Bac in Donn Starry, "Mounted Combat in Vietnam," Center for Military History website, http://www.army.mil/cmh-pg/books/Vietnam/mounted/chapter2.htm, accessed 1 Dec 2006, 27.

exhausting.[32] The successor to the failed MBT-70, the M1 Abrams, was the first American tank to place crew protection at the top of the list of design requirements. The Abrams design also came after the 1973 Yom Kippur war, one of the decisive events in tank design during the Cold War.

The largest and most prominent tank operations after 1945 occurred in a strategic context that exceeded even the German concern with using technology for force protection and multiplication. Israel has little strategic depth and a smaller population than its enemies, and the IDF has always been more concerned than any other army with extracting maximum results with minimal casualties. In 1973, Israeli tanks acquired abroad played a major role in the fighting on the Syrian front, but the first indigenous design resulted from the lessons of the conflict. These lessons produced a tank design that emphasized crew protection over factors such as operational sustainability and mobility. Still in service, the Merkava is the only MBT that puts the engine in front of the crew compartment, and has a ramp in the rear of the tank for evacuation of critically wounded. The strategic assumptions are clear; the Merkava was designed to sit on the Golan heights and engage more numerous Syrian tanks at long range, each Israeli tank achieving impact out of proportion to numbers engaged. The similarity to the situation that produced the Tiger is remarkable. As a multi-role tank the Merkava is limited, just as the Tiger was, but it fills its intended role well. Whether that role is the one that all tanks need adopt is questionable.

Israel provided a sort of live-fire laboratory for Western theories of armored warfare. Not only was its strategic situation a magnified version of the NATO one in Europe, but Israeli opponents tended to be Soviet clients, and thus usually equipped with

[32] Bruce Cooper Clarke interview, USAMHI, 56-7.

tank designs within a generation of what the Soviets deployed in their own forces. The narrow lesson of the tank engagements in the Arab-Israeli wars confirmed the German assumptions from the Second World War about the proper characteristics to emphasize in tank design, namely armor and gunpower. In the broader view, Israel's opponents were often politically weak and operationally clumsy, with a few exceptions. The Soviets could not safely be assumed to be either.

The Yom Kippur war had a major impact on American tank design and overall doctrine. In the late 1970s and early 1980s, General Donn Starry and General William Dupuy took their reading of the Israeli conflict and reorganized American doctrine and technology around trying to win a conventional struggle with Soviet forces in Europe. [33] European pressures also contributed to AirLand Battle doctrine, since NATO members, particularly West Germany, were concerned about the use of nuclear weapons over their territory. AirLand Battle, as understood in the 1980s, involved integrated combined-arms operations in an attempt to stop Soviet forces, at least the first wave. The shift in requirements led to examination of the last war where Americans had used armor on the scale General Starry and company envisioned, but from the perspective of facing a superior force instead of being one. The Soviets were presumed to value quantity over quality, and the Americans now adopted the German focus on small professional forces armed with superior weapons. American doctrine "caught up" with the Germans in one sense, but the better way to view it is that the Americans came to the same conclusions faced with the same problems. The M1 tank and M2/M3 infantry fighting vehicle

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[33] Richard Swain, "Airland Battle" in *Camp Colt to Desert Storm,* Starry and Hoffman, eds., 366-7. See also Swain's collection of DuPuy's papers, http://cgsc.leavenworth.army.mil/carl/download/csipubs/swain3/swain3_pt2.pdf, particularly "Implications of the Middle East War on U. S. Army Tactics, Doctrine and Systems" Presentation by General William E. DePuy, Commander, U. S. Army Training and Doctrine Command, undated.

resulted from this process, just as the M4 and tank destroyers resulted from a different time and place.

Military history was one way to understand that other time and place, and it both influenced and was influenced by doctrine. Given the American political tradition in which soldiers could at best exert indirect influence over larger policy issues, the works produced by American soldier-historians tended to focus on the tactical and operational levels of warfare as providing the best examples for the instruction of new soldiers. The Aggressor manual spoke of the mission of the "enemy" historical section as discovering the "science of tactics."[34] The Army school system produced a series of papers on important events in the Second World War designed to extract useful lessons and pass them on to future soldiers. The Battle of the Bulge continued to play an important role, since it provided more useful examples of what to do when faced with heavy concentrations of enemy armor. Bruce Clarke regarded his actions in front of St. Vith as exemplary of tactics that would work against the Soviets, and said as much in the 1966 foreword to the 1950 study of St Vith, subtitled "An Historical Example of Armor in the Defense."[35] The study drew much the same lesson, noting that one of the keys to the 7th Armored division's success was the mobile reserve it established, which was important "particularly against a force of superior numbers."[36] The obvious inference was that these tactics would serve well against the Red Army. The search for answers to pressing questions of the day led many to forget that the American armored units were rarely outnumbered before 1945.

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[34] Department of the Army, "Aggressor Force", 1947, 18.

[35] U.S. Army Armor School, "The Battle at St Vith, Belgium, 17-23 December 1944: An Historical Example of Armor in the Defense. (Washington: GPO, 1950).

[36] Ibid., 29.

When the American tank decisions are viewed in the context of the comparative rarity of German tanks and the fear of bogging down into immobile warfare, they make much more sense. Comparisons of sets of statistics can be dangerous and misleading if the roles of the machines are not the same. When William O'Neill compared the rapid technological change in American fighter design, which did produce one of the two best fighters of the war by 1945 (the P-51) with the decision to stay with the Sherman chassis, he came away mystified with the Army decisions.[37] The paradigm of technical statistics he used was not dependent on the role of the machine in question; the highest-performance machine was the best. The P-51 was intended to face other high-performance fighters and needed to have similar characteristics to keep up. The P-47 was not as useful a fighter in the air-to-air role, but the features that made it less useful there were less important when it performed the ground-support role, which it did extremely well. American soldiers' belief in their nation's technological superiority had many implications for assessing the Army's performance in the war. Influenced by advertising that equated the most advanced technology with the best, and to proclamations of American genius for machines, many soldiers found the tanks that the U.S. fielded incomprehensible, and their attitudes found their way into the literature of the subject.

