

# From Appomattox to the Argonne:

## *Appreciating a Changing World's Impact on Readiness*

MAJ JESSE BURNETTE

With the latest publication of Field Manual (FM) 3-0, *Operations*, and its reorientation towards near-peer threats, two schools of thought have emerged concerning how the U.S. Army should prepare for the next war: those who concur with FM 3-0 and the threat posed by near-peers and those who still see relevance in limited wars akin to the Global War on Terrorism (GWOT). Case in point, the January 2019 edition of *Military Review* contained the two following articles that represented these opposing positions concerning the sagacity of the latest FM 3-0: “Field Manual 3-0: Doctrine Addressing Today’s Fight” and “Emerging U.S. Army Doctrine: Dislocated with Nuclear-Armed Adversaries and Limited War.”<sup>1</sup>

However, these two varying views on the United States’ most pressing threat are not mutually exclusive. In both cases, threats from near-peer and non-state actors are the United States’ future challenges until the political risk of terrorism diminishes. Moreover, the timing — the context of the competitive fervor — is as equally important as the threat of hostilities posed to the United States by China, Russia, or non-state actors. Ironically, the U.S. Army was in a similar boat of balancing a changing world and a changing threat a century ago. The solution that would have been best then — fully appreciating the totality of the changing times’ implications on future combat along with emerging threats — is just as fitting now.

The Information Age is the catalyst driving our changing times which the United States and other developed countries have not seen since 1914, when the Industrial Age reached full froth in the 20th century. World War I (1914-1918), with all the horrendous blood-letting that it entailed, showcased the impact of advances in transportation, communication, and lethality of weaponry on the conduct of modern war. Had the U.S. Army holistically analyzed the Industrial Revolution’s impact on the American Civil War (1861-1865), the Franco-Prussian War (1870-1871), and the Second Boer War (1899-1902), its readiness for the First World War would have been different. The Industrial Revolution’s impact on these three wars becomes the lens through which to view the maturation of the Information Age and the context of today’s threats. In other words, to attempt B.H. Liddell Hart’s 1929 recipe for distilling the practical value of military history: “throw the film of the past through the material projector of the present onto the screen of the future.”<sup>2</sup>

To follow Hart’s recommendation as implied above, this article charts the development of three inventions during the Industrial Revolution which impacted three wars leading up to World War I and how the U.S. Army failed to fully account for the changing world a century ago. Similarly, this work explores contemporary technological trends, evolving threats, and recent Army doctrine to view readiness for future combat.

### **The Industrial Revolution**

The products of the Industrial Revolution — the enhanced means to do more in better fashion with less manpower — were foundational to the future conduct of war. Professor and author Peter Stearns’ *The Industrial Revolution in World History* succinctly captures the impact of the Industrial Revolution on world affairs. Great changes in thought, deed, and practice — like the Industrial Revolution — often span centuries and come in waves. These waves often interact with yet other waves of either complementing or competing changes as history proves. Stearns cites the 1760s-1960s as the range of the Industrial Revolution and notes that the core of the period “consisted of the application of new sources of power to the production process, achieved with the transmission equipment necessary to apply this power to manufacturing.”<sup>3</sup> The result, as Stearns concludes, became a paradigm change in both the output of goods and that of the individual worker predicated on the revolutions in “technology and in the organization of production.”<sup>4</sup>

Most salient to the professional soldier was the Industrial Revolution’s influence on the conduct of war. The developments in transportation, communication, and weapons were the three most impactful — though certainly not all-encompassing — developments of the Industrial Revolution on the battlefield. More telling, these technological



**Men with the Army of the Potomac's Telegraph Construction Corps put up wire in April 1864. (Photos and artwork from the Library of Congress Prints and Photographs Division)**

innovations were used in concert to achieve a single aim — primacy. For example, the late-1860s British venture in China demonstrated that steam-powered vessels could sail upstream or against the wind and deposit a force armed with repeating rifles, and which could communicate over-the-horizon via the telegraph.<sup>5</sup> Like most changes, none of the above three developments occurred overnight but were decades in the making, and they could have been accounted for through doctrinal innovation before the outbreak of a major conflict between industrial powers. But they were not.

