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14. ABSTRACT
The enemy of the future will intentionally exploit US forces' dependence on information technology. Because of this, information on the future battlefield will be inherently limited, thus requiring a change from the current paradigm of continuous information transfer and centralized, top-down direction of tactical forces to an intent based, decentralized command model. Although the Marine Corps espouses the idea of decentralized command (mission tactics, mission command, maneuver warfare, etc), the service culture actually reflects a tendency towards centralized, rigid command and control. In order to prepare the force for a future battlefield of limited information and concomitant uncertainty, the Marine Corps must make major changes to both organizational structure and training methodology.

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FUTURE WAR PAPER

Playing Football Instead of Soccer

The Marine Corps Culture of Centralized Command and Control

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF OPERATIONAL STUDIES

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Introduction

In his seminal *Command in War,* Martin Van Creveld describes two options for an organization to deal with tasks it does not have enough information to accomplish. First, it can expand information processing capacity. Second, it can improve its ability to act within the uncertainty inherent in the task either by simplifying the organization or by dividing the task into component parts and allowing subordinates to deal with them semi-independently.[1] The US military has based its current methodology for warfighting on the first approach, and its vision of networked forces depends on processing "historically unprecedented amounts of information."[2] However, the American dependence on the Electromagnetic (EM) spectrum to facilitate this information flow is a critical vulnerability that enemies have recognized and will exploit. *Information on the future battlefield will be inherently limited, thus requiring a change from the current paradigm of continuous information transfer and centralized, top-down direction of tactical forces to an intent based, decentralized command model.*

The extant American paradigm for command and control (C2) is a centralized model based on the assumption that EM "freedom of maneuver" is possible and that EM spectrum dependent networks will be usable when confronted with a capable opponent.[3] Doctrine to the contrary notwithstanding, this is largely due to the experiences of the past thirty years combined with rapid technological change in the world at large. US military forces have not faced an opponent with a significant electronic warfare capability since the end of the Cold War, and have largely based their assumptions regarding the character of future warfare on the wartime experiences since then: Operations DESERT STORM, ENDURING FREEDOM, and IRAQI FREEDOM, inter alia. These three conflicts, combined with a number of smaller ones, have all shared a key commonality – almost no contestation of the EM spectrum or the hardware US

forces employed to use it.[4] American C2 nodes were essentially inviolate throughout the course of these operations. Having learned from experience, US forces now rely on wireless communications technology more than ever before – despite the major vulnerabilities it creates. They assume that they will maintain the ability to control the EM spectrum in the future, and thus C2 structures have become increasingly dependent on wireless networks to synchronize, coordinate, and control battlefield actions. This dependence on information networks is the US military's "Achilles heel," both doctrinally and technologically. In the future near-peer and hybrid enemy forces alike will exploit this through both lethal and nonlethal means alike.[5]

The Future Battlefield

Interference in the EM spectrum remains the foremost issue the US military will encounter regarding command and control in the future. As the overall use of the EM spectrum increases due to the growing ubiquity of wireless technology, the issue of interference due to spectrum congestion has potential to become so severe as to prevent the effective passage of information via wireless means.[6] This issue is likely to continue to increase at an exponential rate in the largely unregulated population centers that the Marine Corps believes are the most likely environment for future conflicts.[7] In addition, jammers are becoming smaller, more effective, and easier to obtain.[8] Inadvertent congestion of the EM spectrum notwithstanding, electronic attack – jamming – is the most significant threat to US C2 capability in the future, and will thus have major effects on overall warfighting capability.

In the next 10 years, not only will near peer opponents possess the capability to employ jamming technology against US tactical formations at increasingly lower echelons, but the capability and equipment will also migrate into the hands of hybrid, non-state, and regional

threats.[9] It is likely that the vast majority of tactical actions in future warfare will take place in a contested EM environment – as Russian forces have recently demonstrated in both Ukraine and Syria.[10] This issue is extremely concerning for the Marine Corps, as its current operating concepts describe future operations occurring at extreme distances from headquarters elements afloat or widely dispersed when ashore.[11] The more distant a receiving station is from the transmitting station, the easier it is to jam, and thus Marine forces operating ashore will be exceptionally vulnerable to enemy action in this domain.[12] Although it is possible to mitigate the issue of jamming through the use of assets such as spread spectrum systems,* it is not possible to eliminate the threat entirely.[13] Additionally, jam-resistant systems have their own inherent vulnerabilities that a capable enemy will exploit[14] and target for destruction.

Enemy forces are unlikely to solely rely on electronic attack to disrupt US C2 networks – an apparent critical vulnerability. They will also disrupt the network by focusing on the destruction of C2 nodes – a lethal complement to the electronic means described above. Although targeting C2 nodes is hardly a new component in military doctrines, it will become much more effective in the near future for two reasons. First, precision guided munitions (PGMs) are rapidly proliferating.[15] Paired with drones† that have the capability to quickly and accurately determine the location of large emissions signatures across the EM spectrum (radio, microwave, IR, etc),[16] enemies will be able to rapidly target and destroy C2 nodes. The continuous emissions that have become the norm for US tactical command posts will make them inherently unsafe on the future battlefield. Compounding this issue is the emerging problem of dual use "suicide drones."[17] They will be able to take advantage of the facts that modern

* The most common tactical spread spectrum technique in use by the US Marine Corps is frequency hopping. Other techniques will become more prevalent in the near future.

† Although typically referred to as unmanned aerial systems (UASs) or remotely piloted aircraft (RPAs) inside the US Department of Defense, I will use the colloquial term to facilitate understanding by a wider audience.

command posts are relatively easy to target due to their large electromagnetic signature and that they often demonstrate a general lack of survivability. These two issues combined with threat doctrines that focus on eliminating US information superiority[18] make C2 nodes the likely focus for PGMs and drones with explosive payloads and cheap sensor packages.[19] The most dangerous possibility for the modern command post is that of an attack using swarms of dual use drones targeting C2 nodes either by directing indirect fires or simply running into the command post – in effect acting as inexpensive radiation seeking missiles.

The emergence of drones does not alone present an unsolvable issue. However, if employed properly they will expose additional vulnerabilities through a sort of "electronic combined arms," in which countering one threat capability necessarily exposes the defender to a complementary one. For example, the detection and destruction of drones is possible, yet the most common means for their detection relies on active RADAR emissions,[20] thus exposing the defender to the threat of radiation seeking weapons or follow on drone-PGM combinations.[21] Because of this dilemma, a future command post has effectively three options: first, limit emissions and EM signature to such a degree that the dilemma presented above does not exist – in effect, hide. Second, use radar and directed energy to destroy enemy drones before they are able to attack, thus exposing the command post to anti-radiation weapons and enemy indirect fire. Finally, accept the risk by significantly hardening the command post. Realistically, the future command post will likely need to execute all of these methods to varying degrees depending on the specific context.[22]

Tactical forces will be unable to continue to transmit "historically unprecedented volumes of information"[23] via the EM spectrum in the future. This paradigm creates inherent vulnerabilities that an intelligent enemy will exploit, both attacking the physical network and the

EM spectrum through which information travels.[24] Although there are mitigation strategies available for each of the individual threats described above, combined they present a dilemma that requires a reassessment of the current paradigm. The solution will necessarily have both technological and human dimensions; indeed, technological efforts are afoot to identify means of communicating without using radio or microwave wave propagation at all.[25] Nonetheless, it is axiomatic that "technological advantage tends to be fleeting…it is bound to be temporary."[26] Given that US forces' most apparent vulnerability is their C2 network, enemies will continue to attempt to negate any technological advantage that protects it. The true solution lies in a force that is able to act semi-autonomously in an environment where centralized direction from higher headquarters is extremely limited.