Civilian writers after the Battle of the Bulge argued that technology played a major role in the American reverse in the Ardennes. Although the statistics about the Panther and Tiger tanks had been known for some time, they acquired new urgency after the breakthrough. In early January 1945, Hanson Baldwin argued that the German heavy tanks had a better chance of "steamrollering" through defensive lines than American. To concerns about mobility he responded that bridges and rivers had not stopped the German

[37] O'Neill, *A Democracy at War,* Caption following p. 308.

heavy tanks, suggesting that he understood the difference between formational and individual mobility. The reason for the lag in getting the Pershing into combat, Baldwin suggested, was partly "conservatism and traditionalism in the Army mind", and partly the overly complicated design and procurement process of the War Department.[38] Baldwin's comments became the starting point for a storm of criticism directed at tank design and procurement, repeated in later publications and eventually entering the literature of tank design and employment. The argument that Baldwin advanced found its way into memoirs and scholarly writing on the war. In essence, the argument is that better tanks would have meant a shorter war, and fewer casualties. Fewer casualties are obviously desirable from the point of view of the soldiers actually fighting the war, and the literature of the conflict, particularly after 1980, has supported them.

Casualty figures are another place memoirs, unit and individual, make the case for the Army's lack of foresight and technological ignorance. The specifics usually differ slightly, but the basic argument is that better tanks would have meant fewer casualties. .An unstated assumption is that the technological changes envisioned by the various writers were possible without altering any of the other variables in the strategic calculus. Pausing to replace or substantially redesign the M4 was not an option for the American war effort, and arguably would not have resulted in fewer casualties, particularly if the pause had occurred in the aftermath of the cross-channel invasion. The Army was not unaware of the problems with the M4, and took the steps demonstrated in the previous chapter to improve the tank while keeping pressure on Germany. The industrial apparatus of the United States at wartime mobilization was not easy to shift in a new direction, and doing so might upset the complex system. The reduction in casualties

[38] Hanson W. Baldwin, "The German Blow—III,"*The New York Times*, 5 January 1945, 4.

would have had to have been very dramatic to justify switching to the M26 while letting the Germans catch their breath in the west. In any case, German anti-tank guns could penetrate even heavy German tanks, suggesting that the technology to make an unbeatable tank did not, and does not, exist.

Implicit in the argument for reducing casualties is the idea that individual survival equals institutional success; the more soldiers who survive, the better the Army as a whole is doing. There are instances of units sustaining very high losses and continuing to function, such as the 22nd infantry Regiment of the 4th Infantry division in the Hürtgen forest, but these are unusual.[39] At the other end of the scale, casualties are avoided if a unit avoids combat altogether, but institutional performance suffers accordingly. In unit and individual memoirs, the argument goes that the casualty rate is often too high, and more could or should have been done to protect the troops. Tank unit memoir writers often focus on the role of the tanks their units operated in their explanations of why so many of their comrades were lost.

In recent decades, military history has expanded to focus on the soldier experience, instead of solely examining the command and operational aspects of warfare. In this context, soldier complaints about their technology constitute a primary source, and are often uncritically incorporated into the narrative of American performance in the Second World War. Losses in armored units come in two types: personnel and vehicles. There is a tendency in the literature to conflate the two. An M4 lost did not mean five men dead, or even five casualties. Tank losses in the American army were high, though not remotely as high as Soviet. Recalling seeing a disabled Sherman, Belton Cooper

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[39] Robert Sterling Rush, *Hell in Hürtgen Forest: The Ordeal and Triumph of an American Infantry Regiment.* (Lawrence, KS: University Press of Kansas, 2001), 309-336.

wrote that he could only imagine the crew who had lost their lives.[40] Charles Bailey writes that American soldiers paid a price in blood for the Army's failure to match the heavier German tanks, although he acknowledges that technical factors never caused a serious reverse for the American Army.[41] Paul Fussell overstates dramatically when he claims in *Wartime* that any encounter between an equal number of American and German tanks would result in a defeat for the Americans.[42] Gerald Lindermann in *The World Within War* quotes a combat medic who watched three 76mm shells fail to penetrate the frontal plate of a Panzer V, and who later learned to approach burned American tanks from upwind to avoid the smell of burned flesh.[43] Only one side of the equation is given; burned German tanks smelled much the same, and they burned as well when their ammunition was hit. The implication, however, is that one only ever saw American tanks burned by the side of the road.

Hanson Baldwin, and others after him, decided that the Army had in fact had better tanks in the design process, but had chosen not to produce them because of a blind adherence to the doctrine of mobile exploitation. A unit history of the 743rd Tank Battalion argued that the solution to the problem of the M4 had in fact been on the drawing board before the Sherman, but had been dropped for the same reasons of doctrinal blindness that Baldwin ascribed to the Army. *The View from the Turret* argued

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[40] Belton Y. Cooper, *Death Traps: The Survival of an Armored Division in World War II* (Novato, CA: Presidio, 1998), 230.

[41] Bailey, "Faint Praise," 239.

[42] Fussell, *Wartime*, 268.

