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14. ABSTRACT
Centaurs (human-machine teaming) for Maneuver Warfare addresses service-level direction in the Marine Corps Operating Concept, the Commandant of the Marine Corps' task to reinvigorate a maneuver warfare mindset for the 21st Century, and task to provide a fifth-generation capability for the Ground Combat Element (GCE). The method to explore these directions involved a literature review on human-machine collaboration (HM-C) and manned-unmanned teaming (MUM-T), a historical case study on Operation HUE CITY to examine a problem-set unique to the GCE, and testing of initial concept hypotheses through an operational decision game. These efforts informed the final concept: Centaurs for the Fifth-Generation GCE.

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TITLE:

CENTAURS FOR MANEUVER WARFARE: HUMAN-MACHINE COLLABORATION AND MANNED-UNMANNED TEAMING FOR THE FIFTH-GENERATION GROUND COMBAT ELEMENT

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

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THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

Executive Summary

Title: Centaurs for Maneuver Warfare: Human-Machine Collaboration and Manned-Unmanned Teaming for the Fifth-Generation Ground Combat Element

Author: Major Christopher Andrew Macak, United States Marine Corps

Thesis: The Ground Combat Element should leverage and reinforce the warfighting philosophy of maneuver warfare in how it conceptualizes the employment of human-machine collaboration and manned-unmanned teaming to achieve and exploit increased tempo, maneuver options, and protection for Marines.

Discussion: The purpose of *Centaurs for Maneuver Warfare* is to explore how the Marine Corps' next-generation ground combat element (GCE) can leverage human-machine collaboration (HM-C) and manned-unmanned teaming (MUM-T) to achieve the synergistic benefits of employing robotic and autonomous systems to make Marines more effective on the battlefield. In classical Greek mythology, a centaur represented, "a creature with the head, arms, and torso of a man and the body and legs of a horse."[1] Similar to how this mythological creature exploited the benefits of a liminal being, HM-C and MUM-T reflect various manifestations of a centaur. In this construct, emerging battle networks integrate the best of humans with the best of machines by exploiting commercial advances in autonomy and narrow artificial intelligence to achieve a comparative advantage relative to adversaries. The resulting concept, *Centaurs for the Fifth-Generation Ground Combat Element*, addresses service level direction found in the *Marine Corps Operating Concept*, the Commandant of the Marine Corps' task to reinvigorate a maneuver warfare mindset for the 21st Century, and task to provide a fifth-generation capability for the GCE.[2] The method to explore these directions involved a literature review on centaurs in war, a historical case study on Operation HUE CITY to examine a problem-set unique to the GCE, and testing of initial concept hypotheses through an operational decision game. These efforts informed the final concept.

Conclusion: *Centaurs for the Fifth-Generation Ground Combat Element* leverages, reinforces, and serves as a vehicle to reinvigorate the warfighting philosophy of maneuver warfare. The value offered from recent technological advances to achieve a relative advantage lies in human-machine combat teaming to enhance the effectiveness of human warfighters, rather than replace them. HM-C reinforces the GCE's ability to create temporal advantages, exploiting speed and time as a weapon. High performance computing, autonomy, and narrow artificial intelligence connected to battle networks help filter the noise of large amounts of data to surface relevant cues, outliers, and anomalies in the operating environment. This machine-assisted function assists commanders, and their staffs, to orient on the enemy to support sound decision-making faster relative to the enemy, or competing factors relevant to the operating environment. MUM-T reinforces the GCE's ability to create spatial advantages, exploiting enemy gaps and vulnerabilities. Unmanned systems employed as advance guards and flank screens for manned formations, find, fix, and disrupt enemy formations, while the main effort maneuvers to exploit these shaping actions with speed, surprise, and focused decisive action. The tactical standoff afforded by the employment of unmanned systems achieves increased protection for the paired manned formation. MUM-T reinforces the GCE's ability to create psychological advantages, exploiting deception as a weapon. Multi-domain unmanned systems expand the capability to deceive and misdirect in order to disrupt the speed and accuracy of enemy decision-making. *Centaurs for the Fifth-Generation Ground Combat Element* does not alleviate the need for or replace the value of the Marine Air Ground Task Force's (MAGTF) Aviation Combat Element or Logistical Combat Element. Ground centaur formations compliment the MAGTF construct as an expansion of the combined arms team that seeks to place the enemy off-balance and into a no-win dilemma. As "the only MAGTF element that can seize and occupy terrain," the Fifth-Generation Ground Combat Element should be the main effort in developing the attributes of the combined arms team of the 21st Century MAGTF.[3]

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Preface

The purpose for this Master of Military Studies (MMS) research paper is to explore a topic of **professional significance**, **academic importance**, and **personal interest** within the context of military affairs. This paper builds on inter-service exploration and discussions about the U.S. Department of Defense's third offset strategy, *Army Operating Concept*, *Marine Corps Operating Concept*, and the Commandant of the Marine Corps' tasks to reinvigorate a maneuver warfare mindset for the 21st Century, and provide a fifth-generation capability for the ground combat element.[4] The genesis of this paper stems from the foresight and vision of Marine Corps University Professors Benjamin Jensen and Paul Gelpi.

Beginning in August 2016, these two professors introduced the opportunity to a small group of Marine Corps University Command and Staff College students to undertake additional coursework in the form of an Advanced Studies Program (ASP). The charter of this program for the past ten months focused on exploring the future character of robotic campaigns. They stimulated and facilitated the discourse, provided the academic mentorship, and advised this group of fourteen students as they set out to envision future operating concepts. In these concepts, advances in battle networks, narrow artificial intelligence, and robotic and autonomous systems will integrate the best of humans with the best of machines to achieve a position of comparative advantage relative to existing and anticipated adversaries.

Our discussion utilized the following framework to examine the group's charter. We began with building an understanding of the defense landscape surrounding unmanned systems, and how to develop and write a military concept. We next developed a rich understanding of threat and partner concepts, and how they relate to unmanned systems employment. These examinations explored both the historical and contemporary employment of unmanned systems, as well as emerging and anticipated concepts. We turned to history to conduct case studies that would help extrapolate practical lessons from the past to inform future concept development. This effort provided a concrete basis for analysis, as opposed to unbounded and abstract theoretical premises. From these historical cases, we designed operational decision games (ODG) oriented on a possible future conflict, framed by the concrete problem-sets encountered in our historical cases. The purpose of these ODGs served to crowd source ideas on initial human-machine collaboration and manned-unmanned teaming concepts, and to assess how other military professionals may approach a similar problem-set in the future. An analysis of the ODG solution-sets provided additional perspectives into refined future concepts.

This paper represents one of several student products to capture the enduring **professional significance** and **academic importance** that emerged from this discourse. Although it does not address every warfighting function or aspect of Marine Corps Doctrinal Publication 1, *Warfighting*, or the *Marine Corps Operating Concept*, it is my hope that this academic effort contributes to the larger discourse underway regarding human-machine collaboration, and manned-unmanned teaming in the Marine Corps, and wider Department of Defense community.[5] The objective of this analysis aims to contribute towards improving the Ground Combat Element (GCE) of the Marine Air Ground Task Force (MAGTF) to not only remain decisive on the future battlefield, but also help preserve American lives when our national leaders decide to send them into harm's way in support of national security. If nothing else, I hope that this academic effort will stimulate a latent interest in a more intelligent reader than myself to expand on and refine the research and concepts enclosed in this paper.

My **personal interest** in the historical case study of this project began in 2014 when I served as Company Commander for Company C, 1st Battalion, 5th Marine Regiment. In this capacity, I first met Nicholas Warr and Scott Nelson. Nick served as first platoon commander for the company in 1968 during Operation HUE CITY and later wrote the book *PHASE LINE GREEN* to capture his experience for future generations.[6] Scott Nelson served as company commander of Company C during the same period. Both Marines traveled to Camp Pendleton to conduct a professional military education class for the Marines and Sailors of the company in October 2014 to impart their lessons from the operation. This class first enlightened me to the incredible adversity that the Marines overcame during the month-long urban fight. The lessons captured from many of the veterans of this operation nearly fifty years ago informed improved doctrine and training for military operations in urban terrain. The contemporary veterans of Operation IRAQI FREEDOM and Operation ENDURING FREEDOM should appreciate the efforts made from HUE CITY veterans to capture these lessons.

As the Marine Corps anticipates the character of future war, the complexity of the urban environment has not decreased since 1968. Technology and concepts may evolve, but the complexity remains and continues to evolve. As a Middle East Foreign Area Officer in Cairo, Egypt from 2012-2013, I sometimes asked myself, "How would I approach operating in this city of twenty million people? How would I train my Marines beforehand? What would I equip them with given the opportunity to influence the innovation and acquisition processes beforehand?" To explore this problem-set in-depth, HUE CITY provided a concrete historical example to derive a deeper understanding of the complex urban environment and enduring nature of war.

In researching HUE CITY, I attempted to conduct the analysis as much as possible from not only primary sources found in official historical records, but also first-hand accounts. As many interviews indicated, a wide disparity can exist between the two. Furthermore, while documents may capture a comprehensive account, every veteran from a battle experiences and remembers it in their own way. A study of history may provide an objective account of what happened. It may not capture what was known to a given decision-maker at a particular point in time. While primary and secondary sources provide context, the personal narratives gleaned from multiple interviews help bring the analysis to life.

Despite my best efforts, it is important for the reader to understand that in no way could I capture all of the intimate details encountered by the veterans of HUE CITY. The historical case study of this paper attempts to capture sufficient observations with the aim to inform future operating concepts found at the end of this work. In describing the actions that took place in 1968, I hope that I have not done any harm to the memory of those departed or those still among us, either by inclusion or omission. Any errors or mistakes found herein belong to me alone.

Many great Marines from HUE CITY have unfortunately already left us. Lieutenant General Ernest C. Cheatham USMC and Colonel Stanley S. Hughes USMC who served as commanders for 2nd Battalion, 5th Marines, and 1st Marines respectfully, serve as two exemplars of leadership in the face of adversity. Revisiting their story vicariously through those who knew them, among countless other Marine veterans, helps ensure that their legacy continues to contribute to success on the battlefield and does not become part of "The Forgotten Literature."

Acknowledgements

The many hours of work invested into this MMS research paper reflect significant assistance from several influences and contributors. My sincere thanks extend to **Dr. Benjamin Jensen** and **Dr. Paul Gelpi** for providing this opportunity and the many professional discussions you inspired over the past ten months while part of the advanced studies program.

I am grateful to several veterans from Operation HUE CITY who provided their first-hand accounts and insights for a young Marine major. My special thanks extend to **Ambassador James R. Bullington (Retired), Lieutenant General Ron Christmas USMC (Retired), Brigadier General Michael Downs USMC (Retired), Colonel Chuck Meadows USMC (Retired), Colonel Robert Thompson USMC (Retired), Colonel Myron Harrington USMC (Retired), Scott Nelson,** and **Nicholas Warr.**

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Thank you to the **university students and faculty** who completed the operational decision game or offered suggestions on draft concepts. Your ideas helped elevate the quality and effectiveness of the final concept. I appreciate the reviews conducted by **Dr. Anne Louise Antonoff** and **Dr. Nathan Packard** on earlier drafts of the historical case study. Your insights provided additional depth and value to the final product.

My father, **Lieutenant Colonel William C. Macak USMC (Retired)**, provided context and perspective throughout the course of this project. He raised the questions I overlooked, which helped reveal additional insights. Thank you. Lastly, my gratitude extends to my wife, **Soraya**, and two-year-old son, **Alexander,** for your love, patience, and support…and for the continued interruptions to ensure I did not miss the latest episode of *PJ Masks* or go outside to the playground. You are the light of my life and represent the reason worth investing the time into this project.

Introduction

Figure 1: Marine + Robotic and Autonomous Systems = Centaur.[7]

In classical Greek mythology, a centaur represented, "a creature with the head, arms, and torso of a man and the body and legs of a horse."[8] Similar to how this mythological creature exploited the benefits of a liminal being, human-machine collaboration and manned-unmanned teaming reflect various manifestations of a centaur.[9] In this construct, emerging battle networks integrate the best of humans with the best of machines by exploiting commercial advances in autonomy and narrow artificial intelligence to achieve a comparative advantage relative to adversaries. Official publications, service-level operating concepts, academic literature, and periodicals have stimulated a wider discourse and experimentation on how centaurs might enable the first mover to shift the military balance in its favor.[10]

The purpose of *Centaurs for Maneuver Warfare* is to explore how the Marine Corps' next-generation ground combat element can leverage human-machine collaboration and manned-unmanned teaming to achieve the synergistic benefits of employing robotic and autonomous systems to make Marines more effective on the battlefield. The resulting concept, *Centaurs for the Fifth-Generation Ground Combat Element,* addresses service level direction found in the *Marine Corps Operating Concept*, the Commandant of the Marine Corps' task to reinvigorate a maneuver warfare mindset for the 21st Century, and task to provide a fifth-generation capability for the Ground Combat Element.[11] The method to explore these directions involved a literature review on centaurs in war, a historical case study on Operation HUE CITY to examine a

problem-set unique to the Ground Combat Element, and testing of initial concept hypotheses through an operational decision game (ODG). These efforts informed the final concept.

Section One provides an overview on centaurs in war to build a common understanding of key terms, historical context, and current and emerging paradigms of human-machine collaboration and manned-unmanned teaming. Section Two turns to history to review the value of looking back to look ahead. Studying history provides a concrete basis for analysis, as opposed to unbounded and abstract theoretical premises that may inadvertently exclude relevant considerations. Section Three covers a historical case study on Operation HUE CITY that took place in the ancient imperial city of Hue, South Vietnam during the Tet Offensive of 1968. Although fighting street to street can lend itself to an attritionist bias, this analysis reveals that the reason the Marines won relied less on advanced weapons or technology. The Marines won due to their ability to adapt available means to the problem at hand, and on applying characteristics of maneuver warfare a generation before its adoption as doctrine in 1989.[12] The analysis draws implications on how potential centaur applications can leverage the symbiosis of man and machine to address problems encountered, and reinforce the warfighting philosophy of maneuver warfare. The analysis and implications from this case informed initial concept development. Section Four discusses the design of the ODG *EAGER COLT 20YY*. This ODG extrapolated the problem-set of Operation HUE CITY and overlaid it on a possible scenario Marines could face in the future. Integrating proposed centaur concepts into the ODG for the Fifth-Generation Ground Combat Element provided an opportunity to envision, test, and refine initial theories of victory. The analysis of the solution-sets informed the final concept in Section Five, *Centaurs for the Fifth-Generation Ground Combat Element.*

The Ground Combat Element should leverage and reinforce the warfighting philosophy of maneuver warfare in how it conceptualizes the employment of human-machine collaboration and manned-unmanned teaming to achieve and exploit increased tempo, maneuver options, and protection for Marines. The symbiosis of these emerging technologies and doctrine to leverage and reinforce the other, provides a vehicle to reinvigorate a maneuver warfare mindset. While the vision of the future involving a Marine regiment fighting in the streets of Hue again remains improbable, this concept presents ways to integrate new means with existing service doctrine to reduce and diminish areas of parity for the Marine on the ground. From Hue in 1968 to Fallujah in 2004, among countless other examples involving U.S. and foreign militaries, fighting in the complex urban environment remains a serious endeavor.[13] Winning in the cities does not encompass the only mission of the Ground Combat Element, but it does represent one of the most complex. Today, as in Hue, it reflects a mission where the supporting arms of the Aviation Combat Element and supporting arms organic to the Ground Combat Element have the greatest challenge in supporting the infantryman closing on the objective over the last fifty meters. The next section continues this discussion with a review on centaurs in war.

Centaurs in War
Human-Machine Collaboration and Manned-Unmanned Teaming

This overview builds a common understanding of key terms, historical context, and current and emerging paradigms of centaurs in war. First, it defines key terms with examples to illustrate their function. Second, it provides a review of the historical genesis of unmanned systems on the modern battlefield. Third, it reviews current and emerging paradigms of the U.S. and its competitors. This understanding will provide a perspective to analyze a historical case study to extrapolate problem-sets that future centaur concepts can address.