Implications for the Marine Corps

As shown above, a fundamental characteristic of the future battlefield will be the relative paucity of information. This will create a significantly higher degree of battlefield uncertainty than US forces accept within the current C2 paradigm because of two key factors. First, lower echelon tactical formations will face much greater difficulty passing timely information up the chain of command or amongst themselves. They will either be unable to do it effectively due to congestion of the spectrum or will need to limit it due to force protection concerns. This will thus make information a finite resource amongst tactical formations that they will have to prioritize; because they will only be able to send a limited number of transmissions, they will have to focus only on mission critical transmissions – likely to be requests to supporting units (fire support, medical support, etc) – as opposed to the current practice of detailed coordination via radio or data networks. This limitation means it is probable that there will be an inadequate

amount of information for headquarters at all levels to maintain the degree of situational awareness that defines the current paradigm. This lack of information will concomitantly degrade the ability of higher headquarters' to effectively synchronize and coordinate the actions of their subordinate units due to an inability to keep pace with front line developments and decisions – somewhat analogous to the issues experienced by von Molke the younger during the latter portion of the execution of the Schlieffen plan in the early days of World War I.[27] Secondly, against a capable opponent it will be difficult for higher headquarters to know exactly what instructions to subordinate units were actually received and executed as directed. The denial of the EM spectrum removes a critical feedback loop for command echelons to assess subordinate action and direct subsequent efforts across the unit.

The issues described above will combine to determine the nature of the information required for success in future conflicts. It is reasonable to assume that higher echelon commands will be able to retain some degree of situational awareness due to their physical separation from tactical action, more static nature (facilitating hard wired transmission and hardened structures), and access to a wider variety of information generating assets. However, unlike the current paradigm, higher commands will be unable to effectively synchronize subordinate actions due to the uncertainty described above. Given this inability to manage the battle, the question becomes what information to prioritize. Given that only limited amounts of information will make it to lower level tactical formations, and what information that does reach them may be outdated or contrary to the developing situation, then higher commands will have to focus their direction into broad generalizations of intent, relying on the belief that subordinate units have "more accurate local knowledge… and are therefore better able to adapt to changing circumstances and demonstrate the appropriate creativity and initiative."[28] Although this is likely to lead to

duplication of effort and a reduction in overall efficiency, it is also likely to develop a kind of emergent behavior, where multiple tactical units on the battlefield, operating under the same intent, are able to achieve the desired goal with very little specific direction from higher headquarters.[29]

The situation described above suggests that the uncertainty and lack of information flow created by the contested EM environment will require tactical forces to increase decentralized decision making at every echelon. Higher headquarters are unlikely to be up-to-date enough with the battlefield situation to direct and coordinate specific actions amongst the myriad units on the battlefield, and will thus be limited to the transmission of broad intent. In execution, this will lead to self-synchronization of tactical formations, as the shared understanding of the intent allows them to determine how to fulfill it according to basic rules while using service culture and associated doctrine as their overall guide. Although the fundamental tenets of intent based operations are not new – the most famous example is the German *Auftragstaktik* – they require an overall culture of decentralization and trust that conflicts with current US practices for C2.[30] Given that an environment of uncertainty and limited information is a likely future, the Marine Corps must reassess its service culture regarding C2 and ensure that it is commensurate with the requirements of such an environment.

Marine Corps Culture

The Marine Corps has an existing framework that supports the decentralization of the future battlefield due to lack of information. The service doctrine of *Maneuver Warfare* outlines the principles required for the organization to be effective in such an environment. [31] However, the Marine Corps has not fully accepted the doctrine into its organizational culture over the past

30 years – it is merely an espoused value inside the service. Referring to "the taken for granted values, underlying assumptions, expectations, collective memories, and definitions present in an organization,"[32] culture acts as the "default decision system" for an organization.[33] Organizational psychologist Edgar Schein describes the potential difference between the assumptions that define organizational culture and the espoused values of an organization – essentially what an organization tells itself and others that it does (doctrine is an example of espoused values within military organizations).[34] A gulf between these two is evident in the Marine Corps, which espouses a doctrine based on decentralized action in an uncertain, fluid environment, trust and authority pushed to the lowest levels, and command based on intent. All of these, however, are in conflict with the current underlying assumptions (or paradigm)[35] that use extensive C2 networks to centralize decision making, information, and authority ever higher in the chain of command.

There are two fundamental reasons for the Marine Corps' doctrine of *Maneuver Warfare* remaining merely an espoused value within the overall organizational culture. The first is that paradoxically, the complex, decentralized nature of the wars in Afghanistan and Iraq has led to ever increasing centralization of control across the service over the last 15 years.[36] This has a number of underlying causes. First, when confronted with complex problems that generate uncertainty and some degree of failure, hierarchical organizations tend to *increase* their centralization.[37] This tendency to centralize authority is exacerbated by every commander's inherent human desire for certainty and control – and his or her ability to achieve a modicum of those very things through the use of unprecedented amounts of data from lower echelon headquarters.[38] This, in turn, pairs with the so-called "CNN effect" and the nature of modern counterinsurgency to drive commanders at all levels to assume control of decisions that are well

below their typical decision threshold – centralizing authorities and limiting subordinate decision making in an attempt to mitigate inadvertent strategic effects.[39]

These military specific issues combine with overall American culture to limit the willingness of commanders to decentralize decision making authority. Modern American cultural values demonstrate a focus on risk, limited willingness to accept casualties, infatuation with technology, and a tendency towards centralized management practices.[40] This combination of service experience and American culture has pushed the Marine Corps ever further away from the espoused value of *Maneuver Warfare,* and into a much more limiting, risk averse culture. Indeed, the true nature of the Marine Corps' organizational culture can be seen in examples varying from garrison environments to combat in Iraq and Afghanistan, and it is characterized by a lack of trust, zero-defect mentality, and unwillingness to accept the risk of decentralizing authority.[41]

Although Marine Corps doctrine is in clear conflict with many of the issues outlined above, it is difficult to transcend them; as any military is generated from society at large, its culture is thus inextricably linked to the broader sociocultural background of the nation.[42] Nonetheless, the underlying assumptions that currently govern the actions of the service will be invalidated by a future battlefield that puts severe limitations on information flow, and concomitantly the ability to control tactical actions. Given these inherent limitations, it is essential that organizational changes be made to ensure *Maneuver Warfare* is inculcated within the Marine Corps not only as an espoused value, but as an underlying assumption for how the service actually operates – it must become the service culture.

