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U.S. ARMY WAR COLLEGE

FUTURES SEMINAR
THE UNITED STATES ARMY IN 2030 AND BEYOND
A COMPENDIUM OF U.S. ARMY WAR COLLEGE STUDENT PAPERS

VOLUME THREE (2016)

Samuel R. White, Jr.
Editor

FUTURES SEMINAR
The United States Army in 2030 and Beyond

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STRENGTH and WISDOM

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STRENGTH *and* WISDOM

FOREWORD

I n 1994 the Army embarked on the Army After Next (AAN) study plan to explore new concepts and think innovatively about how the Army would fight in the future. Envisioned as way to develop the Army after Force XXI (thought to be the Army of 2025), the AAN project was chartered by the Chief of Staff of the Army and grew to involve a wide range of participants. Think tanks, scientists, federal laboratories, and organizations across the Army undertook study projects and thought deeply about what "could be."

The Army War College also contributed to the AAN effort through strategic wargames, experimentation and student and faculty research. One of the initiatives was the AAN Seminar – a special program in Academic Year 1997 – composed of students who were interested in contributing to the development of the future Army. The students studied, debated, researched and wrote about the AAN. A compendium of their papers was published to inform senior leaders on a range of issues regarding the Army's future.

Fast forward 20 years to 2014. This was the first year of the Army War College's Futures Seminar – a seminar loosely modeled on the AAN Seminar. As with the AAN seminar, Future Seminar students and faculty collaborate to explore the Army of the Future…in this case, the Army of 2035 and beyond. As with previous years, the seminar focused on the requirements for an Army of the future – and sought to explore the question:

"What kind of Army does the nation need in 2035 and beyond?"

This 3rd annual compendium is one output of their thoughts.

Additive to the experience of the AAN Seminar students, Futures Seminar students and faculty further contribute to the Army's understanding of the future force by substantively participating in force development experimentation, wargames and symposia. This participation is made possible by an excellent partnership with the Army Capabilities Integration Center (ARCIC) – primarily through

the Chief of Staff of the Army's year-long study program – Unified Quest. This year, Futures Seminar students filled leadership roles during the deep future wargame, serving as either combined/joint task force commanders or as chiefs of staff.

The Futures Seminar students are full participants in the professional dialogue about the future force and undoubtedly provide value to the process.

Samuel R. White, Jr
Deputy Director, Center for Strategic Leadership
Faculty Lead, The Futures Seminar

The Attributes of the Future Force

Mr. Samuel R. White, Jr

We live in a dynamic world, an era of contradictory trends shaped by two great forces, one strategic, the other technical - the advent of the Information Age. The scale and pace of recent change have made traditional means of defining future military operations inadequate. Change will continue, requiring our Army to recognize it as the only real constant.

— Paragraph 1-1, TRADOC Pamphlet 525-5
FORCE XXI OPERATIONS, 1 August 1994

Twenty-two years ago the authors of TRADOC Pamphlet 525-2 visualized the operational environment of the first quarter of the 21st century. Even with the information age in its infancy, there was a premonition that something big was on the horizon. Technological innovations, they said, "…will revolutionize – and indeed have begun to revolutionize – how nations, organizations and people interact."[1] "Information technology," they wrote, "is expected to make a thousand-fold advance over the next 20 years (1995 – 2005)."[2] The implications to military operations would be both evolutionary and revolutionary.

The authors may have had their sights set too low. Futurist, author and computer scientist Ray Kurzweil estimates that between 2000 and 2007, technology advanced 1 million times – and using his "Law of

1. TRADOC Pam 525-5: *Force XXI Operations*. Fort Monroe, VA: Dept. of the Army, Headquarters U.S. Army Training and Doctrine Command, 1994. 1-5. TRADOC Pam 525-5, 1-5.
2. Ibid.

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Accelerating Returns" as a measure, anticipates it will advance a *Billion* times over the next thirty years.[3] Advances will occur exponentially faster as time passes. Progress is accelerating. During the twenty-first century, Kurzweil theorizes that we will experience 20,000 years of progress in only 100 years (based upon innovation rates of the past). Kurzweil predicts that by 2020, $1000 will buy a computer capable of 10 quadrillion calculations per second – roughly equivalent to the power of a human brain. In 2030, $1000 will buy a computer that is a thousand times more powerful than the human brain; by 2045, that same $1000 will buy a processor a billion times more intelligent than every human combined.[4]

The internet of things is real and growing and everywhere. In December 1995, there were 16 million internet users in the entire world. In September 2016, there are about 3.8 billion – and growing every day. In only 21 years, half the world's population became connected.[5]

The proliferation of technology into everything will radically change the future military and operational environment. In 2035-2050 the battlespace will be elongated and deepened – and hyper-connected. Engagements will occur at home station military bases through ports of debarkation to tactical assembly areas all the way to the adversary's motor pool. From space to the ocean floor; from military to non-military; from governmental to non-governmental; from state to non-state; from physical to virtual. The operational area will be wherever effects are generated – and the array of stimuli that will generate effects is staggering. The interconnected and global nature of *everything* will produce physical and virtual effects that have tremendous range, saturation and immediacy – along with daunting complexity and stealth.

More than ever before, the tactical fight will be influenced less by the tactical fighter and more by actors or organizations either unknown

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3. Kurzweil, Ray. "KurzweilAI Accelerating Intelligence." *KurzweilAI The Law of Accelerating Returns Comments*. Kurzweil, *Accelerating Intelligence*, 2001. http://www.kurzweilai.net/the-law-of-accelerating-returns (accessed 30 July 2016)

4. Kurzweil, Ray. "KurzweilAI Accelerating Intelligence." KurzweilAI Singularity QA Comments. Kurzweil, *Accelerating Intelligence*, 9 Dec. 2011. http://www.kurzweilai.net/singularity-q-a (accessed 3 Aug. 2016)

5. "Internet Growth Statistics." *Internet World Stat - Usage and Population Statistics*. Internet World Stats, 02 Sept. 2016. http://www.internetworldstats.com/emarketing.htm (accessed 2 Sept. 2016)

to the warfighters, or beyond their ability to affect. A hacked and corrupted computer server in the Defense Logistics Agency will have a disproportionally greater impact on a brigade's combat readiness than an enemy's attack on a main supply route.

Increased adversary reach and the ubiquitous battlespace in the future will mean U.S. freedom of action in all domains will be heavily contested and both sides will take asymmetric cross-domain approaches to offset overmatch. An advantage in fighter aircraft quantity and quality will be offset by adversary interdiction of airfields, radar spoofing, and cyber paralysis of air command and control. Overmatch in ground combat systems will be offset by multi-domain deception, cyber-corrupted logistics networks and swarms of autonomous lethal and non-lethal weapons. An advantage in strategic mobility will be offset by formidable anti-access capabilities, sophisticated information campaigns, and contested deployment that extend into service members' homes, families and private lives.

The absence of sustained overmatch in previously uncontested physical domains will place U.S. forces in an unfamiliar position. Supremacy and superiority in the physical domain will be temporary at best and unlikely at worst. In the future, the concept of decisive point may well be different. In fact, a decisive point may not exist at all – or may have to be created. Lethality and adversary reach will make offensive action less decisive in some domains. Maneuvering to positions of advantage may be impossible and the future principles of war (particularly offensive, mass and maneuver) may not apply – or will be fundamentally different.

Future conflict will likely find adversaries fighting to create a narrow window of advantage, taking action, and then fighting to regain the advantage once lost (or to gain a different advantage). Each side will be continually challenged to identify which advantages to seek and, most importantly, to recognize when the advantage is gained (and when it is lost). The opportunities for action will be sudden, fleeting and will change sides.

While advantages in the physical domains may be brief and few, sustainable decisive advantage (superiority / supremacy) could be gained in the cognitive domain – the boundary-free area of the battlefield which encompasses knowing, predicting and deciding. Though not

a domain in the strictest doctrinal sense, the cognitive dimension of human (and artificial intelligence) and organizational perception is a critical arena for future conflict. In the future, individuals, teams, units and the entire force will operate far more cognitively connected than today – almost as a single cognitive organism. There is great potential for common understanding....collective decision making....and unified anticipatory action. Unlike the physical domains, dominance in the cognitive *domain* is less vulnerable to asymmetric offset. Adversaries may attempt to prevent each other from gaining knowledge, but offsetting the advantage once it is achieved is difficult. Knowledge is not fungible – something is either known or it is not.