Key Terms

Defining the following key terms will ensure a clear lexicon for conceptualizing centaurs in war: offset strategy, human-machine collaboration, manned-unmanned teaming, autonomy, and battle networks. At present, these terms remain undefined in joint doctrine. Definitions for them draw on existing literature or comments made by advocates for them.

An offset strategy conceptualizes how a numerically inferior sized force leverages ways and means to achieve desired ends by offsetting the force imbalance relative to an opponent. In the 1950s, the U.S. developed its first offset strategy to inverse the numerical superiority of the Soviet Union, which "took the form of increasingly numerous and varied nuclear weapons, long-range delivery systems, and active and passive defenses." In the 1970s until present, the second offset strategy "took the form of the application of information technology to a range of tactical systems and the advent of stealth." The aspiration for a third offset strategy reflects a progression of these two preceding offset strategies.[14] In 2014, Chuck Hagel, then U.S. Secretary of Defense, formally launched the department's quest to innovate new technologies that portend to help maintain a qualitative advantage in future war.[15] This effort has assumed the unofficial name, the third offset strategy, led by the Deputy Secretary of Defense, Robert Work.[16]

Two of the technological areas for development introduced in the third offset strategy discussion include human-machine collaboration (HM-C) and manned-unmanned teaming (MUM-T). Other variations of these uncodified terms include human-machine combat teaming and machine-assisted operations.[17] "Human intuition combined with the big data analytical, and modeling and simulation capabilities of high performance computing and narrow artificial intelligence to help humans make better decisions faster" provides a working definition for human-machine collaboration.[18] A basic example of this most people use every day is the commercial traffic program Waze, which uses narrow artificial intelligence to process and filter large amounts of data to provide traffic predictions. The human user derives the analytical processing ability of the network and applies intuition of human judgment to arrive at a better decision faster on how to get to their next destination. [19]

The Marine Corps defines manned-unmanned teaming as the integration of "Robotic and autonomous systems with manned platforms and Marines."[20] A contemporary example of this already in use by the military is the MQ-1 Predator that provides aerial intelligence, reconnaissance, and surveillance with precision fire support to manned formations on the ground.[21] The *Marine Corps Operating Concept* seeks to expand this construct into more formations at the tactical level.

Enabling technologies to exploit the full potential of human-machine collaboration and manned-unmanned teaming include: autonomy and battle networks. Under the umbrella term of autonomy, The Defense Science Board's *Summer Study on Autonomy* emphasizes:

> An important distinction is that systems governed by prescriptive rules that permit no deviations are *automated*, but they are not *autonomous*. To be autonomous, a system must have the capability to independently compose and select among different courses of action to accomplish goals based on its knowledge and understanding of the world, itself, and the situation.[22]

A program like Waze may conduct automated processes to filter data and produce a visualization of the parameters provided to it. But it operates within these fixed parameters. Advances in technology to design *autonomous systems* expand the realm of employment options significantly, especially in communications and GPS degraded and denied environments. A battle network consists of "target acquisition sensors, target localization sensors, command and control (C2) elements, weapons, weapon platforms, and the electronic communications linking them together."[23] In short, battle networks represent the collective component parts and connective tissue that links all the components together.

The Genesis of Centaurs for War

Conventional wisdom holds that the paradigm of armed unmanned systems employment in combat began October 7, 2001 when a MQ-1B Predator conducted the first drone strike in Afghanistan as part of Operation ENDURING FREEDOM.[24] Humankind's quest for unmanned systems on the battlefield emerged much earlier than widely realized. In fact, some of the first experiments with this concept took place in World War II. On September 27, 1944, a U.S. Navy TDR-1 Assault Drone destroyed a Japanese anti-aircraft battery located on Bougainville Island in the Solomon Islands.[25] Among other World War II centaur applications, the Joint Army-Navy Experimental and Testing Board experimented with two unmanned amphibious tractor variants as part of a new concept for ship-to-shore maneuver. Proposed concepts included littoral mine clearance, reduction of fortified positions, and obscuration for follow-on manned waves.[26] Though the modern term "manned-unmanned teaming" is a contemporary naming convention, revisiting these early experiments and concepts reframes the perceived novelty of unmanned systems in the contemporary discourse. The roots of unmanned systems and combat teaming on the battlefield reach much further back in history than widely realized, indicating a well-

entrenched tendency of humankind's pursuit of new technologies to achieve a position of advantage on the battlefield.

In the modern era, Nikola Tesla grandfathered the genesis of modern unmanned systems innovation. In 1898, he introduced his Teleautomaton to the world, a remote-controlled boat and one of the world's first remote controlled devices.[27] This milestone expanded, and the discourse that emerged continued into the twentieth century: *Why Not the Land Torpedo? (1917), Wireless-Controlled Battleship (1928), Drones–Prelude to "Push-Button" Warfare? (1946), Robots for 1965* (*1961*), *Ready for Robot Recon* (1966), *UGV Joint Program Office Created* (1989), and *Manned/Unmanned Teaming to Transform the MAGTF* (2016).[28] H. R. Everett's *Unmanned Systems of World Wars I and II*, offers 655 pages of examples that further underscore the contributions by the early pioneers.[29]

Current and Emerging Paradigms

The U.S. operates thousands of unmanned systems in the military inventory today for a variety of purposes. Unmanned aerial systems range from Group 1 systems such as a Raven RQ-11 found in tactical formations, to a Group 5 UAS such as a RQ-4 Global Hawk employed at the strategic level by the U.S. Air Force. Capabilities for this family of platforms range from tactical aerial reconnaissance to high altitude, long endurance, strike coordinated armed reconnaissance. Unmanned ground systems predominately consist of counter-improvised explosive device platforms. However, recent experimentation has started to invigorate new applications through service level initiatives such as the Marine Corps' SEA DRAGON 2025. Unmanned maritime systems include both surface and undersea platforms designed for mine counter-measures and maritime security. In most of these systems, the vast majority perform jobs consistent with the

"dull, dirty, and dangerous" paradigm.[30] The "3Ds" paradigm holds that unmanned systems best serve purposes that relieve humans from the following:

> "dull" (involving long duration or repetitious operations), "dirty" (involving operations in contaminated environments), or "dangerous" (involving operations in which the danger to humans and manned systems was deemed unacceptably high, such as minesweeping, explosive ordnance disposal and attacks against battle networks employing guided weapons).[31]

Re-conceptualizing the purpose, utility, and potential of unmanned systems would expand the realm of the possible for envisioning future concepts.

Current and potential adversaries seek a relative advantage as well. As the U.S. military experiments with advancing capabilities of unmanned systems in home station training environments, Russia has employed an unmanned ground vehicle with a mounted machine gun to support Russian special forces reduce a strongpoint in the North Caucasus city of Makhachkala.[32] In 2016, Russia unveiled a new unmanned variant of its BMP-3 infantry fighting vehicle, equipped with a suite of advanced sensors, a 30mm automatic canon, a 7.62mm coaxial machine gun, and AT-14 anti-tank guided missiles.[33] As of 2016, the Islamic State adopted the use of various unmanned aerial systems armed with small bombs for use as precision guided munitions.[34] These centaur capabilities of state actors and transnational threats introduce new concepts seeking to offset an existing stalemate or superior competitor's approach to war. The sense of urgency to innovate and adapter centaur concepts faster warrants attention.

Conclusion

This overview has discussed key terms, the historical context, and current and emerging paradigms of centaurs in war. This understanding will support analyzing a historical case study to extrapolate problem-sets that future centaur concepts can address. Examining Operation HUE

CITY illuminates how a Marine ground formation offset the deception, surprise, and fortified positions of a numerically superior opponent to win in the complex urban environment.

The Value of a Studying History: Looking Back to Look Ahead

None of us have a sufficiently clear crystal ball to predict fully the changing kaleidoscope of future conflicts that hover over the horizon…[35]

-- James Mattis, U.S. Secretary of Defense

The best lessons for the future are drawn from our own experience; but since this may be meager, we must use the study of the military historical experience of others.[36]

-- Helmuth von Moltke the Elder, 19th century German Field Marshall

Investigating history provides empirical evidence that enlightens the contemporary warfighting practitioner that the nature of war remains immutable. The face of each conflict changes from one war to the next. But certain influences remain consistent. Some may inquire about the value of using a historical case to imagine future operating concepts. Skeptics may reason that equipping a formation of the past with better technology would clearly translate to victory on the battlefield. Or would it? Despite continued advances in technology and weaponry in warfare, the essence of war remains a clash of human wills. An inquisition into the past to understand the phenomenon of war derives its roots from the time-honored practice employed by great military commanders.

In the opening of Sun Tzu's book, *Art of War*, the fifth century BCE military strategist sets the tone for his aphoristic essays that followed. "War is a matter of vital importance to the state; the province of life or death; the road to survival or ruin. It is mandatory that it be thoroughly studied."[37] Marcus Aurelius, the philosopher king and military leader of the Roman Empire from 161-180 CE imparts a similar token of wisdom in his book *Meditations*, "Look at the past, empire succeeding empire, and from that, extrapolate the future: the same thing. No escape from the rhythm of events."[38] In Napoleon Bonaparte's *Maxims of War*, he concludes:

> Peruse again and again the campaigns of Alexander, Hannibal, Caesar, Gustavus Adolphus, Turenne, Eugene, and Frederick. Model yourself upon them. This is the only means of becoming a great captain, and of acquiring the secret of the art of war. Your

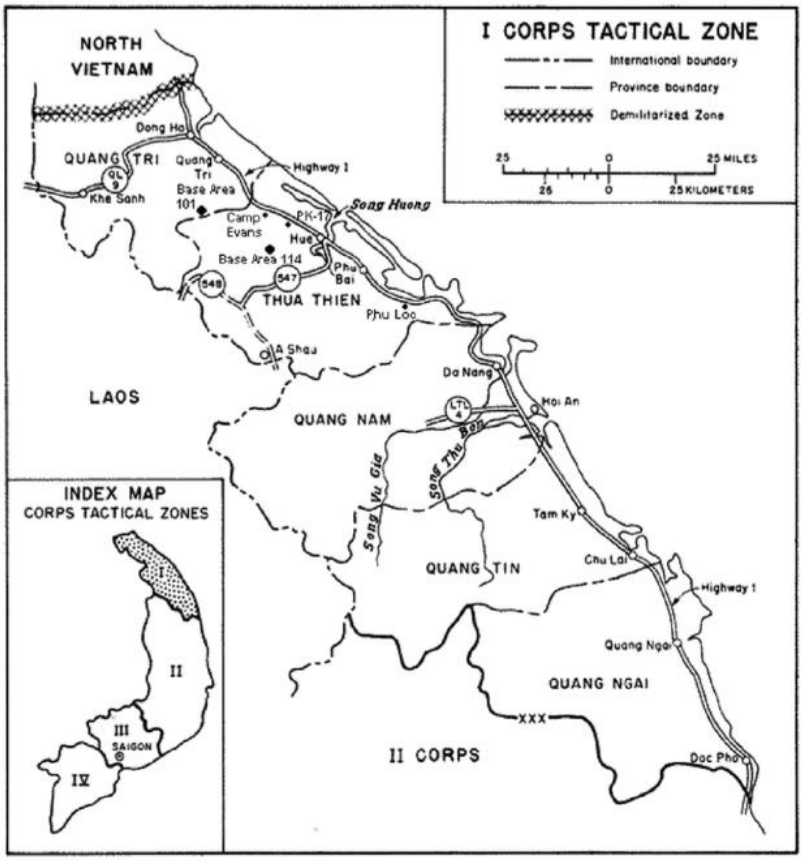
> own genius will be enlightened and improved by this study, and you will learn to reject all maxims foreign to the principles of these great commanders.[39]

In *On War,* Carl von Clausewitz began his dialectical inquiry into the nature of war with an abstract mental model unbounded by reality. However, he realized that when applying the abstract to, "[the] real world, the whole thing looks quite different."[40] War as envisioned in the abstract was possible, "[only] if war were a wholly isolated act, occurring suddenly and not produced by previous events in the political world..."[41] From Sun Tzu to Clausewitz, great commanders of past generations reveal a long practice in studying history.

Helmuth von Moltke the Elder applied the historical experience of others to design operational and tactical decision games as a basis for educating the Prussian officer corps.[42] He realized that unlike most sciences that test a hypothesis in a laboratory, history provided the only concrete set of circumstances to test envisioned tactics, operating concepts, and doctrine for application in future war. With this understanding, Moltke elaborates, "There remains only one way to gain the intended results. That is to investigate the military events of the future and to adapt as much as possible to present-day conditions. In this we have to reckon in part with permanent ones [conditions]. We cannot attain an absolutely correct result, but we can discover the probable."[43] Imagining future war unbounded by present or past realities risks the danger of inadvertently excluding relevant considerations.

The next section will review Operation HUE CITY, which illustrates the realities the Ground Combat Element could encounter regardless of geographic locality. HUE CITY provides a set of fixed circumstances within which to examine the complex character of war in the urban environment, intermixed with rather than devoid of a civilian population, bounded by political realities of governments and other actors on the international stage, and saturated by the fog of war that clouds the physical, mental, and moral abilities of commanders and their Marines.

Historical Case Study: Operation HUE CITY



Map 1: I Corps Tactical Zone AO in northern South Vietnam. Hue located in the North.[44]

I think one of the most significant things that occurred in this battle was for the first eight days, eight to ten days of this battle, the Second Battalion, Fifth Marines fought the enemy on equal ground. In other words, the weather was so poor that we couldn't use air, not even for medical evacuation. The combat was at such a close range, that we were incapable of employing supporting arms. The Marine fought the NVA soldier with the same equipment that the NVA soldier had, was just man against man, eyeball to eyeball. We did not have any advantage of our sophisticated air, we didn't have our artillery, naval gun fire, anything in the first eight to ten days. And yet every time we met him, in house to house, street corner to street corner, we beat him. He never once, not once, set the Marines back. It was surprising to me in a way, because I think many times we have depended on our sophisticated arms, our weapon systems that we have, our airpower and so on. But here, none of them were presently available or could not be employed because of the intimacy of the battle. And so, consequently, it was just this U.S. Marine against the VC or NVA, and it was amazing that time after time, he did win, with exactly the same weapons. I think that this is a real documentation of our training and the capability of our young men.[45]

Lieutenant Colonel Ernest C. Cheatham
Commanding Officer, 2d Battalion, 5th Marines
Hue City Audio Interview, February 1968

Forty-nine years ago, on January 31, 1968, Operation HUE CITY materialized as an unplanned operation during the Vietnam War.[46] The operation began with the initial commitment of two Marine rifle companies sent to reinforce the Military Assistance Command Vietnam (MACV) Compound, and 1st Army of the Republic of Vietnam (ARVN) Division Compound in the city of Hue. As the situation unfolded, the picture grew clearer that a large force from the North Vietnamese Army (NVA) and the National Liberation Front (Viet Cong, VC), had seized the majority of Hue during the Tet Offensive. By the second day, Brigadier General (BGen) Foster LaHue, Commanding General for Task Force Xray (TF Xray), thrust the 1st Marine Regiment (1st Marines) into the city to command and control (C2) the expanding Marine response. Commanded by Colonel Stanley Hughes, initial forces available to 1st Marines included the battalion headquarters (HQ) of 1st Battalion, 1st Marines (1/1) and two rifle companies piecemealed together from separate commands. Unclear to the Marines, three regiments of NVA and VC had seized Hue, a city of 140,000 people, and the venerated cultural and political symbol of greater Vietnam.[47] The ensuing operation to clear the entrenched enemy from the city and restore it to United States (U.S.) control lasted for the next thirty-two days as TF Xray gradually redirected 2d Battalion, 5th Marines (2/5) and 1st Battalion, 5th Marines (1/5) away from the rice paddies and jungles, and sent them into the urban crucible of the city. The Marine mission to liberate Hue, the strategic importance symbolized by the outcome, and the media's portrayal of the operation captured the attention of the President of the United States, and the American people until the operation's termination on March 2, 1968.