With the advent of George and Robert Stephenson's Rocket steam locomotive in the 1830s, steam power held sway in the transportation arena until fossil fuels mixed with internal combustion engines in the early 1900s to provide more reliable propulsion means.<sup>6</sup> Nevertheless, the ability to move soldiers and material quickly by rail was abundantly clear to Western societies by the 1840s and was indeed a viable option for most industrialized countries by the 1850s. Even Imperial Russia, considered a late adapter of industrialization by other Western nations, enjoyed a major rail line connecting Moscow to St. Petersburg by 1851.<sup>7</sup>

In parallel with the locomotive's ascension to transportation supremacy, the telegraph revolutionized the transfer of information. On 1 May 1844, the telegraph reached a crescendo, dating back to William Sturgeon's 1825 electromagnet, with the first news dispatch sent via electric telegraph using Morse Code.<sup>8</sup> The quest to expedite the flow of information has not ebbed since.

While lines of communication were shortened, the range of arms was stretched during the Industrial Revolution. Firearms, artillery, and explosives experienced a similar sea change that increased their accuracy, lethality, range, and rate of fire. The arms industry, more than any other single industry, most benefited from the advances in organization, metallurgy, science, machinery, and manufacturing combining the breadth of the Industrial Revolution into a single product. The pace of innovation in the arms industry was steady from 1760-1850; industrial powers transitioned from smooth-bore muzzle-loading weapons to rifled variants projecting exploding ordnance. By the 1860s, constant, incremental improvements gave way to exponential growth in the arms industry. Mass-produced repeating rifles used self-contained cartridges, which led to the eventual creation of the early machine guns.<sup>9</sup> By the 1880s, with the advent of smokeless powder, the arms industry was yet again revolutionized around the lethality afforded by this propellant.

### **The American Civil War (1861-1865)**

The American Civil War was the world's first taste of nascent industrial war at scale. For generations following the war, the Army recounted the daring nature of the Confederate Army's extraordinary victory at Chancellorsville in May of 1863 and its stunning defeat at Gettysburg that same July. Generals Ulysses S. Grant and William Tecumseh

Sherman's determined campaign and General Robert E. Lee's Fabian strategy in the final 18 months of the war are all too familiar even today. So are the war's commonly told lessons that relegated many Napoleonic practices to obsolescence. The potency of long-range rifled muskets and repeating arms, the indispensability of railroad networks and their supporting manufacturing base, commanders being directed by their chiefs through wire, and the necessity of rapidly erecting earthworks in the face of such improved means of war were harbingers predicting future war as a defender's paradise.

What is so apparently held today was only believed by a scarce few, but influential leaders' (chiefly Generals Grant and Emory Upton) efforts to reform the Army following the Civil War largely fell on a deaf Congress.

Grant's career exemplifies the difficulty in learning to recognize a changing battlefield. Famed military historian J.F.C. Fuller said that Grant's lack of appreciation of the adverse effects of modern weapons meeting antiquated tactics was "tantamount to applying a whip to a locomotive."<sup>10</sup> Written shortly before his death and after the Franco-Prussian War, Grant offered a prophetic warning in his memoirs: "To maintain peace in the future it is necessary to be prepared for war... growing as we are, in population, wealth and military power, we may become the envy of nations which led us in all these particulars only a few years ago; and unless we are prepared for it we may be in danger of a combined movement being some day made to crush us out."<sup>11</sup>

General Upton had the courage to quickly adapt to the reality presented by these new weapons, favoring dispersed troops using well-aimed fire over the bayonet. He also reformed the Army's doctrinal writings to match this important evolution in firepower. Historian Stephen Ambrose recounted that as early as the Wilderness Campaign of 1864, Upton sought the development of a new drill system that allowed the attackers to maximize firepower while minimizing exposure during the offense through the use of skirmishers, or small probing units, bent on forcing the early deployment of the enemy.<sup>12</sup> In concert with his doctrinal innovation, Upton advocated for the adaptation of breech-loading weapons. The underpinning of Upton's suggested reforms was the notion that a large standing army, not ad-hoc citizen soldiers, was required to secure the nation's defense.<sup>13</sup> Unfortunately, before Upton's reforms could fully penetrate the hardened minds of the nation's leaders, the Army lost prestige in the wake of Reconstruction and economic woes. The Army went the entire year of 1877 without pay.<sup>14</sup> From 1877-1917, the United States fought two conflicts that undermined Upton's influence in changing Army doctrine to prepare for the future — the Indian Wars and the Spanish-American War — neither of which required a large standing modern Army to win.