In order to force the cultural adoption of *MCDP-1 Warfighting* within the Marine Corps the service will have to adopt changes in two main areas, which correspond to two general

methods for changing culture – top-down and bottom-up.[43] The first, top-down method for change is that of organizational design. The overall organization of the Marine Corps, and indeed, most of the US Department of Defense, is based on an outdated model. Developed from industrial age practices, the overall service organization prioritizes *efficiency*.[44] The prime characteristics of this sort of structure include specialization, rigid, vertical hierarchies, a focus on measurable metrics to define the success of the organization, and a vision of the workers within the system as interchangeable parts. This model is largely based on a lack of trust and an assumption that poorly educated conscripts are incapable of effective independent action.[45]

Although in many ways directly contrary to the Marine Corps' doctrine,[46] each of these elements is clearly evident in even a brief examination of the Marine Corps: individual specialties continue to increase, the chain of command remains rigidly defined, specific metrics are and have been the standard for defining success over the past 15 years of low-intensity conflict, and finally the so called "up or out" personnel system demonstrates the idea that each individual has no unique abilities and can and will be replaced. In contrast, modern information age organizations prize *adaptability* and *flexibility* when faced with environments that are likely to be fluid and rapidly changing.[47] This contradiction is significant; despite the fact that the Marine Corps espouses values far more aligned with the latter approach,[48] in the field of organizational design it is widely recognized that function follows form – if the organization is structured in such a manner as to prevent decentralization and adaptation, no amount of doctrine writing can force it to happen.[49] Although it is axiomatic that the military has quite different goals than modern businesses, and is thus constrained to certain parts of its organizational design – a hierarchical chain of command, for instance – it can nonetheless use lessons from the business world to change its organization in order to force particular elements of cultural change.

This must be done specifically to force the adoption of the decentralized decision making model espoused by *Maneuver Warfare*, yet prevented by a culture whose underlying assumptions are centered in the extant paradigm for C2.

Redesigning Organizational Structure

The first of three possible options for redesigning the Marine Corps' warfighting structure is the intentional abolition of an intermediate headquarters – specifically regimental or division level. Although far from a new idea, this offers a number of advantages. It would create a force that is inherently more flexible by removing an entire level of bureaucracy, thus streamlining the flow of what little information is able to transit between headquarters. Simultaneously, it would facilitate the sort of emergent behavior that will be a requirement in an information constrained environment, and finally it would drive cultural change.

Removing an echelon of command would essentially force subordinate elements into decentralized decision making through an expansion of higher headquarters' span of control.[50] More often addressed as something organizations desire to limit, span of control refers to the number of subordinates directly under the command of one individual.[51] Based on this definition, it follows that if a given individual (or headquarters) were required to manage a greater number of subordinate units, they would be forced to delegate a large degree of autonomy and decision making authority to those units. In effect, higher headquarters would have to focus on the most important element of the fight – broad direction, and accept that subordinate units would accomplish the specifics. This also suggests the necessity for acceptance of duplication of effort, as different subordinate units given similar broad direction would be more likely to focus on the same task. The benefit, however, is that this model lends

itself to self-organization and emergent behavior, thus increasing the flexibility, adaptability, and resilience of the system.[52] History provides a number of examples of this sort of organizational flattening, from German reorganization during World War I that relegated the Brigade to a solely administrative role, to the US Army's transition to the triangular division before World War II.[53]

The second possible organizational change that would aid in cementing *Maneuver Warfare* as the Marine Corps culture is a reduction in staff sizes across all Marine Corps warfighting commands. Headquarters and staff size across the services have increased significantly since 2001.[54] Conventional wisdom holds that this increase is due to ever increasing complexity in the character of war, and that larger and larger headquarters elements are required to manage it. The counter-argument to this conventional wisdom is that, in fact, the increase of staff size is simply a centralization of information management and control higher and higher up the chain of command, and that the ever larger staff elements actually *increase* overall complexity.[55]

Although the current sizes of headquarters elements are not completely beyond historical norms,[56] the more effective solution to the issue of complexity, especially in an information limited environment, is to push the ability to manage information – and with it, authority to take independent action – farther *down* the chain of command, thus creating van Creveld's semi-independent ability to deal with a given situation.[57] The reduction of higher level staff size would do this. Because the information required by a headquarters is naturally limited to what the staff can process, significant decreases in staff sizes at all levels would force each headquarters to focus on the most important information and trust that their subordinate headquarters' had a greater understanding of their local situation.[58] In effect, a significant reduction in staff size would streamline information flow and limit extraneous reporting

requirements from higher headquarters, much like the *Wehrmacht*[‡] of World War II – recognized by many as the best example of military decentralization and independent action.[59] This staff reduction would also force the adoption of *MCDP*-1 as service culture by creating a requirement for ever smaller units to make decisions on their own.

A final possibility for organizational redesign in order to inculcate *Maneuver Warfare* as the underlying organizational culture is to integrate warfighting commands to a much greater degree. Marine Corps organization stove pipes units into their basic "functional types," integrated only in ad-hoc formations (RCTs, SPMAGTFs, MEBs), specific warfighting units with narrowly defined mission sets (MEUs), or the highest echelons of command (MEF).[60] Designed for administrative efficiency, the overall result of this "stove piping" is that decisions regarding multiple functional entities are at much higher levels than truly necessary – if for no other reason than the level at which their equities intersect is far up the vertical hierarchy. As has been readily identified in the business world over the past 50 years, increasing specialization and limiting integration is a recipe for efficiency – and concomitantly limiting flexibility, stifling adaptation, and centralizing decision making authority ever higher in the organizational hierarchy.[61] Forcing the integration of MAGTF units to the division/wing, regiment/group, or even battalion/squadron level would have a corresponding effect of increasing interoperability, understanding of capabilities, and the organizational trust required to grant decision making authority at lower and lower levels – all of which would make a more flexible, adaptive, and capable force. This, in turn, would accelerate the adoption of *Maneuver Warfare* as an underlying assumption across the service while providing an organizational framework for operating in a communications denied environment.[62]

[‡] Although *Wehrmacht* refers to the entirety of the German armed forces in World War II, our focus here is largely on the German army. This paper will use the term *Wehrmacht* to clearly delineate the difference between the World War II German army and other incarnations, past and present.

Redesigning Training[§]

In order to instill a culture of decentralized action and independent decision making, the Marine Corps will need to adopt change in a second major area – training. Refining the way the service trains its units and personnel is a bottom-up method for inculcating a culture of decentralization and initiative; as individuals are trained based on the underlying principles of *MCDP-1* and continue to increase in rank, they will have an effect from within.[63] This is unlikely to have a major effect in isolation; as discussed above, despite creating a cadre of people within the organization who ascribe to the values described in *MCDP-1*, much of how an organization acts is simply due to how it is structured.[64] Indeed, if the organizational structure does not permit individuals to act in accordance with their training, then the training has been largely for naught.[65] Nonetheless, in tandem with organizational redesign, training redesign will be an effective method for entrenching *Maneuver Warfare* as the organizational culture, as opposed to merely an espoused value.

The first necessary change in Marine Corps training is to make it realistic. It is axiomatic that you must train as you fight – and correspondingly fight as you have trained – for better or worse.[66] Marine Corps tactical formations rarely, if ever, train in an environment that approaches the near peer threat environment described above. Because of FCC restrictions, it is difficult to employ training devices to limit communications (jamming, spoofing, etc), and due to the risk aversion inherent in the service culture it is not acceptable to train in most live fire evolutions with limited communications.[67] Notwithstanding the inherent difficulty of training in emissions denied environments, even a cursory review of the 960 page infantry training and readiness (T&R) manual shows only a single reference to electronic warfare – and then only

[§] See Appendices for an expanded discussion of training methodologies.

regarding offensive employment![68] Marine Corps units consistently train based on the assumption that they will be able to pass continuous information via the EM spectrum without significant interference. Although many units experience difficulties communicating nonetheless, standard practice across the service for a loss of communication is to stop training until communications have been reestablished.

