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MASTER OF MILITARY STUDIES

TITLE: Future Nonlinear Warfare and the Pervasiveness of Uncertainty:
Organization and Cognition in Marine Corps Intelligence

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

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Executive Summary

Title: Future Nonlinear Warfare and the Pervasiveness of Uncertainty: Organization and Cognition in Marine Corps Intelligence

Author: Major William DeLeal, United States Marine Corps

Thesis: Elements of the deployable Marine Corps Intelligence Operations Center must adapt organizationally and cognitively to support decision making and reduce uncertainty in future nonlinear war scenarios.

Discussion: Future combat operations by brigade- and force-level Marine Air Ground Task Forces will be conducted in systemically complex and chaotic settings across the five domains of warfare. Future war projections characterize operational environments composed of interdependent and interactive systems within systems. These projections provide a framework for the type of nonlinear intelligence problems Marines of the Intelligence Operations Center's Production and Analysis Cell will encounter. The nature of these problems demands adaptation within two realms: organization and cognition.

Conclusion: This thesis recommends departure from doctrinal hierarchical designs. It argues for horizontal and cellular organizational structures to cultivate collective consciousness, unbounded flow of information, and conditioning of *systems mentalities* among Marine intelligence analysts. It formalizes roles and relationships of key intelligence personnel, and recommends training and education commensurate with the nonlinear and dynamic cognitive demands of future conflict. Finally, it makes recommendations to encourage better operations-intelligence integration between the Intelligence Operations Center and the MAGTF G-3 Operations and G-5 Plans Staff Sections.

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Preface

This topic was chosen out of a profound desire to reflect on professional experiences and observations while conducting tactical- and operational-level intelligence in support of Operations IRAQI FREEDOM and ENDURING FREEDOM. Intelligence in combat operations can be an extraordinarily abstract and consequential undertaking contrasted against an environment consumed by physical entities and kinetic actions. It is no simple endeavor, and we should avoid becoming too complacent and confident in our ways. As such, the philosophies we embrace to prepare ourselves, and the methods we employ in combat to reduce uncertainty must constantly adapt with a keen eye on the future that is informed by the past. That is the purpose of this work.

This paper would not have been possible without the excellent mentorship of the Marine Corps Command and Staff and Gray Research Center faculties. Most of all, I am indebted to my family for their consistent support and encouragement. My wife Catherine, a fellow Marine and Operation IRAQI FREEDOM veteran, and my girls know me as a husband, a father, and a Marine. They inspire me on a daily basis and remind me that bearing one of those esteemed titles well will always make me better at the others.

I - INTRODUCTION

“The nation that will insist on drawing a broad line of demarcation between the fighting man and the thinking man is liable to find its fighting done by fools and its thinking done by cowards.”

- William Francis Butler

The two principle roles of intelligence in war are to reduce uncertainty and support decision making.¹ Marine Corps Doctrinal Publications 1 and 2 postulate that, given the nature of war, uncertainty cannot be eliminated.² Complex interactions and interdependencies between enemy, friendly, and neutral systems in operational environments (OE)³ produce disproportionate outcomes that influence the nonlinear character of conflicts.⁴ Narratives of warfare more frequently describe nonlinear actors, events, and outcomes than they do those of the linear brand.⁵

Emphasizing the nonlinearity and uncertainty of war, Thucydides and Clausewitz postulate that intractable human characteristics – fear, honor, interest and emotion, chance, reason – comprise unpredictable abstractions that lead to and determine the character of conflict.⁶ War, in Clausewitzian terms, is means employed by social systems for political ends that produces frequently unforeseeable results.⁷ Structurally complex military systems project kinetic and non-kinetic energy into interdependent and interactive friendly, neutral, and enemy systems. Civilian populations organize within vast multiplicities of socio-cultural, ethno-religious, economic, and political systems. Information Age technological systems disseminate images and ideas globally at the speed of light with system-altering effect. Proliferation of advanced sensing and weapons systems dilutes traditional technological dominance. The complexity of war emerges within this deterministic chaos. It confounds intelligence organizations and cognitive perspectives tailored to rigid linearity.

Clausewitz describes the difficulty of understanding the friction of war without experiencing it, and that all things in war are simple, but the simple is difficult.⁸ The same can be said of intelligence analysis in combat OE. Organizationally and doctrinally, analysts are encouraged to think linearly by reducing systemic elements of conflict to their component parts and analyzing those components for order and recognizable patterns. What better way to face friction and uncertainty than to search for order?

Linear analytic processes are quite good at identifying the surface structures of organizations, patterns in abstract problems, or the potential decisions of rational actors. They do not do so well against structures that change spatially and temporally, abstract problems with misleading semblance of patterns, or rational actors deciding irrationally in dynamic situations. The high demand signal to reduce uncertainty in these respects can result in an overreliance on linear thinking and hierarchical organization since their output is generally predictable and its workflow easy to control. Linear, process-driven analysis influences an intelligence culture that organizes and thinks within the same linear paradigm. This “seduction of (linear) simplicity” neglects the chaotic determinism of dynamic systems that permeate conflict OE.⁹

The implications for how the Marine Corps should conduct operational intelligence in future conflict OE hinge on organizational and cognitive capabilities sufficient to reduce uncertainty of such confounding nonlinearity. To this end, the complementary roles of adaptive intelligence production and analysis (P&A)¹⁰ and operations-intelligence (Ops-Intel) integration cannot be understated.¹¹ As the primary brigade- and force-level intelligence node, the Intelligence Operations Center’s (IOC) Production and Analysis Cell is the principle analytic source to achieve both ends. While concerted efforts aligned with the Marine Corps Intelligence, Surveillance, Reconnaissance, and Intelligence Enterprise (MCISRE) Plan 2015-2020 have

advanced the Marine Corps intelligence community writ large, deficiencies exist within the deployable IOC and its Production and Analysis Cell.

Among these, doctrine is dated and inadequate in some respects; no universally accepted deployable IOC model exists; certain approaches to analysis training and education are antiquated and overemphasize linearity; effects related to institutionalized stove-piping of intelligence disciplines persist; and aspects of intelligence culture sustain an insular focus that inhibits Ops-Intel integration. Considering these internal conditions, elements of the deployable Marine Corps IOC must adapt organizationally and cognitively to support decision making and reduce uncertainty in future nonlinear war scenarios.

Recommendations and Methodology

The MCISRE Plan calls for an outthinking of enemies.¹² Implicit in this charge is to outthink the innumerable nonlinear systems of combat OE, a task more challenging than most assume. Success in this endeavor requires not a sea change alteration of current doctrine and practices, but a measured adaptation. Ultimately, this thesis addresses all-source intelligence analysis and the changes necessary to both organize the IOC's Production and Analysis Cell and to prepare its intelligence professionals to operate in future conflict OE.

To this end, prominent future war projections and strategic forecasts are analyzed to identify key characteristics of future conflict OE that Marines of the Production and Analysis Cell will grapple with analytically. The nature of those analytic problems demands adaptation of the cell within two realms: organization and cognition. This thesis recommends horizontal cellular organizational structure that will cultivate collective consciousness, unbounded flow of information, and conditioning of *systems mentalities* (see Endnote for definition).¹³ The thesis formalizes roles and relationships of key intelligence personnel, and recommends training and

education commensurate with the cognitive demands of future conflict OE. Finally, it makes recommendations to encourage better Ops-Intel integration between the IOC and the G-3 Operations and G-5 Plans Staff Sections.

II – CHARACTERIZING FUTURE CONFLICT OPERATIONAL ENVIRONMENTS

“...linear relations and the predictability they offer are the exceptions in the real world.”
- Dr. Alan Beyerchen¹⁴

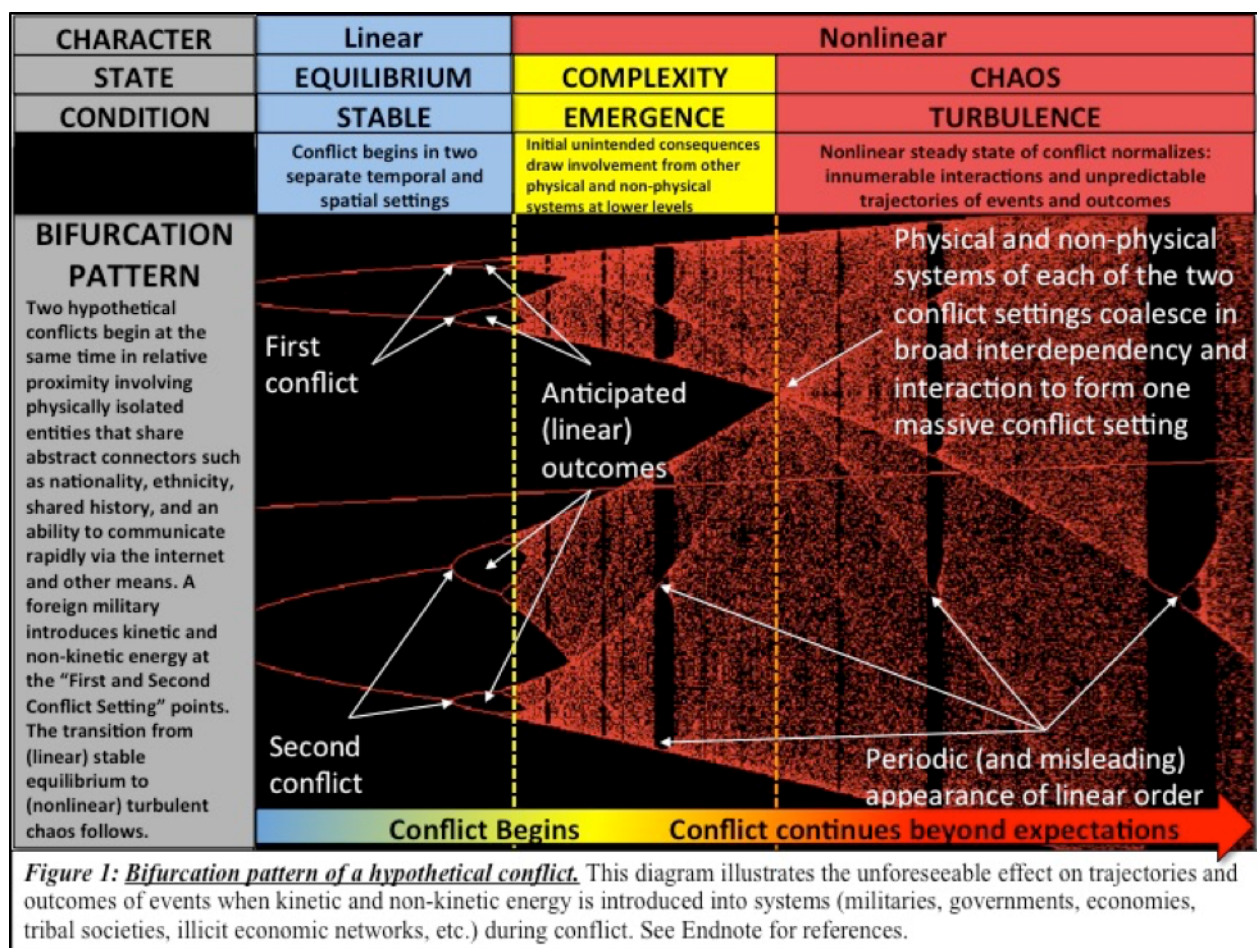
Nonlinearity: War’s Enduring Nature and Varying Character

Will Durant noted in 1968 that human civilization experienced a brief 268 years of non-contiguous peace in the previous 3,421 years of recorded history.¹⁵ War, he intimated, is mass competition and violent clashing of wills by innumerable physical and non-physical systems. Indeed, organized violence is derivative of both human psychological and civilizational design, and it will be as much a part of the future as it is of the past. The nature of war is invariant; its character is variant.¹⁶ What does Clausewitz’s maxim mean for future war?