### **Franco-Prussian War (1870-1871)**

In five short years following the American Civil War, the world saw another example of early industrial war. The Franco-Prussian War of 1870-1871 is a footnote in the American psyche, and in the aftermath of the two World Wars on the European continent, has become so for many European countries save France. The same can be said of the American Civil War to the Europeans of the era. Fought with no standing army or general staff on either side, it was no surprise to Europeans that a decisive outcome during the American Civil War remained elusive.<sup>15</sup> Given the Franco-Prussian War's short duration, many scholars, like Yale's Rachel Chrastil, argue that Prussia was merely the instrument of France's defeat; France's real weakness was its dysfunctional political system and the people themselves who favored peace over continued struggle.<sup>16</sup> There is a measure of truth in this argument; how a country, as a whole, views potential adversaries shapes the conduct of antebellum readiness and prosecution of war itself.

Prussia out-administered, more so than outfought or innovated, the French in the Franco-Prussian War. Prussia had done the same with Austria in 1866 and Denmark in 1864, on the path to German unification following the failed attempt in 1848. That is not to say that the Prussian conduct during their wars of unification was error free. As historian Michael Howard concluded in *The Franco-Prussian War*, the Prussian army was not gifted with unique insights into the techniques of new warfare. In all Prussian reform areas — railway organization, mobilization of reserves, training and coordination of the three main arms (infantry, artillery, and cavalry) — Prussia committed her fair share of mistakes in all three unification wars attempting to embrace industrial advances.<sup>17</sup> The difference, according to Howard, is that the adversaries committed far worse missteps. More importantly, the Prussians — through their newly established general staff under the vaunted chief, Helmuth Von Moltke — possessed a body of hand-selected officers to "apply to the conduct of war a continuous intelligent study, analyzing the past, appreciating the future, and providing commanders in the field with an unceasing supply of information and advice."<sup>18</sup>

France failed to see the Prussians as a threat on the scale of adversaries like the Austrians, Italians, or the British.



**This print illustrates a battle in January 1871 between Prussian infantry (advancing from the left) and French forces (retreating to the right) in the Lisaine River valley with the Château de Montbéliard in the distance.**

The French credited German success in the two previous wars to the Prussian breech-loading needle gun, an egregious error on the part of the French who felt once again at parity with the Prussians with the adoption of their own breech-loading variant, the 1866 Chassepot which outranged the Prussian needle-guns.<sup>19</sup> Few French leaders saw past this myth to see that the special ingredients to Prussian victory lay in the ability to train a short-service conscript army, mobilize said army rapidly, and transport it in an orderly fashion with all needed supplies and enablers to critical points.<sup>20</sup> Emperor Napoleon III, the nephew of the infamous Bonaparte, sought to place France and the Second Empire on firmer war-footing, but his efforts were thwarted by a combative French general staff which resisted reforms and significant legislative budget cuts from 1869-1870. Nevertheless, by July 1870, the French Chief of the General Staff LeBeouf reported to the French government that the French army was ready for war. France had adequate stocks of ammunition, clothes, food, and Chassepots, and by the standards of the day, France was prepared for a war with an army formed and trained in like fashion; however, France failed to realize it was on the eve of an entirely new age of warfare and outnumbered 417,366 to Prussia's 1.2 million trained soldiers.<sup>21</sup>