This lack of realism regarding the EM spectrum is exacerbated by the lack of realistic training against intelligent, thinking opponents. Because the Marine Corps has largely centralized unit and individual training and defined it by checklists (T&R Manual, METLs, PTPs) over the past 15 years, there is no organizational incentive to train against a thinking enemy who forces lower level decision making and creative problem solving. The organization rewards those who achieve excellence in set-piece training – the training checklist is a dominant indicator – and therefore commanders focus there.[69] It is clear in the above paragraphs that higher echelons of command will be unable to specifically direct subordinate actions, and thus subordinates must be able to take independent action within broad intent. Marine Corps training, conducted almost solely according to specified task lists, has created a sterile environment in which the creative adaptation to novel situations based on intent is largely absent.[70] This is directly contrary to the service doctrine, which emphasizes not only decentralized decision making, but small unit training against thinking enemies in order to identify and subsequently codify emergent solutions to unforeseen problems.[71] By creating a prescriptive training environment of checklists and rules, the service has inadvertently continued to centralize decision making and limited the adoption of *Maneuver Warfare* as its overall culture.

The second change to training that the Marine Corps must examine is the lack of opportunity for repetition and experimentation by commanders. According to the "Peter

Principle," individuals continue to advance in a hierarchical organization until they reach the level of their incompetence.[72] The primary issue with this is that the rapid turnover of commanders combines with limited opportunities for testing command capability in anything other than garrison environments; in effect, few unit leaders get sufficient opportunities to practice directing their units in realistic combat scenarios – many may have advanced to the level of their incompetence, yet there is no opportunity to identify it until they are forced to deploy and lead their formation in combat.[73] This issue inherently limits the trust – and concomitantly the willingness for commanders to delegate authority and assume the associated risk – required for *Maneuver Warfare* to become the true organizational culture within the Marine Corps.[74] Shared experience and reputation are two of the key elements to fostering trust.[75] Because unit leaders only get rare opportunities to practice combat realistic exercises with their subordinate and higher headquarters alike, neither experience nor reputation are increased, and thus commanders turn to the other mechanism for fostering group cooperation – prescriptive control.[76]

In order to mitigate these issues, the Marine Corps must explore how to both increase unscripted field training at all levels and integrate simulation to a much greater degree. Although not a perfect analog to combat or even field training, multiple repetitions of simulations *against an intelligent enemy who employs realistic capabilities* will allow tactical commanders to identify areas to work on, experiment with unconventional solutions, and become comfortable with decentralization and its associated risk and uncertainty. It is crucial that unit leaders at all levels are given the opportunity to fail while testing their hypotheses regarding how to direct their units in a communication denied environment, thus building an experience base that allows them to apply "skilled intuition" to familiar situations and recognize novel ones that require critical analysis.[77]

Conclusion

By relying almost solely on the adoption of technology to facilitate the synchronization and control of actions on the battlefield, the Marine Corps has created a significant vulnerability. The current paradigm of networked forces using the EM spectrum as the medium for transmitting information is fundamentally flawed. Despite all the capabilities of high technology networks and the continuous improvements in computing capacity, the future battlefield will be largely one driven by human decisions without complete information.[78] The present paradigm for C2 is only effective when fighting an enemy incapable of contesting the domain that defines it. In the near future this will no longer be the case, and the synchronization, centralized control, and detailed coordination that defines the current paradigm will thus no longer be possible. The Marine Corps must pursue organizational change to inculcate *MCDP-1* as the true culture of the service in order to prepare for this likely future environment, as the current paradigm will be unlikely to succeed when faced with a battlefield that denies tactical formations the ability to send or receive information at will.

Appendix 1 – Sample Training and Readiness Code

Although by no means exhaustive, below is a sample T&R code that would take the likelihood of enemy electronic warfare into account:

INF-C2-8015: Execute Command and Control (C2) in a Communications Denied Environment:

(B) SUPPORTED MET(S): 1, 2, 3, 4, 8, 9, 10, 11

EVALUATION-CODED: YES **SUSTAINMENT INTERVAL:** 12 months

DESCRIPTION: MAGTF Operations are unlikely to occur in a permissive communications environment. MAGTF formations must be able to operate in an environment that permits limited to no communications.

CONDITION: Given an operations order, operational Combat Operations Center (COC) and battle staff and a non-functional/contested communications architecture.

STANDARD: To support the decision making cycle of the commander.

EVENT COMPONENTS:

1. Execute designated operations and achieve commander's intent with no additional direction from higher headquarters.

2. Employ C2 in a communications denied environment.

3. Implement Tactical Control Measures (TCMs).

4. Track decision points (Commanders Critical Information Requirements (CCIR's), Friendly Force Information Requirements (FFIR's)).

5. Track Higher, Adjacent, Subordinate and Supporting (HASS) units.

5. Provide FRAG orders to subordinate and supporting elements.

6. Provide information to HASS units.

7. Monitor transitions (phases, units, etc).

8. Maintain situational awareness.

9. Prepare for follow on operations as appropriate (branches, sequels, etc).

10. Conduct survivability moves.

PREREQUISITE EVENTS: GCE-COND-2504 GCE-PLAN-2502 GCE-PLAN-2505 GCE-TRNG-2504

CHAINED EVENTS: INF-C2-5004 INF-C2-6007 INF-C2-7010 INF-C2-8010 INF-C2-8014

RELATED EVENTS: INF-C2-8001 INF-C2-8002 INF-C2-8004 INF-C2-8007

REFERENCES:

1. MCDP 1-0 Marine Corps Operations, Aug 2011

2. MCWP 2-1 Intelligence Operations

3. MCWP 3-1 Ground Combat Operations

4. MCWP 3-2 Aviation Operations

5. MCWP 4-1 Logistics Operations

6. MCWP 5-1 Marine Corps Planning Process (MCPP)

7. MCWP 6-2 MAGTF Command and Control Operations NAVMC 3500.44B 30 Aug 2013 3-14 Enclosure (1)

SUPPORT REQUIREMENTS:

OTHER SUPPORT REQUIREMENTS: This event can be trained/augmented through the use of the following enablers: VIRTUAL/CONSTRUCTIVE - MTWS, CACCTUS.

CAPSET III is a requirement to execute this task.

MISCELLANEOUS:

ADMINISTRATIVE INSTRUCTIONS: 1. This training can be executed at the local MISTC, local base simulation center or through use of the MCTOG Battle Lab. 2. The C2TECOE and MCTOG adopted COC Tables 1-4 support the training of this task.

Appendix 2: Hypothetical training methodology:

The existing USMC framework of a "building block" approach to training is fundamentally valid. The key elements that are missing are multiple repetitions at every level and the opportunity for a "hypothesis testing" approach for every leader. Just as Napoleon could be said to have been "figuring it out" during his early Italian campaigns by testing various theories of victory,[79] so leaders at every echelon warrant the opportunity to do the same. This can be achieved by leveraging simulations and field exercises. Below is a hypothetical training continuum that adheres to the basic building block approach and could apply to every USMC unit – from the infantry squad to the MEF.