The nature of future conflict will, like its antecedents, continue as violent contests of wills to desired political ends. Familiar determinants such as chance, passion, reason, friction, and difficult simplicity will characterize future conflict nonlinearly and dilute ability to understand or foresee outcomes.¹⁷ Aspects of Chaos and Complexity Theories explain this nonlinearity and the inherent challenges to reducing uncertainty in conflict OE.¹⁸

Poincare, in his *n-Body Problem*,¹⁹ tells of the improbability to predict accurately behavior and outcomes of two interacting entities when a third or more are introduced.²⁰ War of any scale contains infinitely more than two interactive and interdependent entities. These entities can be susceptible to Chaos Theory’s *Sensitivity to Initial*

Conditions²¹ where a tiny alteration to any system component at the onset of change – for example, prior to the commencement of combat actions – can drastically alter anticipated outcomes. At this onset, components of systems sense, learn, and adapt to changes and bifurcate to accelerate the emergence of trends and events from lower levels. This rapid succession of events cascades throughout a conflict OE and compounds the complexity and unpredictability of interactions between enemy, neutral, and friendly systems. Bifurcation diagrams demonstrate a transition from equilibrium to chaos that occurs when systems interact nonlinearly and alter the trajectory of their behavior in unpredicted directions (see Figure 1).²²



Yet, there can be paradoxical order and logic to this apparent disorder stemming from *self-organization* and *emergence* at lower levels of combat.²³ At operational levels, armed forces clash at force, corps, and army levels compelling the shifting of “Big Blue and Red Arrows” on a map; at tactical levels, fire teams engage kinetically forcing mutual change and adaptation between small groups of soldiers. Boundless interaction between these military systems cascades influential energy and change that is agnostic to artificial operational and tactical boundaries. This example represents two themes of complexity and chaos: surface complexity can emerge out of deep simplicity and surface simplicity can emerge out of deep complexity.²⁴

Further illuminating the nonlinearity of combat, Illachinski identifies eight key properties of complex systems: nonlinear interaction, non-reductionist, hierarchical structure, decentralized control, emergent self-organization, non-equilibrium order, adaptation, and collectivist dynamics (see Appendix B for definitions). He describes how each property relates to conflict, such as the nonlinear interaction of combat forces, continual adaptation of systems in conflict, and self-organized local action that produces long-range order.²⁵ Additionally, he describes how complex systems embody processes that adapt continuously, thus minimizing the efficiency of predictive analysis prior to and during conflict.²⁶

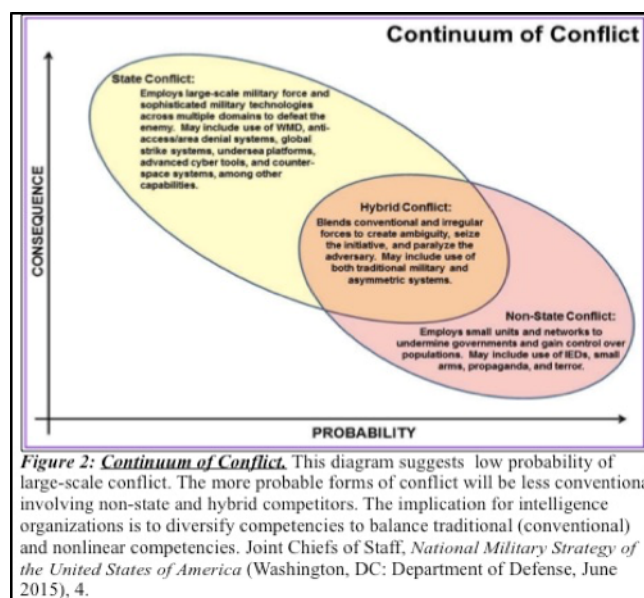
Colin Gray’s works emphasize this point and speak even to the limits of prudent rationality when analyzing future conflict scenarios.²⁷ Predictions of future conflict cannot be precise since accounting accurately for the effects of these potential small- and large-scale interactions is impossible. As such, granular specificity of location and opponent – the *where* and with *whom* the US will fight in future conflict – is a projection

beyond the scope of this paper. The focus, rather, emphasizes place and opponent *types* and broad OE characteristics relevant to probable intelligence analysis requirements.²⁸

Probable Character of Future War Operational Environments

The host of entangled systemic factors and variables that could lead to future conflict can be considered within six broad categories: demographics and ideology, resource competition and environmental stresses, globalization, technology, governance, and enduring conflict legacies.²⁹ Further determining the uncertainty and complexity of future conflict OE, each of these categories represents a host of sub-components. These include influencers such as socio-culture, rapid urbanization, or identity-based motive to conflict (demographics and ideology); economic disparity or collective consciousness of conflict issues (globalization); weapons proliferation or commercially available drones (technology); state collapse and its attendant power vacuum (governance); and unresolved conflict motivators such as grievance (enduring conflict legacies).

Future conflict that compels involvement of a brigade- or force-level Marine Air Ground Task Force (MAGTF) will likely occur when any number of these variables or factors converges to create flashpoints with significant relevance to US national interests. These future wars, in current estimation, will be less like their mass-scale conventional antecedents of the 20th Century (see Figure 2).³⁰ US involvement in conflicts characterized as small wars, irregular warfare, low-intensity conflict,



and counterinsurgency is more probable than force-on-force major combat operations with a near peer such as China or Russia.³¹ The legacy of mass interstate war remains possible, but less likely given current international settings. Intrastate conflict and scenarios involving non-state actors are more likely to occur, and they will transcend traditional concepts of war, peace, victory, and defeat.³² Such ambiguous definitions will challenge linear analytic mentalities.

Competitors in future conflict OE could be comprised of conventional hierarchical military units, non-uniformed asymmetric forces, hybrid criminal and non-state combatant organizations, or ethnically aligned paramilitary groups. Non-conventional opponents will operate in a decentralized manner that presents significant challenges to intelligence efforts. Vast proliferation of weapons, ammunition, and military technology will ensure lethality at all levels. The ease of global travel and accessibility via the Internet will make everything far and near simultaneously, further broadening systemic interdependence and interactivity.

The scale of probable future conflicts includes indirect engagement with adversarial near peers via proxy conflict³³ or direct conflict with non-state entities in collapsing states – those whose internal disorder permeates as a regional flashpoint drawing neighboring weak or developing states into the vortex of conflict.³⁴ These scenarios would present situations where MAGTF units are engaged by conventional kinetic capabilities from an opposing armed force. In the same relative area, non-uniformed forces employ guerilla tactics and formations while manipulating population groups for ideological and logistical support. Host government and other international security forces operate in proximity to the MAGTF further adding to the OE's nonlinear

character. Illicit economic markets support and interact with friendly, neutral, and enemy systems, blurring the lines between threats and benign activities.³⁵

Smaller scale conflicts such as these may present more complex analytic problems than larger scale wars.³⁶ In such circumstances, these various systems adapt asymmetrically to emerging circumstances, and require holistic analysis and continuous alteration of intelligence estimates. This dynamic characteristic of conflict OE compels commanders and decision makers to constantly revise their understanding of the OE. As Schmidt details in his work on systemic approach to operational design, analytic support to fluid understanding requires nonlinear analytic approaches.³⁷

Civilian populations in conflict OE – whose interactions can be driven by subtle, unpredictable, and irrational forces of will – present myriad situations that require this nonlinear analytic mentality. Intelligence challenges in this respect include understanding ideologies, collective will, enduring sources of grievances, ethno-religious friction, and sociocultural binding agents such as tribalism, local history, and law. Groups relevant to tactical-level engagements may be locally or globally coupled, challenging linear analysis of homogeneous actors. This unbound tethering of people from local conditions confounds unsophisticated intelligence analysis capabilities. It also adds complexity to the OE in the form of, for example, asymmetric logistical supply chains, multi-dimensional ideological constructs, and flattened chains of command.³⁸ These challenging characteristics are compounded in densely populated areas.

Marine Corps and US Army projections postulate future conflict within littoral and underdeveloped areas in proximity to rapidly expanding urban centers, to include mega-cities.³⁹ Demographic swelling in underdeveloped littoral and urban settings will

challenge governance and threaten state collapse, providing opportunities for non-state actors to advance their interests violently and possibly draw a US military response.⁴⁰ Potential adversaries in these settings will be comprised of a blurring mix of hybrid conventional and unconventional forces, to include irregular militias, paramilitaries, terrorist groups, and trans-national criminal elements.⁴¹

The traditional “Three Block War” concept quickly becomes the “Three Floor War” where a civilian evacuation is taking place on the third floor, detaining adversaries on the second floor, and operational maneuvering on the first floor.⁴² Intelligence problems in this scenario involve ethno-religious affiliation, consequences following kinetic action, infrastructure and human targeting data, enemy force intent and capability, non-kinetic targeting options, and so on. Intuitive decision making by commanders in this complexity requires a *systems mentality* approach to intelligence analysis.

Some characterize the exponential speed of technological growth as the Fourth Industrial Revolution overlaid on the context of the Information Age.⁴³ While the US military maintains technological dominance and advantage at present, proliferation trends will create opportunities for future adversaries that will mitigate this advantage. There is a large body of literature addressing proliferation of anti-access area denial (A2/AD) technology to near-peer adversaries and non-state actors. OE conditions such as these will challenge rigid, mechanical intelligence processes.⁴⁴

This leveling of technological advantage relates to the already proliferated availability of drone technology and the limitless employment options for unsophisticated non-state actors. Using commercially acquired satellite imagery to identify target areas, one could conduct surveillance, disrupt command and control (C2) systems, deliver a

M67 fragmentation grenade into the tent roof of a combat operations center (COC), or swarm small squadrons of mini-kamikaze drones onto dismounted maneuver units.⁴⁵ Friendly and enemy use of robotics in warfare and the seemingly inevitable merging of drone technology and artificial intelligence are no longer fantastic themes of science fiction. The need to adapt intelligence organizations and cognitive approaches to the myriad challenges presented by Information Age technological advances such as these is without doubt.