[43] Lindermann, *World Within War*, 25.

that the M6 heavy tank was a better design than the M4, mainly because it mounted a large, high-velocity gun and weighed almost twice the Sherman.[44]

Part of the issue may be internal tensions within the Army itself. Although the Ordnance volumes of the Official History suggest that the M26 could have been in production almost a year earlier, Charles Bailey casts doubt on these claims. He suggests that statements about the readiness of the prototype that eventually became the M-26 are exaggerated, specifically that when Ordnance later claimed it was ready to go into production only half of the technical drawings for the machine existed.[45] If the Pershing could not have been ready much sooner, then the decision to stick with the Sherman becomes less one of stubbornness and more one of necessity.

A delayed indictment of American armor policy in the Second World War came in 1998, when a former Ordnance officer in the 3rd Armored Division published *Death Traps: The Survival of an Armored Division in World War II.* Belton Cooper blamed the decision to invade Europe with the M4 rather than the M26 for losses in his unit, which he calculated at over 500% in medium tanks. More specifically, he argued that had the 3rd been equipped with M26 tanks in November 1944, it could have breached the Siegfried line completely, depriving Germany of the staging ground for the Ardennes offensive and shortening the war considerably.[46] His account and argument are worth considering, but ultimately flawed. Cooper's assertion that the M26 could have prevented the Ardennes offensive by allowing the capture of the staging ground has two main flaws. First, the slowdown of the Allied forces in November 1944 was due not to tank

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[44] Volkstead, *The View from the Turret,* 35.

[45] Bailey, "Faint Praise," 143.

[46] Cooper, *Death Traps,* 155, 309.

inferiority, but to fuel shortages. The M26 needed gas just as the M4 did, and was somewhat less fuel efficient, having the same engine but ten more tons to move with it.[47] More problematic is the belief that without the particular staging ground actually used, the German offensive of December 1944 would have been impossible. Contingency works both ways; if the Allies had moved further east before their supplies halted the advance, with the same attitudes that led to the German surprise on 16 December, it is not unreasonable to believe that the German army would have found another staging ground. Both sides' behavior changes if one side takes different action.

The most serious problem is Cooper's assumption that the M26 could have been ready in large numbers by June 1944. Charles Bailey's research on the difficulties in producing the Pershing, and even in upgrading the Sherman suggests that the timetable could not have been as radically altered as Cooper imagines. The advent of production, had Eisenhower requested it, would not have been in January 1944, or likely February either. Even if full-scale production began in March, enough of the new tanks would not have been available to distribute as Cooper suggests. The Germans had rushed new designs through the developmental stages, to their detriment. The Americans had, at the insistence of General McNair, a policy of only putting a weapon in full-scale production after it had been tested thoroughly by the arm that was to use it.[48] McNair valued real-world performance, not technical specifications.

Cooper's version of the decision not to produce the M26 is based on a hearsay account of a weapons demonstration of allied and German weapons given for General

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[47] The Catalog of standard Ordnance items list the approximate cruising range of the M4A3 series as 100 miles, and the M26 as 75. Catalog of Standard Ordnance Items, Volume I, 22, 26.

[48] Greenfield, et al., *The Organization of Ground Combat Troops*, 272.

Eisenhower and his staff in January of 1944. It is Cooper's belief that General Patton argued forcefully at this conference that the M4 should remain the standard tank of the armored divisions. Cooper was not present for this demonstration, nor was he a confidante of any of the major commanders involved. His story does not accord with the more common complaint that General McNair and the war department conspired to keep the M26 out of production until too late.[49] Cooper also illustrates the danger of focusing on kinetic penetration figures as the only way to destroy a tank; he repeatedly points out that even the 76mm gun was at a disadvantage against the Panther and Tiger, but relates the use of white phosphorous to a secondary status, giving one anecdotal example.[50] He switches between German tanks and German guns (which were the more serious threat, particularly a well-placed set of 88s), often citing American tanks destroyed by German anti-tank guns as proof of superior German tank design.

Others argued from a "purely" operational point of view that the American war against German could have been shortened had speed been given preference in operations, most prominently Russell Weigley in *Eisenhower's Lieutenants*. Wiegley contends that American generals were torn between mobility and firepower, choosing the mobility because of a lack of a clear vision of warfare. Even when an author recognizes that purely operational factors are not the most important, as did Martin Blumenson in his essay on strategy in *Heroes Never Die*, he still finds it difficult to reconcile them with his ideas on strategy. Blumenson notes that in a strictly operational sense the Allied strategy

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[49] Jarymowycz, *Tank Tactics*, 262-262.

[50]Cooper, *Death Traps*, 255-6.

could have been better, but also reluctantly admits that it was more attuned to the political and cultural pressures of the day.[51]

Another powerful voice of criticism came from memoirs, unit and individual, published after the war, which suggested that American commanders were poorly trained, or un-aggressive, or simply lacked the aptitude for modern warfare. The wartime theme of Axis superiority in all things military, technology included, continued into postwar materials. For the participants it was easy to continue thinking in accustomed manners, and for later historians there were enough sources imbued with a marked inferiority complex that it was easy to incorporate that attitude into the historical record.

Telescoping is another problem, one more difficult to detect. Even veterans sometimes confuse their later experiences with earlier times; thus authors as diverse as Paul Fussel and William Triplett ascribe later technological developments to the German forces before those developments occurred. Fussel contrasts the American military's emphasis on light and mobile weapons in 1941 unfavorably with the German army (with no exact time reference). One of his examples is the 37mm antitank gun deployed by American units, a gun he characterizes as so obviously obsolete that only idiocy or willful blindness could be behind its continued use. Fussell's Germans, by contrast, were much better equipped and more fully understood the reality of modern warfare.[52] Such assertions are difficult to reconcile with the knowledge that the American weapon in question was a copy of a German gun, the one that the Wehrmacht deployed as its

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[51] Martin Blumenson, "A Deaf Ear to Clausewitz: Allied Operational Objectives in World War II" in Blumenson, *Heroes Never Die: Warriors and Warfare in World War II* (New York: Cooper Square Press, 2001), 458. Originally published in *Parameters*, Summer 1993.