On 19 July 1870, France impetuously declared war on Prussia over claims to the Spanish throne — a grievance the Prussian Chancellor Otto Von Bismarck nurtured from spark to flame. In a series of unrelenting convergent blows, the Prussians surrounded Paris by 19 September 1870 and forced a complete surrender by 26 February 1871 — an eight-month war that cost France the provinces of Alsace and Lorraine along with her national pride.<sup>22</sup> Prussian victory was secured not through technology — the French Chassepot canceled the German superiority in artillery — but through the superior organization, education, and trained manpower. The small social-conscious militaries — more concerned with prestige than potency — the world over should have noticed their irrelevance after France's defeat. Indeed most did, leading to the creation of nations-in-arms, whose populations were both trained and capable of being mobilized to do their master's bidding in the obtainment of quick but decisive ends.<sup>23</sup> Lost in the brevity of the war, and the decisiveness of early Prussian victories, was the bitter struggle fought by Leon Gambetta that bedeviled the Prussians after their victory at Sedan.<sup>24</sup> Gambetta's resistance foretold, given the right circumstances, that the defender still held the advantage. The United States, however, missed all of the lessons of the war.

### **The Second Boer War (1899-1902)**

The Second Boer War (1899-1902) is yet another example of a war uninformed by much forethought about technology on the battlefield. The tightening grip of British imperialism over the South African Dutch settlers (referred to as Boers), whose ancestors had been in the area since 1652, can be cited as the bannered cause for war.<sup>25</sup> The discovery of gold in greater South Africa served as the impetus for the British to increase their colonial efforts — annexing

Transvaal in 1877 — much to the dismay of the resident Boers. The first Boer War of 1880-1881 saw the Boers gain their independence under Transvaal's first president, Paul Kruger; however, the British had successfully isolated the Boers from the Indian Ocean by surrounding them with British colonies.<sup>26</sup> On 11 October 1899, the Boers responded by invading British Natal which the British met with alacrity, thinking the war would be over by Christmas.<sup>27</sup>

Wars seldom go as planned, and the Second Boer War was no exception. Professor Fransjohan Pretorius of the University of Pretoria in South Africa described the ebb-and-flow nature of the war: At first, set-piece battles prevailed throughout the campaign. The Boers besieged Ladysmith in Natal along with Kimberley and Mafeking in the Cape Colony against staunch British relief efforts over five months. The Boers used their advanced knowledge of the terrain to ambush and defeat British forces at Stormberg, Magersfontein, and Colenso by December 1899. However, Boer overt resistance crumbled when the British relieved Ladysmith, Kimberley, and other beleaguered garrisons. The British under General Lord Frederick Roberts had the Boers on the run. Many Boers surrendered or were otherwise enticed to bandwagon with the British against Boer resistance, which selected the asymmetrical approach of attacking British supply lines. The guerrilla phase of the war pitted the British and the South African collaborators against the Boer "bitter-enders." When General Herbert Kitchener succeeded Roberts as the British commander, he brought increasingly harsher methods. First, he instituted a deprivation policy to deny food and shelter to the bitter-enders, which entailed burning farms and crops. Second, and most controversial, Kitchener erected concentration camps to separate the guerrillas from their popular support. Both tactics eventually led to the war's conclusion by 1902.<sup>28</sup>

Britain's lessons from the Boer War were mixed. On the one hand, the British overhauled their ability to wage a prolonged war with the creation of a chief of the general imperial staff along with enhanced organizational measures to both project and sustain a large force far from the British Isles in concert with increasing the sizes and numbers of the standard field guns.<sup>29</sup> On the other hand, the central lesson from British setbacks during the war — that advances in modern weaponry favored the defender over the attacker — was discounted. Instead and counter-intuitively, the British doubled down on the decisiveness of the frontal attack and officially codified the tactic as the form of maneuver of choice in the 1912 Field Service Regulation.<sup>30</sup> Nevertheless, it was high velocity and capacity, smokeless powdered rifles and machine guns used in concert with trenchworks that worked to the advantage of the defender, a fact that was replaced with the British myth that the Boers were simply better shots and more cunning than their British adversaries.<sup>31</sup> The result was a more capable and empowered shepherd to lead the masses of ignorant sheep to the slaughter.