To succeed against a larger foe, the Marines overcame intelligence shortfalls, adverse weather impacts and rules of engagement (ROE) restrictions affecting the use of superior firepower, and the ubiquitous fog of uncertainty in war that pervaded the streets throughout the

operation. These concrete realities adversely affected operational C2 and maneuver, leaving the fight to tactical formations at engagement distances between twenty-five and fifty meters. Operation HUE CITY concluded as a tactical victory for the Marines with ARVN and U.S. Army contributions. However, the damage to friendly forces and the confidence of the American public, inflicted by the enemy and amplified by the media, adversely affected the strategic perseverance of the American public as the war continued.

The Marines overcame challenges in Operation HUE CITY by adapting available means and on applying characteristics of maneuver warfare. Leveraging maneuver warfare in how the Marine Corps conceptualizes the employment of emerging technologies, such as human-machine collaboration and manned-unmanned teaming, presents an opportunity to reinforce the Ground Combat Element's ability to achieve increased tempo, maneuver options, and protection for Marines in future war. While centaur concepts that integrate the best of humans with the best of machines merit further consideration in wargame experimentation, the resilience of the individual Marine should remain as the cornerstone of the future force. To examine Operation HUE CITY, Part I provides the strategic setting and prelude to the operation. Part II reconstructs the evolution of the operational approach as it unfolded to include factors considered, assumptions made, options available, and actions taken. This part does not seek to provide a clear and succinct historical narrative. Many historical records have already performed that task. By design, it seeks to place the reader in the uncertainty, fluidity, and disorderly fog of war encountered from the divergent perspectives of Marine participants. To extrapolate implications for centaurs in maneuver warfare, Part III utilizes the Marine Corps philosophy of *Warfighting* as a basis for analysis.[48] These implications inform Part IV, which envisions future centaur concepts.

Part I: Setting the Stage

From a participant's perspective, Operation HUE CITY emerged as an unplanned operation. This holds true at the individual Marine level, and up through the battalion, regiment, division, Marine Amphibious Force (MAF), and the MACV level. However, no war, campaign, or battle breaks out spontaneously as an isolated event. A political objective always remains at the forefront. To understand the campaign level of the operation merits a review of the strategic setting and prelude – the story before the story.

Strategic Setting

The Democratic Republic of Vietnam (North Vietnam) employed a holistic strategy known as *Dau Tranh* (struggle). This strategy unified the diplomatic, informational, and military instruments of national power towards a unified political objective: to conquer the Republic of Vietnam (South Vietnam) and unify the country. Armed *Dau Tranh* undertook a two-horned approach. One thrust employed guerilla warfare to strike deep exterior lines, and the second employed conventional military means in limited offensive warfare. Political *Dau Tranh* employed civil servants in support of the military, village level psychological operations and propaganda, and strategic messaging aimed at American domestic audiences. North Vietnam recognized their inferior military means to resist the U.S. military directly. By exploiting the U.S. military's critical vulnerability of killed and wounded Americans returning home, it leveraged information warfare in conjunction with protracted war to gradually wear down American strategic perseverance to a point of exhaustion. Just as the French eventually relinquished Vietnam as part of Indochina in 1954, North Vietnam knew the expenditure of American effort would eventually exceed the value of its political objective.[49]

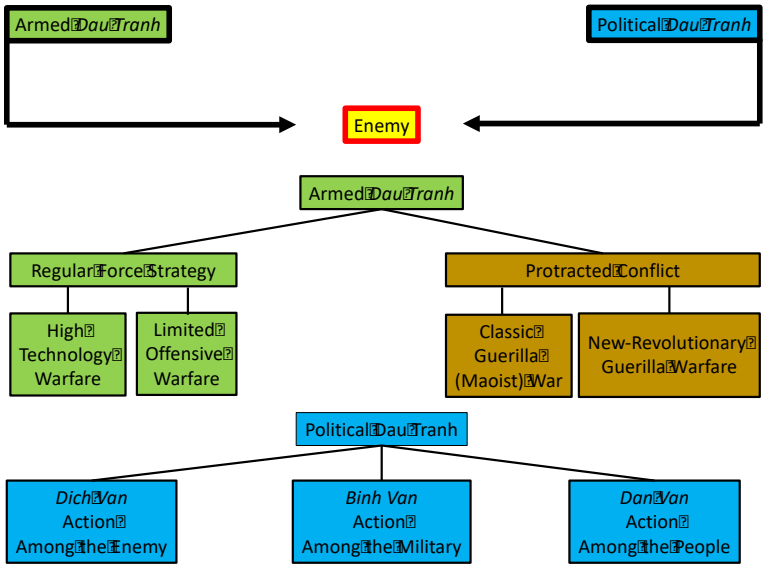


Figure 2: Schematic of Vietnamese Communist Revolutionary War Strategy known as *Dau Tranh* adapted from Douglas Pike's People's Army of Vietnam[50]

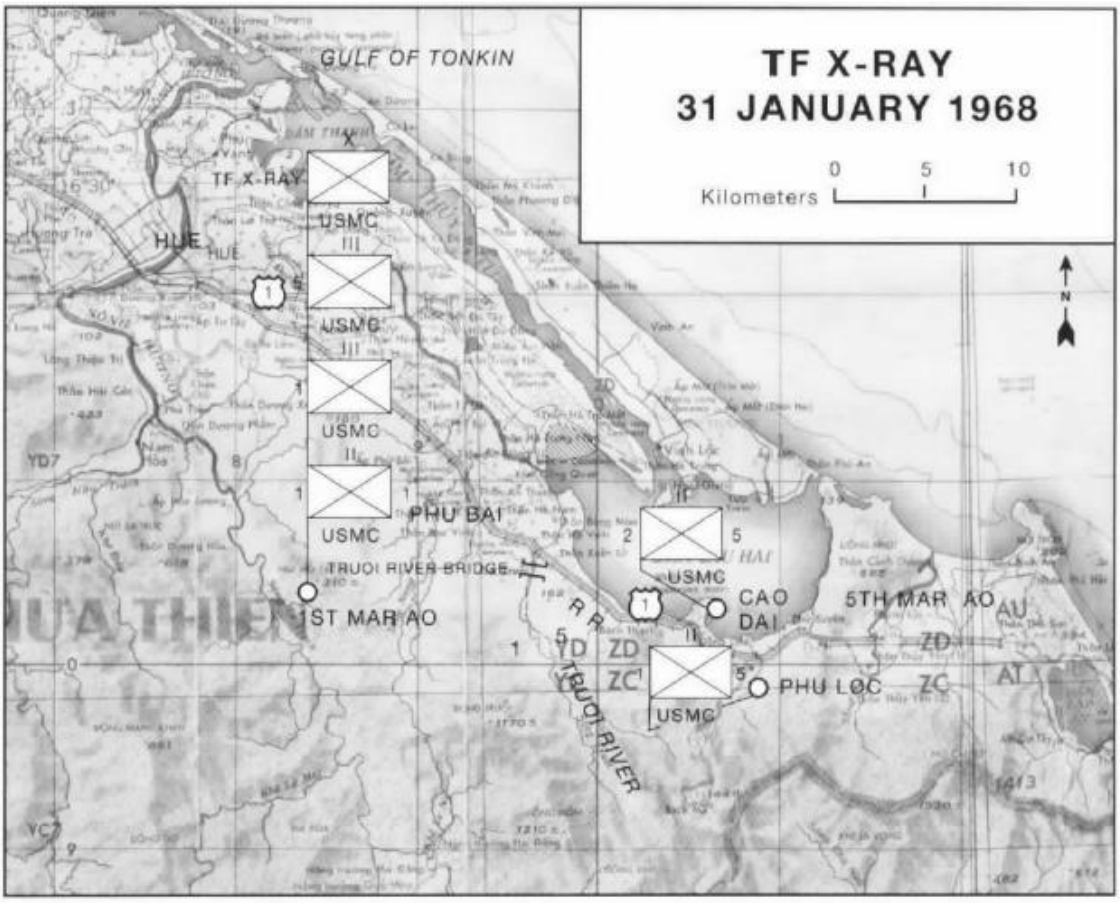
In the wider context of the Cold War, America predicated its involvement in South Vietnam on protecting free nations against the spread of communism. The underlying objective remained limited as a matter of not losing, rather than winning. America placed a disproportionate emphasis on use of the military to achieve strategic ends with no termination criteria clearly defined.[51] While the Civil Operations and Revolutionary Development Support (CORDS) program introduced a more comprehensive and integrated approach to counterinsurgency beginning in May 1967, the military remained the dominant instrument of national power. The concept of 'Search and Destroy Operations' remained the principal mode of operations until the U.S. military stopped its use of the term in March 1968, at the conclusion of the Operation HUE CITY.[52] As part of the larger reaction to the Tet Offensive, the impact of Operation HUE CITY contributed to influencing the U.S. and South Vietnam to leverage more means than the military to defeat the insurgency. The CORDS program provided the organizational construct to adopt a holistic approach and a population centric strategy.[53]

Prior to Operation HUE CITY, America's involvement in Vietnam began in 1950 when the U.S. established a Military Assistance Advisory Group in Vietnam. The Geneva Convention of 1954 ended the First Indochina War between the French and Communist Viet Minh. With the country divided along the 17th Parallel between the communist north and anti-communist south, the U.S. vowed to support the Republic of Vietnam Armed Forces (RVNAF). In 1961, President John F. Kennedy authorized sending the first U.S. military advisors to Vietnam in support of the anti-communist RVNAF. The U.S. established MACV under the leadership of General William C. Westmoreland in 1962, which expanded to 20,000 by 1964. After the controversial Gulf of Tonkin incident in August 1964, the U.S. Congress passed the Gulf of Tonkin Resolution a few days later, which approved and supported a broad and opened-ended objective. It authorized "the President, as Commander in Chief, to take all necessary measures to repel any armed attack against the forces of the United States and to prevent further aggression."[54] Retaliatory air strikes commenced and started the cascade for a larger buildup.

With the security afforded by direct U.S. intervention since 1965, the South Vietnamese government repelled an attempted NVA occupation and persevered through its own internal instability to achieve a constitutional claim to legitimacy by 1967.[55] As 1965 began, the NVA and the VC escalated their guerilla tactics to the employment of full scale regimental sized formations. This signaled their general offensive in the spirit of Mao Zedong's three phase model for revolutionary warfare.[56] In response, President Lyndon B. Johnson committed the first conventional forces to Vietnam in March 1965 and executed Operation STARLITE in August. This marked the first U.S. regimental sized offensive action and earned initial public support for the war.[57] From these initial engagements, MACV expanded to nearly 500,000 service members by January 1968.[58]

The city of Hue resided in the I Corps Tactical Zone (ICTZ). III MAF maintained combined responsibility for ICTZ in coordination with the RVNAF. Forces available to III MAF totaled 100,000 Marines, soldiers and sailors, amounting to forty infantry battalions and twenty-three aviation squadrons. Balancing high desertion rates, the RVNAF expanded to 620,000 men, including the assignment of 80,000 to ICTZ.[59] MACV maintained a coordinating authority command relationship with the Republic of Vietnam Armed Forces (RVNAF). While the relationship remained cordial, lack of unity of command created problems in unified action at tactical levels. The lack of unity established early in the U.S. intervention in Vietnam came into play during Operation HUE CITY.[60]

Leading up to Operation HUE CITY, the strategic situation appeared favorable. Speaking at the National Press Club in Washington D.C. on November 21, 1967, General Westmoreland portrayed an improved situation in Vietnam. He stated, "[I]t is conceivable to me that within two years or less, it will be possible for us to phase down our level of commitment and turn more of the burden of the war over to the Vietnamese armed forces..."[61] In December, he echoed a stronger sentiment to the Commander in Chief, Pacific that in 1968 the allies would, "defeat the VC/NVA main units, destroy the enemy's base areas and resources, and drive him into sparsely populated areas where food is scarce."[62] Despite his confidence in the direction of the war, MACV and III MAF anticipated a major offensive by the NVA at Khe Sanh near the Demilitarized Zone (DMZ) before or after the upcoming Tet holiday in January 1968.[63] Notwithstanding the foreboding of an uprising sensed by operational commanders, the enemy retained the element of surprise and seized the initiative when the Tet Offensive began.



Map 2: TF X-ray Force Laydown 31 January 1968.[64]

Prelude

The month preceding the Tet Offensive marked a period of transition and vulnerability for III MAF for three reasons. First, Marine units relocated throughout ICTZ. As Tet grew closer, General Westmoreland ordered a MACV-Forward command post (CP) established at Phu Bai, which inflamed sensitive inter-service tensions and personalities. Second, greater than fifty percent of commands from company level through TF Xray conducted changes of command in the weeks leading up to the Tet Offensive. Third, the North Vietnamese plan effectively deceived the U.S. and South Vietnam on the location and timing of the attack. The Tet Offensive would exploit these vulnerabilities

In preparation for an anticipated enemy offensive near the DMZ, III MAF initiated a unit repositioning effort in December 1967. Operation CHECKERS resembled a version of musical chairs with regiments and battalions shifting throughout ICTZ. 1st Marine Division (MARDIV) expanded its AO north by establishing TF Xray with an ad-hoc staff on January 11, 1968 to relieve elements of 3d MARDIV concentrating combat power along the DMZ.[65] TF Xray received two regiments (-) to cover the western approaches to the city of Hue, and the remainder of the Thua Thien province south to Da Nang. The assigned battalions would not finish their displacements until later in the month. The Perfume River served as the northern boundary line for TF Xray. It also split the city of Hue in half, with the newer section to the south and old city to the north, known as "The Citadel." Friendly positions in the vicinity of Hue included TF Xray at Phi Bai eight miles south of the city, MACV Team Three (MACV-3) Compound located in the southern sector of the city, and the 1st ARVN Division HQ located in the northeast corner of the old city.

In addition to unit movements, several changes of command occurred in the month of January within the newly established TF Xray. Colonel Hughes assumed command of 1st Marines on 21 January. Lieutenant Colonel (LtCol) Ernest C. Cheatham assumed command of 2/5 on 3 January. LtCol R. P. Whalen assumed command of 1/5 on 8 January, and several of the company commanders also turned over in the weeks leading up to the Tet Offensive.[66]

To achieve surprise, the Politburo of the Communist Party of Vietnam kept its intentions in total secrecy and decided to launch its General Offensive during the Tet holiday of 1968.[67] The objectives for this offensive were: "Annihilate and cause the total disintegration of the bulk of the puppet [RVNAF] army…"; "Annihilate a significant portion of the American military's troop strength…" and; "On this basis, crush the American will to commit aggression and force

the United States to accept defeat in South Vietnam and end all hostile actions against North Vietnam."[68] The city of Hue represented one of three primary focal points of the Tet Offensive. To achieve operational deception, the NVA initiated a siege on Khe Sanh on 20 January. This attack included two divisions, which appeared to validate U.S. assumptions that the main NVA offensive would take place near the DMZ. On 27 January, North Vietnam initiated a seven-day cease-fire for the Tet holiday across the country. South Vietnam and MACV placed no trust in the deceptive North Vietnamese truce after a similar pledge on 1 January resulted in sixty-three violations. However, a large preponderance of the RVNAF took Tet holiday leave across the country.