1. **Basic T&R tasks:** Focus on the basic "blocking and tackling" that individual Marines within the unit will be required to accomplish. Units continue this phase until individual Marines are proficient at designated tasks. The methodology that is currently employed across the Marine Corps is generally effective (although often with significant variance in specific unit capabilities).
2. **Unit level Simulation**: Units at every level train to executing actions within their general span of control, using only simulated friendly and enemy forces. Leadership identifies desired training objectives and allows unit leaders to experiment with methods for achieving the objectives. Low cost supports multiple repetitions and experimentation. Requires extensive debriefing to ensure key learning points are identified and subsequently implemented at each level.

a. Rifle Squad: Plays tailored version of a combat simulation like Call of Duty.
    i. Squad members are first able to communicate within the game
    ii. Once mastered, they are required to operate within the game using implicit communications
b. Rifle Platoon & Company: Tailored wargames for their level. Uses both "board game" and digital simulation.
c. Rifle Battalion and Regiment: Tailored wargames with significant complexity added to the wargame. Just as squad units are required to execute without communications, once Battalion and Regimental units are proficient at basic wargaming techniques, increase friction by limiting communications capability of subordinate units.
d. Division and MEF: Large scale wargames with external complexity added (i.e. cyber, space issues). Same as above regarding the inclusion of communications limitations.

3. **Small Unit Execution:** Small units aggregate and execute basic mission essential tasks in a live-fire environment (small unit live fire attacks and defenses, for example). Lessons learned from simulation combine with existing TTPs and methods. Small units confirm their capabilities through execution of live fire "battle drills"
4. **Small Unit Competition:** Small units aggregate and execute multiple force on force exercises WITHOUT an explicitly defined checklist of tasks that they must accomplish. The intent is to allow unit leaders to test the techniques that they developed through simulation/wargaming.

5. **Large Unit Competition:** Aggregate at larger units to execute force on force exercises. Same as above regarding task checklists.
6. **Service Evaluation:** Live fire battalion and regimental level evaluation remains a useful capstone live-fire event for units preparing to deploy. Nonetheless, the current structure of ITX or other 29 Palms based live fire exercises is overly prescriptive and checklist driven. It is useful for ensuring that units understand basic TTPs.[80]
7. **Large Unit Competition:** After service evaluation, large unit competition must be revisited in order to both ensure that the unit has learned and applied the lessons of its previous evolution, and continue to evaluate its combat potential. This phase is unscripted and tests actual combat potential. This contrasts with current division-level "combat readiness evaluations" that are prescriptive and master-scenario event list (MSEL) driven.

Appendix 3: Discussion of German Training Methodology

It is widely recognized that the German Army of World War I and II was consistently more tactically effective than its allied counterparts.[81] Although this has a number of reasons, one of the most fundamental was its decentralized command nature, often referred to as *auftragstaktik*. Initially codified by von Moltke the Elder (known before World War I as *weisungsfuhrung*, and generally applying to army and corps commanders), the system became truly revolutionary with the advent of the tactical innovations of storm troop tactics and defense in depth during World War I.[82] These innovations subsequently formed the basis of the so-called "*blitzkrieg*" which would remain among the most effective of tactical methods through the 20th century and into the 21st. The rub, however, is that the German Army rapidly discovered the need for significant training to facilitate independent action in these tactical systems. Indeed, military decentralization is largely ineffective without extensive training of all units in the chain of command paired with a culture that emphasizes independent action at the smallest level, and the Germans recognized and perfected this.[83] The methodology described below clearly contrasts with current Marine Corps training methods, and thus should be examined for potential ways to improve the force.

As previously discussed, current Marine Corps training is driven by checklists, set-piece events, and limited (if any) realism.[84] Given this issue, and the recognition that the Imperial German Army and its successor, the *Wehrmacht*, were arguably the most capable tactical organizations of the last century, then it follows that the Marine Corps may be able to achieve greater proficiency as an organization by emulating some of their training methodologies.

Unit level training in the German Army was focused around three types of "military simulation:" the commander's wargame (*fuhrerkriegspiel)*, staff tours (*fuhrerreisen*), and full unit training evolutions, divided into field exercises (*uebung*), and maneuver (*manoevre*).[85] Each

of these will be more closely examined in turn, but they share a number of elements in which the Marine Corps is largely deficient. All three of these types of training had some key characteristics: an effort to ensure realism, a willingness to allow for experimentation, free-play environments without scripted, checklist driven training, and finally an organizational desire to "create a situation in which small-unit leaders had to make quick decisions in the face of rapidly changing conditions."[86]

The use of commander's wargames** inside the Marine Corps is greatly deficient. As previously discussed, there is insufficient opportunity for unit commanders at every level to gain experience in employing their unit – both as a tactical formation in its own right, and as a formation within a larger operational context. Much of this can be addressed through extensive use of simulations and wargames. Indeed, some historians allege that the commander's wargame was considered by the German Army to be the most important of the three types of unit training listed above.[87] This is quite distinct from a Marine Corps that uses commander's wargames rarely – certainly not often enough to use them as a "hypothesis testing" leadership development tool.[88]

The second type of training that the Germans used extensively was the staff tour (or staff ride). Although the term is likely familiar to much of the reading audience, within the US Military the staff ride has all too often been bastardized as a mere sight-seeing tour. What the German military focused on when conducting these tours was largely making decisions and then evaluating them by actually walking the terrain. More of a training evolution without troops (TEWT) than what is currently considered a staff ride, the focus was not on understanding *what*

** A distinction is to be drawn between the term "commander's wargame," and the step of the various US military planning processes known as "Wargaming."

happened on historical battlefields, but more on making a decision and subsequently walking the ground in order to understand the operational and tactical effects of the decision.

Finally, the Germans focused on large scale, free play exercises. These were refereed by a professional corps of "umpires," who ensured that the training met the overall objectives of the commander. Of note, and in stark contrast with the Marine Corps' various large scale exercises, these umpires did not use checklists to ensure that units executed according to a standardized model. They employed experience, general guidelines, and judgement. There was a significant focus on realism and decentralized decision making, and extensive use of after action reviews (AARs), not to simply recap what happened, but to ensure that all the lessons of the event were identified and subsequently *applied* for the participating units. The application of lessons learned is a crucial issue for the Marine Corps – although there are extensive AARs collected and submitted to the Marine Corps Center for Lessons Learned (MCCLL) after unit exercises varying in size from platoon to MEF, there is no institutional culture of learning from or applying them to the future. The recording of an AAR is simply another "check in the box."

Although the *Wehrmacht* has very evident drawbacks – there can be no question that they were strategically lacking[89] – at the tactical and operational levels of war they offer an example that the Marine Corps would be foolish to disregard. Much of the effectiveness that they displayed on the battlefield was a result of extensive training in the interwar years that developed a culture of mutual trust, respect, and understanding amongst officers and NCOs. This is the culture that the Marine Corps must achieve in order to reach its full potential as a fighting force.

[1] Martin Van Creveld, *Command in War.* (Cambridge, Massachusetts: Harvard University Press, 1985), 269.

[2] Antoine Bousquet, *The Scientific Way of Warfare: Order and Chaos on the Battlefields of Modernity.* (London: Hurst and Company, 2009), 234.

[3] Headquarters, U.S. Marine Corps. *Expeditionary Force 21.* (Washington DC: Headquarters U.S. Marine Corps, 2014), 35.;

U.S. Department of Defense. *Electronic Warfare.* Joint Publication 3-13.1. (Washington DC: U.S. Department of Defense, 2007), V.