The related role of cyber to future conflict is significant.⁴⁶ The Internet of Things (IoT) concept characterizes the evolving cyber-physical joining of electronic systems to the Internet to collect and process data and control systems such as cloud computing, sensors, power grids, and transportation and communications systems. By 2020, more than 30 billion of these sensor-enabled systems and another 182 billion that will become enabled will comprise the IoT, significantly altering traditional methods of sensing, analyzing, and interacting between humans and information systems.⁴⁷ This system of systems benefits the US military by synchronizing C2 with all warfighting functions and pulsing vast amounts of data to inform planning and decision making; it challenges it by presenting Information Age security concerns and providing future adversaries similar commercially available technology.⁴⁸ The intelligence challenges in this respect are clear.

Organizations that conduct intelligence analysis to support decision making and planning amidst such systemic interaction and interdependency must carefully prepare their personnel. Basic intelligence functions such as reporting enemy force disposition, effects of weather and terrain, and battle damage assessments will remain core functions of the status quo. While these functions are important to broad intelligence efforts, the

additional challenges inherent in probable OE discussed thus far require advanced organizational and cognitive capabilities.

III – THE PRODUCTION AND ANALYSIS CELL IN FUTURE CONFLICT: ADAPTING ORGANIZATIONAL DESIGN AND COGNITIVE PERSPECTIVES

“Thinking is the hardest work there is, which is probably the reason so few engage in it.”
- Henry Ford

“The conventional view serves to protect us from the painful job of thinking.”
- John Kenneth Galbraith

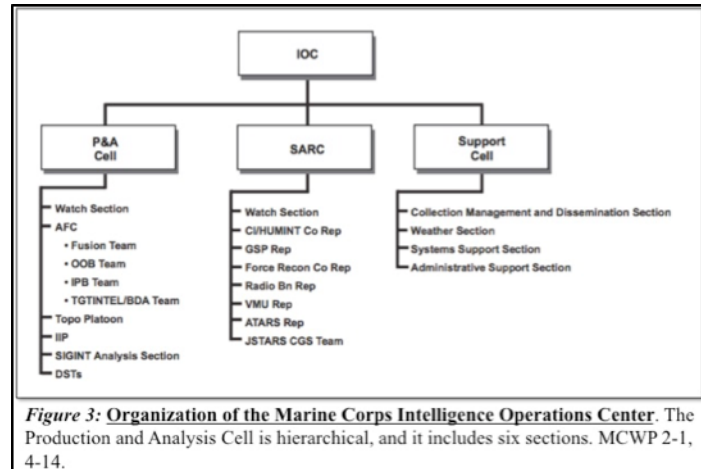
The Production and Analysis Cell: Organizational Design

There is no universally accepted model for a deployed IOC or hybrid Ops-Intel fusion center. While this condition allows for flexibility in design to meet contextual demands, it fails to define how to best form a brigade- or force-level MAGTF IOC. Marine Corps Warfighting Publications (MCWP) 2-1 *Intelligence Operations* and MCWP 2-3 *MAGTF Intelligence Production and Analysis* provide sound doctrinal basis for how to begin conceptualizing this design.⁴⁹ They are, however, nearly 13 and 15 years out of date respectively. They further lack specificity for how to design the IOC’s Production and Analysis Cell, the MAGTF’s principle analysis node.

Future warfare in the Information Age will compel intelligence organizations and professionals to act and think nonlinearly, counter to predominant preferences for linearity. Instead of forming rigid organizations and cultivating cognition that favors order and expects sequenced outputs to analytic problems, organizational hierarchy must flatten for adaptability and analysts must cultivate *systems mentalities*. To this end, the following presents an idealized Production and Analysis Cell design that is based on a number of factors. Among them are relevant experiences from the force-level Tactical Fusion Center (TFC) and Southwest Analysis Center (SWAC) models in Operations IRAQI FREEDOM (OIF) and ENDURING FREEDOM

(OEF) in Iraq and Afghanistan, current practices, doctrine, and the nonlinear OE characteristics of future conflict identified in this paper.

The IOC is the primary intelligence node of deployed brigade- and force-level MAGTF's (Figure 3

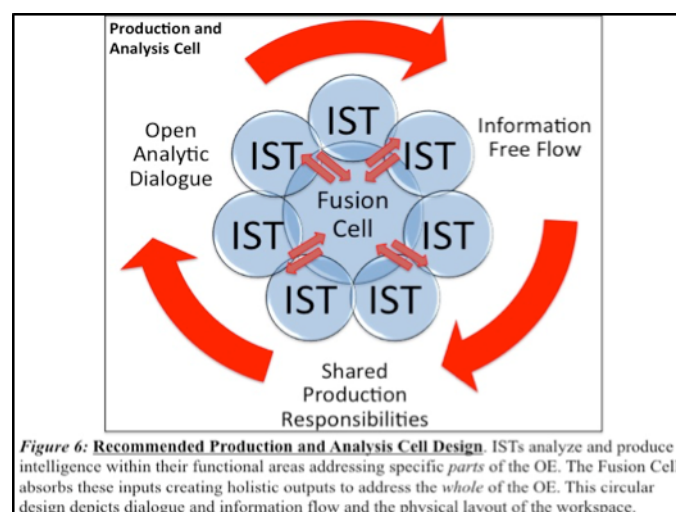
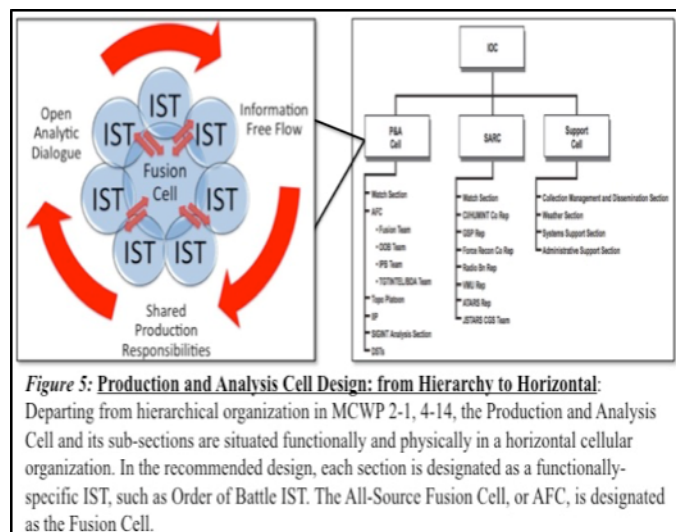
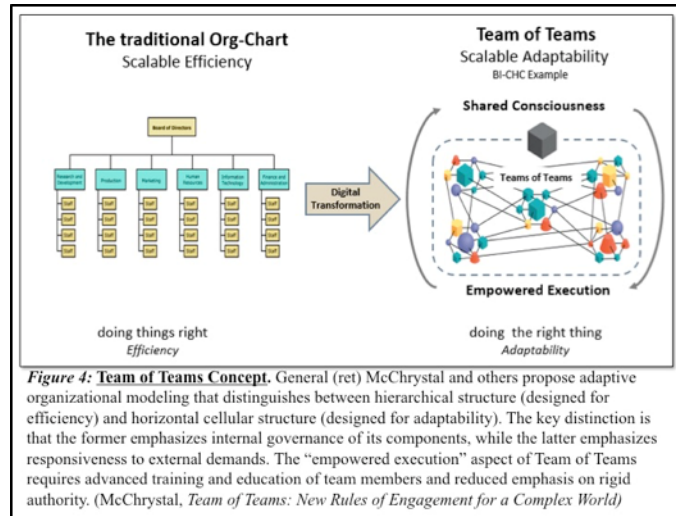


depicts the doctrinal IOC design in MCWP 2-1).⁵⁰ IOC functional responsibilities include collections management, meteorology and oceanographic analysis, human intelligence operations management, and other functions mainly related to the collection and management of information.⁵¹ The IOC's Production and Analysis Cell is the MAGTF's primary all-source intelligence analysis asset.

Two considerations are important when discussing organization of this cell. First, it is a military organization and, as such, must have some semblance of hierarchy to create efficiencies and resonate with the other organizations it interacts with; its cellular design is not without rank-based seniority. Second, the Marines who function within its structure are in the business of individual and collective cognition. Their base function is to analyze in the abstract to reduce uncertainty in highly complex settings. As such, their personal and shared mental faculties should be conditioned to develop adaptive functioning inherent in mammalian immune systems or other biological subsystems known as *complex adaptive systems*.⁵² How is this adaptability achieved within traditionally rigid and hierarchical military organization?

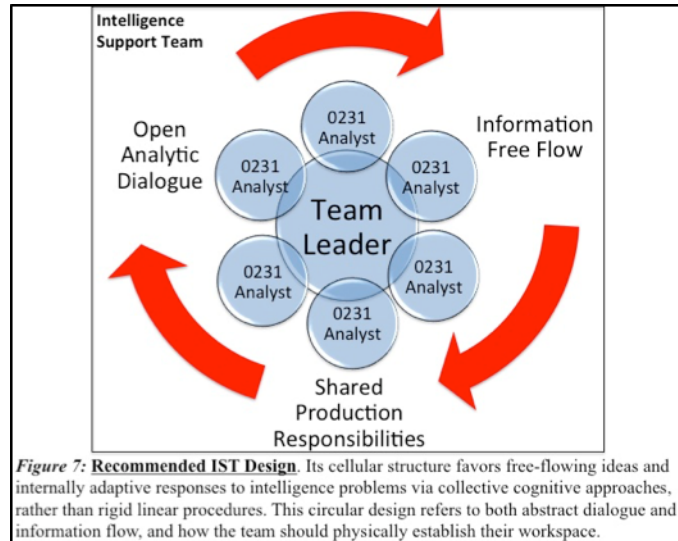
The recommended organizational design resonates with General (ret) McChrystal's "Team-of-Teams" concept (see Figure 4) and calls for a departure from the hierarchical design in MCWP 2-1 (see Figure 5).⁵³ The recommended Production and Analysis Cell design is horizontal and cellular with the Fusion Cell in the center surrounded by functionally designated Intelligence Support Teams (IST) (see Figure 6).

The design concept emphasizes adaptability and unbounded flow of information and analytic dialogue. Analysts are free to surge to other ISTs within the Production and Analysis Cell when necessary to, for example, address complex problems with multi-discipline approaches such as overlaying socio-cultural perspectives on geospatial information. The information flow from functionally specific ISTs into and out of the Fusion Cell is free flowing and



unimpeded by typical layers of control inherent in hierarchical organizations.

The recommended IST design resembles the horizontal design of the Production and Analysis Cell (see Figure 7). A non-commissioned officer analyst leads from the center fostering cyclical dialogue and free flow of analytic



perspectives among the team of analysts. The IST is capable of exploiting and processing information from all intelligence disciplines⁵⁴ and supports the collective analytic efforts by providing finished intelligence products and dialogue to analytic discussions. The Production and Analysis Cell should be composed of no less than seven ISTs of specified functional design; characteristics of the OE will determine if additional ISTs are required (see Figure 8 on the following page).