[52] Fussell, *Wartime*, 5.

primary antitank defense only six months before Pearl Harbor.[53] The invasion of the Soviet Union provided operational evidence than such light weapons were inadequate against heavier tanks, such as the T-34 and KV-1. Thus, the German command structure had to develop alternatives, and deployed increasingly heavy weapons in the antitank role, not proactively but reactively.[54] When American forces encountered difficulties in Northern Africa they made a similar decision, again in reaction to heavier German tanks.

Colonel William Triplett recalled his days in the Foreign Ordnance section, citing sloped armor as a major German advantage at a point when German tanks did not have sloped armor.[55] With the exceptions of the Panzer V, and Panzer VI Mark II (called the King or Royal Tiger by the Americans) German tanks did not have sloped armor of any significant area; there was a small slope on the lower chassis, but then a boxy projection on which the turret sat. American and Soviet tanks, by contrast, had entirely sloped fronts, affording better protection. Even the oft-lauded Panzer VI had an almost slab-sided design; the U.S. Army handbook on German forces published in 1945 commented that the Mark VI was in the German design tradition where the Mark V (Panther) was not.[56] Adding to the problem were alarmist contentions that the Germans had heavy and super-heavy tanks, weighing up to 100 tons, which they had used "extensively" prior to 1942.[57] The Armored Force G2 had to assess such rumors as well, and mentioned the

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[53] Green, et al., *Planning Munitions for War*, 183.

[54] Timothy A. Wray, "Standing Fast: German Defensive Doctrine on the Russian Front During World War II, Prewar to March 1943"(Research survey/Combat Studies Institute; no. 5), September 1986.Combined Arms Research Library, http://cgsc.leavenworth.army.mil/carl/resources/csi/wray/wray.asp#over, accessed 20 February 2007., 20.

[55] Triplett, *A Colonel in the Armored Divisions,* 18.

[56] War Department, "Handbook of German Forces," VII-80.

possibility of super-heavy tank in one bulletin, though without any real specifics.[58] Aside from contributing to the popular perception that the Germans were ahead in tank technology, these reports had little major impact on how the Americans organized tank forces.

Another difficulty assessing the relative use of technology is the very existence of the Panzer Mk VI. Referring to the situation on the Soviet front, Christopher Duffy suggests that the Tiger never repaid the German resources spent on it.[59] The situation prevailed in the war in the West, since the amounts of steel and fuel that the Tiger consumed were prodigious, and it was far from immune to Allied air action, or mobile enough to carry out offensive penetrations. The Tiger looms larger in the literature of the war than it did in the war itself. If a casual reader were to consult most discussions of tank technology in the Second World War, the impression he or she would receive is that the Germans deployed the clearly superior Tiger, while the Americans unaccountably stuck with the more numerous but much inferior Sherman. Roughly thirteen hundred Tiger tanks were produced in the Second World War, and the bulk of those were sent to fight the Soviets. Discussions of tanks in historical writing go straight to the comparatively rare Tiger variants, and contrast them with the American standard issue-tank. Over forty thousand M4 tanks were produced, and shipped not only to American units in Europe, but the Pacific, and supplied as Lend-Lease to Britain and the USSR. Roman Johann Jarymowycz's *Tank Tactics From Normandy to Lorraine* includes charts of Tiger armor thickness and gun penetrating power, alongside the same numbers for the

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[57]Paul C. Raborg, *Mechanized Might: The Story of Mechanized Warfare*, (New York, London,: Whittlesey house, McGraw-Hill, 1942), 139.

[58]Armored force G2 bulletin 94, 23 June 1941, USAMHI.

[59] Duffy, *Red Storm on the Reich*, 360.

standard Sherman tanks in late 1944, as well as the British tanks in Normandy. The discrepancies are startling: in some cases the Tiger's effective range doubles that of the Sherman. From these statistics the reader is meant to conclude that the tank programs of the Western Allies were inadequate when contrasted with the Germans, who had the wisdom to produce clearly superior machines. Jarymowycz's numbers, while accurate within their scope, do not reflect the entire situation. By numerical predominance, the Panzer IV was the most common tank in the German army by 1944.[60] While it was a serious opponent, especially with upgraded gun and armor, it did not possess the wide advantages of its larger brothers. The tables in Kenneth Mackseys' *Tank Versus Tank* display a similarly narrow concern with production statistics. Allied tanks are inferior because they do not look as impressive on the gun and armor chart, not because of comparisons of performance in combat.[61]

One of the most important books on the Allied war in Europe, and the most important mis-comparison of the armor, involves Russell Weigley's *Eisenhower's Lieutenants*. Weigley examines American tank and tank destroyer development in the context of two main categories, mobility, which he argues the Americans over-emphasized, and fire-power, where he concludes the Americans had severe deficiencies compared to the Germans. Weigley chooses to make his point with the same comparison as Fussel, contrasting the 37mm anti-tank gun standardized in 1940 with German experimental developments in the same period. Again, the experimental and comparatively rare German weapon is contrasted to the standard-issue American.

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[60] War Department, "Handbook of German Forces," II 24-26

[61] Kenneth Macksey, *Tank vs. Tank: The Illustrated Story of Armored Conflict in the Twentieth Century*, (Topsfield, MA: Salem House, 1988), charts scattered across 62-106.