Advantages in the cognitive *domain* could be deep and long-lasting. In future conflict, ambiguity will increase despite interconnectedness. The velocity and scale of activity will make it difficult to discern the important from the unimportant; the real from the fake. Adversary spoofing, deception, and data manipulation and corruption will create a common operational picture that is part fact, part fiction. This murky situational awareness will feed decision cycles that will be compressed by pervasive data and near-instantaneous communications. Decision events will increase in frequency and speed. The OODA loop decision cycle (observe, orient, decide, act) – must be compressed in the short-term to RDA – (recognize, decide, act). Observation and orientation as discrete actions will be a luxury that the future battlefield will not allow. Superiority will be predicated on further evolving the decision cycle to PDA (predict, decide, act) – with the goal of reducing (or ultimately eliminating) the time to decide – PA (predict, act) – through automation and artificial intelligence (AI).

Predicting will be more important than understanding. In fact, AI could make it possible to reliably predict without understanding. Accurately predicting changes to the environment and probable adversary actions makes it possible to be anticipatory and preemptive – gaining supremacy over the adversary by eliminating their options – and then focusing on countering the option(s) that remain. Limiting adversary options controls outcomes and denies the adversary the initiative (at a minimum the range possible choices are controlled). Conversely, retaining friendly freedom of action (options) is imperative. Cognitive reliability and the

ability to act appropriately (time and action) will be the foundational principles to build a sustainable advantage.

As the Army develops concepts to guide development of the future force, it will also describe the attributes of the future force as principles that will frame required capabilities. These attributes are important descriptors that tell what the future force *is*. Getting them right is important.

The authors of the Force XXI concept developed characteristics of the Force XXI as a "unifying concept" to help focus force and capability design:

- Doctrinal *Flexibility* – operations across a varied and multifaceted strategic landscape.

- Strategic *Mobility* – being at the right place at the right time with the right capabilities.

- *Tailorability* and *Modularity* – using those forces which are absolutely necessary.

- Joint, Multinational, and Interagency *Connectivity* – battle command systems must promote interoperability with a range of partners.

- *Versatility* in War and Operations Other Than War (OOTW) – trained and ready forces that can win the land battle and transition to OOTW missions as required.[6]

Given that the authors envisioned a thousand-fold advance in information technology over the ensuing two decades (and may have actually been off by a magnitude of a thousand), their proposed characteristics seem remarkably absent any consideration of information technology for the Force XXI.

If the future operational environment is markedly different from today, then the attributes of the Army should be different. Legacy attributes such as mobility and versatility are focused on the physical domains, where any advantage is fleeting and is met with asymmetric counters. Using these legacy attributes solely to describe the future force belies appreciation of the future operational environment and the evolving character of warfare and does not fully account for the possibility of sustainable advantages in the cognitive *domain*.

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6. TRADOC Pam 525-5, 3-1 to 3-2.

While the (some) legacy attributes may still be useful to describe the Army in 2035-2050, the Army should continue to broaden its thinking about the character of the future force. Simply projecting a variant of the current force into the future and outfitting it with new equipment is not intellectually rigorous enough to fully explore how the future force <u>must</u> operate – nor will it ensure the future force is prepared for the challenges of the future operational environment. If the traditional notions of superiority and supremacy in the physical domains have changed, then new attributes must be described for the future force – because how it will operate must change as well. This new set of attributes would likely include legacy attributes – and some legacy attributes may not be relevant 30 years in the future and should be discarded.

The cognitive component should not be overlooked in developing the future force. While cognitive attributes are not the only characteristics, they will be integral to how the force operates. Integrating cognitive qualities into a description of the future force will help the Army visualize itself over the coming three decades. Though admittedly not an authoritative or an exhaustive listing, the following six attributes provide examples of a *type of broad thinking* about the Army of 2035+:

<u>The Future Force is: Continuously Learning – Continuously Aware</u>. The Future Force continuously increases understanding of the environment, the adversary and itself.

- Scans the environment across all domains
- Collects the right data and information at the speed of production
- Synthesizes the data into relevant knowledge in advance of need
- Assembles and forms the knowledge into increased awareness

<u>The Future Force is: Predictive</u>. The Future Force anticipates and predicts events and their implications to the environment, the adversary and itself.

- Integrates autonomous and continuous learning into decision making tools and processes
- Incorporates advanced analytic and assessment capabilities at tactical echelons
- Reduces adversary options and minimizes possible outcomes

- Leverages embedded modeling and simulations in weapons and mission command systems

- Adapts operations in anticipation of changes to the operating environment

The Future Force is: Unknowable (Hidden). The Future Force hides its intent and actions from adversaries.

- Deceives the adversary as to true intentions – engrained and embedded deception capabilities at multiple echelons and multiple platforms make deception an integrated part of operations

- Ensures communications security and data reliability

- Employs anti-acquisition measures – stealth, camouflage and emissions minimization

- Reduces predictability by increasing the pace of decision making

The Future Force is: Compelling. The Future Force confronts the adversary with unacceptable outcomes or consequences.

- Predicts adversary vulnerabilities in time and space

- Shapes the environment to reduce adversary options

- Achieves multi-domain overmatch at adversary fracture points

- Deters or defeats adversaries to achieve and sustain desired outcomes

The Future Force is: Adaptive. The Future Force operates in a contested environment that is volatile, uncertain, complex and ambiguous.

- Maintains systems and processes that are continuously learning and self-healing

- Employs Soldiers, teams and units that are multi-functional and cross-domain capable

- Safeguards a baseline backup capability for critical systems and processes

The Future Force is: Decentralized. The Future Force is capable of increased levels of distributed or independent action.

- Operates as dispersed organizations but anticipates and aggregates effects and efforts

- Adapts to fractured mission command in a degraded communications environment – with understanding of the risk and impact to the mission

- Continuously understands and accounts for vulnerabilities and changes to mission command systems and processes

- Changes mission command and organizational structure (task organization) near-instantaneously

- Empowers, enables and informs leaders to employ the greatest level of mission command

- Equips individual Soldiers to operate autonomously or (semi) independently (autonomous Soldier)

The Army should exercise honest intellectual rigor in envisioning and developing the future force. The Training and Doctrine Command's Force 2025 and Beyond maneuvers are a sound roadmap and process, but caution must be given to avoid describing the future force by solving today's problems with today's forces – equipped with tomorrow's technology. This thinking will lead us to search for a better howitzer or a better tank…rather than to ask the questions, "what is better than a howitzer"…or "do we still need tanks"?

Posturing the Army to dominate in 2035+ will require broad and innovative thinking. Beyond fielding a force that simply competes in the physical domains, the Army of 2035+ must be designed to dominate and achieve overmatch in the cognitive *domain*; for the greatest potential for *superiority / supremacy* lies here.

Intelligence Explosion and the Future Force

Colonel Kevin P. Butler, U.S. Army

The nature of war will never change as long as it remains a human endeavor. It is "why" we fight; it is the "reason" war is waged. The character of war, however, is "how" we fight and does change – it is influenced by technology, organization, doctrine, the domains in which war is waged, and the adversary in which we are contesting. Artificial intelligence (AI) will change the character of war and impact the speed, lethality and precision of U.S. warfighting capabilities. Its effect will influence the organization of U.S. forces, mission command, doctrine and how war is waged within the domains of land, sea, air, cyber and space. The evolution of AI can positively impact the "ways" and "means" of U.S. forces in support of national interests if managed correctly, but we should be extremely cautious to ensure that AI does not evolve beyond our control and change the nature of war. A change to the nature of war as a result of autonomous super intelligent AI could cause an existential threat on a global scale. AI in support of future forces should be constrained to the conduct of war (jus in bello) and not leveraged to act autonomously aimed at the reason for war (jus ad bellum).

Prominent scientists such as Steven Hawking, Bill Gates, Elon Musk, and Shane Left (co-founder of Google Deep Mind) have voiced

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warnings about the possible global threat of a super intelligent AI.[1] This is applies when humans are taken out of the decision cycle, especially in matters of strategic scale. Their position is once AI evolves beyond the scope of human intelligence, it will become impossible to understand and manage. Managing and understanding an intelligence explosion is a critical concern for the safe use of AI. The theory of intelligence explosion states that once machines have surpassed human intelligence, they could produce more capable machines. This second generation could be tasked again with designing superior versions, producing a third generation, then a fourth, a fifth, etc.[2] This large increase in machine capability is the "intelligence explosion" and happens rapidly once AI has surpassed the level of human intelligence.[3] The "chain reaction" and management of a super intelligent AI will require an understanding of intelligence explosion in order to prevent catastrophic consequences.