**Lord Roberts' infantry crosses the Zand River in South Africa. Note the balloon in the background that was watching ahead for the Boers.**

## The U.S. Army Experience in the First World War

In the immediate years prior to entering World War I, the U.S. Army of 1917 is analogous to today's Army in that it was a small expeditionary force, tailored for constabulary duties with its most recent experience being low-intensity combat in Latin America, the Philippines, and Mexico. To say that the Army failed to learn, adapt, and innovate from 1865 to 1917 is wholly wrong — but the Army was unable to grasp the totality of the changing world. The Army myopically centered its reforms around the rifleman — an error that resulted in 116,516 men killed and more than 258,000 wounded in six months of combat (28 May-11 November 1918).<sup>32</sup> In October 1917, General John “Black Jack” Pershing, commander of the American Expeditionary Forces (AEF), made clear he aimed to break the deadlock of the trenches with open warfare, stating, “The rifle and bayonet remain the supreme weapons of the infantry soldier... the ultimate success of the Army depends upon their proper use in open warfare.”<sup>33</sup> The reality was much less sanguine. Upon arrival to a training camp in France in late 1917, a Soldier from the U.S. 105th Infantry recalled a British instructor, noting with tears in his eyes, “My God! This is Kitchener's army all over again.” Which like Kitchener's force in 1916, the AEF was vibrant but wholly unprepared for the crucible of industrial warfare that awaited it.<sup>34</sup>

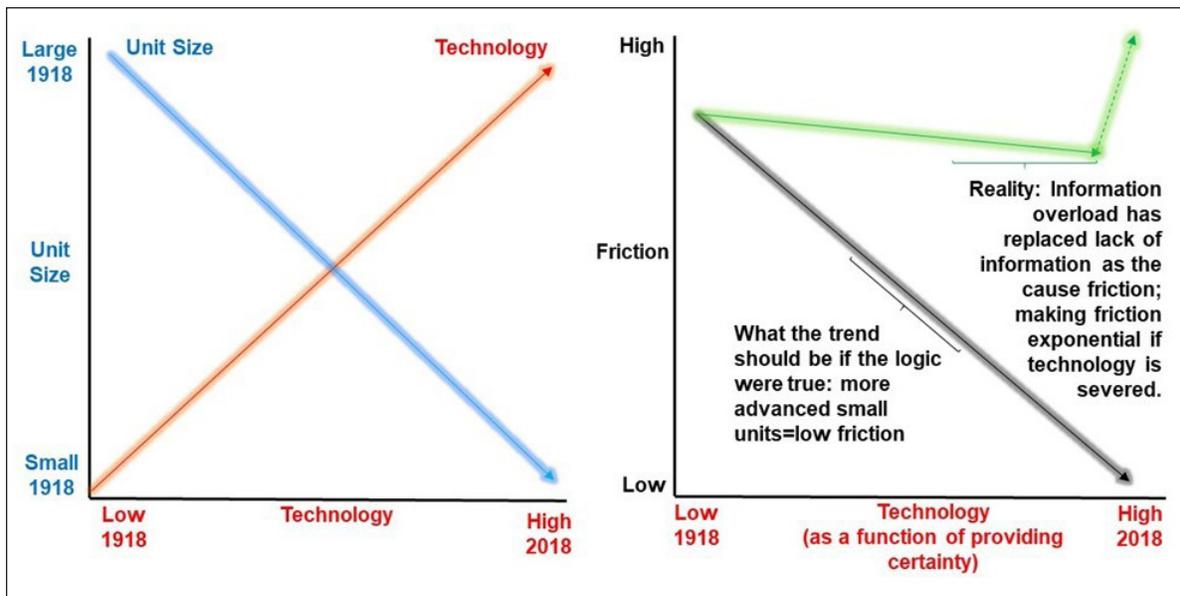
The AEF's combat record as a whole is mixed; some divisions adapted to the brutal realities of World War I combat better than others. Mark Grotelueschen's *The AEF Way of War* examined the conduct of four different divisions — the 1st, 2nd, 26th, and 77th — charting how each balanced existing doctrine with the war's circumstances. Grotelueschen summarized four organizational impediments that hindered the sharing and transforming of unit lessons into greater doctrinal change. First, Pershing's headquarters (GHQ) never ceased emphasizing the prewar rifleman-centric doctrine. Second, the open-warfare doctrine was premised on nonexistent technologies, training, and capability. Thirdly, GHQ failed to reconcile the proper nature of firepower vis-à-vis artillery and rifleman, favoring the latter until war's end. Fourthly, GHQ's version of open warfare called for aggressive instead of nuanced plans.<sup>35</sup>