[4] *Soviet Analysis of Operation Desert Shield and Desert Storm* (Washington, DC: US Defense Intelligence Agency, 1991), 76, quoted in Jeffrey Record, *Hollow Victory: A Contrary View of the Gulf War.* (Washington DC: Brassey's, 1993), 135.

Joe Gould, "Electronic Warfare: What the US Army can Learn from Ukraine," *Defense News,* 4 August 2015, http://www.defensenews.com/story/defense/policy-budget/warfare/2015/08/02/us-army-ukraine-russia-electronic-warfare/30913397/.

[5] Bousquet, 230.

For specific examples of Russian and Chinese thought regarding this issue, see: Korolyov, I.L., V.N. Pavlov, and A.V. Ganin. "Electronic Information Blockades by Combined Arms E.W. Forces," *Military Thought* no. 3, vol 0022 (2013): 17-25.;

Vinand Anod, "Chinese Concepts and Capabilities of Information Warfare," *Strategic Analysis* vol 30, no 4 (Oct-Dec 2006): 781-797.

[6] Sokolow, David. "Seizing the Wireless Advantage: Addressing an Increasingly Congested and Contested Electro-Magnetic Spectrum," CSIS New Defense Approaches Project, 2010. http://csis.org/files/publication/101018_seizing_wireless_advantage_final2.pdf, 2.

For a recent example of spectrum congestion, see: Geoff Fein, "Abundance of Devices in Iraq Causing 'Electronic Fratricide,' General Says," *Defense Daily,* vol 228, issue 19 (31 Oct 2005), https://search.proquest.com.

Global data traffic is expected to more than triple by 2019, and "internet penetration" will reach 71% of the global population, thus taking the estimated number of internet users in excess of 3.9 billion. See:
The Internet Society, *Internet Society Global Internet Report 2015,*
http://www.internetsociety.org/globalinternetreport/assets/download/IS_web.pdf.

[7] Headquarters, U.S. Marine Corps, Futures Directorate. *2015 Marine Corps Security Environment Forecast: Futures 2030-2045.* Washington DC: Headquarters U.S. Marine Corps, 2015.
http://www.mcwl.marines.mil/Portals/34/Documents/2015%20MCSEF%20-%20Futures%202030-2045.pdf , iii.

[8] Sydney J. Freedberg Jr., "US has 'Lost Dominance in Electromagnetic Spectrum:' Shaeffer,"
Breaking Defense. http://breakingdefense.com/2014/09/us-has-lost-dominance-in-electromagnetic-spectrum-shaffer/. 3 September, 2014.

[9] David Eshel, "Israel-Lebanon War One Year Later: Electronic Warfare in the Second Lebanon War," *The Journal of Electronic Defense* vol 30, no 7 (Jul 2007): 27-34. https://search.proquest.com.;

Yeganeh Torbati, "Iran Says Capable of Jamming Foes' Communications Systems," *Reuters World News,* 15 Jan 2013. http://in.reuters.com/article/2013/01/15/iran-military-idINDEE90E0DF20130115.;

Dan Winters, Katie M. Palmer, and Dan Matuina. "Flying Blind," *Wired,* vol 22, issue 3 (Mar 2014). https://search.proquest.com.

[10] Paul Mcleary, "Russia's Winning the Electronic War." *Foreign Policy.* October 21, 2015. http://foreignpolicy.com/2015/10/21/russia-winning-the-electronic-war/.

[11] *Expeditionary Force 21,* 32.

[12] David Adamy, *EW 103: Communications Electronic Warfare.* (Boston, Artech House, 2008), 252-258.

[13] David Adamy, *EW 104: EW Against a New Generation of Threats.* (Boston, Artech House, 2015), 266.

[14] Ross J. Anderson. *Security Engineering: A Guide to Building Dependable Distributed Systems,* 2d edition. Cambridge: Wiley, 2008. http://www.cl.cam.ac.uk/~rja14/book.html, 329

[15] Randy Huiss, "Proliferation of Precision Strike: Issues for Congress," *Congressional Research Service, Issues for Congress.* (Washington DC: Congressional Research Service, 2012).

Shawn Brimley, *While We Can: Arresting the Erosion of America's Military Edge,* (Washington DC: Center for a New American Security, 2015).

[16] Marianne Kunkel, "EA/SIGINT Payloads for UAVs: Assessing the International Market for EW Payloads on UAVs." *Journal of Electronic Defense* 31 (2008): 32-34,38-40. http://search.proquest.com.

For a discussion of modern drone based radio direction finding (RDF) paired with indirect fires, see: Phillip Karber, "Lessons Learned from the Russo-Ukranian War: Personal Observations, DRAFT," *The Potomac Foundation – Historical Lessons Learned Workshop,* 6 July 2015.

[17] Rowan Scarborough, "Russia, Iran Unleash 'Suicide Drones' in Syria Fight." *The Washington Times.* http://www.washingtontimes.com/news/2015/oct/22/syrian-forces-unleash-suicide-drones-rebels/. 22 Oct 2015.;

Zachary Keck, "Iran Tests Kamikaze 'Suicide Drone," *The National Interest.* http://nationalinterest.org/blog/iran-tests-kamikaze%E2%80%99-suicide-drone-11934. 29 December 2014.;

Spencer Ackerman, "US Troops Will Soon Get Tiny Kamikaze Drone," *Wired.* http://www.wired.com/2011/10/tiny-kamikaze-drone/. 18 October 2011.

[18] Korolyov, I.L., V.N. Pavlov, and A.V. Ganin. "Electronic Information Blockades by Combined Arms E.W. Forces," *Voennaia mysl'* no. 3, vol 0022, translated by Gennady Kmelev, (2013): 17-25.;

Vinand Anod, "Chinese Concepts and Capabilities of Information Warfare," *Strategic Analysis* vol 30, no 4 (Oct-Dec 2006): 781-797.;

Joseph S. Bermudez Jr., "SIGINT, EW, and EIW in the Korean People's Army: An Overview of Development and Organization," in *Bytes and Bullets: Information Technology Revolution and National Security on the Korean Peninsula,* edited by Alexandre Y. Mansourov, 234-275. (Honolulu: Asia Pacific Center for Security Studies, 2005).

[19] "Attack of the Drones - the Dangers of Remote-Controlled Aircraft." 2012. *Jane's Intelligence Review* 24 (1). http://search.proquest.com/.

For a current example, see:
Thomas Gibbons-Neff, "Israeli-made Kamikaze Drone Spotted in Nagorno-Karabakh Conflict." *Washington Post*, 5 Apr 2016. https://www.washingtonpost.com/news/checkpoint/wp/2016/04/05/israeli-made-kamikaze-drone-spotted-in-nagorno-karabakh-conflict/.

[20] Robert Wall, "Meet the Drone Killers --- as Military and Aviation Concerns Mount, Companies Develop Systems to Detect and Disable the Vehicles." *Wall Street Journal,* Jul 24, 2015, Eastern edition. http://search.proquest.com

[21] Stanislaw Czeszjeko, "Anti-Radiation Missiles vs Radars," *International Journal of Electronics and Telecommunications* vol 59, no 3 (Sept 2013): 289-291.