> *Intelligence explosion must have a controlled detonation, we have one chance to get it right, it's like creating a nuclear weapon.*[4]

> —Nick Bostrom

Several arguments in support of super intelligent AI revolve around the benefits to humanity and warfighting in a period of declining resources. These romanticized benefits (cure disease, efficiency, speed, precision, etc.), have created an ideological gap in thinking that has overlooked the strategic implications on the nature of war; and the secondary impacts on a global scale, if mismanaged, have not been clearly identified. This is most evident with counter arguments that gloss over potential catastrophic consequences supported by assumptions

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1. Paul Croke, "Artificial Intelligence could spell the end of the human race," *Baltimore Post Examiner*, June 9, 2015, http://baltimorepostexaminer.com/artificial-intelligence-could-spell-the-end-of-the-human-race/2015/06/09 (accessed May 22, 2016)

2. Daniel Dewey, "The long-term future of AI (and what we can do about it) at TEDxVienna" December 6, 2013, https://www.youtube.com/watch?v=CK5w3wh4G-M (accessed May 20, 2016)

3. Ibid.

4. Nick Bostrom, "What happens when our computers get smarter than we are" March, 2015, https://www.ted.com/talks/nick_bostrom_what_happens_when_our_computers_get_smarter_than_we_are?language=en (accessed May 20, 2016)

that human values can be reliably encoded and reliable machine self-improvement will occur.

U.S. National Policy is derived from our National Purpose (values, ethics, and beliefs), which translates to National Interests and resulting grand strategy to support political objectives. The values, ethics and beliefs that encompass our National Purpose are purely associated with an American identity. It is the American cultural framework which determines purpose, values and interests that form the foundation for policy and strategy to attain, or to preserve those interests. The National Military Strategy states that enduring National Interests include the respect of "universal values" at home and around the world, and the preservation and extension of universal values as part of National Security Interests.[5] Arguments can be made that the promotion of universal values are subject to the interpretation of the dominant culture's values. For example, "slavery was once accepted as natural or even divinely ordained throughout much of history – as long as the dominant culture accepted it as such."[6] Another criticism of universal values states that it can only become universal when it is so abstract that it becomes meaningless.[7] "Fairness" (justice, equality, and respect) may be somewhat universally accepted but the prescription for fairness will vary widely from culture to culture.

One method often touted to circumvent these ambiguities associated with machine learning is to emulate the human brain using neural nets or evolutionary algorithms to build dozens of separate components which can then be pieced together.[8] However, this is dubious as the interpretation will vary across individuals and culture. This method is based on the assumption that machine learning will evolve and produce the results we want based on things that are ambiguous and subject

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5. The Joint Chiefs of Staff, *National Military Strategy of the United States of America* (Washington DC: The White House, June 2015), 5.

6. Hick, J., "The Universality of the Golden Rule," in J. Runzo (Ed.), *Ethics, Religion, and the Good Society: New Directions in a Pluralistic World* (Louisville, KY: Westminster/John Knox, 1992), 155-166.

7. Linton, R. L. "The Problem of Universal Values," in R. F. Spencer (Ed.) *Moral Principles of Action: Man's Ethical Imperative* (New York: Harper & Brothers, 1954), 39-47.

8. Luke Muehlhauser, "Intelligence Explosion FAQ," Machine Intelligence Research Institute, 2013, https://intelligence.org/ie-faq/#HowCouldGeneral Intelligence (accessed May 22, 2016)

to interpretation. How essential is it to have confidence in results obtained through super intelligent AI without having the capability to understand how it was derived? The saying "I don't know what I want…but I'll know when I see it" comes to mind, but even then it is subject to the interpretation of whoever is in charge. Even a machine successfully designed with benevolent intentions could easily go awry when it discovers implications of its decision criteria unanticipated by its designers.[9] The limitation of AI design will be biologically limited to a human's ability to account for all possible criteria from which an AI will consider in its decision cycle. Shane Left, the co-founder of Deep Mind, and a pioneer in the design of neural nets singled out AI as "the number one risk for this century" if not managed correctly.[10] Managing an intelligence explosion will require a long-term strategy that incorporates parameters to ensure that it remains controlled. This may include controlled biologically assisted AI (trans-human technology) to overcome human limitations in AI design, or it may include limiting the scope of AI platforms to perform specific tasks or functions in support of human interactions, instead of an automated "general" super intelligent AI that would have to power to change the nature of war.

The nature of war will always remain a human endeavor as long as there are humans on this planet representing different cultures. Humans must remain in control at the strategic level, assisted by AI as the world evolves. There are far too many issues which are not fully understood associated with the development of an autonomous "general" (human level of intelligence) AI, which has the capability to learn at machine speeds and "self-improve" resulting in an unharnessed super intelligence. Containment after the fact would almost be impossible once exposed, as there is no "off switch" to the cyber domain.

The future force should leverage AI as supporting and not a supported role. The Deputy Secretary of Defense (DEPSECDEF) Robert Work astutely recognized that AI should remain as a supporting function to U.S. forces when describing the "Third Offset Strategy." This strategy is designed to ensure that U.S. military forces can successfully operate in a technically evolving world. This includes electronic warfare, space,

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9. Ibid.

10. Croke, "Artificial Intelligence could spell the end of the human race"

cyber considerations, and the profusion of precision munitions. The question of how the future force should operate in this scenario is a very difficult problem.[11] As technology changes the character of war, the role of AI should be to help humans make decisions and act autonomously with strict controls when fighting or reacting in domains that require machine speeds. Examples include keeping an "unblinking eye on potential enemies; to sort through gigabytes of big data for actionable intelligence; to see subtle patterns in the movement of troops and satellites; to counter incoming cyberattacks, jamming, and missiles that move too fast for human reflexes; to assemble routine target lists so the humans can concentrate on strategy."[12] Concentrating on strategy requires an understanding of the current operational environment (OE), desired OE, and a design and approach to shape those outcomes.

One of the biggest problems facing senior leaders is understanding the future OE. The conditions, circumstances, and influences that affect the employment of capabilities extend beyond an adversary's technology, organization, and doctrine. It includes understanding the cultural framework (identity, political culture, and resilience), which is deterministic of behavior. According to the DEPSECDEF:

> *The third offset strategy should be framed as the establishment of comprehensive deterrence under a 21st century model in the face of nuclear-armed adversaries opposed to the current international order; it is an attempt to prevent great powers from using violence as a form of arbitration by deterring them from acting with their military instrument.*[13]

11. Shawn Brimely and Loren Dejonge Schulman, "Sustaining The Third Offset Strategy In The Next Administration," *War On The Rocks*, March 15, 2016, http://warontherocks.com/2016/03/sustaining-the-third-offset-strategy-in-the-next-administration/ (accessed May 26, 2016)

12. Sydney J. Freedberg Jr., "People, Not Tech: DepSecDef Work On 3rd Offset, JICSPOC," *Breaking Defense*, February 9, 2016, http://breakingdefense.com/2016/02/its-not-about-technology-bob-work-on-the-3rd-offset-strategy/ (accessed May 25, 2016)

13. Andy Massie, "Reframing the Third Offset as a 21st Century Model for Deterrence," *War On The Rocks*, March 28, 2016, http://warontherocks.com/2016/03/reframing-the-third-offset-as-a-21st-century-model-for-deterrence/ (accessed May 25, 2016)

AI and technology will certainly contribute to attaining capability overmatch across the domains of conflict, but It is only one half of the problem to be solved. Understanding and shaping the OE will be critical to the future force as information in a globalized era expands and diffuses at machine speeds. AI can play a critical role by assisting the future force with the development of a strategic design in order to facilitate understanding of the OE to shape the environment.