### Post First World War Industrial Revolution Reconciliations

Grotelueschen's four concerns were noticed in the United States and elsewhere. German General Hans Von Seeckt established nearly 57 different committees to study the German army's conduct during the First World War. Seeckt clearly defined the purpose of these committees by stating, “It is absolutely necessary to put the experience of



**A Vickers machine-gun team from Company B, 115th Machine Gun Battalion, 30th Division, prepares to engage in Bibeauville, France, on 19 October 1918. (U.S. Army Center of Military History)**



How Technology Affects Unit Size and Friction

the war in a broad light and collect this experience while the impressions won on the battlefield are still fresh, and a major portion of the experienced officers are still in leading positions.”<sup>36</sup> The new doctrine of Blitzkrieg — “emphasizing surprise, judgment, speed, and exploitation of an enemy’s momentary weaknesses” — was born.<sup>37</sup>

The U.S. Army’s experience was similar. In 1919, General Pershing established the Lewis Board, named after its chairman, Major General E.M. Lewis, to consider “the lessons to be gained from the experiences of the recent war and to determine how they affect the tactics and organization of the Infantry.”<sup>38</sup> The Lewis Board’s findings concluded that “decisive results can only be accomplished by the offensive, wherein the coordination between artillery, mortars, tanks, and aircraft attached to the infantry in coordinated teams to overcome strong defenses.”<sup>39</sup> In short, combined arms maneuver became the sinew for modern means and to achieve legacy ends.

### The Information Age and the Next War

Today’s publications — military and civilian alike — are obsessed with articulating and predicting the implications of the Information Age on the future. Common themes stress a multi-domain environment stitched together with a nexus of low cost but advanced technology that implies the need to safeguard systems of old, like the Global Positioning System (GPS), for fear of instantaneous degradation at the opening of the next war.<sup>40</sup> Artificial intelligence (AI) and information operations intending to deceive adversaries are two other common themes. The underlying fear, in a word, is friction. In the past century, friction was born of uncertainty. Technology was invented to lessen that uncertainty, and to a large degree if appropriately used, it reduced friction born of uncertainty.

Contemporary trends chart a path for friction replacement, where information overload inadvertently induces friction. Moreover, as we become increasingly reliant on technology, we forget the fundamentals. In the past era, technological advances were mainstays; there was no uninventing the train, machine gun, or radio. Sure, these modern implements could be destroyed, but they could also be replaced. In present parlance, the same can be said of the internet or any other connectivity-driven device; however, connectivity itself — the intangible — once lost, would instantaneously put us back to the 1900s. Then what? How does one survive? The chart on the next page shows two themes: On the left, as technology and capabilities increased over time, the size of troop formations decreased; and on the right, that as technology increases, friction should but does not always decrease.

To confound this further, the persistent threat of terrorism and the desire to maintain global influence complicates our prioritization efforts to meet the challenges of the Information Age but compels us to act in places like Syria, Iraq, Africa, Afghanistan, etc. According to the Council of Foreign Relations, as of 10 April 2019, there were 18 problematic areas worldwide characterized as presenting significant or critical impacts for United States’ interests.<sup>41</sup>

The solution is twofold: The Army must remain at the cutting edge of technology — that is having the latest systems and knowing how to operate them — while at the same time, firmly investing in the time-proven practices of combat

in modernity to best our would-be near-peer adversaries. Secondly, the Army cannot afford to make the mistake of the post-Vietnam era and squander lessons learned from the most recent war. Now more than ever, the Army has to fight exceedingly well in high- and low-intensity combat.