Weigley suggests that the German experiments with the 88mm FlaK gun in the late thirties meant that the Wehrmacht was much ahead of everyone else in this area, a suggestion that the German advance into Russia does not support.[62] The German guns issued for the anti-tank role were unequal to the task of destroying the heavy Soviet tanks.

In combat every German tank could appear to be a Tiger, and the perception that the Germans had more of these tanks than they did spread. Some made the claim explicit, such as the photo caption in *Life* that "German tanks are usually Panthers or Tigers."[63] Statistically this was not accurate, but the perception was harder to overcome. In other cases the Tiger and Panther were presented as standard without mentioning the Panzer IV. American soldier perceptions form the basis for Peter Schrivers's focus on the Tiger II in *The Crash of Ruin.*[64] A.J. Smithers focuses on the Tiger and Panther, noting in passing that the Panzer IV in fact made up the bulk of German forces.[65]

Tables of armor thickness and gun penetration present a flawed version of armored warfare in any case. A one-on-one comparison of the machines involved obscures the complexity of the battlefield situation, where duels of individual tanks were rare, and undesirable. Terrain, weather, crew skill, and even plain luck all influenced the outcomes of tank engagements, and these factors do not always translate easily into statistical form. The M4 series did labor under a disadvantage when German heavies

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[62] Weigley, *Eisenhower's Lieutenants,* 8-11.

[63] *Life*, 11 Dec 1944, 33.

[64] Schrivers, *The Crash of Ruin.* See especially pages 68-9.

[65] Smithers, *Rude Mechanicals*, 194.

were on the field,. The anti-armor mission was not the Sheman's main one, and more importantly, not the one it was called on to perform most frequently.

Even accepting that the Americans could have fielded a more technically advanced armored or gunned tank, did they need to do so? Focusing on a single element of the force engaged implies that it is key to success. The army that the United States fielded by 1944-45 was adequate, even if the spectacular victories of August and September 1944 did not take Germany out of the war, as the victories won by the German tank forces had done to France in 1940. Those German victories were most often won against nations who had less operational capacity (that is, flexible and mobile defenses) or political will to resist. Having inaugurated the era of mobile warfare, the Germans had the necessary equipment and command structure to deal with such attacks. They also had the determination to continue fighting; fueled by Nazi visions of victory or national annihilation, the German government refused accommodation until the very end, although the Allies, particularly the Russians, were not terribly interested in negotiated settlements. Much has been made of the lack of brilliant operations in the second half of the Second World War, although after the fall of the Soviet Union in 1991 Western historians again admitted that BAGRATION in 1944 and the Vistula-Oder operations in 1945 were indeed worthy of the brilliant label.[66] Even so, the offensives of 1944-45 did not produce the rapid victories that the German ones did in 1939-40.

Officers and men at the front had little patience for concerns such as logistics and grand strategy. Studies of combat suggest that individuals and groups in combat narrow their focus considerably, often to the point of personal survival balanced with the fear of

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[66] Examples of this reappraisal are Duffy, *Red Storm on the Reich,* and David M. Glantz and Jonathon House, *When Titans Clashed: How the Red Army Stopped Hitler* (Lawrence, KS: University Press of Kansas, 1995).

failing the other members of their "primary group."[67] From their perspective, any obstacle to their survival is of paramount concern, and anything that helps them survive is good. The perspective of their organization is not the same.

The "tunnel vision" common to soldier memoirs is often shared by historians of that particular branch of service. For the soldier it is only natural that survival concerns render relatively unimportant all but one's immediate situation. Bill Mauldin captured the feeling with one of his wartime cartoons; Willie, in response to newspaper headlines about the invasion of France, responds "The hell this aint't the most important hole in the world—I'm in it!"[68] The implication is that high command made important decisions out of ignorance of local conditions, and that did sometimes happen. The logic transfers to decisions about tank deployment. David Johnson contends in *Fast Tanks and Heavy Bombers* that since the Allied command, from Eisenhower down to various divisional commanders, were aware that their tanks were "inferior", their slowness in replacing or upgrading them must indicate an inability or unwillingness to face the demands of the technological battlefield.[69] More detailed examination by Charles Bailey suggests that there was no agreement among front line commanders on the exact requirement for their tanks, and thus very little likelihood that Marshall, McNair, Eisenhower, or Bradley would interpret the situation as unfavorable, especially when the existing tanks were succeeding at the overall task.[70]

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[67] See Stouffer, et al., *Combat and Its Aftermath,* 130-1, 143.

[68] Mauldin, *Bill Mauldin's Army,* 169

[69] Johnson, *Fast Tanks and Heavy Bombers,* 197-199.

[70] Bailey "Faint Praise", 83-85.

Kenneth Macksey's *Tank Versus Tank* is a prime example of the choosing of evidence to fit the postwar paradigm. The title accurately conveys the intent of the book, which is to discuss the "great' tank duels of the world, focused mostly on the Second World War. The Germans in the book are tactically and technologically more advanced, and the examples chosen are usually favorable to them. The narrative skips from the Normandy breakout to the logistic-enforced pause at the Siegfried, line with no mention of the success of the American armored columns in the exploitation role in August and September 1944. The example of an American action against the Panther-armed Germans involves an engagement in early December 1944, around Singling. Although the Americans are given some credit for using tactics similar to German offensives, Macksey's overall conclusion is that the American tanks were technically inferior.[71]