Martin Streetly. "ARMing Up," *Jane's Defense Weekly.* https://janes-ihs-com. 25 Feb 2015.

[22] There is a fourth option beyond the scope of this paper: Leverage use of steganography to "hide" messages in pre-existing networks, thus limiting military emissions signature while still passing messages. This could be something so simple as Twitter messages that have dual meanings, or it could be far more complicated. Unlikely to have major applicability at the lower tactical level, operational and higher tactical headquarters may be able to take advantage of pre-existing civilian networks to pass messages. This is somewhat analogous to German use of newspapers during the execution of the Schlieffen Plan in 1914. For a definition and discussion of steganography, See:
David Adamy, *EW 104: EW Against a New Generation of Threats.* (Boston, Artech House, 2015).

[23] Bousquet, 234

[24] Michael Frater and Michael Ryan, "Communications Electronic Warfare and the Digitised Battlefield," *Land Warfare Studies Centre, Working Paper no. 116.* (Australia: Land Warfare Studies Centre, 2001), 10.

[25] Although not exhaustive and largely beyond the scope of this paper, for examples, see:
Leslie Horn, "Chinese Scientists Invent Lightbulbs that Emit Wi-Fi," *Gizmodo,* http://gizmodo.com/chinese-scientists-invent-lightbulbs-that-emit-wi-fi-1447764194; 18 Oct 2013.;

Joshua Buck and Dewayne Watson, "NASA Laser Communications System Sets Record with Data Transmissions to and from the Moon," *NASA Press Release*, https://www.nasa.gov/press/2013/october/nasa-laser-communication-system-sets-record-with-data-transmissions-to-and-from/#.VoWBPhUrKM8, 22 Oct 2013.

[26] Colin S. Gray, *Another Bloody Century: Future Warfare,* (London: Weidenfeld & Nicholson, 2005), 127.

[27] Van Creveld, 154-155.

[28] Bousquet, 225

[29] Don Vandergriff, "The Myth of Mission Command" *The Bridge,* https://medium.com/the-bridge/the-myth-of-mission-command-78b81d7f7987#.i804x0vst, 30 Mar 2014.

[30] Eitan Shamir, *Transforming Command: The Pursuit of Mission Command in the U.S., British, and Israeli Armies,* (Stanford, California: Stanford University Press, 2011), 164-168.

[31] See Headquarters, U.S. Marine Corps, *Warfighting,* MCDP 1, (Washington DC: Headquarters U.S. Marine Corps, 1997), 78-92;

Headquarters, U.S. Marine Corps, *Command and Control,* MCDP 6, (Washington DC: Headquarters U.S. Marine Corps, 1997), 109-117, 130-135.

[32] Kim S. Cameron and Robert E. Quinn, *Diagnosing and Changing Organizational Culture,* (Reading: Addison-Wesley, 1999):14, quoted in Stephen J. Gerras, Leonard Wong, and Charles D. Allen, "Organizational Culture: Applying a Hybrid Model to the US Army," unpublished paper, US Army War College, Nov 2008.

[33] Jamshid Gharajedaghi, *Systems Thinking: Managing Chaos and Complexity, A Platform for Designing Business Architecture,* second edition, Amsterdam: Butterworth-Heinemann, 2006), 84.

[34] Edgar H. Schein, *Organizational Culture and Leadership* 2d edition, (San Francisco: Jossey-Bass Publishers, 1992), 12.

Paul Johnston, "Doctrine is not Enough: The Effect of Doctrine on the Behavior of Armies," *Parameters* (August 2000), 30-39. http://strategicstudiesinstitute.army.mil/pubs/parameters/Articles/00autumn/johnston.htm.

[35] Paradigms, as defined by Thomas Kuhn in *The Structure of Scientific Revolutions*, are by their very nature the underlying assumptions on which science is based. Applying this model to the Marine Corps' culture, one can see that the extant paradigm for C2 (centralized control via uncontested wireless networks) is driven by and reinforces a number of organizational underlying assumptions (radio communications will be effective, data networks will facilitate C2, Command posts will not be targeted, satellites will not be targeted, etc). See:

"Thomas Kuhn," *Stanford Encyclopedia of Philosophy,* 11 Aug 2011, http://plato.stanford.edu/entries/thomas-kuhn/#pagetopright.

[36] Meir Finkel, *On Flexibility: Recovery from Technological and Doctrinal Surprise on the Battlefield,* (Stanford, California: Stanford University Press, 2011), 109-110.

[37] Ori Brafman and Rod A. Beckstrom, *The Starfish and the Spider: The Unstoppable Power of Leaderless Organizations, (*New York: Penguin, 2006), 139-143

[38] Jeremy M. Burger, *Desire for Control: Personality, Social, and Clinical Perspectives,* (New York: Plenum Press, 1992), 179.

Bousquet, 234.

[39] Francis Fukuyama and Abram N. Shulsky, *The "Virtual Corporation" and Army Organization,* (Santa Monica, CA: RAND Arroyo Center, 1997), 49

[40] Dima Adamsky, *The Culture of Military Innovation: The Impact of Cultural Factors on the Revolution in Military Affairs in Russia, the US, and Israel,* (Stanford, CA: Stanford Security Studies, 2010), 77-92.;

Adrian R. Lewis, *The American Culture of War,* second edition, (New York: Routledge, 2012), 37-38.;

For specific discussion of risk management and casualty aversion in American culture, see:
Mikkel Vedby Rasmussen, *The Risk Society at* War, (Cambridge: Cambridge University Press, 2006), 9.

[41] Robert Kissel, "The Hidden Cost of Downsizing: A Zero Defects and Risk Avoidance Mentality," Unpublished Paper, Marine Corps War College, 3 Jun 1999. http://www.dtic.mil/dtic/tr/fulltext/u2/a525755.pdf.;

In reference to centralization/prescriptive control in garrison environments, see:
Carleton Forsling, "Intrusive Leadership: Bad by Definition," *Marine Corps Gazette,* vol 99, issue 7 (July 2015), https://www.mca-marines.org/gazette/2015/07/intrusive-leadership.;

In reference to Marine Corps training, see:
Daniel R. Grazer and William S. Lind, "Maneuver Warfare: Making it Real in the Marine Corps," *Marine Corps Gazette,* vol 99, issue 4 (April 2015).

In reference to centralization in Afghanistan, see:
Daniel R. Green, "Our Own Worst Enemy: How America Defeated itself in Afghanistan," *Foreign Policy*, 7 April 2015, http://foreignpolicy.com/2015/04/07/our-own-worst-enemy-how-america-defeated-itself-in-afghanistan/. Although Army focused, this article addresses issues that apply throughout Afghanistan.

[42] Adamsky, 15, Lewis, 14-15

[43] Schein, 315-316

[44] Stanley McChrystal, *Team of Teams: New Rules of Engagement for a Complex World,* (New York: Penguin, 2015), 34-35.

[45] Fukuyama and Shulsky, 7

[46] MCDP 1, 53-90.

[47] Mary Jo Hatch and Ann L. Cunliffe, *Organization Theory: Modern, Symbolic, and Postmodern Perspectives,* (Oxford: Oxford University Press, 2006), 190.

[48] MCDP 1, 71-72.

[49] Senge, Peter M, *The Fifth Discipline: The Art & Practice of the Learning Organization,* (New York: Doubleday, 1990), 40.;

R. W. Komer, *Bureaucracy Does its Thing: Institutional Constraints on US-GVN Performance in Vietnam,* (Santa Monica, CA: RAND, 1972), X.