> *The highest realization of warfare is to attack the enemy's plans; next is to attack their alliances; next to attack their Army; and the lowest is to attack their fortified cities.*[14]

> —Sun Tzu

The American Way of War may be technology enabled, but it must also respect the fact that both war and warfare are culture centric as well as human centric.[15] While the character of war is influenced by technology, it must keep this aspect in context when augmenting performance with AI. Structuring future forces to operate across the full spectrum of conflict as described in the Army Operating Concept will remain a challenge. We must possess the right capabilities and have the flexibility to adjust to the nature of the threat, the changing environment and levels of conflict. This can only be successful upon identification of the anticipated OE, identification of the problems, an adversary's propensity to impose their interests, and the potential of our ability to influence their actions. Deterrence in the future or desired OE should include bending an adversary's will in order to change their interests in the region, and reduce the propensity of an adversary to take undesired action before it happens. This must be accomplished through strategic design and a strategic approach between the Department of State and Department of Defense at the grand strategy level. It should include the synergistic application of all elements of national power augmented by technology and AI across the five domains in concert with regional capabilities. The desired effects should be to shape an adversary's interests through synergistic application to alter the strategic environment in our favor and fear of U.S. capabilities.

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14. Sun Tzu, "The Art of War," May 16, 2009, http://sun-tzu-aow.blogspot.com/2009/05/chapter-3-planning-offensives.html (accessed May 25, 2016)

15. Frank Hoffman and Michael C. Davies, "Joint Force 2020 and the Human Domain: Time for a New Conceptual Framework?" *Small Wars Journal*, June 10, 2013**.**

The Big 8's Potential for Battle Group 2030

Colonel Kyle E. Feger, U.S. Army

I am tempted indeed to declare dogmatically that whatever doctrine the Armed Forces are working on now, they have it wrong. I am also tempted to declare that it does not matter that they have got it wrong. What does matter is their capacity to get it right quickly when the moment arrives.

—Michael Howard[1]

The U.S. Army's Training and Doctrine Command laid out its "Big 8" initiatives in March 2016 during the Association of the U.S. Army's Global Force Symposium. The goal of the Big 8 is to stay ahead of global threats and maintain overmatch against present and future adversaries. These initiatives for modernization include:
- Future Vertical Lift
- Active protection
- Cross-domain fires
- Combat vehicles
- Robotics and autonomous systems
- Expeditionary mission command

1. Michael Howard, "Military Science in the Age of Peace," *Journal of the Royal United Services Institute for Defense Studies* (March 1974), 7.

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- Cyber electromagnetic
- Soldier/team performance and overmatch

> Moving these efforts from initiatives to fielded capability will prove challenging. The next five years – a typical Defense Department future years budget planning cycle – poses "significant risk," specifically to the Army as it fights the other services for funding major priorities, said Jim McAleese, a Washington-based defense budget analyst, during a Big 8 panel discussion.[2]

If the DoD and Army put the appropriate amount of money and effort toward these eight initiatives, and pair them with a purposefully designed new combat formation – the Medium Armored Battle Group – the result could be the much enhanced and innovative combat capability the Army and the nation needs in 2030 and beyond.

The Medium Armored Battle Group would be based loosely on the current MTOE of the Stryker Brigade Combat Team (SBCT) with several hybrid solutions and augmentations integrated into the organization. The goal would be to restore strategic and operational maneuver to the medium-weight force in order to enable rapid and decisive responses to emerging contingencies across the Range of Military Operations.

The current SBCT construct was a response to DoD and Army transformation efforts at the turn of the century and was meant to address the 'heavy' forces' inability to deploy globally in a timely fashion, and the 'light' forces' inability to provide staying power against an adversary with more mobility, firepower, and protection. The fact that the SBCT went from conception to combat in Operation Iraqi Freedom in less than four years is testament to the potential agility of the Army to innovate when necessary to meet emergencies.[3] However, the quick turnaround of the organization and subsequent employment

2. Jen Judson, "Army unveils its 'Big 8' initiatives," *Defense News*, March 16 2016 http://www.defensenews.com/story/defense/show-daily/ausa-global-force/2016/03/16/us-army-unveils-its-big-8-initiatives/81882852/ (accessed 16 May 2016)

3. Mark J, Reardon and Jeffery A. Charlston, *From Transformation to Combat: The First Stryker Brigade at War* (Center for Military History U.S. Army, Washington D.C., 2007), iii.

in combat in Iraq and Afghanistan over the ensuing decade hampered the realization of some of the more advanced concepts as originally envisioned.

Therefore, as the Army emerges from over fifteen years of counterinsurgency and stability operations, and takes a hard look at what capabilities are needed to meet threats from emerging near-peer and peer competitors, it must apply the enhanced capabilities of the Big 8 to the SBCT to take it to the next logical level – the Enhanced Medium Armored Battle Group. With the realities of shrinking fiscal budgets for large defense procurements, the Army will have to become more creative with the ground combat vehicle platforms it currently possesses to make them better and employ them smarter. "Continued modernization of the Stryker BCT's combat vehicles is required to regain its mobility and increase its ability to employ precision long-range fire."[4]

In order to present adversaries with multiple dilemmas through multiple domains, the vertical lift line of effort will be critical for employing this battle group. As vehicles continue to add more protection, armament, and C4I enhancements, they have outgrown our intra-theater lift capability. By 2030 only one of nine of the SBCTs will be light enough to move via C-130 lift due to the weight of the Double-V Hull protection upgrade. This weight puts additional strain on the C-17 fleet and limits the number, size, and capabilities of available airfields where the battle group can be air landed. The Army must invest in future heavy vertical lift to include rotary-wing aircraft large enough and strong enough to lift a Medium Armored Combat Vehicle, with the science and technology enhancements to deliver the force in a dispersed and indirect approach, to hit the enemy at his Achilles' heel and put him on 'the horns of a dilemma.' This can be achieved only by increasing the vertical lift capability of the aircraft while simultaneously reducing the weight of the vehicles.

The Battle Group must have improved active protection. Similar to the Trophy system developed by the Israeli Defense Force (IDF), the system must be capable of enabling the vehicle to survive the first contact

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4. *The U.S. Army Combat Vehicle Modernization Strategy*, Maneuver, Aviation, and Soldier Division, Army Capabilities Integration Center (Ft. Eustis, VA: U.S. Army Training and Doctrine Command, September 2015), 9.

with an asymmetric, hybrid enemy with improved anti-tank guided missile (ATGM) munitions.[5] And with the proliferation of near-peer competitors employing massive rocket artillery barrages, these vehicles must have protection against top-attack and cluster munitions in 2030. Swarming small unmanned aerial vehicles (UAV) tactics employed by competitors will be engaged and defeated by 50Kw Lasers mounted on the organic Air Defense Platoon vehicles.[6]

Because the Battle Group will accomplish its tasks in a more dispersed fashion to avoid large consolidated targets, it will continue to rely heavily on cross domain fires to enable its movement into and maneuver through the future contested environment. This will require even more emphasis in training to employ joint, cyber, and space fires and effects throughout the battlespace. In the Anti-Access/Area Denial (A2AD) threat environment of the future, the Battle Group can no longer depend on the air-superiority advantage the Army has enjoyed since the end of the Korean War. In order to penetrate enemy territory by air, sea, or land, cross-domain fires must open windows of local superiority in time and space to enable the delivery of the battle group, and then keep the window open in order to sustain the forces on the ground. The Battle Group will retain an organic indirect fires capability by employing a 155mm tubed artillery gun on a medium armored vehicle platform, making it self-propelled and commensurate in mobility and protection with the other vehicles of the Battle Group. It will also maintain the Mortar Carrier Vehicle to bolster short range indirect fire capacity that is all terrain, all-weather, all-visibility capable for those occasions where airpower cannot fly or space and cyber effects are negated by the enemy.

The Battle Group will employ a hybrid fleet of vehicles, both manned and unmanned. The most common vehicle will be the next generation Stryker vehicle. It will be wheeled, medium-armored, and employ a mix of 30mm cannons and ATGM launchers for improved lethality

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5. Barbara Opall-Rome, "Israel To Equip Troop Carriers With Trophy APS," *Defense News*, 28 January 2016, http://www.defensenews.com/story/defense/land/vehicles/2016/01/28/israel-trophy-active-protection-system-aps/79460018/ (accessed 16 May 2016)

6. Scott R. Gourley, "'Laser Stryker' a Collaborative Countermeasure," *Army: The Magazine of the Association of the United States Army* (AUSA: Arlington, VA, May 2016), 75.

against armored threats. Additionally, the much-maligned Mobile Gun System (MGS) will be replaced by the newly fielded semi-autonomous Mobile Protected Firepower Platform.[7] This ground combat vehicle will provide an increased direct fire overmatch capability to both the Light Infantry Battle Group to include Airborne and Air Assault units, as well as replace the MGS in the legacy SBCT formation. The system will feature a 120mm main gun to defeat armor threats as well as destroy reinforced enemy dismount positions, bunkers, and buildings. The system will be semi-autonomous in that it can be employed by a crew of three, or remotely controlled. The requirement to keep a human in the loop for lethal decision making is likely to remain into the year 2030, but the unmanned option allows use as a firepower/breacher vehicle to attack enemies in complex mountainous and urban terrain, in front of the dismounts and their infantry carriers with decreased threat to human operators.