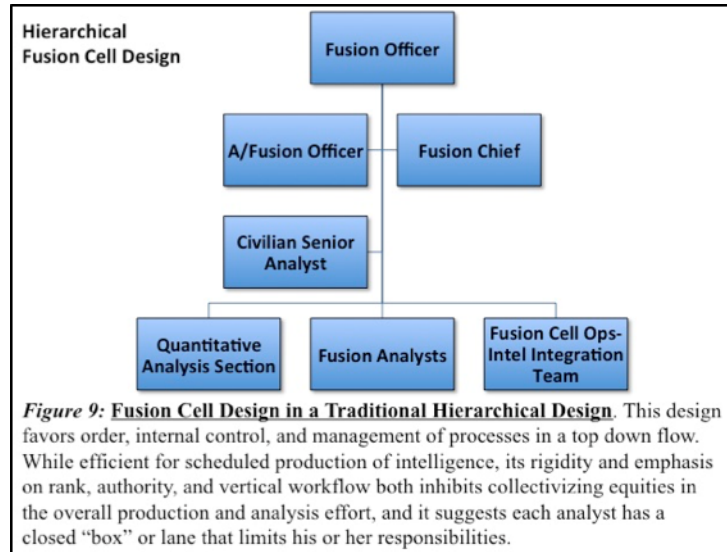
This functional designation of IOC components was employed to varying degrees by the TFC and SWAC in al-Anbar Province, Iraq and Helmand Province, Afghanistan. Critiques of this design aptly identify some problems.⁵⁵ The breadth of complexity in Iraq and Afghanistan presented a host of OE factors that confounded linear organizational design, so smaller cells were formed to reduce the *whole* of prominent analytic problems into *parts* to make them manageable for generally linear thinking and processes. This reductionist approach led, at times, to compartmentalized perspectives that mischaracterized the *whole* based solely on a perspective of a *part*.

Intelligence Support Team Designator	Functional Specificity	Brigade-Level Task Organization	Force-Level Task Organization
Geospatial IST (GIST)	• Geographic and imagery interpretation • Collection and analysis	• (12) Marines • (6) 0241 Imagery Intelligence • (6) 0261 Geographic Intelligence	• (20) Marines • (10) 0241 Imagery Intelligence • (10) 0261 Geographic Intelligence
Order of Battle IST (OOBIST)	• Analysis of enemy forces structure and capabilities	• (5) Marines • (5) 0231 Intelligence Specialists	• (7) Marines • (7) 0231 Intelligence Specialists
Intelligence Preparation of the Battlefield IST (IPBIST)	• Continuous maintenance and update of the MAGTF IPB	• (5) Marines • (5) 0231 Intelligence Specialists	• (7) Marines • (7) 0231 Intelligence Specialists
Targeting IST (TIST)	• Kinetic and non-kinetic targeting analysis • Battle Damage Assessment	• (5) Marines • (5) 0231 Intelligence Specialists	• (7) Marines • (7) 0231 Intelligence Specialists
Economic and Political IST (EPIST)	• Analysis of licit and illicit economics • Analysis of governance and political power structures	• (5) Marines • (5) 0231 Intelligence Specialists	• (7) Marines • (7) 0231 Intelligence Specialists
Sociocultural and Ethno-Religious IST (SEIST)	• Analysis of these aspects related to intelligence requirements	• (5) Marines • (5) 0231 Intelligence Specialists	• (7) Marines • (7) 0231 Intelligence Specialists
Information IST (IIST)	• Analysis of aspects in the information domain, to include cyber, propaganda, messaging, and narratives	• (5) Marines • (5) 0231 Intelligence Specialists	• (7) Marines • (7) 0231 Intelligence Specialists

Figure 8: The seven fundamental Intelligence Support Teams in the Production and Analysis Cell.

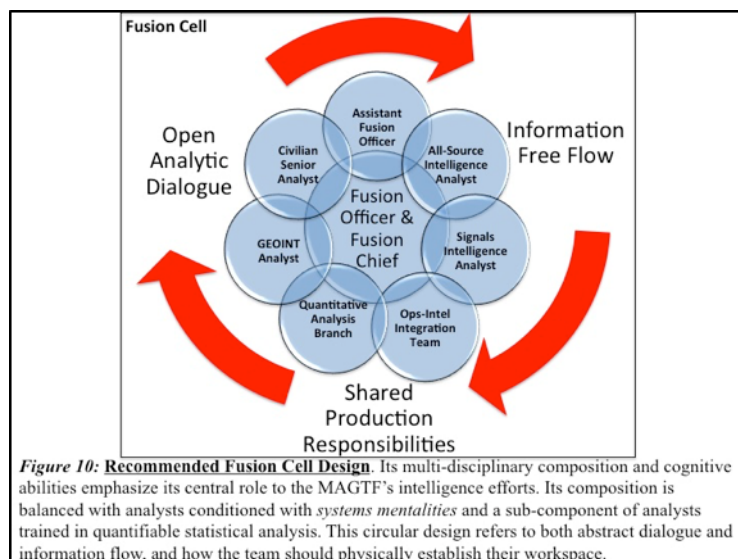
Parochial cognition emerged that partitioned collective efforts into color-coded camps.⁵⁶ Those in the “Red” Camp studied the Iraqi insurgency or the Taliban and argued heavily for kinetic solutions; those in “White” and “Green” camps studied governance and the Iraqi and Afghan people and argued passionately to resource government and civil institutions. Neither camp was wrong. In fact, they both executed their duties, in many ways, superbly according to how they were resourced and designed. When the design failed to meet expectations, it was missing a connecting sinew that should have coalesced their perspectives and products to speak for the *whole* of analytic problems. That critical sinew-like hub is the Fusion Cell (see Figure 9 for traditional hierarchical design and Figure 10 for the recommended horizontal, cellular design on the next page).

The Fusion Cell is the principle all-source P&A entity in the IOC. ISTs form around the Fusion Cell, as the analysts form around their IST team leader, in a cellular structure. The design is a flat “hub and spoke” configuration that encourages shared consciousness and seamless flow of dialogue and information into and out of the Fusion Cell.



While other components are functionally designed to address an intelligence topic such as targeting or geospatial intelligence analysis, the Fusion Cell analyzes, produces, briefs, and ensures holistic synthesis of the various types of intelligence each IST produces. It provides inputs to intelligence collection, targeting, and most importantly, to MAGTF planning and key decision-making in the form of finalized intelligence production, briefings, and direct dialogue with key members of the G-2 Intelligence, G-3 Operations, and G-5 Plans Sections.

Among these responsibilities, it creates and maintains an OE intelligence narrative that, in essence, represents the sum of all G-2 operations.⁵⁷ Its personnel represent each intelligence discipline, and they are screened



and selected for their advanced cognitive abilities and experience.

The horizontal cellular design emphasizes adaption, free thought, and equitable P&A responsibility among its members. For example, brilliant junior analysts are responsible for writing the same intelligence estimates or delivering briefings that the more senior members would typically complete. While rank, station, and associated leadership responsibilities remain a salient part of the organization, they are deemphasized to enable open dialogue, unbounded flow of information, and collective input to Fusion Cell operations. While theoretically sound, the practical challenges of this model cannot be ignored.

Marine Corps good order and discipline rely on the authority of rank and station. Deemphasizing these at certain points for the sake of better discussion assumes a level of maturity and professionalization that comes typically with age and experience. Young, brilliant, and relatively inexperienced analysts who are needed in the Fusion Cell would be challenged by this departure from the norm. Still, analytically addressing nonlinear analytic problems requires unbridled thought and discussion that can be inhibited by fear of retribution following debate or disagreement with a superior. Senior Fusion Cell members must strike a consistent balance between maintaining good order and discipline and setting the right conditions for unbounded discussion.

The Fusion Cell centers on the Fusion Officer, a senior captain (O-3) or major (O-4) MAGTF Intelligence Officer, 0202 military occupational specialty (MOS). This officer is less a functional leader than he or she is what the Intelligence Community (IC) considers a Senior Analyst; he or she is the MAGTF's Senior Intelligence Analyst. The Assistant Fusion Officer is a captain (O-3), 0202 MOS or chief warrant officer (CWO3-

4), 0205 MOS. This officer assumes both a leadership role that ensures efficient functioning of the entire Production and Analysis Cell, and an analytic role that supports the Fusion Cell.

To add cognitive depth with outside perspectives, a (deployable) civilian Senior Analyst with graduate education and relevant IC experience is assigned to the Fusion Cell. Marine analysts from multiple intelligence disciplines who demonstrate cognitive ability and MOS proficiency are assigned from other ISTs. To complete the Fusion Cell's holistic capability, a team of no less than two analysts forms the Quantitative Analysis Branch. These Marines are trained in statistical analysis methods to "crunch the numbers" of battlespace trends and other quantifiable data such as significant events, estimated enemy casualties, and population density.

The Fusion Cell contains an Ops-Intel Integration Team that consists of a captain (O-3), 0202 MOS and two or three sergeants (E-5) or staff sergeants (E-6), any intelligence MOS. This team physically resides within the deployed brigade or force COC or other node designated by the G-2 and G-3 to optimize Ops-Intel Integration. More than a traditional G-2 Watch Section, the team splits time with the Fusion Cell to participate in analytic discussions, production planning sessions, and discussion of key P&A issues such as the OE intelligence narrative. This battle rhythm builds a level of intelligence knowledge within the team sufficient to conduct rapid actions to reduce uncertainty about significant activities, incidents in the OE, or other rapid planning requirements. The team, in essence, is an extension of the quality and depth of intelligence capability inherent in the Fusion Cell that is imbedded within the G-3.

Finally, the Fusion Cell contains an Intelligence Information Control Officer, a chief warrant officer (CWO 2-4), 0205 MOS. He or she is responsible for the maintenance of and dissemination of finished intelligence products. This role includes applying emerging intelligence to completed intelligence products, determining distribution means and recipients, and establishing methods to catalogue and store the host of working and finalized intelligence information. The prominent role of this officer in the effective functioning of the entire IOC cannot be understated (see Figure 11 for a list of personnel in the recommended Fusion Cell design).

In this optimized design, P&A components of the deployable IOC reside within the permanent fixed-site MAGTF Intelligence Center (MIC) at each of the Marine

Title	MOS or Other Designator	Function
Fusion Officer	- Marine senior captain (O-3) or major (O-4) 0202 MAGTF Intelligence Officer - Screened billet	- MAGTF Senior Intelligence Analyst - Primary analytic advisor to MAGTF Commander, G-2, G-3, G-5 - Deep, nonlinear thinker; understands philosophy of war, MAGTF operations, and all-source intelligence operations
Assistant Fusion Officer	- Marine captain (O-3) or chief warrant officer (CWO 2-4) 0202 or 0205 Master Analyst	- Production and Analysis Cell functional leadership - Advises Fusion Officer and other IOC leadership - Sinew between Fusion Cell and ISTs
Fusion Chief	- Marine gunnery sergeant (E-7) or master sergeant (E-8) 0231 Intelligence Specialist	- Oversees analytic processes and guides junior analysts - Quality assurance
Senior (Deployable) Civilian Analyst	- Masters Degree or PhD in relevant field - Intelligence Community experience	- Deep, nonlinear thinker - Long-term analysis
Fusion Cell All-Source Analysts	3-5 Marine lance corporal (E-3) through staff sergeant (E-6) 0231, 0241/0261 IMINT and GEOINT Analysts, 2621 SIGINT Analyst	- Connectors to IST analysts - Bottom-up analysis - Final intelligence production - Comfort and experience with writing
Ops-Intel Integration Team	- Marine captain (O-3), 0202 2-3 Marine sergeant (E-5) through staff sergeant (E-6), any intelligence MOS	- Primary conduit between G-3, G-5 and P&A Cell - Permanently resides in G-3; attends P&A Cell fusion meetings and briefings
Intelligence Information Control Officer	Marine chief warrant officer (CWO 2-4), 0205	- Synthesizes current intelligence with finalized products to update standing assessments - Designs and provides guidance to SharePoint and other intelligence dissemination mediums
Qualitative Analysis Branch	2-4 Marine lance corporal (E-3) through staff sergeant (E-6), any intelligence MOS	- Masters Excel and other statistical analysis software - Produces finalized quantitative inputs to qualitative all-source analysis - Comfort and experience with math

Figure 11: Recommended personnel of the Fusion Cell.