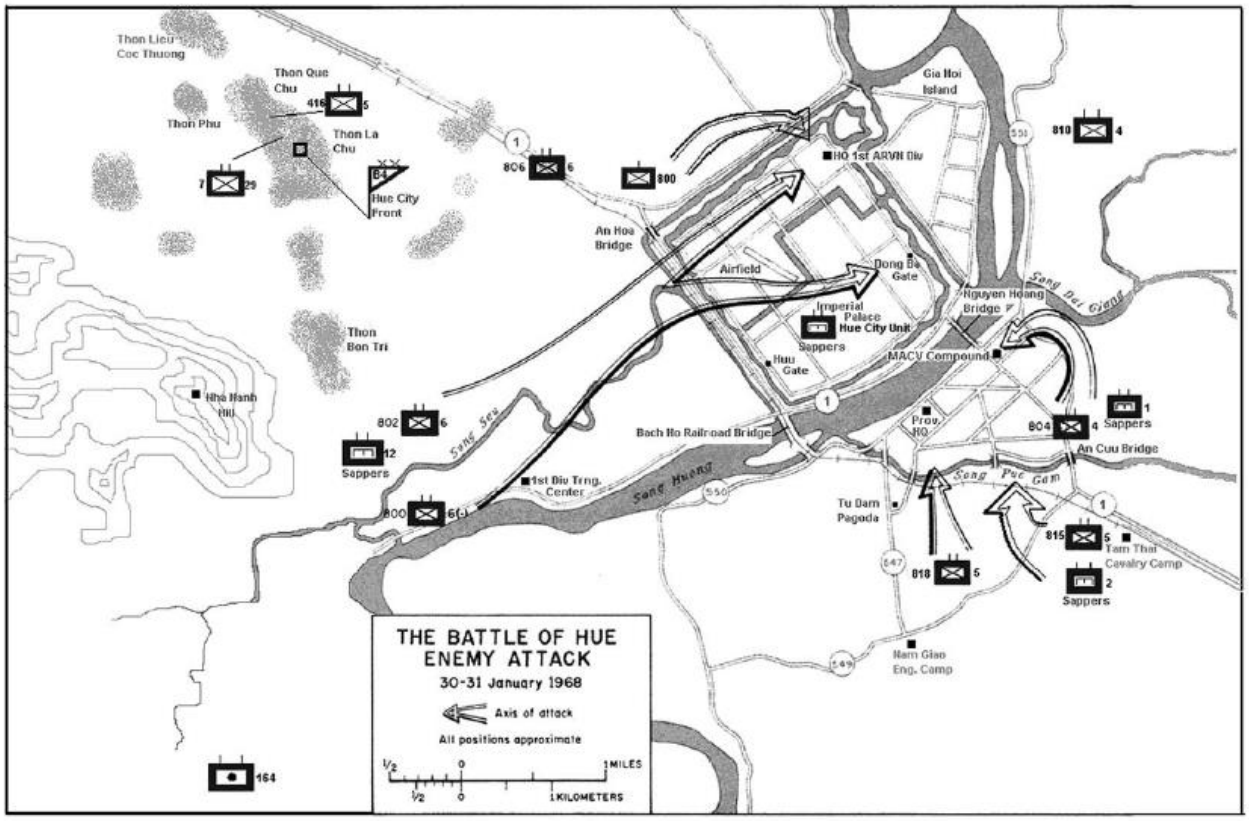
As the assault on Khe Sanh began, III MAF continued Operation CHECKERS. From 28-30 January, TF Xray received the forces it would employ during Operation HUE CITY. On 28 January, HQ elements for 1st Marines and 5th Marines relocated to Phu Bai. 1/1 began displacement by echelon from Quang Tri to Phu Bai. Both regimental HQ maintained the majority of their forces ten to twenty miles south at Phu Loc, Cao Dai, or the surrounding countryside for search and destroy operations. On 29 January, RVNAF and MACV initiated a countrywide ceasefire in honor of the Tet holiday with the exception of ICTZ.[69]

The Tet Offensive began at midnight of 29-30 January when the NVA and VC struck thirty major cities in surprise attacks throughout South Vietnam. Contrary to the rest of the country, the city of Hue remained quiet. After reviewing ARVN intel reports in the morning, BGen Truong, Commanding General of 1st ARVN Division based in Hue, cancelled Tet holiday leave and recalled the division. Allied intelligence assessments indicated two NVA regiments in the Thua Thien Province, however neither the U.S. nor the ARVN believed an attack would occur on the ancient and revered imperial capital. Twenty miles south of Hue, 1/5 and 2/5

encountered the NVA in squad to company sized engagements on 30 January. However, they remained unaware of the larger systemic attack underway across the country.[70]

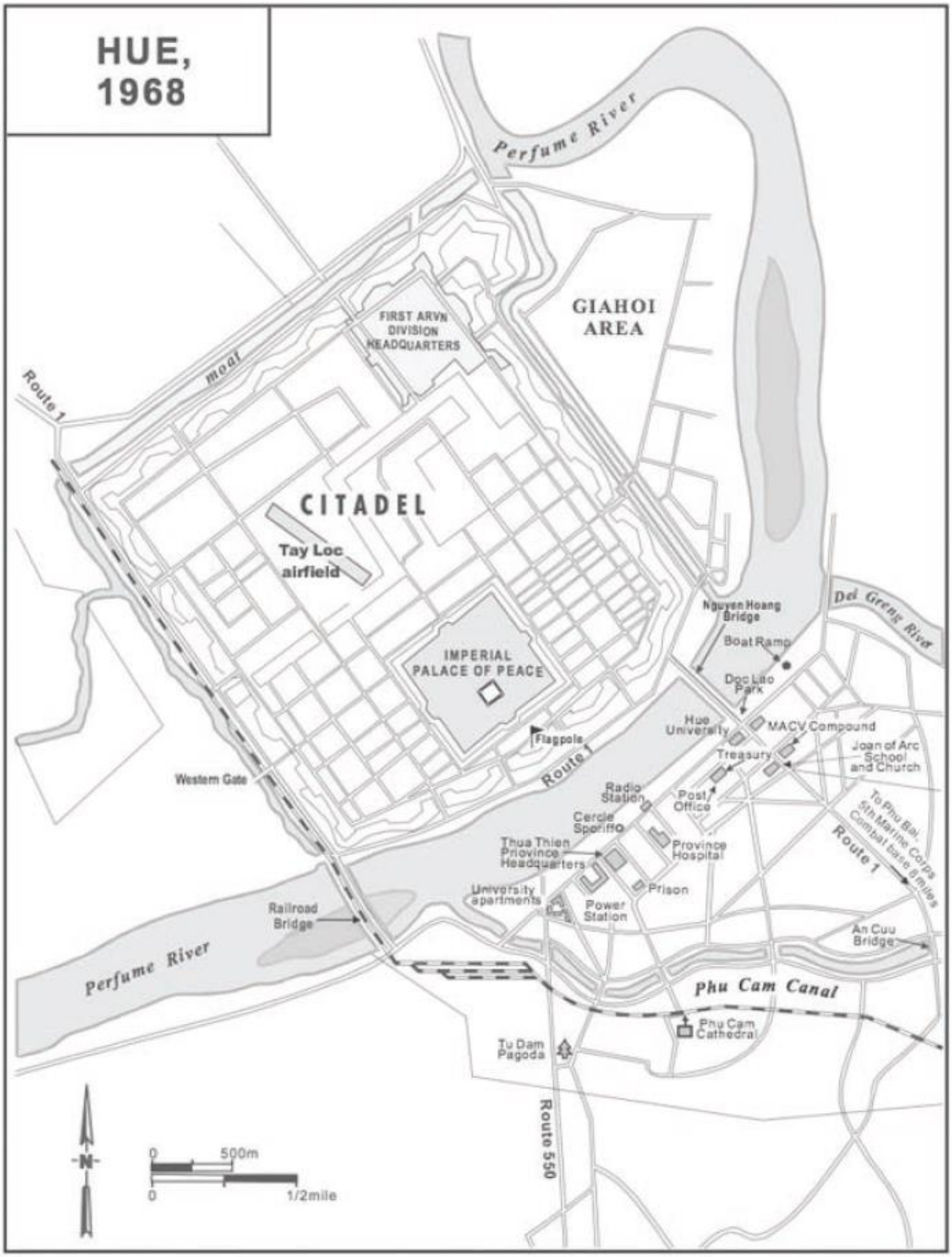
As the sun set on 31 January, U.S. and ARVN forces remained unaware of the impending NVA and VC attack to seize Hue. Most ARVN forces remained home on holiday leave, which left the Division HQ Company and the division commander's "Black Panther" Company holding the fort. MACV-3 maintained a small garrison of about 200 personnel with U.S. advisory staff to the 1st ARVN Division.[71] The U.S. Navy maintained a Landing Craft Unit (LCU) ramp near MACV-3 on the Perfume River. At Phu Bai, TF Xray had two regimental HQ with three infantry battalions engaged in combat operations throughout the AO or in transition from Quang Tri. Attached and supporting forces included 1st Field Artillery Group (1st FAG) with two artillery battalions; company (-) sized elements of M48 Tanks, M50 Ontos, engineers, motor transport, logistics, communications, and force reconnaissance; a company reinforced from 1st Medical Battalion; and low density capabilities for signals and human intelligence, and psychological operations.[72] TF Xray shared the camp with the MACV-Forward advanced party, and rear echelons of 3d MARDIV and 1st Air Cavalry Division still in a state of flux as part of Operation CHECKERS.[73] After arriving to Phu Bai from Quang Tri in the afternoon, Alpha Company (-) 1/1 (A/1/1) assumed duties as the regimental reserve. After several months engaged in combat with the NVA near the DMZ, the company looked forward to a 'stand down" period until 1 February when the rest of the company would arrive to Phu Bai.[74]

Part II: Operation HUE CITY



Map 3: Reconstruction of the NVA/VC assault on Hue City.[75]

Exploiting the element of surprise, a division of NVA and VC infiltrated and seized the city of Hue. U.S. and South Vietnamese after action reports, and enemy documents captured months later, validated that three NVA and VC regiments seized the city, and one to two additional regiments maintained secure lines of communication for resupply from outside the city.[76] Captured enemy documents indicate the NVA maintained forty-five battalions in the Quang Tri and Thua Thien Provinces during the Tet Offensive.[77] Since before U.S. intervention in 1965, the VC had maintained clandestine elements inside Hue to conduct reconnaissance, recruit sympathizers, and conduct targeting of key leaders and media outlets for political mobilization.[78] The Marines and ARVN were not aware of this information until after the operation.



Map 4: Hue City 1968.[79]

January 31, 1968: Discovering and Framing the Problem

From the vantage point of U.S. forces, the NVA initiated simultaneous attacks at 0230 on Phu Bai and MACV-3 with mortars, rockets, and automatic weapons. 2/5 at Cao Dai and 1/5 at Phu Loc reported enemy contact with squad to multiple company sized engagements. Reports trickled in to TF Xray in Phi Bau that unknown sized forces had struck eighteen friendly positions in the area including bridges, company firm bases, and Combined Action Platoons (CAPs). At 0400 in Phu Bai, Colonel Hughes (1st Marines) tasked A/1/1 (-) to reinforce the An Cuu Bridge, a key piece of terrain on Highway 1, which served as the main avenue of approach to Hue. A/1/1 (-) arrived to the bridge on trucks at 0630 only to receive new instructions from TF Xray "to proceed to the Hue Ramp area [near MACV-3] …to investigate reports that Hue city was under attack." At the TF Xray Command Post (CP), BGen LaHue knew only that MACV-3 and the 1st ARVN Division HQ received unspecified enemy contact during the night.[80]

En route to Hue on Highway 1, A/1/1 (-) came up behind a platoon of tanks from 3d Tank Battalion en route to the LCU Ramp. As the two forces linked up, they received heavy fire from a superior sized force. After the Company Commander, Captain Gordon Batcheller, suffered multiple gunshot wounds, the Company Gunnery Sergeant took command of the company, and repelled the enemy's attack.[81] TF Xray remained unaware of the contact that took place.

At 1020, in response to disjointed situation reports from 1st ARVN Division, 1st Marines tasked recently attached G/2/5 to go to the 1st ARVN HQ, pick up BGen Truong, and bring him back to Phu Bai. Colonel Hughes advised Captain Meadows (G/2/5), it should, "take no longer than two to three hours."[82] The ambience of the situation appeared routine with no indication of an enemy threat. At the time, no indication of A/1/1 (-) in contact existed and no inclination had

begun to form that the NVA and VC had occupied Hue. Accompanied by LtCol Gravel (1/1) en route to Hue, Captain Meadows noticed no people were in the market place, no chickens, no activity, absolutely no one was present. He did not think much of the observation until immediately after crossing the An Cuu bridge where they received heavy enemy contact. Captain Meadows scavenged a tourist map of the city while taking cover in a gas station that provided grid reference graphic (GRG) quality detail compared to his 1:50k topographical map of the city.[83] As the company repelled the enemy's assault, G/2/5 discovered several wounded A/1/1 Marines nearby, including Captain Batcheller. With poor visibility from overcast weather, helicopters could not support an air medevac or provide close air support (CAS). G/2/5 loaded the wounded on trucks to return them to Phu Bai and then continued to MACV-3 on foot. They would remain on foot for the next thirty-two days and never reached BGen Truong to pick him up for TF Xray to better develop the situation.[84]

The situation continued to unfold. At 1515, 1/1 (A/1/1 (-) and G/2/5) arrived to MACV-3. The U.S. Army Colonel serving as senior advisor to the 1st ARVN Division advised, "[The] Citadel was in fine shape." The only support requested from MACV involved assistance in evacuating U.S. Citizens in southern Hue at unknown locations.[85] Meanwhile, BGen LaHue received reports from III MAF that 1st ARVN Division "was in trouble" and tasked 1/1 with going "across the river to relieve some of the pressure." This order filtered down to G/2/5.

Sensing that a sizable enemy presence existed in the city, Captain Meadows and LtCol Gravel expressed reservations about the mission to BGen LaHue via radio. Not grasping the immensity of the unfolding situation and not listening to his commanders on the ground, BGen LaHue directed the mission to continue. As Captain Meadows led his company across the Nguyen Hoang Bridge, he noticed the VC flag flying from the Citadel flagpole in the distance.

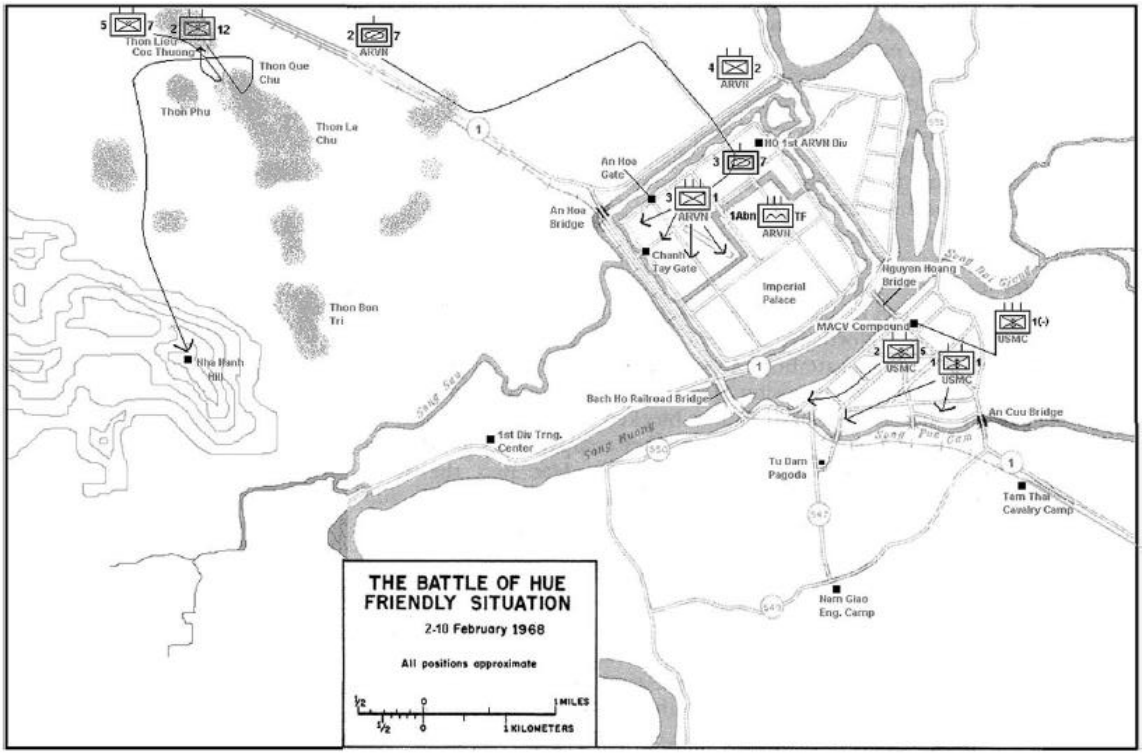
Heavy fire by small and heavy caliber weapons systems opened up on G/2/5 from an unknown sized force entrenched in the old city on the north side of the Perfume River. Unable to employ aviation fires due to poor weather, and denied repeated requests for artillery due to rules of engagement (ROE) restrictions that limited collateral damage to the city, G/2/5 sustained forty-nine casualties crossing the bridge, including the 1/1 Operations Officer. LtCol Gravel withdrew G/2/5 back to the MACV Compound to consolidate for the night.[86] Other than encountering a large enemy force, the situation remained unclear beyond this realization.