Other robotics and autonomous capabilities that will be integrated will include small recce robots to conduct route and point reconnaissance from longer standoff distances. A dismounted breaching robot will also facilitate the traditional infantry task of entering a building and clearing rooms by blowing the door, then stunning the occupants with a non-lethal stun grenade, smoke, and intense strobe-light. The robot can also be employed in canalized terrain to proof a lane before introducing vehicles into a defile or potential ambush. Additionally, autonomous UAVs will launch from each vehicle and fly ahead of the unit to identify threats over the horizon. The UAVs will provide real-time video back to the vehicle commanders and identify targets while the force remains covered and concealed one terrain feature behind the UAV screen line. The UAVs will be capable of lasing the targets and relaying data back to the myriad weapons systems available in the battle group to select and employ the best weapon system for the mission – 30mm, ATGM, artillery, or joint fires.

In order to improve protection from future enemy electro-magnetic detection capabilities, the battle group will be dispersed in a fashion not seen in the history of warfare. The organization will be employ expeditionary mission command throughout all echelons. Small

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7. Gordon L. Rottman, *Stryker Combat Vehicles* (Osprey Publishing, New York, NY, 2006), 22.

units down to platoon and even vehicle section level will operate well out of line of sight of one another but have advanced situational awareness and C4I connectivity that will allow them to see where their counterparts are on the battlefield. The Augmented Squad "A-squad" and its associated vehicular platform will be able to cover the terrain a platoon once covered through a mix of humans and systems optimized for seeing, sensing, targeting, and destroying the enemy. If necessary, the ground vehicle platform can be operated remotely with the full squad dismounted, and the vehicle providing supporting fires, casualty evacuation, and resupply activities at the command of the leader.

With the proliferation of electro-magnetic and cyber threats on the future battlefield, the battle group will have to rely more than just physical dispersion to reduce its target signature. Each vehicle will mount an electro-magnetic jammer providing an invisible protective bubble around it that masks friendly unit signatures to enemy detection while still allowing friendly unit communications systems use. Classic Electronic Warfare will be employed in military deception operations to fix enemy forces on flanks, maneuver to a position of advantage and attack the enemy via the indirect approach.

Finally, the future Battle Group will attain overmatch in the human dimension through performance enhancement training for individuals and team development. Initiatives begun at the individual training level in initial-entry training will extend to small unit training to include imaging, energy control, goal setting, and when to employ the practice (training) versus competition (combat) mindsets. Units from Platoon to Battle Group will employ a simulations capability resident in every vehicle to conduct full force virtual rehearsals in the Intermediate Staging Base or at the Line of Departure. This will allow the Soldiers and units to play out a full engagement through their C4I systems with graphics depicting the terrain and enemy array they will face. Additionally, this virtual combat simulation capability will allow a replay of the battle to conduct a more realistic after action review as soon as gains are consolidated and security established. Weapons sensors will calculate ammunition and other supply expenditure and generate a resupply request to the unit's autonomous support platoon to deliver all classes of supply as needed.

In order to stay ahead of the myriad hybrid threats the United States will encounter across the range of military operations in 2030, we must adapt and inculcate the changing aspects of warfare vis-à-vis science and technology, while simultaneously engaging in the human dimension of warfare that is the enduring and immutable nature of war as a human struggle of wills and extension of politics.

> *The CBO estimates acquisition costs for major programs will exceed DoD estimates by $155.5 billion for the period of 2017 through 2030, with more than $130 billion of the overage coming after 2020. There is nothing new about the military pushing expensive programs into the future but affordability becomes a major factor in the fate of major systems. Smaller buys, delays or even cancellations are possible.*[8]

As the Army is forced by budget constraints to focus on the current and short-term readiness of its forces to be ready to "Fight Tonight," we must remain vigilant in visualizing the future battlefields and ensure our nation has the best, most capable force required to meets the demands of armed conflict in 2030 and beyond. The Big 8 Army initiatives unveiled in May 2016 must be developed and integrated into a future force that is more capable of defeating all threats along the spectrum of future conflict from counterinsurgency and stability operations through high intensity conflict waged with armored vehicles, electromagnetic pulses and swarming unmanned vehicle tactics. We can no longer afford to mortgage the future by delaying and deferring these required capabilities.

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8. "AUSA's Five Things: A Weekly Tip Sheet for AUSA Members," http://us8. campaign-archive2.com/?u=cf4422403808ba82123895442&id=92a32bbe5a&e=8 b6fc6dd42

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The Army in 2030 and Beyond: Insights on Domain Challenges

Lieutenant Colonel Philip A. Holmes, U.S. Air Force

The 2014 *Quadrennial Defense Review* observed that, "modern warfare is evolving rapidly, leading to increasingly contested battlespace in the air, sea, and space domains – as well as cyberspace – in which our forces enjoyed dominance in our most recent conflicts."[1] Likewise, General Raymond T. Odierno, in his forward to the 2014 Army Operating Concept (AOC), stated:

> *Army forces will be essential components of joint operations to create sustainable political outcomes while defeating enemies and adversaries who will challenge U.S. advantages in all domains: land, air, maritime, space, and cyberspace. Joint operations are critical to cope with such complexity, and the Army's contribution must provide unique capabilities and multiple options to the President, Secretary of Defense, and Combatant Commanders.*[2]

These observations highlight the challenges and environmental complexities when developing the future joint military force – and

1. Charles T. Hagel, *Quadrennial Defense Review* (Washington DC: U.S. Department of Defense, March 2014), III.
2. U.S. Army Training and Doctrine Command, *The U.S. Army Operating Concept: Win in A Complex World* (Fort Eustis: Training and Doctrine Command, October 31, 2014), i.

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then defining the specific role of the Army in 2030 and beyond. The necessity of joint operations along with the overlapping nature of the land, air, maritime, space and cyberspace domains create a fundamental dilemma in determining capabilities needed from each of the components to contend with peer adversaries in all domains.

The Army Operating Concept describes the Army, "as part of joint, inter-organizational, and multinational teams, employs forces and capabilities in complex environments against increasingly capable opponents."[3] The Army cannot solve the issue of how the Army will fight, organize or understand the future capability gaps without clearly understanding the fight throughout the five domains along with the joint, interagency and coalition capabilities. Briefly exploring some of the broad conceptual dilemmas in each of the domains will highlight the importance of looking at the future Army in terms of domain capabilities (vice strictly land capabilities).

The land domain appears simple to understand, but there are clear conceptual issues with operating in the land domain. As defined in *The Army Operating Concept*, "the land domain is the Earth's physical surface located above the high water mark and inclusive of the physical, cultural, social, political, and psychological aspects of human populations that reside upon it."[4] The fundamental and central land-force competency may be influencing people through elements of culture, social, political and physiological means. To defeat, deter and deny an enemy may be possible through these factors and may likely not involve military combat at all. The idea of the land domain as strictly terrain or geography is likely of limited value in the future. The people who occupy the land hold the power in the land and they should continue to be the primary focus of the future conflicts with less emphasis on the physical.

The physical nature of land combat is evolving and presents its own challenges. The land is likely to continue to grow perceptively smaller as technological advances increase along with better communication and extended reach weapon systems. The "battlefield" in essence has grown to a global space versus large theaters of operation. The idea of a commander overlooking or having a physical presence on a battlefield

3. Ibid., 25.
4. Ibid., 47.

is again a piece of history with potentially little relevance in the future. The physical land domain is large, ground forces cannot physically cover the battlespace, and commanders will likely be geographically separated from their formations. Small tactical engagements around the globe may become a reality, but not by combat forces actually occupying the physical part of the land domain – an eventuality against a peer or near-peer adversary. The current practice of employing historically linear combat formations and closing with the enemy will be prohibitively difficult on the land and will generate a strong reliance by the Army on the other domains.