### **The Great Debate: Readiness for What?**

It could be argued that trying to optimize for polar opposite challenges is wrongheaded. Some argue for selecting the most threatening challenge and direct the abundance of one's resources against combating it. The October 2017 FM 3-0 ostensibly does just that, stating, "Today's operating environment presents threats to the Army and joint force that are significantly more dangerous in terms of capability and magnitude than those we faced in Afghanistan and Iraq. Major regional powers like Russia, China, Iran, and North Korea are actively seeking to gain a strategic positional advantage."<sup>42</sup> The manual states further in the introduction: "In 2001 and 2003 the U.S. conducted two offensive joint campaigns that achieved rapid initial success but no enduring political outcome, resulting in protracted counterinsurgency campaigns in Afghanistan and Iraq. The focus of Army training and equipping shifted from defeating a peer threat to defeating two insurgencies and the global terrorist threat."<sup>43</sup>

Getting back to those two January-February 2019 *Military Review* articles, one lauds FM 3-0's virtues while the other offers pause for its lack of attention towards nuclear weapons and asymmetrical threats. "Field Manual 3-0: Doctrine Addressing Today's Fight," as one of the article's titles implies, suggests both the timeliness and appropriateness of the new manual, concluding, "We, as Army professionals, must learn, speak, and exercise doctrine grounded in today's fight. Doing this can only better serve the Army to answer the changing complexities of warfare. This will no doubt provide the direction for tomorrow's concepts and the Army beyond 2040. The rapid publication of FM 3-0 illustrates the present need for doctrine to serve as an engine of change for today's Army to successfully operate."<sup>44</sup>

The second article, "Emerging U.S. Army Doctrine Dislocated with Nuclear-Armed Adversaries and Limited War," argues that FM 3-0, as currently written, is myopic and ill-suited to addressing all potential future challenges: "If the U.S. Army cannot develop concepts and operational methods for the limited warfare environment of the future, then the service risks losing its utility to resolve many political conflicts. Without realistic potential solutions, U.S. political leaders should avoid employing the Army unless the interest in question is so vital that a nuclear exchange is an acceptable risk."<sup>45</sup>

The anomaly is that the authors of these three works (FM 3-0 and the two articles in *Military Review*) are not wrong in their respective conclusions. One cannot overlook the near-peer threat, especially in the contemporary environment; however, the preponderance of those 18 areas of concern from the Council of Foreign Relations are more akin to the GWOT than Desert Storm, which also cannot be overlooked. The more prudent approach is to adhere to the lessons of the last epoch transition, casting the most far-reaching net of understanding derived from recent combat experience and changing realities born of circumstance and technology, as the lodestar to guide our readiness for future combat. This is far too daunting of a task to place on a single publication — even one as well-written and timely as FM 3-0.

### **Conclusion**

The U.S. Army remains between the rock-and-the-hard place of presently engaging with GWOT-type threats while preparing to confront Russia and China, endeavoring not to forsake readiness to meet one challenge in efforts to prepare for the other.

Yet the gauntlet for both has been laid down during an epoch transition. Field Marshall Ferdinand Foch, commander of the allied forces at the end of the First World War, poetically concluded that in combat "to make a little possible, one must know much."<sup>46</sup> The knowledge for today's Army centers on understanding the ramifications of the Information Age on the implements of war so that we better understand the grammar of the next engagement. Like the last epoch transition, developments born of the Industrial Era remain; however, the connective tissue that binds how we use our present machinery — connectivity — presents a weakness that one must assume will be attacked. Once connectivity is lost, all that remains is what one knows to accomplish the task. The sensible solution resides in appreciating the fact that a transition period is afoot which requires a balanced view of the past century of combat with present trends and realities. Industrialized ways and means, not fully appreciated by most countries, directed the conduct of World War I during the last transition. As great powers compete, no one can predict with certainty the next field of competition. However, the advances of the Information Age will certainly increase the

speed of the game. Technology alone is no guarantee for victory nor is outmoded practices and machines hurled at an advanced foe. Future victory is best assured by those that fully safeguard their technological advances, while rapidly embracing the most promising new innovations, yet remain firmly grounded in the battle-proven methods of the last century to win the big and small wars alike.