As the first day of Operation HUE CITY concluded, the composition, disposition, and size of the enemy remained unknown to leaders from the tactical level all the way up to MACV in Saigon. General Westmoreland reported to the Chairman of the Joint Chiefs of Staff that, "the enemy has approximately three companies in the Hue Citadel and Marines sent a battalion into the area to clear them out."[87] This report represents a stark difference from the reality on the ground revealed months later. At the MACV-3 Compound, "doctors performed miraculous work" to save as many of the sixty plus Marines wounded between A/1/1 and G/2/5. The combined strength of A/1/1 and G/2/5 amounted to almost a full-strength company compared to the 10,000 NVA and VC soldiers occupying Hue.[88]

An imperfect understanding of the situation continued into the next day. At a morning meeting on 1 February with the press at Phu Bai, BGen LaHue advised, "Very definitely, we control the south side of the city…I don't think they [NVA] have any resupply capability, and once they use up what they brought in, they're finished."[89] Tasked with securing the provincial building and the jail, the enemy denied 1/1 the ability to move more than a block from the MACV-3 Compound that morning. BGen LaHue started to realize the requirement for more forces.

At 1230 on 1 February, BGen LaHue sent Colonel Hughes to MACV-3 to take tactical control (TACON) of all U.S. forces. The mission: "to conduct search and destroy operations in Hue City south of the Song Huong…to locate and destroy enemy forces and to restore that portion of the city to U.S. control." BGen LaHue promised reinforcements, which began to arrive the next day. By 3 February, 1st Marines consisted of 2/5 with F, G, and H companies, 1/1 with A company (-), and Tank and Ontos platoons.[90] The 1st ARVN Division continued to request support.

<u>February 3, 1968: The Operational Approach to Clear Southern Hue</u>



Map 5: From 2-10 February, 1st Marines with 2/5 and elements of 1/1 cleared the NVA from southern Hue.[91]

Now with a specified mission and objective, 1st Marines developed an operational approach. A legitimate problem framing and operations order at this point did not yet exist. Only in the aftermath of the operation did 1st Marines have the time to record the information known as the time and organize it in a coherent manner. On 3 February at the MACV-3 Compound,

Colonel Hughes pulled in LtCol Cheatham and LtCol Gravel to provide his direction. An analysis of multiple sources and interviews indicates that at best, Colonel Hughes most likely defined the problem as follows:

1. A large, uncertain sized enemy force occupied the city of Hue.
2. The situation for the 1st ARVN Division in the Citadel remained unclear.
3. Adverse weather and ROE restrictions denied the employment of supporting arms from artillery and CAS.
4. The large civilian population resident in Hue created an additional challenge to limit collateral damage, and prevent unnecessary death and destruction to non-combatants.
5. After several days of fighting, friendly casualty rates surpassed forty-five percent in some companies.
6. An unknown quantity of interagency employees, non-governmental organizations, and American citizens remained dispersed in the city at unknown locations.
7. With political pressure originating from as far away as the President of the United States in Washington DC, time was of the essence to liberate the city as fast as possible. 1st Marines must regain the initiative.

With the problem framed, Colonel Hughes developed a plan to liberate the city.

Colonel Hughes tasked LtCol Gravel (1/1) to maintain security of Highway 1, the MACV-3 Compound, and to support 2/5 once B/1/1 arrived the next day. He then provided the following direction to LtCol Cheatham (2/5):

> I want you to move up to the Hue University building, and your right flank is the Perfume River and you're going to have an exposed flank. I want you to attack through the city and clean the NVA out…(pause)...now if you're looking for more intelligence, you're not getting anymore because we don't know what's going on. Just get up there and get going. And I'll support you any way I possibly can." Pausing again, he added in a softer tone, "You do it any way you want to and [if] you get any heat from above, I'll take care of that."[92]

As additional guidance trickled down to the Marines executing the plan, Captain Ron Christmas (H/2/5) understood the mission had three elements:

> (1) Destroy as many of the enemy as possible.
> (2) Keep their own casualties to a minimum.
> (3) Spare as much of the city from destruction as was humanly possible.[93]

The Marines understood the first two prongs of the mission. The third element seemed unreasonable, if not impossible.

In the face of adversity, a renewed sense of confidence and cohesion emerged with the arrival of LtCol Cheatham and his battalion staff. Captain Christmas and his fellow company commanders felt the increased confidence, noting to each other that, "the *Chariot* was coming," making an analogous reference about their commander as the cavalry, or Caesar, coming to save the day.[94] LtCol Cheatham pulled his company commanders in and advised them, "[T]o do our job as leaders, we must command from the front." When the fight resumed, a bystander would have observed LtCol Cheatham and his officers at the front. Leading from the front enabled 2/5's leaders to see the next objective with their own eyes and direct their Marines, while sharing in the same dangers of their men.[95]

The complex urban environment represented the quintessential Three Block War.[96] Marines balanced engaging in full-scale offensive actions on one street, while remaining flexible to exercise measured restraint when civilians exited from a building on the next, or facilitating the safe movement of civilians to the rear area for refuge and humanitarian aid on the next. With the 'plan' set, from 4-10 February, 2/5 supported by 1/1 cleared thirty-four city blocks to the provincial capital building. No quick solutions emerged. The fight became a system of expedients. Marines adapted to the unique character of the new urban environment: suppressing before moving, utilizing the 3.5" rocket for breaching, integrating infantry with tanks, and exploiting the recoilless rifles on the M50 Ontos to achieve combined arms solutions. They confronted a tenacious "fight to the death" enemy that employed machine guns with interlocking fields of fire, rockets, snipers, semiautomatic weapons, and registered mortars every block. In addition to the enemy's entrenched positions, use of subterranean tunnels, rubble, and holes in

the wall; the NVA and VC also exploited the civilian population for protection. On one occasion, Captain Christmas and his Marines encountered a man dressed as a nun that raised a pistol towards them before a Marine shot him. The Marines had to balance deciphering friend from foe, while also helping injured civilians, and directing innocent bystanders in a safe direction as they rooted the NVA out of the city one house at a time. Most of the fighting took place at twenty-five to fifty meters.[97] Employing lethality discriminately and exercising measured restraint characterizes how the levels of war cascade in the complex urban environment where small tactical actions can result in significant strategic implications.

Figure 3: *Despite rooting the NVA out from Hue, building by building, the Marines also encountered thousands of civilians throughout the month-long operation. Here, a H/2/5 Marine evacuates a woman from a hospital to relative safety.*[98]

The Marines continued to adapt. The three 1:50k topographical maps available initially for 2/5 proved insufficient in number and detail for the urban environment. The tourist map picked up by Captain Meadows on 31 January and additional tourist maps picked up on the way by others provided the best means to maintain a shared mental model of the situation.[99] In the absence of aviation and artillery fire support, 2/5 relied heavily on 81mm mortars for supporting arms. Observing impacts behind the defilade of buildings proved difficult, so the Marines

employed 81mm mortars “like a hammer on a building.” Eventually the roof would cave in. This example captures one of many examples on how adaptation served as a critical enabler to success. Deciding on ROE guidance effects tactical actions that can have strategic implications ranging from death to civilians and assuming greater risk to tactical formations.

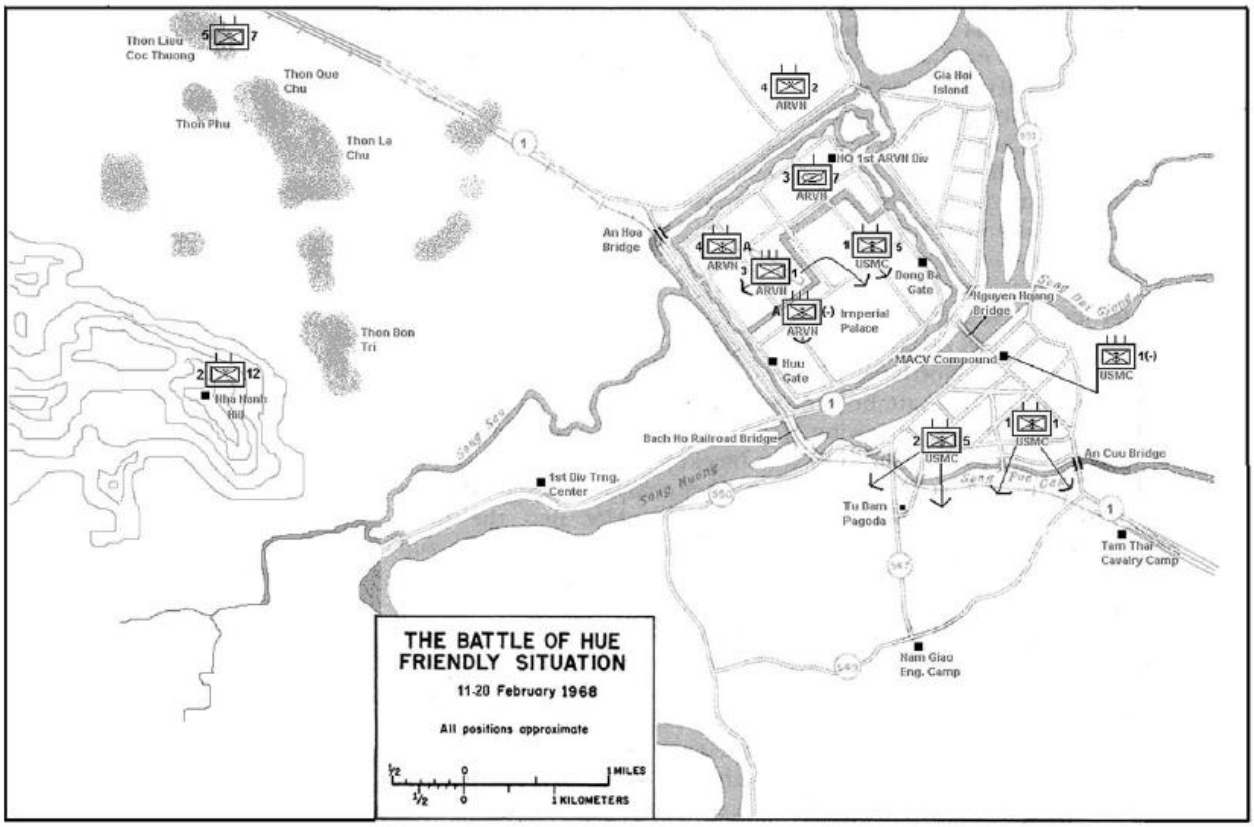
Chance and luck played a role. LtCol Gravel observed that despite the enemy’s initial advantage of surprise in the opening days of the operation, the enemy failed to exploit it. Once the Marines built up sufficient combat power, they were able to seize the initiative and progressively gain momentum as they cleared southern Hue block by block.[100] The NVA eventually destroyed the An Cuu Bridge on 4 February and the Nguyen Hoang Bridge on 7 February. This development required engineers to emplace pontoon bridges that took several days to erect. Fortunately for 1st Marines, sufficient combat power arrived in zone prior to demolition of the bridges, which enabled the Marines to secure southern Hue by 10 February.[101]

Despite a valiant effort through 9 February, the 3d Brigade from 1st Air Cavalry Division in Quang Tri had unsuccessfully isolated the city. As a result, fresh NVA reinforcements continued to pour into the city. When General Creighton B. Abrams arrived at Phu Bai to command MACV-Forward, he started to pull two regiments of U.S. Army and RVNAF reinforcements to the TF Xray AO to support the isolation of the city.

Inside the Citadel, 1st ARVN continued to face a committed enemy. 1st ARVN built up to four Airborne Battalions, two armored cavalry squadrons, the Black Panther Company, 3d ARVN Regiment with four organic battalions, and one additional battalion (reinforced). However, ARVN efforts to secure the city remained unsuccessful. The NVA remained entrenched in the old city, dominating the ARVN response. BGen Truong requested help from the Marines.

In the evening of 9 February, BGen LaHue ordered Major Robert Thompson, 1/5's new battalion commander, to prepare to enter Hue City. As the III MAF Embarkation Officer a week earlier, Major Thompson had flown into a hot landing zone on 1 February to take command from a wounded and medically evacuated LtCol Whalen.[102] Currently engaged in a fight of its own twenty miles south of Hue, Major Thompson started to move his battalion north by echelon.

February 10, 1968: Operations in the Citadel



MAP 6: By 10 February, 2/5 had cleared southern Hue, but continued to encounter pockets of resistance while back clearing previously cleared areas. 1st Marines sent 1/5 through the backdoor to reinforce the 1st ARVN Division and clear the NVA out of the city.[103]

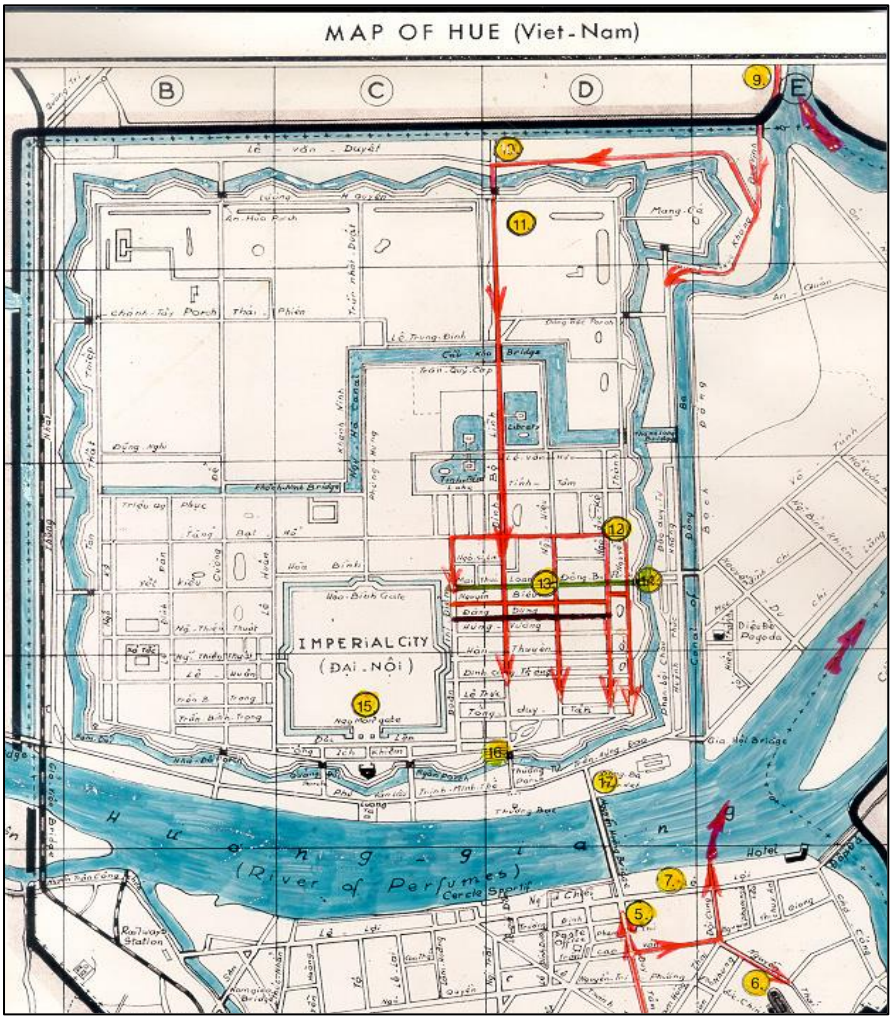
Despite ten days of sustained fighting, the operational picture in Hue remained obscure as 1/5 prepared to clear the Citadel. Hiking ten miles back to Phu Loc during the night of 9 February, A/1/5 departed at 0700 by trucks up to Phu Bai and onward to southern Hue to reinforce 1st Marines. B/1/5 soon followed. By 1045 on 11 February, CH-46 helicopters and LCU's inserted A/1/5, B/1/5 and five tanks into the 1st ARVN Division Compound in the north-

east corner of the Citadel. D/1/5 attached to 2/5 to reinforce continued operations in Southern Hue. Arriving to Phu Bai mid-day on 11 February, Major Thompson learned from BGen LaHue, "that the 1st ARVN Division was having a very difficult time in the Citadel," and added that, "it shouldn't take more than a few days to clean up the Citadel affair."[104] When asked about the enemy situation inside the Citadel, BGen LaHue advised that it remained unclear and requested from Major Thompson, "Let me know what's going on when you get there."[105] If the responsibility of senior commands includes shaping the battlespace to provide subordinate commanders an advantage with the enemy, then TF Xray consistently proved unable to deliver. Major Thompson next headed to the MACV compound to linkup with Colonel Hughes.