The air domain poses challenges to the future Army as the rise of more capable peer competitors contest this domain. As described in JP 3-30, the air domain "is the atmosphere, beginning at the Earth's surface, extending to the altitude where its effects upon operations become negligible."[5] The air domain, unlike land, is not people centric. Operations in the air domain employs technical solutions to effect the people on the ground. For land forces to move or maneuver on the ground there must be a level of dominance in the air – often against an adversary seeking the same advantage.

There are different levels of dominance or control of the air domain. These levels are defined as, "no control, to a parity (or neutral) situation wherein neither adversary can claim any level of control over the other, to local air superiority in a specific area, to air supremacy over the entire operational area."[6] This broad range of control makes the integration of the air domain important to how the Army shapes itself in the future. The rise of the peer competitors such as Russia and China with forces capable of contesting the air domain will likely make air superiority difficult to attain or maintain. The Army land forces need to plan for this inevitability and factor in these scenarios to determine how to conduct operations or shape the Army in this contested environment. Furthermore, the use of future advanced technologies generated from the land or other domains become more of a necessity. The service components primarily operating in the air domain require additional cross-domain effects to counter the peer combatant. This does not

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5. U.S. Joint Chiefs of Staff, *Command and Control of Joint Air Operations*, Joint Publication 3-30 (Washington DC: U.S. Joint Chiefs of Staff, February 10, 2014), I-1.

6. Ibid.

necessarily mean the Army must fill capability gaps of other services, but these gaps must be identified and accounted for in planning for the future operating environment and in turn the future Army. An Army that assumes the future environment will yield air parity (at best) and accounts for it will be better prepared for operations than the Army, which counts on air superiority (at worst) and is surprised and disadvantaged when it does not materialize.

The maritime domain is not without challenges that provide insights for consideration in planning for the Army of 2030 and beyond. The maritime domain is described as "the oceans, seas, bays, estuaries, islands, coastal areas, and the airspace above these, including the littorals."[7] Again, as with the air domain the maritime assets assist with freedom of maneuver and other support on the land. Additionally, maritime assets provide for freedom of navigation and access to contested regions.[8] If there is a contested maritime domain, direct support to the land through execution of joint fires or other maritime capabilities is limited. In addition, there are negative effects on land forces with the inability to create access for personnel and equipment into various regions. As the ability to project maritime domain power diminishes, there are gaps to the capabilities of the joint force. Again, creating insight for the Army in terms of expectations within the maritime domain and the possible limitations of joint maritime capabilities are important considerations.

The Army must look at those access vulnerabilities and determine how to mitigate them. Planning for the future of the Army must take all capabilities and limitations within the maritime domain into consideration. The Army's current reliance on maritime access for deployment and sustainment may be a vulnerability that induces unacceptable strategic risk into the future force. Lighter air-deployable combat platforms, additive manufacturing, prepositioned stocks, self-sustaining formations and increased partner and host-nation capabilities are some ways to mitigate this risk. There is a list of dilemmas created with the disruption of a single domain and the maritime domain is no exception.

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7. U.S. Joint Chiefs of Staff, *Command and Control for Joint Maritime Operations*, Joint Publication 3-32 (Washington DC: U.S. Joint Chiefs of Staff, August 7, 2013), I-6.

8. Ibid., I-3.

The next domain posing challenges in planning for the future Army is space. This domain inherently affects all the other domains with complicated technical challenges. The description of the space domain is the "region above the earth's surface in which astrodynamics generally govern the planning and conduct of military operations."[9] A very technical definition that is not necessarily helpful in understanding this domain. More important to understand the capabilities applied or available in the space domain and how these capabilities in turn affect the other domains. Some examples include intelligence, surveillance, reconnaissance, missile tracking, launch detection, environmental monitoring, satellite communications, positioning, navigation and timing.[10] Understanding the integration of these capabilities into the other domains further emphasizes the need for a clear understanding of the effects and gaps in each of these capabilities. Limitations from attacks on space assets create dilemmas in air, maritime, cyberspace and land domains. The primary insight is the requirement to understand the current and future capabilities provided in the space domain. Leveraging the effects of these capabilities while simultaneously identifying those space domain vulnerabilities affecting land forces is critical to identifying Army requirements for the future.

Lastly, in comparison to the space domain the cyberspace domain is equally or more technically difficult to communicate in terms of capabilities. A description of the cyberspace domain is the "global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers."[11] The complexity of the cyberspace domain creates several challenges for planning, but it is clear that the technology available in the future is unknown. Experts can provide limited levels of certainty on types of technology that may be available. Predicting technological capabilities requires a determination of applicability and assumptions on any future adversary advances to counter or defend against in the cyberspace domain. Compounding

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9. LeMay Center for Doctrine, *Air Force Doctrine Volume 1: Air Force Basic Doctrine* (Maxwell Air Force Base: Lemay Center for Doctrine, February 27, 2015) 26.

10. U.S. Joint Chiefs of Staff, *Space Operations*, Joint Publication 3-14 (Washington, DC: U.S. Joint Chiefs of Staff, May 29, 2013), II-5 - II-6.

11. Ibid.

this challenge is the duration of government procurement process that may not keep up with the advances in cyber capabilities.

Another challenge is communicating current cyberspace capabilities to allow commanders and planners to understand the effect provided in cyberspace. The compartmentalization of the capabilities limits information sharing throughout the government and commercial sector and potentially creates gaps in understanding. Additionally, internal controls of classification hinder the distribution of the tools available in the cyber domain. The ability to streamline the communication of available capabilities is critical for proper planning now and for the future force.

The operational challenge in the cyberspace domain affects both the current and future operations within of the domain. In order to understand present and future technology along with capabilities for application, there is a need to consolidate cyberspace operations. The joint force and the interagency have created multiple entities with cyberspace responsibilities. In order to ensure coherency in this domain, there is a need to streamline the cyber community to feed execution and procurement efforts. This focusing will provide integration throughout government that will assist not only the Army, but also the whole of government in planning and preparing for the future. This is not an Army centric issue, but of strategic importance for Army leaders to assist in shaping how the United States operates in the cyberspace domain.

In conclusion, there are many challenges in the land, air, maritime, space and cyberspace domains that affect decisions on how the United States Army will operate in 2030 and beyond. The totality of these insights demonstrates the importance of thoroughly examining each of the domains, in a joint and interagency forum, to identify those known capabilities and gaps. Without this integrated effort, each service and governmental agency will not be in a position to properly plan for the future.

Educating the Army: The Genesis of Innovation

Colonel Robert W. Marshall, U.S. Army

The nation that makes a great distinction between its scholars and its warriors will have its thinking done by cowards and its fighting done by fools.

—Thucydides

The United States Army is currently moving deeper into an interwar period, characterized by reviewing recent conflicts for relevant lessons and searching for the appropriate context to shape preparedness for the next conflict. As the Department of Defense (DoD) is developing its Third Offset Strategy, the Department of the Army is seeking to balance the human and technological dimensions of future warfare and align Army requirements inside the emerging DoD construct. The Army is considering the impact of technology in future warfare and how best to allocate resources in a time of fiscal constraints. Decisions in the present will shape in large measure the capabilities available to the leaders of the Army in 2030 and beyond. While invention and the development of systems will continue to be important, the Army should place premiere focus on the education of Soldiers and leaders as the cornerstone of the Army of 2030 and beyond as a cost effective hedge against the complexity of the future environment.[1] The ubiquitous complexity of the future security

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1. *The Army Human Dimension Strategy: Building Cohesive Teams to Win in a Complex World* (Washington, DC: U.S. Department of the Army, 2015), 1.

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environment, the strength of the existing Army education system, and the continual diffusion of technology require the Army to reprioritize education as a primary effort.