Expeditionary Forces (MEF) Headquarters while in garrison. In the event of a brigade- or force-level MAGTF deployment, the Fusion Cell and ISTs from the MIC form a modular detachment as the Production and Analysis Section of the deploying IOC. These intelligence battalion personnel are permanently assigned to the MIC for no less than one year, a timeframe that does not include preparatory analytic training and, when possible, satisfying fiscal and annual Marine Corps Common Skills training requirements. No less than 90% of Marines assigned to the MIC for this period are from the intelligence battalion; the remaining 10% space provides opportunities for short-term assignment of junior intelligence personnel from other MEF major subordinate commands to cross-pollinate MIC experience throughout the MEF's units. Consistent with the fixed-site support concept of the MCISRE Plan, the MIC provides 24-hour analytic reach-back support to the Production and Analysis Cell when it deploys.

The benefits of building this deployable and modular Production and Analysis Cell into the MIC are clear. First, as the primary regional artery of the MCISRE Plan, the MIC provides advanced P&A support not only to the MEF Command Element, but also to every intelligence node in the MEF down to the battalion S-2 level. That 360-degree demand signal sharpens collective analytic skills and diversifies their garrison production portfolio to include commanding generals and squad leaders. Second, the modular design provides continuity and continuous analysis opportunities, regional familiarity of potential conflict OE, and institutionalization of the "fixed-site support to deployed entities" concept of the MCISRE Plan.⁵⁸ The success of this organizational design is contingent on the Marine Corps' ability to educate and train intelligence analysts and inculcate individual and collective *systems mentalities*.

The Production and Analysis Cell: Cognitive Perspectives

The viability of this organizational design is contingent on two factors: inculcating the nonlinear intuition of *systems mentalities* in analysts and affecting change in current personnel practices.⁵⁹ To this first point, those who become Marine intelligence analysts bring decades of cognitive biases that largely favor order, expected outcomes, and linearity. Beyerchen examines the source of linear thinking, and he suggests the desire for simplicity and predictability has trained our imaginations to see the world in linear terms.⁶⁰ Thus, the transition to nonlinear thinking from this baseline must be fundamental. Basic intelligence training for enlisted Marines and officers professionalizes the force, but fails to fundamentally alter cognition to think in nonlinear terms.

There is no simple model to affect such change. Gladwell theorizes that it takes no less than 10,000 hours of experience to make an expert.⁶¹ This translates to 416.67 full days, or 1,000 10-hour days. Marine intelligence analysts are not commonly afforded sufficient time to become an expert in this respect while in garrison or exercise scenarios. When they conduct analysis in these settings, they typically collect data points related to intelligence requirements, aggregate those points in a PowerPoint presentation, and brief those points as would a newscaster. This is hardly analysis and nothing resembling a force that would affect fundamental cognitive change. Understanding the inherent contradictions and illogical tendencies of the human mind, the Marine Corps needs to enact a long-term approach that demands a disciplined personal commitment to learning alongside institutional mandates and incentives.

This approach contains eight components. The first requires all Marine intelligence analysts and intelligence officers to achieve annual certification in the form

of MOS-specific testing, and demonstration of proficiency and cognitive proclivity to nonlinearity during decision-making exercise scenarios.⁶² These certifications should be grade appropriate and become progressively more challenging each year. This program should be established by the Community of Practice (CoP) approach outlined in the MCISRE Plan and managed by individual units.⁶³ Its effect would not only demonstrate levels of proficiency to unit commanders, it would allow analysts to understand quantifiably their professional growth and create a more professionalized career progression as intelligence analysts.

The second component requires the Marine Corps to establish a mandatory intelligence analysis reading list that is both appropriate to career progression and emphasizes learning decision making, nonlinearity, critical thinking, and all-source P&A tradecraft. In addition to analytic principles in MCWP 2-1, Chapter 4, and MCWP 2-3,⁶⁴ the list would require no less than ten books or other publications in these subjects to choose from each year for a total of 200 or more publications consumed during a 20-year career. This career approach establishes a framework for long-term cognitive adaptation. Analysts would submit book reports and thematic analysis of those topics through the unit that are recorded as mandatory training events in the individual's training record (see Appendix 1 for recommended reading list).

The third and fourth components address endemic deficiencies in writing ability of the analysis community. Marine intelligence analysts should be required to write at least one 250-500 word essay each week as part of their annual certification and the unit's training requirements; this essay would be additive to steady state P&A activities. The unit's senior intelligence officer should establish the topics with influence from the

Service- and unit-level CoPs. Additionally, the Marine Corps must invest time and money to send its junior analysts to college-level writing courses for at least 1-3 months following primary MOS school or at some manageable point while at their initial unit.

The fifth component applies to exercises and unit-level intelligence training. The Marine Corps needs to invest in a standardized exercise simulation portfolio tailored specifically to nonlinear intelligence analysis in complex OE. This investment requires permanent assignment of a contracted White Cell exercise control group at each of the MEFs to support radio and intelligence battalions; other intelligence analysts throughout the MEF would coordinate participation through these battalions.

This portfolio should deliver short-duration (3-6 hours on the short end and 1-2 days on the long end) exercise scenarios that present unsolvable or *wicked*⁶⁵ stochastic problems involving dynamic and interdependent conflict OE factors. Intelligence requirements in the scenarios should simulate planning or operational decision making. These scenarios depart from the norm because they offer no decisive winning moment or finality to the problem. In doing, they would deemphasize linear or models-based analysis *methods* and instead emphasize *systems mentalities*. Repetitive application of the inherent uncertainty of the scenarios will gradually shift cognitive perspectives to favor nonlinearity and chaos as normative.

The sixth component applies to intelligence officers and senior enlisted analysts and opportunities to enhance Ops-Intel integration. Selection of the best Marines to serve in the Fusion Cell is key to the success of this recommended Production and Analysis Cell design. The Fusion Officer billet must be a screened assignment recognized as a key billet commensurate with operations officer and executive officer billets. The Fusion

Chief billet must also be a screened assignment with long-term career implications. This change requires advocacy at the Headquarters Marine Corps Intelligence Department level, with MOS Monitors, and throughout the MEF G-2s and their Intelligence Battalions.

This component also requires an update to doctrine. The Fusion Officer and Fusion Chief billets do not exist in MCWP 2-1. The Fusion Officer is listed as the P&A Officer in Charge in a way that suggests it is a functional leadership billet, rather the MAGTF's Senior Intelligence Analyst.⁶⁶ Doctrine also does not suggest what kind of officer is best suited for this role. A Fusion Officer must have cognitive capacity to absorb vast sums of diverse data to reduce uncertainty of complex situations; this point cannot be overstated and should not be an assumed quality inherent in all Marine intelligence officers. This officer should be a deep-thinking polymath who understands the mechanics of each intelligence discipline, and how to synthesize intelligence from each to aggregate finalized all-source intelligence products or dialogue with senior commanders and decision makers.

Future Fusion Officers should have at least at least one operational deployment with practical experience in the creation of finalized intelligence, and sustained experience involving intelligence support to planning and decision making. Specific examples include company command or battalion operations and executive officers at intelligence or radio battalions, Marine Expeditionary Unit S-2, and analytic experience at the Marine Corps Intelligence Activity. Graduates from the National Intelligence University, Naval Postgraduate School, or any resident career- or intermediate-level professional military education institution are desirable candidates. Officers must also

possess a demonstrated ability to write effectively (preferably who have published work) and speak publically.

The seventh component requires that Marine Corps Intelligence Schools (MCIS) and other informal intelligence training forums teach Systems Theory as a core analytic competency to build individual and collective *systems mentalities*. In its nascent form, Chaos Theory was too abstract for physicists and too experimental for mathematicians.⁶⁷ Marine intelligence professionals likewise struggle with its abstract nature and consider it experimental in the absence of sustained practical application. Building curricula and qualified instructors requires intellectual and material resources not readily available. Illachinski recognized the difficulty of applying systems thinking to combat in 1996, and he recommended patience and building a foundation of learning over time.⁶⁸

Systems Theory is not yet institutionally accepted because of its abstract nature and the inability of the intelligence community to consistently demonstrate its practical use. Change will not materialize unless Systems Theory is embraced as necessary and practical to intelligence analysis. As Israeli experience fighting Hizballah in 2006 demonstrates,⁶⁹ Systems Theory cannot be hastily institutionalized, but incorporated gradually as a significant component of foundational and continued learning curricula in formal and informal intelligence training and education.

Systems concepts threaded throughout Joint and Marine Corps warfighting and doctrinal publications provide a tenuous foundation to foster *systems mentalities*. Combat experience in Iraq and Afghanistan among senior- and mid-level leaders is sufficient to demonstrate applicability of Systems Theory to intelligence analysis. Therefore, these leaders must compel an institutional examination of current analytic training and processes to inculcate Systems Theory

into training and education. The institution gains individual and collective *systems mentalities* necessary to alter cognitive biases to accept nonlinearity as the norm.

The eighth component calls for a deeper, institutionalized integration of the Production and Analysis Cell with the MAGTF G-3 Operations and G-5 Plans Sections. To this end, the G-2 Intelligence Officer should be the Reporting Senior (RS) and the G-3 Operations Officer should be the Reviewing Officer (RO) for the Fusion Officer and Assistant Fusion Officer's fitness reports (FITREP). The Fusion Chief and the Civilian Senior Analyst should also have reporting chains that include the G-3. All other Marines of the Production and Analysis Cell should be assigned steps of the 6-Step Intelligence Cycle and evaluated based on how they perform against that specified step(s) as they relate to Ops-Intel integration.⁷⁰

IV - CONCLUSION

The probable character of future conflict OEs requires deep-thinking intelligence professionals who can rapidly make sense of complex situations to reduce uncertainty. Information Age warfare demands flexible and adaptive brain-like intelligence nodes that can, like the human brain, absorb large sums of data, process that data, and produce intelligence to influence planning and operational decisions. The horizontal organizational design and *systems mentality* concepts presented in this paper provide a stepping-off point to prepare elements of the IOC for future conflict. Considering the scope of this paper, these recommendations are incomplete and require further research and development along the following lines.