Colonel Hughes decided to expel the NVA out of the Citadel by way of an indirect approach – entering through the backdoor to gain positional advantage. At the MACV Compound, Colonel Hughes directed Major Thompson to:

> [m]ove up the Perfume River in LCUs, land and enter the Citadel from the north…then seek out General Truong and advise him of my intentions [to launch a 3-company attack from north to south] within a zone of action that extended from the inner palace wall on the west to the Citadel Wall on the east.[106]

When Major Thompson began to share his plan with the regimental commander, Colonel Hughes responded, "Major Thompson, I don't care how you do it, that's your business."[107] Armed with commander's intent and his mission-type order, Major Thompson and the remainder of 1/5 not already in the Citadel, moved by LCU to the 1st ARVN Division HQ on 12 February. After coordination with BGen Truong, Major Thompson understood that 1/5 would link-up with an ARVN battalion at an assault position the next morning to begin clearing Hue. Had Major Thompson known the ARVN battalion would not remain in place, it would have changed his plan entirely for what 1/5 encountered next.[108]



Map 7: Concept of Operations for 1st Battalion, 5th Marines to clear the Citadel. Note that 1/5 moved from the LCU Ramp (7) north to linkup with 1st ARVN Div (10), before attacking north to south. This maneuver sought to gain an element of surprise by entering the city through the "back door."[109]

The fight for the Citadel began at 0800 on 13 February. 1/5 approached the assault position and saw no ARVN battalions. Approximately seventy-five meters short of the linkup point, the NVA initiated contact. "Within 15 minutes all hell broke loose." The NVA killed A/1/5's company commander, executive officer, and company gunnery sergeant. With thirty-five casualties in the opening minutes, Major Thompson replaced A/1/5 with B/1/5 to hold the line with C/1/5 on their right flank. With no air or artillery fire support due to ROE restrictions and persistent low cloud levels, 1/5 relied on their battalion organic weapons and a Tank-Ontos 'Killer Teams' to achieve combined arms solutions. Unable to break the stalemate with the

NVA, Major Thompson requested "the entire arsenal of allied power to support his attack the next morning." Loosening the ROE involved high level discussions between General Westmoreland, General Abrams, and General Cushman (III MAF) with the South Vietnamese Vice President (VP). Faced with a protracted fight to secure the symbolic old city, the South Vietnamese VP agreed to loosen ROE restrictions, except for fires on the Imperial Palace and its surrounding walls.[110] Ironically, the message to loosen ROE arrived to Major Thompson by way of the 1st ARVN Division at first, and had not filtered down through U.S. channels.[111]

Compared to the fight in southern Hue, Major Thompson later described that his Marines encountered an NVA enemy that employed:

> [B]etter city-fighting tactics, improved the already formidable defenses, dug trenches, built roadblocks and conducted counterattacks to regain redoubts [fortifications] which were important to…[their] defensive scheme… [the Citadel consisted of] row after row of single-story, thick-walled masonry houses jammed close together and occasionally separated by alleyways or narrow streets. [The Marines encountered] hundreds of naturally camouflaged, mutually supporting, fortified positions…both of our flanks were exposed to the enemy…the NVA were able to dominate the top of the Citadel wall with observation and fire…the imperial palace provided the enemy a haven from which he could deliver small arms, rocket and mortar fire.[112]

Major Thompson recounted that the Marines, "never saw the enemy until taking fire. Buildings were so close together. It was an eyeball to eyeball fight. We took a lot of casualties."[113] 1/5 tried walking artillery into the Citadel, but the enemy was too close by the time artillery impacts achieved effects that it presented a greater risk of fratricide to friendly forces.[114] With the chaos, violence, and danger inherent in war evident, decentralizing decision-making and initiative down the chain of command became imperative to achieving speed and focus of combat power to exploit opportunistic gaps on the battlefield.

From 14-20 February, 1/5 cleared the next 1,000 meters of the old city, supported by intermittent artillery and naval gunfire support, and occasional close air support (CAS). Weather

remained a limiting factor and although ROE restrictions loosened, poor battlespace geometries made safe employment of supporting arms challenging. 1/5 relied primarily on battalion organic weapons, supported by Tanks-Ontos 'Killer Teams.' Two South Vietnamese Marine Corps battalions arrived on 14 February and provided the ARVN renewed combat power to exploit 1/5's slow progress on their adjacent flank.

TF Xray and MACV Forward still had not yet isolated the city. At Phu Bai, discussions between TF Xray, MACV-Forward, 1st Air Cavalry Division north in Quang Tri, and reports from 1st ARVN Division revealed that the NVA continued to resupply enemy forces in the Citadel. MACV Forward and TF Xray's efforts to isolate the city had failed as the U.S. Army encountered its own resistance outside the city attempting to isolate it. Concerned by a renewed NVA effort to regain the initiative, MACV-Forward explored options with the 1st Air Cavalry Division and 1st ARVN Division to achieve isolation of the city.[115]

On 16 February, a stroke of luck emerged when a 100-round volley of artillery and naval gunfire hit a tower in the Citadel. ARVN intercepted a NVA radio message that the volley killed a suspected NVA general officer. The new NVA commander cited that "many other men had either been killed or wounded," and requested permission to withdraw from the city. The NVA commander outside the city disapproved the request and the fight for Hue continued.[116] This event marked an influential turn of events to close out the operation.

With four blocks remaining to clear and faced with continued NVA resistance and increasing casualties, TF Xray reinforced 1/5 with L/3/5 to reinforce the battalion's final push forward on 21 February. The next day, TF Xray received operational control (OPCON) of the 1st Brigade, 101st Airborne Division and assumed TACON of all U.S. forces in the vicinity of Hue,

twenty-two days after fighting had begun. By 24 February, 1/5 and South Vietnamese forces captured the Citadel and completed the liberation of the city the next day.[117]

February 25, 1968: Consolidation and Transition

Beginning on 25 February, TF Xray began transition to post combat recovery efforts inside the city while units swept through the countryside to clear remaining pockets of resistance.[118] Operation HUE CITY concluded on March 2, 1968. The operation's end also signaled the end of the Tet Offensive, with the exception of assault on Khe Sanh at the DMZ. MACV-Forward deactivated on 10 March.[119]

Part III: Analysis & Implications for Centaurs in Maneuver Warfare

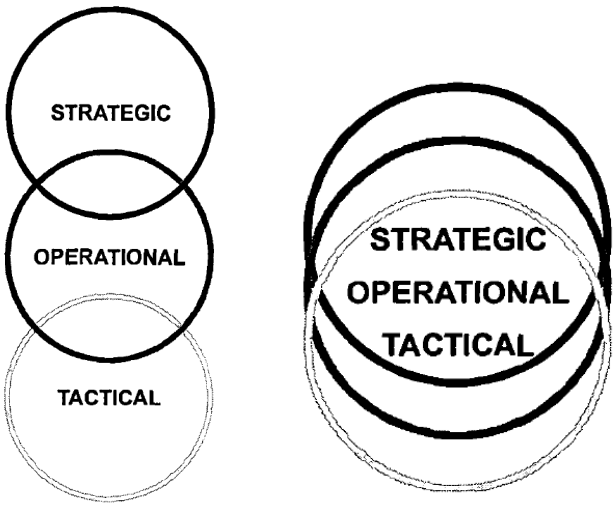
Drawing on the reconstruction of events, this analysis extrapolates implications for centaur concepts and considerations for the Ground Combat Element. To succeed, 1st Marines employed the fundamentals of maneuver warfare well before the Marine Corps first published *Warfighting* in 1989.[120] Observations pertaining to all the Warfighting Functions and Principles of Joint Operations readily present themselves. However, they ultimately serve individual roles as constituent parts to the larger whole. As seen in the uncertainty, fluidity, disorder, and complexity experienced in Hue City, a holistic analysis of the operation indicates not to over emphasize any singular part. Capturing the essence of this complexity, *Warfighting* states, "War is not governed by the actions or decisions of a single individual in any one place but emerges from the collective behavior of all the individual parts of the system interacting locally in response to local conditions and incomplete information."[121] Taking this into account, this analysis focuses on aspects of *Warfighting* and their relationship with other aspects. The following framework provides structure for this analysis: (1) the Theory of War, (2) the Conduct of War, and (3) morale forces and the human dimension in war.

The Theory of War

The single most important thought to understand about our theory is that war must serve policy.
-- MCDP-1 Warfighting[122]

A study of a historical case reinforces the importance to place upon *Warfighting*'s Theory of War when envisioning future operating concepts. In short, "[W]ar must serve policy."[123] With new advances in technology that promise a competitive edge in future war, the alluring appeal to imagine the future unbounded by real world contextual realities risks expensive irrelevance. Technology remains a means to a political end, and does not represent the end in itself. To ensure future centaur concepts for the Ground Combat Element remain in context, examining Operation HUE CITY illustrates (1) the cascading levels of war in the complex urban environment, (2) how means in war vary across the spectrum of conflict, (3) and war as an act of policy.

Cascading levels of war in the complex urban environment. Warfighting codifies the area that links the tactical and strategic levels of war as the operational level.[124] Unique to Operation HUE CITY, liberating the city from the enemy represented not only a series of tactical objectives comprising multiple enemy positions inside the city, but also a strategic objective due to the political and cultural importance symbolized by the city and the larger Tet Offensive. Linking the achievement of this objective with limitations imposed in the form of ROE placed the burden of operational art predominately on the shoulders of those engaged in the fighting, at the regimental and below level. Figures 4 and 5 represent an idealized abstraction of the levels of war and the cascading effect experienced in Hue.



Figures 4 and 5: The strategic, operational, and tactical levels of war. [125]

As it relates to linking tactical engagements with strategic objectives, the result of engagements matter. Operation HUE CITY concluded as a 1st Marines tactical victory with support by the U.S. Army and RVNAF. However, the significant friendly casualties inflicted by the NVA and VC, civilian deaths associated with the fighting, damage to the city, and the protracted time required to liberate the city adversely affected the strategic perseverance of the American public. U.S. casualties exceeded fifty percent for the units involved in the urban fighting. 1st Marines alone reported 137 killed in action (KIA) and 1,079 wounded in action (WIA). In smaller formations, the toll took on a more visible impact. Second Lieutenant Nicholas Warr, First Platoon Commander C/1/5, entered the Citadel on 12 February with fifty-one Marines and Sailors. Twenty-two walked out on their own ability thirteen days later, disbanded to other platoons in the company. Before becoming the Chairman of the Joint Chiefs of Staff, General Peter Pace USMC started out as Second Lieutenant Pace. He met his first platoon on the backside of Operation HUE CITY from Lieutenant Steve Hancock. He recalls, "Instead of 43 Marines, it had 14. *Fourteen*. I was the third platoon commander in as many weeks," for Second Platoon G/2/5.[126] Across the companies in 1st Marines, second lieutenants

emerged as company commanders, corporals and sergeants commanded platoons, and private first classes led squads. In a matter of minutes during one instance for H/2/5, every officer in the company became a casualty along with the staff non-commissioned officers (SNCO). A Staff Sergeant commanded the company until the battalion could backfill new leadership.[127]

The RVNAF suffered similar casualty rates as U.S. forces.[128] When 1/5 cleared the eastern sector of the Citadel, 1st ARVN provided the remainder of a recon platoon and its infamous Black Panther company to help manage civilian refugees. These forces equated to approximately twenty-five ARVN soldiers that would have once numbered approximately 200 at the beginning of the offensive.[129] From a population of 140,000 people, 116,000 became homeless. More than 5,800 died or remained missing. The month-long siege to liberate the city leveled an estimated eighty percent of the city's structures.[130]

Media coverage amplified the information domain as a latent dimension in modern conflict, which contributed to the cascading levels of war. Despite proactive public affairs efforts on the part of III MAF and MACV, the American media broadcasted an image of a struggling U.S. military, embattled in a stalemate with a determined communist enemy.[131] The media's coverage of the violence, danger, death, and destruction associated with the eye ball to eye ball street fighting, beamed a new face of the Vietnam war not supported widely by Americans back home glued to their televisions. By extension, this coverage contributed to a loss in strategic perseverance in the American public.[132] At a tactical level, psychological operations aimed at the enemy proved ineffective. However, 1st Marines did achieve successful messaging objectives to inform and influence the local civilian population as it related to refugee support efforts.[133]

The intensity and complexity of the urban environment, influence of the media, and casualties experienced by the Marines in Hue raise important implications for envisioning

Ground Combat Element centaur concepts. The intensity and complexity of conflict has continued since 1968 as evidenced by the Russians in Chechnya (1994-1995, 1999-2000), U.S. in Fallujah (2004), and Iraqi Security Forces battling the Islamic State in Mosul today.[134] The influence of the media on the battlefield has only increased. Proliferation of technology and digital networking has only magnified this variable.[135] The Ground Combat Element needs to explore capabilities that enable it to win in the urban environment while achieving greater protection for friendly forces.

Means in war and the Spectrum of Conflict. *Warfighting* highlights that the means in war vary across the spectrum of conflict.[136] As the U.S. envisions future war, Operation HUE CITY provides a fifty-year-old example that involved characteristics of what some experts in 2007 started to term 'hybrid war.'[137] The notion of hybrid war connotes that a military force can employ a blend of conventional military means and ways such as tanks and infantry; and combine them with irregular means and ways such as non-uniformed personnel who can infiltrate into an objective area. In reviewing the North Vietnamese overall *Dau Tranh* strategy and operational approach to the Tet Offensive, parallels emerge that resemble Russia's 2014 infiltration of Crimea. In both instances, the NVA and Russia employed irregular forces to infiltrate and set conditions prior to committing their decisive forces.[138] Phasing the deployment of forces into theater in this way allows an adversary to shape the battlespace in a manner that increases their situational awareness and creates localized advantages before committing combat power. In 2014, Russia employed masked special forces without insignia, misinformation, and ambiguity to phase forces into Crimea. Combined with concurrent political posturing, Russia annexed the territory a month later without engaging in major combat operations. In 1968, the use of irregular forces (VC) to infiltrate, mobilize support, and subvert existing power structures

in preparation for employment of conventional means (NVA) illustrates an older example of a similar approach. The NVA employment of VC irregular forces as a shaping action before the conventional hostilities of the Tet Offensive emphasizes the array of means and spectrum of conflict the enemy viewed available for maneuver. As it pertains to the Ground Combat Element, the Tet Offensive signals that students of war should envision means and ways that afford it the ability to maneuver across the spectrum of conflict. Dropping the adjective “hybrid” and considering war in its holistic nature may help contribute towards this objective.