Although few are willing to share a vision of the future with supreme confidence, most writers and thinkers on the subject of the future global security environment agree complexity will remain one of its defining attributes. The 2014 Quadrennial Defense Review, the 2015 Chairman of the Joint Chiefs' message to the joint force, and the 39th Chief of Staff of the Army's initial message to the Army all underscore the continuing presence of complexity in the future security environment.[2] The Army Operating Concept defines a complex environment as one that is unknown, unknowable and constantly changing.[3] Academia has a considerable body of work defining complexity, or complex systems, describing a bountiful collection of theories including general systems theory, catastrophe theory, and chaos theory. Some themes, however, are constant in defining complex systems: they involve a large number of parts; these parts have many interactions; outputs occur in a non-linear fashion and can be hard to predict; and simple inputs on a small number of system components can have a drastic effect on the whole.[4] The simple definition seems to fit the global security environment consisting of billions of people with many ethnicities and histories, hundreds of states and governments, and powerful non-state actors all interacting in political, economic and social systems with separate rules and structures. Only through education can developing and future Army leaders hope to gain insight into how to shape and win in the future global security environment. The Army has recognized this in its

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2. Chuck Hagel, *Quadrennial Defense Review* (Washington, DC: U.S. Department of Defense, March 2014), 6; General Joseph F. Dunford, "Message to the Joint Force", October 2, 2015, http://www.jcs.mil/portals/36/Documents/151002_CJCS_Message_to_the_Joint_Force.pdf (accessed May 25, 2016); and General Mark A. Milley, "Initial Message to the Army," August 2015, http://www.army.mil/e2/rv5_downloads/leaders/csa/Initial_Message_39th_CSA.pdf (accessed December 12, 2015)

3. U.S. Department of the Army, *The U.S. Army Operating Concept: Win in a Complex World*, Training and Doctrine Command (TRADOC) Pamphlet 525-3-1 with Change 1 (Washington DC: U.S. Department of the Army, October 31, 2014), iii.

4. Philip Anderson, "Complexity Theory and Organizational Science," Organization Science, Vol 10, no 3 (May-June 1999), 216-217.

Human Dimension Strategy by including intellectual optimization as a supporting objective for its cognitive dominance line of effort.[5]

A common maxim is "…training prepares you for certainty, education for uncertainty."[6] Quality education provides differing perspectives on issues enhancing understanding. This enhanced understanding underpins and provides context to operational experience. Academic discourse on issues can fill gaps in experience and provide the feedback required for reflection on past experiences. Education improves critical and creative thinking skills needed to deal with complexity and the unknown. Education provides the opportunity to hone analytic skills and then synthesize new concepts. These analysis and synthesis skills are critical to understanding complexity. If in fact, as described in the Army Operating Concept, complexity is defined in part by constant change, then a critical ability for the future is to identify, drive and sustain needed organizational change. Education can introduce theories of organizational culture and change and provides a basis for application towards the future Army.

The Army already has a well-defined process available as a base on which to improve Soldier education. Professional military education (PME) programs already exist at most leadership levels. Non-commissioned officers attend the Warrior Leader Course, the Advanced Leader Course, the Senior Leader Course and the Sergeants Major Academy. This structure provides opportunity for education on a regular and predictable basis. Officers attend a similar number of PME schools including the Captains' Career Course, the Command and General Staff College course, and Senior Service College with additional opportunities for advanced civil schooling. Warrant Officers and civilians have comparable echelons of education. The challenge for the Army is rebalancing the training taking place in Army schools with an increased focus on cognitive and affective domain development (education). The opportunity and facilities are in place, but the Army would incur additional costs in lengthening courses, expanding instructor education and developing additional/different instructional resources and methods.

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5. U.S. Department of the Army, *The Army Human Dimension Strategy,* 8.

6. Allison Abbe and Stanley M. Halpin, "The Cultural Imperative for Professional Military Education and Leader Development," *Parameters* 39, (Winter 2009-2010), 26.

Another characteristic of global complexity is the continual diffusion of technology. States and non-state actors now have access to capabilities once reserved for the most powerful and developed states. The proliferation of Global Positioning Systems, unmanned aerial systems, and cyber capabilities are all examples of this phenomenon. Even closely guarded technologies, such as nuclear weapons and stealth technology, are diffusing through parallel development or espionage. Since propensity for diffusion is the historical norm of technology, it follows that new technology will only provide a temporary advantage for developers or early adopters. Given that technology will provide an advantage for only a finite time, it follows that the ability to develop concepts and organizations to leverage technology is more important than the inventions themselves.

World War II provides an illustrative case study. Tank technology was available to most, if not all, industrial nations of the time. During the interwar period, armies debated concepts for the employment of tanks and developed organizations and doctrine to support the new technology. Most did not seize upon the full potential of the new technology because they were anchored in the past. The Germans, however, created innovation by understanding and harnessing the potential of several new technologies and, although the new capability existed in a fraction of the German Army, changed the character of warfare with the Blitzkrieg. Education can improve the creative thinking skills required to see alternate possibilities and create new concepts based on the synthesis of old and new ideas. It is important to note that education also supports the development of military requirements that can be a driver for technological development and invention.

To improve the likelihood of U.S. overmatch in the future, the Army could adopt education initiatives to develop improved Soldier cognitive performance:

- The Army should assess the cognitive ability and potential of every Soldier (enlisted and officer). The Army begins assessment of Soldiers' aptitude upon enlistment via the Armed Services Vocational Aptitude Battery (ASVAB). The Army should use this enlistment and assessment process to begin cognitive assessment testing – either in conjunction with or in lieu of the ASVAB. This assessment should

drive an individual improvement plan with measurable milestones that are tracked as part of developmental counseling. This assessment would then be paired with operational and educational evaluations for use during promotion and selection boards. PME courses would have access to the assessment records to tailor student learning and also conduct follow on assessments to gauge the need to update or modify an individual's development plan.

- The Army should reexamine the career map for officers and non-commissioned officers (NCOs) to create time for broadening and educational opportunities outside of PME. Time assigned in key jobs should be as short as possible, based on an individual's demonstrated performance. Extended periods in tactical formations should be seen as demonstrating the need for additional development not acumen. A majority of top performers should be sent to advanced civil schooling or other broadening assignments working outside their field of expertise or experience. Only a minority of top performers should remain in tactical assignments because they have already proven the ability to operate in that environment. This will open opportunities for junior officers to fill key positions sooner and create time for broadening assignments. The Army should use the cognitive assessments to match officers and NCOs to the opportunities with the most potential to create growth and development.

- Army senior leaders, particularly in tactical and operational echelons, should encourage Officer Professional Development Programs and NCO Development Programs in units to better balance training and education. Both are important but are currently out of balance in favor of training. Units should require officers and NCOs to do more writing as professional development and discuss issues such as ethics and national strategy to prepare leaders to mature as Army professionals. Development Programs should include group and individual self-awareness education and assessments to help leaders with the third leg of the Army Leader Development Model, self-study. By assuming some additional responsibility for Soldier and leader education, the operational Army can assist the training base in preparing Soldiers before attending PME and creating opportunity for greater depth of understanding during PME courses.

- The Army's Training and Doctrine Command should expand instructor education in the branch schools towards a more professional instructor model. Branch schools should invest in long term instructors with advanced degrees in education for senior NCO and Captain courses and pair them with top performers with recent operational experience. This would improve instructional technique and course design and allow for adjustment of courseware based on current feedback from operational units. It is important to note that institutional education must have a long term view and avoid redundancy with operational experience. Long term instructors would have the time, and the requirement, to research and write on issues important to the branch and could tap a currently ignored pool of intellectual capital in our mid-grade officer and NCO school accounts.

Creating a better educated Army is the first step toward balancing the human and technology equation and may be the enduring quality of the coming Third Offset. The Army has already invested in many of the requirements to improve Army Education. The facilities and organizations are already in place and have, in cylinders of excellence, the resources to improve education across the Army. Technology will continue to change and develop; the first to recognize and adapt technology to the battlefield will secure competitive advantage. Education can improve the consistency of the Army's ability to adapt first. Through some modest adjustments of existing structures, such as Soldier entry assessments and career timelines, the Army can create the conditions across the force to increase the rate of innovation and maintain U.S. overmatch into the future.

The Army Reserve of 2030: A 100% Active Army Augmentation Force

Peter M. Stemniski, DA Civilian

Let's take a journey to the year 2030. The United States continues to be a global military power, but there are domestic issues at home including rising national debt and dwindling national public support for a robust military. Funding for defense continues to decrease while discretionary spending increases. While attempting to be technologically superior to our adversaries, the Army fights with the Cold War era 'Big 5' legacy systems while the Department of Defense (DoD) cancels state-of-the-art weapon systems due to the lack of funding. Military recruiting maintains a downward trend and the Army struggles to fill critical positions within Active Army, Army National Guard, and Army Reserve units.