Johnston, 30-39

[50] Eric M. Mellinger, "Cutting the Stovepipes: An Improved Staff Model for the Modern Unified Commander," Unpublished Masters Thesis, Marine Corps Command and Staff College, Marine Corps University, Apr 2001, 25-27.

[51] William G. Pierce, "Span of Control and the Operational Commander: Is it More than Just a Number?," Unpublished Masters Thesis, School of Advanced Military Studies, US Army Command and General Staff College, 1991, 14.

[52] Bousquet 206-215

[53] Fukuyama and Shulsky, 31-36,;

Mark T. Calhoun, *General Lesley J. McNair: Little Known Architect of the US Army,* Unpublished Doctoral Dissertation, University of Kansas, 2012, 218-237.

[54] For example, combined HQMC and US Navy headquarters staffs are currently double the size of their statutory limit (set in 1986), and increased 74% from 2012-2013. United States Government Accountability Office, "Report to the Committee on Armed Services, House of Representatives: Defense Headquarters," January 2015, http://www.gao.gov/assets/670/667997.pdf, 21.

[55] Jim Storr, *The Human Face of War,* (Birmingham, UK: Continuum, 2009), 150-152.

[56] John J. McGrath, *The Other End of the Spear: The Tooth to Tail Ratio (T3R) in Modern Military Operations,* (Ft Leavenworth, KS: Combat Studies Institute Press, 2007), 69-70.

When military contractors are included in the calculations it becomes apparent that the current tooth to tail ratio is one of the least efficient the US military has ever had.

[57] van Creveld, 269.

[58] Bousquet, 225.

[59] Martin van Creveld, *Fighting Power: German and US Army Performance, 1939-1945,* (Westport, CT: Greenwood Press, 1982), 51, 163-166.

For a related example, see: Field Marshall Viscount William Slim, *Defeat into Victory: Battling Japan in Burma and India, 1942-1945,* (New York: Cooper Square Press, 1956), 25. Field Marshall Slim believed that his staff during the retreat from Burma in 1942 was efficient precisely *because* they had too few people to issue detailed written orders.

[60] Headquarters, U.S. Marine Corps, *Organization of Marine Corps Forces,* MCRP 5-12D, (Washington DC: Headquarters U.S. Marine Corps, 1998), 2-1 - 2-5.

[61] Hatch and Cunliffe, 110-111.

[62] An analog to this is the *"einheit* principle" adopted wholesale by the *Wehrmacht* prior to World War II. It stipulated that any given formation would have sufficient organic elements required to accomplish its mission when operating independently – fire support, maneuver, administration and supply. In effect, each unit would be a self-supporting combined arms formation. See Thomas E. Greiss, *The Second World War: Europe and the Mediterranean,* (West Point: West Point Military Series, 2002), 18-19.

[63] Schein, 304, 313.

[64] Senge, 52-53.

[65] James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It,* (United States: Basic Books, 1989), 36-44.

[66] Komer, vii-ix.

[67] Mark Pomerlau, "Army Tests Small Electronic Jammers for use in Training," *Defense Systems,* 10 Dec 2015, https://defensesystems.com/articles/2015/12/10/army-direct-inject-jamming-tests.aspx.;

Don Vandergriff, "Personnel Reform and Military Effectiveness," *Project on Government Oversight*, 24 Aug, 2015, http://www.pogo.org/our-work/straus-military-reform-project/military-reform/2015/personnel-reform-and-military-effectiveness.html.

In live fire training, it is obviously a safety concern to continue training with no means to coordinate a response if an injury occurs. However, this is a common occurrence in blank fire and no fire training as well. It is beyond the scope of this paper to posit the reasons behind this issue.

[68] Headquarters, US Marine Corps, *Infantry Training and Readiness Manual,* Navy and Marine Corps Order 3500.44B, 30 Aug 2013.

[69] Vandergriff, "Personnel Reform and Military Effectiveness."

For a detailed discussion of the "dominant indicator" model of organizational decision making, see:
Scott Sigmund Carter, *Strategic Assessment in War,* (New Haven, CT: Yale University Press, 1997), 42-57, 170-177.

[70] Grazer and Lind

[71] MCDP 1, 59-60.

[72] Lawrence J. Peter and Raymond Hull, *The Peter Principle: Why Things Always Go Wrong,* (New York: Harper, 1969), 15-16.
Although a humorous look at so-called "Hierarchiology," many of the assertions in the book have been since proven by behavioral psychology, to include The Peter Principle itself. See foreward to 2009 printing, written by Robert I. Sutton of the Stanford School of Business, xv-xix.

[73] Vandergriff, "Personnel Reform and Military Effectiveness."

[74] Shamir, 26

For a discussion of the trust required for effective maneuver warfare, see:
Frans P.B. Osinga, *Science, Strategy and War: The Strategic Theory of John Boyd,* (London: Routledge, 2007), 170-171.

[75] Marion Bogers, Andrea van Dijk and Jacqueline Heeren-Bogers, "Trust and Control in the Military: Duel or Dueling Forces?," in *Managing Military Organizations: Theory and Practice,* ed. Joseph Soeters, Paul C. van Fenema, and Robert Beeres, (London: Routledge, 2010), 165.

[76] Bogers, van Dijk, and Heeren-Bogers, 164

[77] Daniel Kahnemann and Gary Klein, "Conditions for Intuitive Expertise: A Failure to Disagree," *American Psychologist,* vol 64, no 6 (Sept 2009), 524.

[78] Williamson Murray, "Clausewitz Out, Computer In: Military Culture and Technological Hubris," *The National Interest,* vol 48 (Summer 1997), 63.

[79] Gordon Rudd, "Napoleon and the Operational Art of War," (Lecture, US Marine Corps School of Advanced Warfighting, Quantico, VA, 3 August 2015).

[80] Grazer and Lind

[81] James S. Corum, *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform,* (Lawrence, KS: University Press of Kansas, 1992), 5-10.

van Creveld, *Fighting Power,* 1-9.

[82] *Truppenfuhrung,* 4-5

[83] Erich Ludendorff, *Ludendorff's Own Story,* (New York: Harper, 1919), 460-469.

Truppenfuhrung, 282

[84]See: Jacob W. Foster, "Complex Military Environment: A Checklist Mentality in a Maneuver Warfare Environment," *Marine Corps Gazette,* vol 100, no 2 (February 2016), 52-54.

[85]Robert M. Citino, *The Path to Blitzkrieg: Doctrine and Training in the German Army, 1920-39,* (Mechanicsburg, PA: Stackpole, 2008), 105-106.

[86] *United States Military Intelligence Reports: Germany, 1919-1941,* (Frederich, MD: University Publications of America, 1983), quoted in Robert M. Citino, *The Path to Blitzkrieg: Doctrine and Training in the German Army, 1920-39,* (Mechanicsburg, PA: Stackpole, 2008), 123.

[87] Citino, 105.

[88] For a discussion of wargaming, see Gregory Thiele, "Marines Ought to Play More Games!," *Marine Corps Gazette,* vol 100, issue 1 (January 2016).

[89] See: Shimon Naveh, *In Pursuit of Military Excellence: The Evolution of Operational Theory,* (London: Frank Cass, 1997).

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