War as an Act of Policy. Warfighting highlights from Clausewitz in *On War* that, "The political object is the goal, war is the means of reaching it, and the means can never be considered in isolation from their purposes."[139] Placed in this context, 1st Marines provided a military means to solve a military problem with strategic ends and political implications for the war. Winning battles matter, provided they lead to achieving strategic ends. The mission to liberate the city became much more difficult than destroying the enemy and clearing the city. The Marines had to balance the achievement of tactical success in the complex urban environment, while attempting to achieve protection, minimize destruction of the city, and death to civilians. Accomplishing these paradoxical objectives each carried relative value towards a strategic end. The Marines could not achieve one without the other to ensure their actions led to success at the strategic level. Future centaur concepts should factor these competing requirements during concept development. Indiscriminate and wanton destruction by an unmanned system from a safe standoff distance may achieve favorable tactical effects, but risks leading to strategic failure if it cannot adhere to internationals norms and the Law of Armed Conflict.[140]

The North Vietnamese month-long occupation of Hue achieved the psychological impact of its objective.[141] The shock of Hue and the wider Tet Offensive, combined with the extended siege at Khe Sanh, amplified by American news media, induced President Lyndon B. Johnson to announce his decision on 31 March not to pursue re-election. He also denied a request by General Westmoreland for 200,000 additional service members, placed restrictions on bombing in North Vietnam, and re-engaged North Vietnam on the prospect of peace talks. General Abrams replaced General Westmoreland soon thereafter and began the years of withdrawal from Vietnam.[142] Seen from the perspective of North Vietnam, the NVA succeeded in partially achieving its campaign objectives.

In summary, the Marines liberated Hue City. It came at a cost in American lives that when amplified by American media, adversely affected the strategic perseverance of the American public when considered in the larger context of the Tet Offensive. The North Vietnamese viewed the Tet Offensive as a decisive turning point in the war. Their historical account states, "The Tet General Offensive and Uprising conducted by our soldiers and civilians dealt a major blow to the American and puppet armies…our soldiers and civilians secured a great strategic victory."[143] The month-long occupation of Hue symbolized this sentiment. As evidenced by the cascading level of war, the varying means of war across the spectrum of conflict, and considering war as an act of policy, Ground Combat Element centaur concepts must remain consistent with *Warfighting*'s Theory of War. The technology that enables them as a means do not serve an end in themselves.

Figure 6: *LtCol Cheatham (2/5) pictured above, commanded from the front and made numerous decisions in the face of uncertainty that enabled the Marines to achieve a faster tempo relative to the NVA.*[144]

The Conduct of War

Maneuver warfare is a warfighting philosophy that seeks to shatter the enemy's cohesion through a variety of rapid, focused, and unexpected actions which create a turbulent and rapidly deteriorating situation with which the enemy cannot cope.[145]

-- MCDP-1 Warfighting

To operate and win in the uncertainty, fluidity, disorder, and complexity experienced in Hue City required an approach that afforded, "rapid, flexible, and opportunistic maneuver" to achieve a spatial, temporal, or cognitive advantage.[146] *Warfighting* conceptualizes this philosophy as maneuver warfare. The success and failures of Marines in Hue City validate several aspects of *Warfighting* that bear continued relevance when introducing Ground Combat Element centaur concepts to maneuver warfare. Examining Operation HUE CITY illustrates the importance of (1) Orienting on the Enemy relative to Decision Making amidst uncertainty; (2) Philosophy of Command, Mission Tactics, and Commander's Intent; and (3) Shaping Actions and Combined Arms.

Orienting on the Enemy. TF Xray's orientation on the terrain (city of Hue) and disregard for the enemy's opening actions during the onset of the Tet Offensive surrendered the initiative and element of surprise for the enemy to exploit. *Warfighting* advises the following. "It is essential that we understand the enemy on his own terms. We should not assume that every enemy thinks as we do, fights as we do, or has the same values or objectives."[147] In war, friendly actions do not exist in isolation. They are relative to a thinking opponent. The enemy receives a vote too.

After the misdirection by the NVA in the siege at Khe Sanh on 20 January and the Tet Offensive initiated throughout the country on 30 January, the NVA and VC achieved surprise when they attacked Hue on 31 January. From TF Xray through MACV, the systemic attacks of the Tet Offensive across the country paralyzed senior commanders that attempted to make sense of the situation as it unfolded. Surprise enabled the NVA and VC to mass initial combat power faster in relation to the U.S. and ARVN. Although significant gaps in pre-Tet intelligence hindered clarity, indications started to emerge from initial reaction forces that a large enemy force had occupied the city. TF Xray leadership failed to take heed of available information and listen to tactical commanders – "the guys on the ground." The idea that an enemy division could have seized Hue overnight remained an outlier to senior commanders. This bias hindered their ability to listen to reports from the ARVN and their tactical commanders on the ground, which led to delays in committing sufficient forces and loosening ROEs to enable success at the tactical level. At higher headquarters levels where myriads of diverging reports can create more disorientation than clarity, commanders would benefit from Ground Combat Element centaur concepts that assist them in observing, orienting, deciding, and acting faster than adversaries. The increasing digital connectedness of the operating environment compounds the challenge

with an increasing amount of reports and data to process. Concepts that help commanders filter the noise from the relevant cues necessary to make sound decisions would enable them to accelerate the unit's tempo relative to the enemy.

Decision-Making. Experienced commanders such as Colonel Hughes, LtCol Cheatham, and Maj Thompson rose to the occasion and made the best decisions with the information available to them. Sometimes less information, or the ability to see the right cues amidst conflicting reports and uncertainty, simplifies the problem. It allows a decision maker to fight the problem and not mountains of information. Each commander maintained a superior presence of mind and intellect during the chaos that not many possess. As a veteran of Cape Gloucester and Peleliu during World War II, and as a recipient of the Navy Cross and Silver Star, the combat experiences of Colonel Hughes likely contributed to his decision-making abilities under pressure. LtCol Cheatham's and Major Thompson's experiences in the Korean War provided them a valuable reservoir of situations to develop their intuitive decision-making abilities as well.[148]

For LtCol Cheatham, part of his intuition cued him to speed read a couple manuals on urban operations the day before he entered Hue. This quick review resulted in him pulling the battalion's heavy weapons out of storage that had remained unused while Marines patrolled through the jungles and rice paddies of Vietnam. Were it not for his quick study, the battalion would not have brought weapons that proved vital during the month-long operation: 106mm recoilless rifles mounted on mechanical mules, 3.5" rockets, and CS tear gas.[149] LtCol Cheatham later recalled a two-hour long firefight that involved hundreds of rockets exchanged with the NVA at a range of fifty meters.[150] The same firefight may have fared differently had he not pulled the battalion's 3.5" rockets out of storage. Indicative of his commitment to the study of his profession, LtCol Cheatham advocated for military officers to examine military tactics and hone

their decision-making, while subjected to a thinking opponent in a simulated combat environment. His seventy page, 1967 Marine Corps Command and Staff College Individual Research Project, *The Educational War Game*, outlined a methodology and set of decision game rules to perform this exact purpose.[151] Developing Marines to make sound, intuitive decisions amidst uncertainty merits comparable attention as developing the technology that assists them as part of a Ground Combat Element centaur concept.

Decision Making relative to Uncertainty. Operation HUE CITY demonstrated that the realm of uncertainty, the "fog of war" effects friendly forces and foe alike. Effective commanders exploit uncertainty as opposed to allowing it to paralyze them. When the NVA seized the city on 31 January, the NVA anticipated a particular, yet uncertain, U.S. and ARVN response. The fog of war served as "the great equalizer." While the Marines did not anticipate the NVA seizing the city of Hue overnight, the NVA may not have expected the violent and determined counterattack conducted by the Marines. Developing leaders that can cut through the fog and make decisions faster than the enemy enables Marines to seize and maintain the initiative, turning speed and time into a weapon. The implications of this reality for the Ground Combat Element raises two points. First, leaders must heed the reality that achieving certainty remains inconsistent with the nature of war. At best, centaur concepts can exploit narrow artificial intelligence and advanced sensors to reduce probable noise to allow probable cues to surface. At the same time, the Ground Combat Element needs to consider how it can exploit the ubiquitous connectedness of the battlefield by developing centaur concepts that can disrupt, disorient, and misdirect the enemy. In essence, the Ground Combat Element can maneuver in the cognitive domain to turn the fog of war into an advantage.

Philosophy of Command, Mission Tactics, and Commander's Intent. Colonel Hughes employed simple, mission type orders with commander's intent during Operation HUE CITY.[152] Tasking his subordinate commanders without telling them explicitly how to perform their mission afforded them a wide range of flexibility to adapt to changing circumstances. His commander's intent captured his understanding of the situation and underlying purpose for the missions assigned to his battalions. This common understanding, or shared mental model, enabled his commanders to exercise initiative that remained in harmony with his vision of the operation.[153] Colonel Hughes recognized that just as important as clear direction for his battalions, part of his responsibility required moderating and filtering the directions and requests from higher headquarters. The philosophy of command employed by Colonel Hughes exhibited mutual trust between senior and junior, and functioned on implicit communication unified by a commonly understood objective. This philosophy filtered down to the company level, which enabled subordinate commanders to delegate decision-making down to the squad level. This allowed 1st Marines to create and exploit gaps, seize the initiative, and generate tempo relative to the adversary faster than if decision-making remained centralized at the top.[154]

As the Ground Combat Element explores the right mix of manned and unmanned formations, developing concepts for employing them should remain consistent with the attributes of maneuver warfare that enable initiative and harmony of action. Concepts should take into consideration the importance to balance relevant information without creating a cognitive burden on the user. They should also consider how a Marine can impart a shared mental model to a machine and how to apply mission tactics in employing unmanned systems. With time and continued experimentation, exploiting autonomy and machine learning may provide a means toward this objective.[155]

Developing, imparting, and maintaining a shared mental model to enable implicit communication and harmony of action represents one area where centaur concepts could assist. Part of the challenge that precluded an accurate understanding of the situation early in the operation resulted from poor map availability and no aerial reconnaissance due to adverse weather conditions. In 1968, 2/5 initially had only three 1:50k maps available for the battalion, which lacked sufficient detail for a built up urban area. The GRG map picked up by Captain Meadows (G/2/5) in the gas station on 31 January provided a higher fidelity map than the three 1:50k maps initially available to 2/5. In the future, just as in 1968, the Ground Combat Element may not have the luxury of time to develop and print maps, or disseminate overlays, before committing forces. Centaur concepts that enable the Ground Combat Element to rapidly reconnoiter, generate, disseminate, and update a common operational picture with shared multi-dimensional overlays of the situation would enhance horizontal awareness and unit effectiveness.

Shaping Actions and Combined Arms. The enemy exploited civilians and the old city for protection, which limited the application of heavier aviation and surface fires. However, the Marines adapted the tools they had available to develop new combined arms solutions. The same concept of combined arms maneuver to place the enemy in a no-win situation, a 'horns of a dilemma,' still applied. By way of metaphor, Clausewitz compared war to that of a duel between "a pair of wrestlers" on a larger scale.[156] Inherent in this metaphor resides not only the use of physical force to defeat an opponent. In wrestling, the use of a 'setup move' to place an opponent off-balance, serves as a primary way for two equal strength opponents to maneuver in relation to one another. The use of shaping actions trigger the enemy to react in a particular way, enabling Marines to exploit a new spatial advantage. The warfighting philosophy of maneuver warfare expands this concept to the temporal, technological, and cognitive domains.[157]

Employing battalion organic weapons provided sufficient tools to place the enemy off-balance to maneuver and seize objectives. The use of CS gas proved effective at penetrating urban structures and forcing the enemy from his protected positions. Employing 3.5" rockets served as effective breaching tools to create new "doorways" for Marines to enter from.[158] Attaching 106mm recoilless rifles to companies contributed their greatest organic firepower if they had no tanks available. They also afforded a technological advantage in firepower relative to the NVA's organic weapons systems.

Employing Tank-Ontos 'Killer Teams' with infantry formations proved critical to applying combined arms solutions. While each formation moved in the city, each protected the other. Tanks and Ontos provided superior firepower to support infantry maneuver, whereas infantry formations had greater mobility to cover blind spots for their counterparts. The heavy firepower afforded by these teams in the absence of artillery and CAS at key points in the operation provided the necessary firepower to reduce enemy fortified positions. For Major Thompson in the Citadel, he halted his advance when he ran out of tank ammunition.[159] The important takeaway is that the Tanks-Ontos 'Killer Teams' did not replace the infantry, they complimented the them and formed a combined arms team to pose multiple dilemmas to the enemy.

Orienting on the enemy to adapt throughout the operation proved important to create effective shaping actions. At one point, Captain Christmas recalled that the NVA started to target smoke every time the Marines threw a smoke canister into the street prior to crossing. The NVA recognized smoke as a target indicator. After sustaining a few casualties, Marines realized they could pop a smoke canister in the street to bait snipers to fire. Once the enemy fired, he gave his

position away and the Marines could move to a position of advantage prior to attacking.[160] Triggering the enemy to act first revealed a vulnerability to exploit.

These observations provide valuable insights for Ground Combat Element centaur concepts. On a fundamental level, manned-unmanned teaming represents a combined arms concept. Unmanned systems employed in centaur concepts may represent a 21st century evolution of how Napoleon employed his light cavalry formations to find, fix, and disrupt enemy forces prior to committing his main effort. Similar to Captain Christmas' Marines employing smoke to bait and ambush the enemy, Napoleon employed his light cavalry to find the enemy and force him to react, thereby exposing vulnerabilities to exploit. His cavalry also screened his flanks with pickets to provide early warning, and provided a fast means to exploit success by pursuing a fleeing enemy.[161] As an illustrative example, the Ground Combat Element could employ organic, expeditionary, and disposable unmanned systems to fly, drive, or swim ahead to find, fix, and disrupt the enemy prior to committing a manned formation at a time and position of advantage. This conceptual approach to employment holds true whether the unmanned formation teams with dismounted infantry or mounted armored formations, at the fire team level or in larger formations. Backpacks of small unmanned aerial systems may represent the platform of choice for an infantry squad leader, whereas a regimental commander may employ platoons of unmanned systems to conduct shaping actions in preparation for his manned formations to exploit.

Ultimately, the warfighting philosophy of maneuver warfare enabled the Marines to fight and win in Operation HUE CITY. The illustrative lessons of the operation illuminate ways that centaur concepts can enhance the application of maneuver warfare in the future. Concepts that enhance orienting on the enemy would improve decision making and operating tempo. Concepts

that generate shared situational awareness and mental models could enhance harmony of action, provided they remain consistent with the application of mission tactics and commander's intent. Concepts that provide new combined arms formations for the Ground Combat Element, would introduce new ways to find, fix, and disrupt the enemy, while screening for friendly formations, and exploiting success on the battlefield.

Figure 7: *In this picture, a Marine 106mm recoilless rifle team employ "Lance Corporal Ingenuity and PFC Power"[162] in a Hue University classroom. According to the gunner, "we fired it with a lanyard where we knocked out our objective – we kind of knocked out the building that the 106 was in too, but it didn't hurt the gun, once we dug it out."[163]*

Moral Forces and the Human Dimension in War

"The best lesson learned was that imagination and aggressiveness are the best weapons in a commander's arsenal."[164] -Captain Ron Christmas 1971

While the means and methods employed in war remain relevant, the moral forces in war emerged as a critical factor to winning tactical engagements. Winnings these engagements contributed to achieving the objective of liberating Hue. The influence of moral forces surfaced in both commanders and individual Marines throughout the operation. Despite humankind's unbridled fascination with technology, this observation illustrates that the essence of war reflects

a clash of human wills. Seen from this perspective, the real value offered from recent technological advances to achieve a relative advantage lies in human-machine collaboration to enhance the effectiveness of human warfighters, rather than replacing them.