How can the Army maintain its global dominance in 2030 under these conditions? DoD strategic leaders constantly ponder this question, including asking how the force of the future will look 15 years from now. If the current trends continue, the Army will be faced with tough decisions which may include major organizational changes. With the Army's force structure and annual operating budgets growing smaller in the coming years, now is the time for Army senior leaders to consider making major organizational changes in all three components so that the

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Army can operate efficiently in 2030. One major organizational change that should be considered is changing the structure of the Army Reserve.

The mission of the U.S. Army Reserve (USAR) is to provide "trained, equipped and ready Soldiers, Leaders, and Units to meet America's requirements at home and abroad."[1] Army Reserve units are called upon to assist Active Army units in times of conflict and have been mobilized to assist Combatant Commanders in global contingency operations since the events of 9/11. The USAR comprises 20% of the Total Army (~202K Soldiers) and provides specialized capabilities to the Army and the Joint Force.[2]

As valuable as the USAR is, the downward trend in Army funding, recruiting, and retention, necessitates a new organizational model for the Army Reserve. One model that should be considered is establishing the USAR as a 100% augmentation force for the Active Army. This could be achieved by eliminating the current Army Reserve unit structure, expanding the Individual Mobilization Augmentation (IMA) system so the Army Reserve is a 100% augmentation force, forming Army Reserve Augmentees into Army Reserve Elements (AREs) and embedding them in Active Army units.

As defined in Army Regulation 140-145, the objective of the Army Reserve IMA program is to "facilitate the rapid expansion of the Active Army wartime structure of the DoD and/or other departments or agencies of the U.S. Government to meet military manpower requirements in the event of military contingency, premobilization, mobilization, sustainment, and/or demobilization operations."[3] Periodically Army Reserve IMA Soldiers are recalled to active duty to fill critical shortfalls to meet the needs of their assigned unit. This reorganization option expands the IMA concept so that 100% of the Army Reserve falls under this construct. Embedding Army Reserve Soldiers into Active Army units will help fill critical shortfalls, which will also increase the mission readiness of the Active Army units.

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1. *About Us, A Life Saving and Life-Sustaining Force for the Nation,* http://www.usar.army.mil/AboutUs.aspx (accessed 18 May 2016)

2. Ibid.

3. U.S. Department of the Army, *Individual Mobilization Augmentation Program,* Army Regulation 140-145 (Washington DC: U.S. Department of the Army, March 21, 2016), 3-4.

When any major organizational change is proposed, there are many questions to be answered. One question that will be asked is what should be done with all the current positions in the 26 Army Reserve Operational, Functional, Support and Training Commands. A thorough troop-to-task analysis should be conducted to determine which positions in these Commands should be repurposed to support the newly formed AREs and which positions should be eliminated. Upon completion of the analysis, the identified positions can be repurposed to fill headquarters-like elements for these newly created AREs within the Active Army units.

Another question that will be asked is where to place these ARE headquarters-like elements. These elements should be located at least at the Active Army Division Headquarters but can go lower depending on the composition of specialized Active Army units. Since a majority of the positions at these 26 Army Operational, Functional, Support, and Training Reserve Commands are Active Guard and Reserve (AGR) Soldiers, these full-time Soldiers can become a staff element within the Active Army unit while continuing to provide administrative support to the assigned Army Reserve Soldiers within the unit. The AGR Soldiers also can work with their Active Army staff sections to develop training schedules for the assigned Army Reserve Soldiers based on the Active Army unit's training schedule. Depending on the needs of the Active Army unit, the Army Reserve Soldier's training schedule could be the traditional one-weekend-a-month training schedule or even block-drilling training. Annual training can also be conducted at the needs of the Active Army unit, whether it is a combat training exercise or other unit training requirements.

There are several benefits implementing a 100% Army Reserve augmentation force for the Active Army. One benefit is the reduction of headquarters related overhead expenses. By possibly eliminating or even consolidating many of the 26 Army Reserve Operational, Functional, Support and Training Commands, funding required to maintain these Commands can be repurposed for other higher priority Army missions. Additionally, there is the potential to consolidate and/or repurpose positions at the Army Reserve Command level. While there is still a requirement to have Army Reserve representation at the department level inside the Pentagon, there is the potential to reduce

the number of positions at this level and these identified positions could be used to augment ARE headquarters-like elements within Active Army units.

Another significant benefit is the ability to reduce Army Reserve related infrastructure. By embedding Army Reserve Soldiers within Active Army units, the requirement to have Army Reserve Centers to conduct monthly training may no longer be needed. An infrastructure utilization study should be conducted to determine if Army Reserve Centers need to remain open or if they can be closed since most of the training activities will occur on Active Army installations. There may be a requirement to maintain some Army Reserve Centers, but the number of these Centers can be reduced if this concept is implemented.

Having Army Reserve Soldiers train with Active Army units is also another benefit, which potentially could improve the Army Reserve Soldier readiness. These Soldiers will be able to participate in training exercises with the Active Army Soldiers in their assigned units, giving Army Reserve Soldiers the ability to train for combat before actually being deployed for combat. Additionally, being able to train with Active Army Soldiers could potentially motivate Army Reserve Soldiers to achieve higher fitness standards and higher scores on mission rehearsal training exercises. Training side-by-side with Active Army Soldiers will significantly improve the quality and readiness of Army Reserve Soldiers, thus helping to improve the readiness standards of Active Army units.

The Army Reserve Soldier also brings another personal quality to Active Army units – civilian professional experience. It is possible that Army Reserve Soldiers have more hands-on experience in some technical areas than Active Army Soldiers do, and this will greatly benefit Active Army units. For example, an Army Reservist who is an engineer in civilian life can incorporate lessons learned from working engineering scenarios in the public sector to engineering scenarios when conducting missions in uniform. In fact, sometimes Army Reservists are faced with greater engineering challenges working in the public sector than challenges faced by Active Army engineer units. By using their professional experience in civilian life, the Army Reservist will

bring different insights on how to solve complex problems in the most efficient manner.

While there are several benefits to implementing this proposed concept, there will be some challenges. There will be significant force management challenges, including how to integrate Army Reserve Soldiers into Active Army units. There will also be challenges on how to fund the AREs belonging to Active Army units. One question likely to be asked is should the Active Army units fund these AREs? Another challenge in implementing this proposed concept will be an enormous change in Army culture. This culture change could lead to some initial growing pains, but once fully implemented there is the potential to field a more well-rounded Army.

To get this proposed concept started, it will be necessary to test this provisional concept with a designated Active Army unit. Once this provisional concept is tested and proven successful, the Army can take steps to redesign the Army Reserve to become a full 100% Active Army augmentation force. The concept will take time to implement, but the time is now to consider implementation.

We have all participated in meetings where a subject matter expert proposes an idea that will not only improve efficiency but also reduce costs, all to have that idea eliminated by the 'that will never work' crowd. With diminishing financial resources and increasing military recruiting challenges, that automatic response of 'that will never work' needs to change to 'that is a good idea – let's explore it further.' This proposed concept is likely to yield a similar response and be met with major hesitation and even dissension, but it needs to be thoroughly considered.

Drastic changes to the DoD and the Department of the Army are coming. Our strategic leaders can decide to kick the can down the road or make decisions now that will help sustain the force in the future. The time is now to consider changing the structure of the Army Reserve to a 100% Active Army augmentation force. A 100% Active Army augmentation force will provide Active Army units with additional capabilities necessary to conduct contingency operations and international training missions. The 100% Active Army augmentation force will also provide Army Reservists a chance to continue to serve

their country. By implementing this concept, Army Reservists can fill critical shortfalls in Active Army units which will help improve readiness goals throughout the Active Army. A 100% Active Army augmentation force is a win-win for the United States Army. While many might not understand the need for this now in 2016, funding available for our nation's defense force is decreasing. To plug those gaps in the future, especially in times of major conflict, a 100% Army Reserve augmentation force for the Active Army will help ensure our nation has the most capable Army available to address future contingencies.

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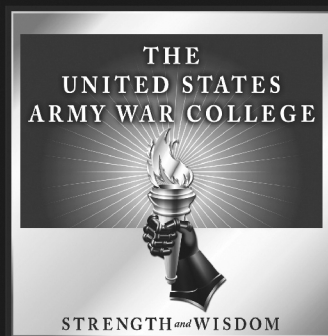
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