Judging the performance of the American military in preparing for future conflicts after the First World War is complicated by the fact that they were not perfectly prepared for the Second; later efforts to discover deficiencies were done on the basis of knowledge not available to planners before the war. One of the most important forms of knowledge was battle experience, as digested and passed up the chain of command. Some of this experience was American, but with the interviewing of German officers (not just generals, although B.H. Liddell Hart gave that impression with *The German Generals Talk*) a wider group contributed to an understanding of how the war was fought. The problem with after-the-fact soldier experience is that soldiers are not immune from the general human tendency to interpret what they went through in terms of preexisting categories. Although German officers tended to deny political connections to the Nazi

[71] Macksey, *Tank vs. Tank*, 139-41.

régime, their explanations of Soviet victory echoed Goebbels propaganda about Asiatic communist hordes. Moreover, prewar German dependence on technology led them to emphasize that aspect of their war, never questioning if high technology was the best solution to their particular problem. Such explanations had the added benefit of exculpating the *Wehrmacht* from failure, since they were essentially correct but so badly outnumbered that eventually superior technology, tactical skill, unit cohesion, etc. were overwhelmed.

The United States emphasized technology on a broader scale than the Germans did during the war, but a "lower-tech" version. When the Soviet Union emerged as the primary military rival for the United States, the obvious solution to facing the largest tank park in the world was to wed German dependence on technology to American productive capacity and understanding of mass. From such a perspective, the Armored Force that entered WWII was blind to the "truth" of how to conduct armored operations. Both groups accepted the idea that certain military principles were objective, yet the German army of 1940 and the Soviet Red Army of 1950 were two very different forces, as were the regimes that fielded them and their potential war aims.

At the tactical level, one piece of evidence often introduced to show the failure of the Armored Force to understand the realities of the battlefield is the number of German tanks destroyed by tactical air action. The implication that tank gunnery should have been responsible for those losses represents a kind of parochialism itself, the tunnel vision of tank on tank operations as "correct." Given that tanks were not necessarily expected to perform in the antitank role in every circumstance, successfully using other resources could be interpreted as supporting 1940 ideas on tank use. The trend to focus

on individual branches also obscures the larger picture here; the U.S. military overall seems to have done a relatively good job of countering German armored warfare, even if the armored branch was not primarily responsible

Although the term "paradigm" is often overused, it applies to in this case to how veterans of the Second World War organized their experiences. Historians of the conflict face a difficult time when a memoirist reports experiences that do not fit into the overall pattern, or occasionally directly challenges a generalization that does not match remembered experience. The most obvious way to reconcile the two positions is to point out that generalizations will of course not apply in all cases. Another, more difficult approach is to suggest that ways of thinking have shifted since the event in question, and so the way that participants organize their experiences have shifted as well. The sheer number of soldiers who operated in or with tanks means that a number of views emerged on the technological adaptability of American forces. Much of the official material produced in Europe immediately at the end of the war was essentially celebratory in nature, concerned with memorializing the service of the men involved, particularly those who fell. The neutral or positive assessments in these works prompted soldiers with a different point of view to air their differences, in later unit memoirs and interviews.

Richard DiNardo noted in his study of the German Army's use of horses in the Second World War that his research often was greeted with great surprise, if not outright skepticism.[72] The reason, he suggested, was the ability of the Nazi propaganda machine to create and distribute film of the Wehrmacht in action, which focused on their mechanized aspect. The trend was intensified when Frank Capra chose to reuse Nazi footage in his *Why We Fight* series, and DiNardo argues that the impression continues in

[72] Dinardo, *Mechanized Juggernaut*, 107-9.

documentary films down to the present. The visual image is a powerful tool, and one not easily contradicted by literary evidence and modern observers organize the world in such a way that the camera does not lie. A similar case might be made for the German Panzer forces; they hardly wanted to film their obsolescent tanks in order to strike fear into their enemies. Much of the visual evidence of German armored warfare is skewed toward the heavier tanks. In one of the U.S. Army official history volumes on the Ordnance Department, the illustrations of German tanks move from the early Panzer I and II to the final V and VI.[73] Represented are the bookends of the German armored experience, the early and late models. Omitted are the Panzer models III and IV, the tanks with which Germany won its early victories, and which were still in service until the end of the war.[74] The text around the illustrations argues that American tank crews had a less than a two to one chance of surviving combat, which the casualty figures do not support.

The reputation of the German Army seems only to have been enhanced by its defeat. Few have questioned its approach to organization, technology, or replacements. Richard DiNardo notes in passing that a column of tanks and trucks towing 88mm guns is more intimidating than a column of infantry with horse-drawn carts.[75] Although the bulk of the German army was in fact the latter, they did not affect the viewers as much as did the physical artifacts of modern warfare. While DiNardo's assertion is entirely reasonable, it reveals something about the way we conceptualize warfare. To the

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[73] Green, et al, *Planning Munitions for War,* 286.

[74] Manufacture of the Panzer III ceased in 1943, but there is evidence of their being destroyed occasionally by American forces in Normandy. The Panzer IV remained in production.

[75] DiNardo, *Mechanized Juggernaut*, 109.

"modern" mind, the products of the industrial age are more symbolic of military power than armed men.

What James McPherson and others call "contingency" is a factor in military decision-making.[76] Much historical criticism emanates from people who have much time to think about the situation, in some cases years. The exact nature of the German force is clearly and certainly known. Historians can see the big picture, and know that its particulars are correct, while the historical agents must accept a degree of uncertainty in their knowledge about their present. One example of this is the National Redoubt (sometimes called the Tyrolean redoubt), a German plan to retreat to the south and regroup in a mountain stronghold. The Allies would then face the unenviable task of digging out the fanatics at great cost. References to the National Redoubt have faded with time, since it turned out to be little more than a propaganda fortress. At the time, it was a potential problem that had to be addressed. Units were deployed with the aim to prevent the bulk of German forces from escaping southward, and the redoubt was a cause of anxiety until the bulk of the German armies surrendered. In hindsight, and with full knowledge of German industrial and manpower difficulties, the redoubt appears an obvious fantasy. It was less so at the time. The standard of judgment must be set accordingly; to condemn American policy or strategy for being imperfect is counterproductive. Even from the point of view that history can provide useful guidance for the future, failure to understand the full context of the historical situations leads not only to distorted history, but misinformed decision-making.