Those implementing such change should not underestimate the personnel management challenges to intelligence battalions. These challenges include continuity and stabilization of personnel to reside within the fixed-site MIC for protracted periods sufficient to benefit from this

design. Training and educating intelligence Marines and placing them in these billets is, likewise, not a simple processes. Marine analysts are often sent to additional duties or short-term deployments that will disrupt this process; many of these assignments do not involve intelligence analysis. They also arrive at units with limited time left on current contracts, years spent outside the analysis tradecraft in non-intelligence assignments, or other disruptive situations that could have atrophied their evolving *systems mentalities*.

Headquarters Marine Corps Intelligence Department (I-Dept), MCIS, force-level G-2s, and intelligence and radio battalion leadership should conduct research to determine realistic ways and means to include Systems Theory as a core component of analysis training at formal and informal training venues, beginning with beta-testing and evaluation measures. They should also research methods to sufficiently train, educate, and select mid-grade officers, to include the 0205 Master Analyst community, for future service as Fusion Officers. Additionally, I-Dept, force-level G-2s, and intelligence and radio battalions should address long-term planning and resourcing required to fund and staff a permanent intelligence exercise White Cell at each MEF. Further efforts are needed to determine the procedures to incorporate their exercises into standing battalion training, exercise, and employment plans. Finally, I-Dept, force-level G-2s, and intelligence battalion leadership should explicitly define and contextualize the role of 0205s in the IOC, and determine how to designate the Fusion Officer, Assistant Fusion Officer, and Fusion Chief billets as universally accepted key billets.

Marines conducting intelligence analysis in conflict OE is, at its most challenging, an abstract endeavor with tangible consequences. While conflict is not without aspects of linearity, its enduring nature is more complex than convention and certain doctrinal principles suggest. Considering this, the Marine Corps should spare no effort to adapt and improve its intelligence

capabilities to best reflect the presumed character of future conflict with a keen eye on the nature of warfare and its recent operational experiences.

APPENDIX A: RECOMMENDED INTELLIGENCE ANALYST READING LIST

This list is not comprehensive, and it should be read to understand the types of subjects that should be included in the Intelligence Analyst Reading List recommended on page 29.

Anderson, Virginia and Lauren Johnson. *Systems Thinking Basics: From Concepts to Causal Loops*. Acton, MA: Pegasus Communications, 1997.

Beyerchen, Alan D. "Clausewitz, Nonlinearity and the Predictability of War." *International Security*, 17:3, Winter, 1992,
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Blakesley, Major Paul J. "Operational Shock and Complexity Theory." Master's Thesis, School of Advanced Military Studies, US Army Command and General Staff College, 2005.

Clausewitz, Carl Von Clausewitz. *On War*. Princeton: Princeton University Press, 1984.

Coveney, Peter and Roger Highfield. *Frontiers of Complexity: The Search for Order in a Chaotic World*. New York: Ballantine Books, 1995.

Connable, Ben. "Military Intelligence Fusion for Complex Operations: A New Paradigm," Virginia: RAND, 2012.
http://www.rand.org/content/dam/rand/pubs/occasional_papers/2012/RAND_OP377.pdf.

Dorner, Dietrich. *The Logic of Failure: Recognizing and Avoiding Error in Complex Situations*. trans. Rita and Robert Kimber, New York: Metropolitan Books, 1996.

Gray, Colin S. *Another Bloody Century: Future Warfare*. Phoenix: Orion Books, 2006.

Headquarters Marine Corps. *Intelligence Operations*. MCWP 2-1. Washington, DC: 10 September 2003.

Headquarters Marine Corps. *MAGTF Intelligence Production and Analysis*. MCWP 2-3 Washington, DC: 13 July 2004.

Headquarters Marine Corps. *Warfighting*. MCDP 1. Washington, DC: Headquarters Marine Corps, 20 June 1997.

Headquarters Marine Corps. *Command and Control*. MCDP 6. Washington, DC: Headquarters Marine Corps, 4 October 1996.

Ilachinski, Andrew. *Land Warfare and Complexity, Part I: Mathematical Background and Technical Sourcebook*. Virginia: Center for Naval Analyses, 1996.

Ilachinski, Andrew. *Land Warfare and Complexity, Part II: An Assessment of the Applicability of Nonlinear Dynamic and Complex Systems Theory to the Study of Land Warfare*. Virginia: Center for Naval Analyses, 1996.

Mumford, Stephen. *Causation: A Very Short Introduction*. Oxford University Press, Oxford: 2014.

Simon, Herbert. *The Sciences of the Artificial*. MIT Press, Cambridge, Massachusetts: 1996.

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Treverton, Gregory F. and C. Bryan Gabbard. "Assessing the Tradecraft of Intelligence Analysis." Virginia: RAND, 2008,
http://www.rand.org/content/dam/rand/pubs/technical_reports/2008/RAND_TR293.pdf

US Government. "A Tradecraft Primer: Structured Analytic Techniques for Improving Intelligence Analysis." March 2009, <https://www.cia.gov/library/center-for-the-study-of-intelligence/csi-publications/books-and-monographs/Tradecraft%20Primer-apr09.pdf>.

Appendix B: Components of Systems Theory, Nonlinear Dynamics, and Chaos Theory Relevant to Combat

These terms and components of Systems Theory were selected for their applicability to describe, understand, and ultimately reduce uncertainty in combat. They should be considered foundational elements of a study of Systems Theory and its applicability to combat.

Adaptation. “In order to survive, combat forces must continually adapt to a changing environment.” (Ilachinski, *Land Warfare and Complexity, Part II*, 2)

Adaptability in Systems Theory. “The essence of a complex adaptive system is that its constituent parts are not Newtonian “billiards” that react blindly to the world around them, but are instead endowed with an ability to sense, learn from, and adapt to their environment as they and the environment both evolve in time.” (Ilachinski, *Land Warfare and Complexity, Part II*, 140)

Bifurcation. “The splitting into two modes of behavior of a system that previously displayed only one mode.” (Ilachinski, *Land Warfare and Complexity, Part II*, 132)

Collectivist Dynamics. There is a continual feedback between the behavior of (low-level) combatants and the (high-level) command structure.” (Ilachinski, *Land Warfare and Complexity, Part II*, 2)

Decentralized Control. There is no master “oracle” dictating the actions of each and every combatant.” (Ilachinski, *Land Warfare and Complexity, Part II*, 2)

Emergence in Systems Theory. “Perhaps the central concept of complex systems theory is that high-level behaviors emerge naturally out of a brewing soup of low-level interactions. For example, a flock of birds does not need a central direction to behave in an apparently orchestrated manner.” (Ilachinski, *Land Warfare and Complexity, Part II*, 140)

Global Order Affects Local Dynamics in Systems Theory. “Not only does an emergent high-level structure generally owe its existence to low-level local dynamics, but the high-level patterns also affects the local behavior.” (Ilachinski, *Land Warfare and Complexity, Part II*, 141)

Global Order Arises from Local Activity in Systems Theory. “Complex high-level patterns are often due to relatively simple local dynamics lying on a much lower level.” (Ilachinski, *Land Warfare and Complexity, Part II*, 141)

Hierarchical Structure. “Combat forces organized in a C2 hierarchy.” (Ilachinski, *Land Warfare and Complexity, Part II*, 2)

Interconnectivity is Important to Systems Theory. “How the parts of a complex system are interconnected is just as important as what those parts are and what those parts do.” (Ilachinski, *Land Warfare and Complexity, Part II*, 139)

Linearity and Nonlinearity Defined. “For a system to be linear it must meet two simple conditions. The first is proportionality, indicating that changes in system output are proportional to changes in system input. The second condition of linearity, called additivity or superposition, underlies the process of analysis. The central concept is that the whole is equal to the sum of its parts. This allows the problem to be broken up into smaller pieces that, once solved, can be added back together to obtain the solution to the original problem. Nonlinear systems are those that disobey proportionality or additivity. They may exhibit erratic behavior through disproportionately large or disproportionately small outputs, or they may involve ‘synergistic’ interactions in which the whole is not equal to the sum of the parts. If interactions are irreducible features of the system, however, it is nonlinear even if described by relatively simple equations.” (Beyerchen, “Clausewitz, Nonlinearity and the Predictability of War,” 62-63)

Non-Equilibrium Order. “Military conflicts, by their nature, proceed far from equilibrium.” (Ilachinski, *Land Warfare and Complexity, Part II*, 2)

Nonlinear Feedback in Dynamical Systems. “A key dynamical mechanism responsible for deterministic chaos is nonlinear recursive feedback. Chaos is the result of a cascading series of feedback chains whereby one variable affects another which in turn affects the first, and so on.” (Ilachinski, *Land Warfare and Complexity, Part II*, 131)

Nonlinear Interaction. “Combat forces composed of a large number of nonlinearly interacting parts; sources include feedback loops in C2 hierarchy, interpretation of (and adaption to), enemy actions, decision making process, and elements of change.” (Ilachinski, *Land Warfare and Complexity, Part II*, 2)

Nonlinearity is Key in Systems Theory. “Without nonlinear interactions there can be no deterministic chaos in simple systems and no complex behavior in complex systems. By virtue of nonlinearity, the behavior of the ‘whole’ is not just a simple aggregate of the constituent ‘parts’.” (Ilachinski, *Land Warfare and Complexity, Part II*, 139)

Non-Reductionist. “The overall ‘fighting ability’ of a combat force is not a simple aggregate function of the fighting ability of individual combatants.” (Ilachinski, *Land Warfare and Complexity, Part II*, 2)

Operational Environment. “A composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander.” (JP 3-0, JP 2-01.3)

Phase Space. A mathematical space spanned by parameters that describe a dynamical system’s behavior. Each point on this curve represents a particular state of the system at a particular time. (Ilachinski, *Land Warfare and Complexity, Part II*, 131)

“Process and Evolution” vice “Solution” in Systems Theory. A complex system embodies process, a ceaseless search for a better solution to an ill-defined, amorphous ever-receding problem. (Ilachinski, *Land Warfare and Complexity, Part II*, 140)

Self-Organization. Local action, which often appears ‘chaotic’ induces long-range order.” (Ilachinski, *Land Warfare and Complexity, Part II*, 2)

Sensitivity to Initial Conditions in Chaos Theory. Deterministic chaos is characterized chiefly by the so-called “Butterfly Effect,” which alludes to the fact that two initially nearby points of a chaotic trajectory diverge exponentially in time. (Ilachinski, *Land Warfare and Complexity, Part II*, 131)

Sociocultural Factors. The social, cultural, and behavioral factors characterizing the relationships and activities of the population of a specific region or operational environment. (SOURCE: JP 2-01.3).

Stochastic Dynamics. Dynamics such that the future state is not determined by the current state. (SOURCE: Smith, *Chaos: A Very Short Introduction*, 168).