## Notes

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- <sup>2</sup> Edward Drea, *Defending the Driniumor: Covering Force Operations in New Guinea, 1944*, Leavenworth Papers 9 (Fort Leavenworth, KS: Combat Studies Institute, 1984), ix-x.
- <sup>3</sup> Peter N. Stearns, *The Industrial Revolution in World History*, 4th ed (Boulder, CO: Westview Press, 2013), 6.
- <sup>4</sup> *Ibid*, 8.
- <sup>5</sup> *Ibid*, 104.
- <sup>6</sup> Thomas Shedd and Geoffrey Allen, "Locomotive | Vehicle," Encyclopedia Britannica, 24 February 2019, <https://www.britannica.com/technology/locomotive-vehicle>.
- <sup>7</sup> Stearns, *The Industrial Revolution*, 90-91.
- <sup>8</sup> Mary Bellis and inventors, "The History of the Electric Telegraph and Telegraphy," ThoughtCo, 12 January 2019, <https://www.thoughtco.com/the-history-of-the-electric-telegraph-and-telegraphy-1992542>.
- <sup>9</sup> Stearns, *The Industrial Revolution*, 104.
- <sup>10</sup> James Marshall-Cornwall, *Grant as Military Commander* (NY: Barnes & Noble Books, 1995), 224.
- <sup>11</sup> Ulysses Grant, *Personal Memoirs of U.S. Grant* (Project Gutenberg Ebook, 2004), 497, [http://www.gutenberg.org/files/4367/4367-pdf/4367-pdf.pdf?session\\_id=a89d674c6deb3ac8ea5abd8392875b5a2e099e0e](http://www.gutenberg.org/files/4367/4367-pdf/4367-pdf.pdf?session_id=a89d674c6deb3ac8ea5abd8392875b5a2e099e0e).
- <sup>12</sup> Stephen E. Ambrose, *Upton and the Army*, Louisiana paperback ed. (Baton Rouge: Louisiana State University Press, 1993), 59-62.
- <sup>13</sup> *Ibid*, 108.
- <sup>14</sup> *Ibid*, 112.
- <sup>15</sup> *Ibid*, 133.
- <sup>16</sup> Rachel Chrastil, "Who Lost the Franco-Prussian War?: Blame, Politics, and Citizenship in the 1870s," *Journal of the Western Society for French History* 32 (2004), <http://hdl.handle.net/2027/spo.0642292.0032.016>.
- <sup>17</sup> Michael Howard, *The Franco-Prussian War: The German Invasion of France, 1870-1871* (NY: Routledge, 2001), 23.
- <sup>18</sup> *Ibid*, 23.
- <sup>19</sup> *Ibid*, 35.
- <sup>20</sup> *Ibid*, 29.
- <sup>21</sup> *Ibid*, 39.
- <sup>22</sup> *Ibid*, 448.
- <sup>23</sup> *Ibid*, 455.
- <sup>24</sup> Ambrose, *Upton and the Army*, 133.
- <sup>25</sup> Carlo D'Este, *Warlord: A Life of Winston Churchill at War, 1874-1945* (NY: Harper Perennial, 2009), 88.
- <sup>26</sup> *Ibid*, 88.
- <sup>27</sup> *Ibid*, 89.
- <sup>28</sup> Fransjohan Pretorius, "BBC - History - The Boer Wars," 28 March 2011, [http://www.bbc.co.uk/history/british/victorians/boer\\_wars\\_01.shtml](http://www.bbc.co.uk/history/british/victorians/boer_wars_01.shtml).
- <sup>29</sup> Thomas Pakenham, *The Boer War* (NY: Random House, 1979), 610.
- <sup>30</sup> Pretorius, "BBC - History - The Boer Wars."
- <sup>31</sup> Pakenham, *The Boer War*, 610.
- <sup>32</sup> The United States World War One Centennial Commission, "Home - World War I Centennial," accessed 16 April 2019, <https://www.worldwar1centennial.org/index.php>.
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**MAJ Jesse Burnette** is an Infantry officer studying defense analysis at the Naval Postgraduate School in Monterey, CA. His thesis, "From the Argonne to the Arghandab: Junior Officer Leader Development in the Modern Age," takes the salient lessons from the past century of combat to develop an in-unit leader development program for junior leaders. MAJ Burnette earned a bachelor's degree from the Virginia Military Institute and has served as a platoon leader and company commander in the 82nd Airborne Division and twice in the 75th Ranger Regiment, most recently as a company commander in the 3rd Ranger Battalion.