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[76] James M. McPherson, *Battle Cry of Freedom: The Civil War Era* (New York: Oxford, 1988), 858.

After 1945 the tank's image changed from symbolizing German aggression to embodying Soviet domination of Eastern Europe. Over the course of the Cold War, the image of Soviet intervention in the affairs of their neighbors was the tank, as when tanks crushed the Hungarian uprising in 1956 and Czech and Slovak revolt in 1968. Soviet tanks acquired an image as heavy and dominating, and in hindsight American tanks of the Second World War had not been that.

Although the fear of a Soviet invasion drove much defense planning in the years between 1945 and 1991, the actual confrontation never materialized. Thus, the doctrine and technology developed for it had to sit on the shelf. In this context, judgment of the each successive generation of Soviet and American tank designs had to depend largely on the comparison of vital statistics, armor slope and gun power, weight and horsepower, and so on. Rarely did such comparisons take into account the role intended for the platform, or the relative skill and training level of the crew involved.

On the question of the speed of the development of the M26 Willis Crittenberger had possibly the best comment. Asked in an interview if it would have been better to have had the Pershing sooner, he responded that the answer was obviously yes, but that had not been possible.[77] The attitude of American armored commanders was to take the machines they had and fight the best war they could, an attitude mirrored in naval aviation. The Japanese carrier plane, the A6M Zero, was technically superior in many areas to the American designs of the first years of the war, a fact not lost on American pilots. One of the loudest critics of the American planes, James Thach, devised a tactic known as the Thach weave that allowed American pilot fighting in teams to defeat Japanese pilots on even terms, or even when outnumbered. The design about which the

[77] Willis Crittenberger interview, USAMHI.

Americans complained, the F-4F, could be loaded on carriers in greater numbers that the Japanese Zero, so within a few years the odds were rarely even. James Flatley, an American carrier squadron commander, agued that rather than complaining about equipment, the goal should be to "take that equipment and learn to use it more effectively."[78]

Good historical thinking is vital for success in understanding most any human endeavor. The line between good and bad history can be thin indeed, since both involve crafting a theoretical framework into which specific information may be fitted. Bad history starts with the framework, and proceeds to accept information that fits it and reject or downplay information that does not. More careful analysis begins with the necessary assumption that the world is knowable and human actions matter in determining the course of events, but then begins to sift available evidence for patterns that constitute a workable interpretive framework. The Air Force arrived at its theory and set about proving it, while the armor innovators within the Army took much longer to arrive at a comprehensive understanding. The role of technology differed in each case, and it is to our detriment that the careful model has been slowly replaced in the past sixty years by the optimistic one. Technology does not operate in a vacuum, and is not solely influenced by rational factors, in development or evaluation.

In the context of later American frustrations on the world stage, the Second World War acquired a retrospective air of even greater legitimacy. The memorializing of the last war that the United States declared and fought to a cathartic conclusion contributed to the obscuring of the factors that produced that situation. Both civilian and military

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[78] Ron Spector, *At War at Sea: Sailors and Naval Combat in the Twentieth Century* (New York: Viking, 2001), 218.

observers viewed the record with an eye to their particular situation and as a result produced useful distortions, but distortions nonetheless. The postwar need of the United States to prepare for a confrontation with the Soviet Union led to a reevaluation of the war, as postwar affluence led to greater expectations being placed on technology and science to solve the nation's problems or ensure its defense. Historians are often reluctant to draw ironclad "lessons", and rightly so, but the mass of available fact must still be sifted and conclusions drawn. One conclusion is that perspective matters when evaluating the adaptation of military institutions to changing circumstances. The controversy over American tank design and deployment can be seen as part of the contest over the nature of military technology in the mid-twentieth century. Evidence from one facet of the situation has tended to become evidence that that situation was universal; anyone with a different perspective being either incapable of adapting to the realities of ground warfare, or, more charitably, not closely in touch with those realities. Failure to adapt tank design to mimic the heavy German tanks was interpreted in this manner.

The American relationship with military technology was and is conditioned by the broader expectations society places on technology in general. These expectations are part of the "modern" experience, and although they are modified from generation to generation, the fundamental premise that knowledge and the technology that results from it are forces for improvement continues in its descent from Benjamin Franklin to the present day. War was one of the last areas of American civilization to incorporate dependence on technological instead of human factors, and the process had the same tensions and competing visions as did the rest of society. The apparent triumph of one relationship between technology and warfare should not obscure the alternate versions

that fell by the wayside. As the military context of the twentieth century fades, some of its lessons become less useful. The American cognizance of the role of military technology in winning wars became dependence on it to prevent casualties. Supplementing manpower with technology led to replacing it instead, and the military context in which firepower balanced manpower is fading. The inability of critics to understand why a technologically advanced power such as the U.S. has difficulty facing peripheral, low-technology threats results from the loss of contextual understanding of the Second World War. American soldiers could not, and cannot, fully control the standards by which their society judges their efforts, and their reasonable search for way to maximize their resources has obscured the efforts of their predecessors to do the same.