Strange Attractors. A region of phase space that a system inevitably approaches as it evolves that also displays sensitivity to initial conditions. (Ilachinski, *Land Warfare and Complexity, Part II*, 132-133)

Systems Mentality. *Systems Mentality* is a fundamental cognitive approach that observes, analyzes, and understands physical and non-physical entities as interactive and interdependent linear and nonlinear systems. The term is used to describe an ideal condition among Marine Corps intelligence professionals that would result from alteration of current training, education, and common analytic processes to emphasize systems and nonlinearity. Analysts with *systems mentality* would accept systems interdependency, interaction, fluidity, adaptability, emergence, and nonlinearity as rules to govern analytic thought. Ilachinski described a similar guideline for applying nonlinear dynamics and complex systems theory to understanding land warfare. He recommends that, “...decision makers go beyond the conventional linear intuition and develop an intuition for the kinds of nonlinear behaviors pervasive in complex systems,” and that, “this is something that, with proper instruction and practice, can be learned.” (Ilachinski, *Land Warfare and Complexity, Part II*, 119-120)

Unpredictable Determinism in Chaos Theory. Sensitivity to initial conditions implies that, despite the dynamics of a system being rigorously deterministic, the long-term behavior of such a system appears irregular and is unpredictable. (Ilachinski, *Land Warfare and Complexity, Part II*, 131-132)

¹ Headquarters Marine Corps, *Intelligence Operations*, MCWP 2-1 (Washington, DC: 10 September 2003), 1-1; Headquarters Marine Corps, *MAGTF Intelligence Production and Analysis*, MCWP 2-3 (Washington, DC: 13 July 2004), 1-5; Headquarters Marine Corps, *Intelligence*, MCDP 2 (Washington, DC: 7 June 1997), 5.

² Headquarters Marine Corps, *Warfighting*, MCDP 1 (Washington, DC: Headquarters Marine Corps, 1997), 7-8; Headquarters Marine Corps, *Intelligence*, MCDP 2, 5.

³ Operational Environment is described as, "...the composite of the conditions, circumstances, and influences that affect employment of capabilities and bear on the decisions of the commander. It encompasses physical areas and factors (of the air, land, maritime, and space domains) and the information environment (which includes cyberspace). Included within these are enemy, friendly, and neutral systems that are relevant to an operation. The nature and interaction of these systems will affect how the commander plans, organizes for, and conducts operations." Joint Chiefs of Staff, *Joint Operations*, JP 3-0 (Washington, DC: Joint Chiefs of Staff, 11 August 2011), xvi; Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment*, JP 2-01.3 (Washington, DC: 16 June 2009), I-2.

⁴ Chaos Theory's *Sensitivity to Initial Conditions* describes how microscopic changes to the initial conditions of a system could result in disproportionate effects. Herbert Simon, *The Sciences of the Artificial* (MIT Press, Cambridge, Massachusetts: 1996), 176.

⁵ Alan D. Beyerchen, "Clausewitz, Nonlinearity and the Predictability of War," *International Security*, 17:3 (Winter, 1992), 62-63.

⁶ Thucydides, *History of the Peloponnesian War* (Penguin Classics, New York: 1972), 76; Carl Von Clausewitz, *On War*, ed. Michael Howard and Peter Paret, trans. Michael Howard and Peter Paret (Princeton University Press, Princeton, NJ: 1984), 89.

⁷ Carl Von Clausewitz, *On War*, 75-89; Beyerchen, "Clausewitz, Nonlinearity and the Predictability of War," 59-90.

⁸ Clausewitz, *On War*, 119-121.

⁹ Peter Coveney and Roger Highfield, *Frontiers of Complexity: The Search for Order in a Chaotic World* (Ballantine, New York: 1996), 11-14.

¹⁰ Intelligence P&A is an umbrella term defined as, "...the filtering, recording, evaluating, and analyzing of information, and product preparation of developed intelligence. Analysis is a process that involves sifting and sorting evaluated information to isolate significant elements related to the mission of the command, determining the significance of the information relative to information and intelligence already known, and drawing deductions about the probable meaning of the evaluated information. Production is the conversion of evaluated material or information into intelligence." Headquarters Marine Corps, *MAGTF Intelligence Production and Analysis*, 1-1.

¹¹ MCDP 2 and MCWP 2-1 state that the conduct of intelligence is inseparable from operations. This is the doctrinal basis for the Ops-Intel integration focus of this paper. Headquarters Marine Corps, *Intelligence*, MCDP 2, 4; Headquarters Marine Corps, *Intelligence Operations*, MCWP 2-1, 1-5.

¹² Headquarters Marine Corps, *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Plan*, (Washington, DC: Headquarters Marine Corps, 2014), 2 and 6-9.

¹³ *Systems Mentality*, as referred to in this paper, is a fundamental cognitive approach that observes, analyzes, and understands physical and non-physical entities as interactive and interdependent linear and nonlinear systems. The term is used to describe an ideal condition among Marine Corps intelligence professionals that would result from alteration of current training, education, and common analytic processes to emphasize systems and nonlinearity. Analysts with *systems mentality* would accept systems interdependency, interaction, fluidity, adaptability, emergence, and nonlinearity as rules to govern analytic thought. Ilachinski described a similar guideline for applying nonlinear dynamics and complex systems theory to understanding land warfare. He recommends that, "...decision makers go beyond the conventional linear intuition and develop an intuition for the kinds of nonlinear behaviors pervasive in complex systems," and that, "this is something that, with proper instruction and practice, can be learned," Andrew Ilachinski, *Land Warfare and Complexity, Part II: An Assessment of the Applicability of Nonlinear Dynamic and Complex Systems Theory to the Study of Land Warfare Center for Naval Analyses* (Virginia: Center for Naval Analyses, 1996), 119-120.

¹⁴ Beyerchen, "Clausewitz, Nonlinearity and the Predictability of War," 82.

¹⁵ Will and Ariel Durant, *The Lessons of History* (Simon and Schuster, New York: 1968), 81.

¹⁶ Clausewitz, *On War*, 89.

¹⁷ Headquarters Marine Corps, *Warfighting*, MCDP 1, 3-4.

¹⁸ Chaos Theory is the study of nonlinear dynamics, in which events are predictable from simple deterministic equations. Complexity Theory examines complex systems exhibiting a complicated (i.e. chaotic) behavior that

includes nonlinear dynamics and complex systems theory (artificial intelligence, cellular automata, neural networks, etc.). Ilachinski, *Land Warfare and Complexity, Part II*, 14.

¹⁹ The n-Body Problem applies classical Newtonian mechanics to accurately compute the motion of a system of two bodies. When a third or more bodies are introduced to the system, their interactions diffuse to an unpredictable scale. Simon, *The Sciences of the Artificial*, 179.

²⁰ June Barrow-Green, *Poincare and the Three Body Problem, Vol 2* (New York: American Mathematical Society, 1991).

²¹ Chaos Theory's *Sensitivity to Initial Conditions* states that a small change in initial values of a system can change paths of movement and produce unexpected results. Simon, *The Sciences of the Artificial*, 176.

²² Andrew Ilachinski, *Land Warfare and Complexity, Part I: Mathematical Background and Technical Sourcebook* (Virginia: Center for Naval Analyses, 1996), 181; Gleick, *Chaos: Making a New Science*, 71 and 74-75; Major Paul J. Blakesley, "Operational Shock and Complexity Theory," (master's thesis, School of Advanced Military Studies, US Army Command and General Staff College, 2005), 30-31; Tom Czerwinski, "Coping with the Bounds: Speculations on Nonlinearity in Military Affairs," (DoD Command and Control Research Program, 1998), 31-43; Beyerchen, "Clausewitz, Nonlinearity, and the Unpredictability of War" 59-90.

²³ Ilachinski, *Land Warfare and Complexity, Part II*, 1-26 and 140-141.

²⁴ Ibid, 17-18.

²⁵ Ilachinski, *Land Warfare and Complexity, Part II*, 2.

²⁶ Ibid, 139-141. In, Major William DeLeal, "The Systems Mentality: Intelligence Preparation of the Battlespace and Joint Intelligence Preparation of the Operational Environment," *Introduction to Systems Theory Elective Course* (Marine Corps Command and Staff College, 9 March 2016), 3.

²⁷ Colin S. Gray, *Another Bloody Century: Future Warfare* (Orion Books, Phoenix: 2006), 370-373; Colin S. Gray, "Thucydides Was Right: Defining the Future Threat," *Advancing Strategic Thought Series* (Pennsylvania: US Army War College, 2015), 50-51.

²⁸ Future conflict scenarios addressed in this paper will have generated enough threat to US national interests to compel deployment of US military forces. Any discussion in this paper of brigade- or force-level MAGTF involvement in future conflict assumes the MAGTF's role as some level of component in a joint or combined force.

²⁹ Joint Chiefs of Staff, *National Military Strategy of the United States of America* (Washington, DC: Department of Defense, June 2015); Joint Chiefs of Staff, *Counterinsurgency*, JP 3-24, (Washington, DC: Department of Defense, 22 November 2013), I-1 thru I-8; Headquarters Department of the Army, *Counterinsurgency*, FM3-24, MCWP 3-33.5, (Washington, DC: Department of the Army, December 2006); LtCol (ret) Frank Hoffman, "Thinking About Future Conflict: Preparing for the Full Spectrum," *Marine Corps Gazette*, Vol 98, Issue 11, November 2014; Headquarters Marine Corps, *Marine Corps Vision and Strategy 2025* (Washington, DC: Headquarters Marine Corps, 2008); Futures Directorate, *2015 Marine Corps Security Environment Forecast: Futures 2013-2045* (Quantico, VA: Marine Corps Warfighting Lab, 2015); The World Bank, "World Development Report 2011: Conflict, Security, and Development," (Washington, DC: The World Bank, 2011); Headquarters Marine Corps, *Expeditionary Force 21* (Washington, DC: Headquarters Marine Corps, 4 March 2014); US Army Training and Doctrine Command, *Operational Environments to 2028: The Strategic Environment for Unified Land Operations* (Virginia: US Army Training and Doctrine Command, August 2012); Headquarters Marine Corps, *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Plan*; Joint Staff J-7, *Planner's Handbook for Operational Design, Version 1.0* (Suffolk, VA: Joint Staff J-7, Joint and Coalition Warfighting, 7 October 2011).

³⁰ Joint Chiefs of Staff, *National Military Strategy of the United States of America*, (Washington, DC: Department of Defense, June 2015), 4.

³¹ Hoffman, "Thinking About Future Conflict: Preparing for the Full Spectrum"; Seth Jones, *The Future of Irregular Warfare* (Virginia: RAND CORPORATION, 2012); W. Alexander Vacca and Mark Davidson, "The Regularity of Irregular Warfare," *Parameters* (Spring 2011); US Marine Corps, *Small Wars Manual*, FMFRP 12-15 (Washington, DC: US Marine Corps, 1990).