Currently the United States does not face enemies who mobilize from a national base and plan to conduct main-force battles. It is perhaps too soon to pronounce that way of warfare fully dead. Other nations have fought such conflicts since 1945; both Ethiopia and Eritrea, and India and Pakistan have faced off in such terms, in some cases within the last ten years. The emerging Chinese economy provides a potential for such a conflict: Iran's regional ambitions provide another. The other main threat to American security comes from enemies in small numbers ignore the traditional "rules" of warfare to combat opponents much stronger in conventional terms than they are. In this context, the relevant lessons of the Second World War are the ones related to coalition warfare and diplomacy, not operations and strategy. Recognizing this fact means looking elsewhere for direct guidance for the threats facing the United States today. The process of adaptation and reaction to events is still relevant, and better understanding of how others

faced it can perhaps help the current generation. That is, after all, the purpose of attempting to understand the past.

AFTERWORD

OPERATIONS AND INNOVATION AFTER THE COLD WAR

The end of the Cold War coincided with the triumph of the combined-arms doctrine that the U.S. army had spent the previous four years developing. The 1991 campaign to remove Iraqi troops from Kuwait was brief, successful, and came at the cost of a minimum number of Allied casualties. Airpower observers concluded that the month-long bombing campaign against targets in Iraq meant that the era of strategic airpower had come at last.[1] Proponents of ground maneuver warfare found much satisfaction in the ability of the combined-arms force that took only 100 hours to eject a force several times its size from Kuwait. All in all, the stage seemed set for brief, successful Western military interventions in troubled parts of the world.

Events since 1991 have not followed these expectations; western technology and operational skill have not prevailed in conflicts against the security threats of the twenty-first century. Maneuver warfare seems best adapted to fighting European-style nation-states for territorial or ideological reasons. Methods evolved to fight opponents who conduct large-scale operations backed up by a national industrial complex are less effective against groups who choose not to operate that way. Few would argue that Israeli operational skill has brought them security, and to focus on the operational skill of

[1] See Thomas Keaney, *Revolution in Warfare? Airpower in the Persian Gulf,* (Annapolis: Naval Insititute Press, 1995)

American troops in Iraq in 2003 is to miss the point of that war entirely.[2] Although somestates may still conduct large-scale operations, for the time being the security of the United States does not rest on mastering those skills.

Does this mean that the large-scale wars of the twentieth century are no longer useful in providing guidance for the future? Have we reached the end of military history, at least of the Second World War? The answer depends on the answers we seek from the past. Industrial-age warfare provides less direct guidance to the Unites States military establishment than ever, since the prospect of fighting a conventional war with the Soviet Union, always remote, has faded. Indirect guidance depends on looking at how others in times when history seem to provide poor guidance have adapted. The time between 1918 and 1939 is one such time, and a number of books on innovation, particularly *Military Innovation in the Interwar Period* and *The Challenge of Change* take this approach.[3] Other works take a broader approach, going back to the beginning of the modern period to see the roots of technological and cultural change that led to new ways of fighting. Always at the core is the question of why the historical actors chose to change how they fought.

The term "revolution" is often thrown around by authors who write about military change.[4] Revolutions are generally recognized as a conscious process, as an individual or group seeks to break with past traditions. In impact the changes in warfare in the

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[2] Citino, *Blitzkrieg to Desert Storm*. 299.

[3] Willaimson Murray and Allan R. Millett, eds., *Military Innovation in the Interwar Period* (New York and Cambridge: Cambridge University Press, 1996) and Harold R. Winton and David R. Mets, *The Challenge of Change: Military Institutions and New Realities, 1918-1941* (Lincoln: University of Nebraska Press, 2000).

[4] See Williamson Murray and MacGregor Knox, eds., T*he Dynamics of Military Revolution, 1300-2050.* (New York: Cambridge, 2001), particularly the introductory essay by Murray and Knox.

twentieth century were revolutionary, but in the intent at least of tank warfare was to restore traditional principles of warfare, not to create new ones. Theorists of strategic bombing had revolutionary intent, but their revolution has yet to be realized. It might be more productive to view innovation as an evolution, as many small decisions taken for non-revolutionary reasons that add up to produce a major change. The preceding chapters suggest that the U.S. Army's adaptation to armored warfare fits this model, and that it produced good results in the Second World War.

The social and cultural context of innovation is also a major part of the story of any innovation. What is possible for an innovator, or a military strategist, depends in no small part on the limitations under which they work. Individual actions and choices matter in driving history, but only in the context of the choices and actions of other individuals. Military innovators cannot decide what acceptable casualties are, for example, independently of what the expectations of their societies are on that subject. The U.S. Army faces limitations on manpower because of the context of Vietnam, and for years argued, based on its experience in Vietnam, that interventions should only occur when there was a good chance of success (the Powell doctrine). Military innovation must understand these limitations as part of the strategic environment in order to adapt successfully.

Who the enemy is matters as well. The U.S. Army mobilized between 1940 and 1945 was torn between two enemies, but was designed primarily to defeat the German Army of 1940-42. Since most of the U.S. mobilization framework was complete before 1942, it could hardly have been otherwise. After 1945 the enemy was very different, and the Army adapted accordingly. Today the enemy is different again, and technology-

based combat operations may not be the best way to quiet the sectarian warfare in Iraq, quiet the extremists in Afghanistan, or curb the operations of a super-national criminal group like Al Qaeda. What we can learn from the twentieth-century military experience is that the interplay between past and future is very complex, and influenced by more reasons than battlefield effectiveness and ideological requirements on strategy. The example of careful leadership, aware of limitations, and searching for the best solution within those limitations is perhaps the most useful lesson that today's leaders can take from the Second World War.

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