³² The World Bank, "World Development Report 2011: Conflict, Security, and Development," 2; Futures Directorate, *2015 Marine Corps Security Environment Forecast: Futures 2013-2045*, 63; Eric V. Larson, Derek Eaton, Brian Nichiporuk, and Thomas S. Szayna, *Assessing Irregular Warfare: A Framework for Intelligence Analysis* (Virginia: RAND CORPORATION, Arroyo Center, 2008), 29-33.

³³ Lionel Beehner, "How Proxy Wars Work And What That Means for Ending the Conflict in Syria," *Foreign Affairs*, 12 November 2015, <https://www.foreignaffairs.com/articles/2015-11-12/how-proxy-wars-work>.

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- ³⁴ Futures Directorate, *2015 Marine Corps Security Environment Forecast: Futures 2013-2045*; Headquarters Marine Corps, *Expeditionary Force 21*.
- ³⁵ Headquarters Marine Corps, *Marine Corps Vision and Strategy 2025*.
- ³⁶ Joint Staff J-7, *Planner's Handbook for Operational Design, Version 1.0*, II-11.
- ³⁷ John F. Schmitt, *A Systemic Concept for Operational Design* (Quantico, VA: Marine Corps Warfighting Lab), 14, http://www.au.af.mil/au/awc/awcgate/usmc/mcwl_schmitt_op_design.pdf.
- ³⁸ Marine Corps Combat Development Command, *Marine Corps Operating Concepts: Assuring Littoral Access...Winning Small Wars, Third Edition*, (Quantico, VA: US Marine Corps, June 2010), 110-116.
- ³⁹ Headquarters Marine Corps, *Expeditionary Force 21*; Marine Corps Combat Development Command, *Force Development Strategic Plan* (Quantico, VA: US Marine Corps, October 2015), 1; Strategic Studies Group, *Megacities And The United States Army: Preparing For A Complex And Uncertain Future*, (Washington, DC: Chief of Staff of the Army, June 2014), 10-14.
- ⁴⁰ Headquarters Marine Corps, *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Plan*, 6-7; US Army Training and Doctrine Command, *Operational Environments to 2028: The Strategic Environment for Unified Land Operations*, 2.
- ⁴¹ Headquarters Marine Corps, *Expeditionary Force 21*; US Army Training and Doctrine Command, *Operational Environments to 2028: The Strategic Environment for Unified Land Operations*, 2.
- ⁴² Futures Directorate, *2015 Marine Corps Security Environment Forecast: Futures 2013-2045*.
- ⁴³ Klaus Schwab, "The Fourth Industrial Revolution: What It Means, How to Respond," *World Economic Forum*, 14 January 2016, <http://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond>.
- ⁴⁴ Headquarters Marine Corps, *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Plan*, 1-7; US Army Training and Doctrine Command, *Operational Environments to 2028: The Strategic Environment for Unified Land Operations*, 2.
- ⁴⁵ The effective casualty-producing radius of a M67 Fragmentary is 15 meters (49 feet). Headquarters Department of the Army, *Grenades and Pyrotechnic Signals*, FM 3-23.30 (Washington, DC: Headquarters Department of the Army, 15 October 2009), A-2; Brigadier General Michael Groen, "Lecture: ENSCO 9201 - Future Operating Environments," Marine Corps University, Command and Staff College, 4 January 2016.
- ⁴⁶ Headquarters Marine Corps, *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Plan*, 1-7; US Army Training and Doctrine Command, *Operational Environments to 2028: The Strategic Environment for Unified Land Operations*, 2.
- ⁴⁷ Jacob Morgan, "A Simple Explanation Of 'The Internet Of Things'," *Forbes Magazine*, 13 May 2014; Daniel Burrus, "The Internet of Things Is Far Bigger Than Anyone Realizes," *Wired.com* (accessed 5 January 2016), <http://www.wired.com/insights/2014/11/the-internet-of-things-bigger/>; Larry Payne, "Internet of Everything could transform the battlefield," *Defense Systems*, 1 October 2013, https://defensesystems.com/articles/2013/10/01/internet-of-everything_0.aspx; Denise Zheng and William Carter, "Leveraging the Internet of Things for a More Efficient and Effective Military," *Center for Strategic and International Studies*, September 2015, http://csis.org/files/publication/150915_Zheng_LeveragingInternet_WEB.pdf; Bill Chamberlin, "The Next Phase of the Internet: The Internet of Things," *IBM Center for Applied Insights*, 25 June 2014, <http://ibmcai.com/2014/06/25/the-next-phase-of-the-internet-the-internet-of-things/>; Joe Mariani, Brian Williams, and Brett Loubert, "Continuing the March: The Past, Present, and Future of the IoT in the Military," *Deloitte University Press*, 6 August 2015, <http://dupress.com/articles/internet-of-things-iot-in-military-defense-industry/>.
- ⁴⁸ George Seffers, "Defense Department Awakens to Internet of Things: When Everything is Connected, Everyone is Vulnerable," *Signal Magazine AFCEA*, 1 January 2015, <http://www.afcea.org/content/?q=defense-department-awakens-internet-things#sthash.kwG16kzZ.dpuf>.
- ⁴⁹ Headquarters Marine Corps, *Intelligence Operations*, MCWP 2-1; Headquarters Marine Corps, *MAGTF Intelligence Production and Analysis*, MCWP 2-3.
- ⁵⁰ Headquarters Marine Corps, *Intelligence Operations*, MCWP 2-1, 4-1.
- ⁵¹ *Ibid*, 4-3 thru 4-14.
- ⁵² G. Cowan, D. Pines, and D. Meltzer, "Santa Fe Institute: Studies in the Sciences of Complexity," *Proc. Vol XIX, Addison-Wesley* (1994), 16-18, http://tuvalu.santafe.edu/~mgm/Site/Publications_files/MGM%20113.pdf; John H. Holland, "Complex Adaptive Systems," *Daedalus* (Winter 1992: 121, 1), 17-18.
- ⁵³ Dr. Paul Gromball, "Digital Transformation with Team-of-Teams Platforms: Efficiency vs. Adaptability," *Technologie Management Gruppe Munchen*, 4 August 2015,

<http://learnmore.tmg-muenchen.de/blog/digital-team-of-teams-platform-the-adaptability-advantage>; General (Retired) Stanley McChrystal, Tatum Collins, David Silverman, and Chris Fussell, *Team of Teams: New Rules of Engagement for a Complex World* (New York: Penguin Publishing Group, 2015).

⁵⁴ These intelligence disciplines include signals intelligence, human intelligence, counter-intelligence, geospatial intelligence, measurement and signature intelligence, electronic intelligence, open-source intelligence, and other functional derivation of intelligence such as financial or cyber.

⁵⁵ Ben Connable, "Military Intelligence Fusion for Complex Operations: A New Paradigm," *Occasional Papers* (Virginia: RAND, 2012), http://www.rand.org/content/dam/rand/pubs/occasional_papers/2012/RAND_OP377.pdf; Gregory F. Treverton and C. Bryan Gabbard, "Assessing the Tradecraft of Intelligence Analysis," *Occasional Papers* (Virginia: RAND, 2008); Major General Michael T. Flynn, Captain Matt Pottinger, and Paul D. Batchelor, "Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan," *Center for a New American Security, Voices from the Field* (January 2010), https://www.cnas.org/files/documents/publications/AfghanIntel_Flynn_Jan2010_code507_voices.pdf.

⁵⁶ Connable, "Military Intelligence Fusion for Complex Operations: A New Paradigm"; Flynn, "Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan."

⁵⁷ An intelligence narrative is a pseudo-doctrinal product that reflects the sum of all intelligence collection and analysis. It provides a story-like description of the primary aspects of the conflict and the OE, and directly relates to the MAGTF's mission statement, commander's critical information requirements (CCIR), and priority intelligence requirements. It is not a critique of how well or poorly the MAGTF is executing its mission, nor is it a mechanical response to CCIRs in sequential order. It exists both as a living document and as fluid discussion within the G-2, G-3, and G-5. The Fusion Officer is the primary author of the MAGTF intelligence narrative, and the Fusion Cell is responsible for its maintenance and dissemination to appropriate recipients.

⁵⁸ Headquarters Marine Corps, *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Plan*, 20.

⁵⁹ Connable, Treverton, and Gabbard provide excellent starting points to reform and adapt intelligence analysis organizations and individuals in their 2012 and 2008 papers. These works influence the recommendations in this thesis and should be included in any future research to implement the change recommended in this paper. Connable, "Military Intelligence Fusion for Complex Operations A New Paradigm"; Treverton and Gabbard, "Assessing the Tradecraft of Intelligence Analysis."

⁶⁰ Beyerchen, "Clausewitz, Nonlinearity and the Predictability of War," 86.

⁶¹ Thomas Gladwell, *Outliers: The Story of Success* (New York: Little, Brown, and Company, 2008).

⁶² Headquarters Marine Corps, *Marine Corps Intelligence, Surveillance, and Reconnaissance Enterprise Plan*, 9.

⁶³ Ibid, 7.

⁶⁴ Headquarters Marine Corps, *Intelligence Operations*, MCWP 2-1, 4-1 thru 4-15; Headquarters Marine Corps, *MAGTF Intelligence Production and Analysis*, MCWP 2-3.

⁶⁵ Rittel and Webber characterize Wicked Problems, "...in a meaning akin to that of 'malignant' (in contrast to 'benign') or 'vicious' (like a circle) or 'tricky' (like a leprechaun) or 'aggressive' (like a lion, in contrast to the docility of a lamb)." Horst W. S. Rittel and Melvin M. Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4 (1973), 155-169.

⁶⁶ Headquarters Marine Corps, *Intelligence Operations*, MCWP 2-1, 2-3 thru 2-11.

⁶⁷ Gleick, *Chaos: Making a New Science*, 38.

⁶⁸ Ilachinski, *Land Warfare and Complexity, Part II*, 9. In, DeLeal, "The Systems Mentality: Intelligence Preparation of the Battlespace and Joint Intelligence Preparation of the Operational Environment," 6-7.

⁶⁹ This paper does not call for a sudden shift from current practices to a systems approach. Rather, it proposes a long-term approach to institutionalizing *systems mentality* in Marine Corps intelligence professionals that begins at entry-level schools. This gradual foundational approach is influenced by a number of factors that include the abstract (and difficult) nature of Systems Theory, its near absence in current training and education, and typical bureaucratic resistance to change. The impracticability of a sudden change of doctrine without sufficient foundational training and education is represented in the Israeli Defense Forces' experience during the 2006 Second Lebanon War. Systemic Operational Design was too abstract a concept for some commanders and decision makers to grasp, and lower-level leaders were not trained sufficiently to comprehend its design leading to systemic problems in execution. David E. Johnson, *Hard Fighting: Israel in Lebanon* (Arlington, VA: Arroyo Center and Project Air Force, RAND: 2011), http://www.rand.org/content/dam/rand/pubs/monographs/2011/RAND_MG1085.pdf, 28. In,

DeLeal, “The Systems Mentality: Intelligence Preparation of the Battlespace and Joint Intelligence Preparation of the Operational Environment,” 6-7.

⁷⁰ Headquarters Marine Corps, *Intelligence Operations*, MCWP 2-1, 3-1.

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