The significant effect that compassionate and competent leadership can bear on a situation emerges as a central theme in the operation. *Warfighting* advises that, "Commanders should command from where they can best influence the action, normally well forward."[165] This allows them to appreciate a more accurate representation of the situation and make more informed decisions. It also recognizes the moral imperative of leadership. *Warfighting* states, "by demonstrating the willingness to share danger and privation…commanders [can] fully gain the trust and confidence of subordinates."[166] The resiliency of the individual Marines, led by competent leaders, that formed cohesive units provides credence to Napoleon Bonaparte's often quoted maxim, "In war, the moral is to the material as three to one."[167] Though intangible and difficult to measure, the moral forces in war matter just as much as the mental and physical forces. While centaur concepts merit consideration, the resilience of the individual Marine should remain as the cornerstone of the future force.

The "command from the front" style of leadership exemplified by LtCol Cheatham affirmed the prominent role of the commander in positively influencing the moral forces involved in war.[168] LtCol Cheatham placed himself at points of friction throughout the operation in southern Hue. This allowed him to maintain the best awareness of the unfolding situation, which supported sound decision-making. It also sent the moral message to his Marines that he assumed the same risks they did. Clausewitz refers to those who possess this talent of sound mind and temperament as a *military genius*.[169] Centaur concepts that enable a commander to remain forward at points of friction, while maintaining a bird's eye perspective of the larger

picture in sight would afford commander's greater flexibility on the battlefield. Employing unmanned systems as a form of 21st Century Napoleonic Cavalry may push the front farther forward in future war. Employed as a centaur concept, commanders would posture manned formations in close enough proximity to exploit shaping actions of their unmanned counterparts. In the dense urban environment, this distance may extend a few city blocks, or it could reside across the street depending on the echelon of the command. The inflexion point where manned formations exploit the shaping actions of unmanned formations will likely represent a potential friction point where the commander may choose to position him or herself in the future.

Ultimately, no singular piece of technology guarantees success on the battlefield. Tough, thinking Marines with strength of character and endurance win battles. This truism repeats consistently in every after-action report, interview, television documentary, and personal book on Operation HUE CITY. Marines adapted to and overcame a numerically larger force, aided by the element of surprise, with no pre-contact intelligence, despite the ROE limitations, and despite significant casualties in combat. The *esprit de corps*, determination, and combat endurance in the face of adversity exhibited by the Marines in Hue City validated that human will and the moral element of war remain just as important, if not more important, than the other constituent parts that combine to form the whole phenomenon of war. From Belleau Wood to Guadalcanal, to Peleliu and the Chosen Reservoir, the exploits of Marines in Hue City reaffirm the importance of developing Marines for complexity and developing leaders at every echelon of the Marine Corps.[170]

Part IV: Envisioning Future Centaur Concepts

The following concepts provide suggestive examples to illustrate how human-machine collaboration and manned-unmanned teaming could have afforded 1st Marines a competitive

edge in Operation HUE CITY. *Ender's Command Post of the Future* envisions means and ways for commanders and their staffs to exploit human-machine collaboration to help filter the noise from increasing amounts of data to surface relevant cues, outliers, and anomalies in the operating environment. It also teams unmanned systems to conduct forward reconnaissance and conceptualizes the value of rapid common operating picture development and dissemination. The second concept, *Infantry ISR-PGM Strike*, illustrates means and ways for capitalizing on the combined arms value of manned-unmanned teaming.

Ender's Command Post of the Future

Ender's Command Post of the Future conceptualizes the ability to sense, make sense, and re-make sense faster than an adversary and maintain a shared mental model of the operating environment to support harmony of action. It illustrates how HM-C and MUM-T can enhance the Ground Combat Element ability to orient on the enemy to support decision-making, and conduct certain shaping conditions for decisive actions. The name references the book *Ender's Game* to draw a metaphorical parallel in how the main character, Ender, uses visualization tools to aid command and control.[171]

Expeditionary vertical take-off and landing (VTOL) unmanned aerial systems (UAS), able to employ modular sensor payloads would afford a next generation regiment, battalion, or company greater employment options than 1968, or 2017 capabilities. In the month-long adverse weather conditions of 1968 that prevented manned aircraft from aerial reconnaissance, 1st Marines could have launched one or several UAS to assess the situation in the city versus sending a company in blind. Commercially available, miniaturized sensors can provide electro-optical (EO), infrared (IR), synthetic aperture radar (SAR), auto-target detect (ATD), moving target indicator (MTI), and light detection and ranging (LIDAR) capabilities while maintaining

an expeditionary footprint. Supported by high performance computing (HPC), narrow artificial intelligence (AI), and big data analytics, UAS collections could support rapid synthesis of three-dimensional mapping and models for mission planning. Auto-image recognition software that utilizes the same cameras and processing chips of multiple smart phones could have geo-located all weapons and military equipment by type down to the size of a person's face.[172] Balancing capabilities across the Ground Combat Element enhances the ability of leaders at all levels to orient on the enemy and shape their understanding of the operating environment prior to committing forces.

The same high performance computing used to process collections from the physical terrain, could also comb social media feeds and security cameras to geo-locate faces of known enemy key leaders, weapons, and military equipment. The emerging "internet of things" provide an array of sensors and communicators already pre-positioned throughout an urban setting. Measuring changes in public sentiment on social media similar to how politicians use big data analytics to support their campaigns, and detecting unusual traffic pattern changes could serve as 'pulse points' for Marines to assess changes to the environment. The originating unit of this processed intelligence could then transfer or synchronize the common operational picture (COP) built during planning to either tablet based maps or augmented reality glasses utilized by commanders and small unit leaders.[173]

As the situation continues to evolve, synchronization across all devices would foster a shared mental model of the situation. The shared situational awareness would aid in achieving harmony of action towards a common objective. While these capabilities would not achieve predictive certainty, or lift the fog of war as some would portend, they would contribute significantly to a commander's ability to build a mental model of the larger battlefield and in turn

share it with the unit. Providing Colonel Hughes these tools would have enabled him to remain forward at points of friction, and exercise the moral imperative of command, while portraying an accurate visualization of the larger fight to higher headquarters and supported battalions alike.

Infantry ISR-PGM Strike

Infantry ISR-PGM Strike conceptualizes modular, expendable, multi-domain, small unmanned systems for intelligence, surveillance, and reconnaissance (ISR), and strike with precision-guided munitions (PGM) at the squad to battalion level. The purpose for this concept is to provide the infantry an expeditionary, lightweight, and organic capability to collect intelligence and rapidly engage targets from protected positions in the urban environment, while minimizing risks of fratricide to friendly forces and civilians.

Small UAS make effective ISR platforms. They can also provide companies, platoons, squads, and fire teams with an organic, stand-off, PGM capability by attaching a modular explosive payload. Compared to a 500-pound Joint Direct Attack Munition (JDAM), a squad organic PGM capability would afford the ability to achieve a 'CAS-like' solution while also minimizing risk of fratricide to Marines, and collateral damage to nearby civilians. In concept, the "assistant to the squad leader" in the new Marine infantry squad structure could employ one or more small UAS or small unmanned ground systems (UGS) with a mixture of ISR and strike payloads to achieve a rapid ISR-Strike solution. Increases in autonomy would support increased efficiencies in human-machine interface (HMI) and resiliency to operate in a Communications, Position, Navigation, and Timing denied environment. Multi-domain employment (i.e. air, land, subterranean) would present multiple thrusts towards the adversary that limit his freedom of action for friendly manned formations to exploit. Employing small unmanned systems as collective unmanned formations, or 'swarms', could disrupt an enemy's ability to orient on the

right cues. Payloads designed to effect the electromagnetic spectrum can disrupt enemy command and control. A battalion fire support coordination center (FSC) working with company Fire Support Teams (FiST) could shape the 'company's deep fight' with swarms and hunter-killer 'packs', while platoons and squads exploit the conditions set by small unmanned systems.[174] This centaur concept would provide the Ground Combat Element with organic squad-level CAS and battalion-level DAS equivalents.

By reframing small unmanned systems as an expendable asset and not a coveted piece of equipment to preserve and make last ten years, the challenge becomes how fast logistics officers and company gunnery sergeants can resupply the frontlines with more unmanned systems, modular payloads and batteries. Newer small unmanned systems can fit into a space the size of a Marine's cargo pocket and cost approximately $1,000.[175] Adding ten pounds of explosives increases the cost by $30. Compare a $1,030 small unmanned system to the 20,500 81mm mortar rounds ($639.71/round) fired in 1968, a $1,123.93 Anti-Tank 4 (AT-4), or Shoulder-launched Multipurpose Assault Weapon (SMAW) at a cost of $2,950.83 to $12,697.54 per rocket, and the logic to reframe small unmanned systems as expendable emerges.[176] The Marine Corps has the supply-chain management processes in place to develop ways to sustain this concept. In the interim, the Islamic State of Iraq and Al-Shem's (Daesh) acquisitions strategy discovered the qualitative edge afforded by small UAS for ISR and PGMs in 2016.[177]

Employing this concept would enable Marines to employ unmanned systems from a tactical standoff distance that achieves increased protection. This advantage may contribute to an anticipated reduction in friendly casualties, which would contribute to preserving strategic perseverance. This would increase the propensity for a tactical victory to support strategic outcomes.

Employing centaur concepts to enhance maneuver in the close quarters urban environment highlights the importance of the *Marine Corps Operating Concept's* tasks to train and fight as distributable forces, exploit automation, network for rapid/precise fires, and conduct urban operations in complex terrain.[178] Small unmanned systems can provide an expeditionary solution for a light infantry force to retain mobility, while also achieving greater protection through increased capabilities in intelligence and fires. Launching small unmanned systems from aerial delivered or indirect surface fired means of delivery provides additional flexibility in employment options.[179]

Conclusion

As evidenced by this historical case study, the Marines overcame challenges in Operation HUE CITY by adapting available means and on applying characteristics of maneuver warfare. Leveraging maneuver warfare in how the Marine Corps conceptualizes the employment of emerging technologies, such as human-machine collaboration and manned-unmanned teaming, presents an opportunity to reinforce the Ground Combat Element's ability to achieve increased tempo, maneuver options, and protection for Marines in future war. As evidenced by the cascading level of war, the varying means of war across the spectrum of conflict, and considering war as an act of policy, Ground Combat Element centaur concepts must remain consistent with *Warfighting*'s Theory of War. Employing narrow artificial intelligence to help commander's orient on the enemy and generate shared mental models to enhance harmony of action enables the Ground Combat Element to gain and maintain tempo relative to the enemy. Concepts that provide new combined arms formations such as a 21st Century Napoleonic Cavalry, would introduce new ways to find, fix, and disrupt the enemy, while screening for friendly formations, and exploiting success on the battlefield. In these aspirations, no singular

piece of technology guarantees success on the battlefield. Tough, thinking Marines with strength of character and endurance win battles. For these reasons, the adaptability and resilience of the individual Marine should remain as the cornerstone of the future force.

This case demonstrates the importance of winning the nation's battles as part of military campaigns, if they lead to winning the nation's wars. *Warfighting* recognizes the lessons of Hue as part of the enduring challenge for the Marine Corps. "Especially in expeditionary situations in which public support for military action may be tepid and short-lived, it requires a concept with which we can win quickly against a larger foe on his home soil with minimal casualties and limited external support."[180] Operation HUE CITY provides one historical example that validates this premise and how the warfighting philosophy of maneuver warfare can enable the Ground Combat Element to fight and win in the future.

The next step in developing Ground Combat Element centaur concepts requires the use of an operational decision game (ODG) to envision, test, and refine new theories of victory. Extrapolating the problem-set posed to the Marines in Operation HUE CITY provides a concrete reality from which to design a plausible operation set in the near future. Proposing Ground Combat Element centaur concepts for use in the ODG, enables game players to envision how they could offer a competitive advantage against possible adversaries. Analysis of the ODG solution-sets will offer fresh perspectives to harvest ideas and incorporate refinements into final concept development.

Operational Decision Game
The Design of EAGER COLT 20YY

The purpose to design an operational decision game (ODG) with proposed centaur concepts for the Fifth-Generation Ground Combatant Element is to envision, test, and refine new theories of victory. The following provides the method utilized to design the ODG for *EAGER COLT 20YY* with the problem-set extrapolated from Operation HUE CITY. A copy of the final ODG is available for reference in the appendix.

The method to design this ODG began by framing the problem-set posed to Marines in Operation HUE CITY. It then envisioned a possible adversary and area of the world where the Marine Corps could fight, but not necessarily will fight, in the future. In *EAGER COLT 20YY,* the ODG envisioned a possible future where a resurgent Islamic State of Iraq and Al-Shem (Daesh) has expanded its transnational insurgency into Jordan, triggering the response of the 1st Marine Expeditionary Brigade (MEB).[181] The approach to creating the ODG involved deciding which elements of the problem-set remain germane, and which aspects to introduce based on the evolving character of war. Challenging game players with the ODG provided them an opportunity to exercise decision-making when faced with uncertainty, sharpen their mind utilizing a plausible scenario where they could find themselves in the future, experiment with proposed future concepts, and inform refinements towards these concepts.

This ODG also incorporated a pre-mortem at the end of the game.[182] In war gaming, the use of a pre-mortem provides a tool to deepen the analysis of a plan and make necessary refinements prior to execution. The main idea focuses on presupposing the plan fails, forcing the game player or planning team to reconsider the reasons why it could have failed. The resulting analysis provides insights to strengthen the plan prior to execution with the intent to avoid the

requirement for a *post-mortem*. In other words, pre-mortems help make the plan better so no need for a post-mortem emerges. This criterion informed the design of *EAGER COLT 20YY*.

1. *Relevancy*. The ODG must achieve sufficient suspension of reality to allow game players to assess the game as plausible and worth considering. At the same time, it must balance avoiding exact replication from real world events or operational plans. To achieve this requirement, this ODG relies entirely on open-source information.

2. *Understandable*. The ODG must provide sufficient background and detail for a military service member to read the game and play it, without additional explanation. This detail should include a clear articulation of the perspective the game player takes, the problem-set presented to them, the mission(s) assigned to them, and their resources available. For proposed concepts, the ODG should include sufficient detail to convey how the player could employ them, or allow them to envision alternative employment methods.

3. *Game Players*. People must play the game. Otherwise, the game generates no alternative theories of victory or refinement to proposed concepts. A sufficient sized population and diversity of game players must play the game to produce sufficient quality and quantity of feedback.

This ODG achieved its purpose when at least ten players completed the game. The analysis of the ODG solution-sets provided a means from which to review fresh perspectives and alternative ideas to incorporate into final concept development.

Summary of Problem-Set and Themes

	Operation	
Problem-Set	**HUE CITY (1968)**	**EAGER COLT (20YY)**
Perspective of key decision-maker (game player)	Colonel Stanley Hughes, Commanding Officer, 1st Marines Regiment	Commanding Officer, Regimental Combat Team 1 (1st Marines reinforced)
The enemy	North Vietnamese Army (NVA) and National Liberation Front (VC)	The Islamic State of Iraq and Al-Shem (Daesh)
Strategic context	South Vietnam represented an important regional partner where the U.S. committed to halt the spread of Communism.	Jordan represents an important regional ally in combating the spread of totalitarian Islam. Rising activity by Daesh has created concerns about security inside the Kingdom.[183]
Ideological and cultural context	Communism versus capitalism	Totalitarian Islam versus the rest of the world
Type of conflict	Limited: Stability and Counterinsurgency Operations	Limited: Stability and Peacekeeping Operations

Friendly objectives	Operational: Defeat VC insurgency in South Vietnam. Tactical: Liberate the city of Hue seized by NVA during the Tet Offensive.	Operational: In coordination with the Jordanian Armed Forces (JAF), 1st MEB conducts stability operations and creates a 'safe zone' in southern Syria to support the restoration of stability in Jordan. Tactical: Liberate the city of As-Suwayda from enemy forces.
Enemy objectives	Operational: The NVA sought to deal a major blow to American and South Vietnamese resolve in the form of the Tet Offensive. Tactical: Seizing and retaining Hue while inflicting as many casualties as possible against the U.S. and South Vietnamese would provide a symbolic achievement of this objective.	Operational: Daesh seeks to deepen U.S. involvement into a regional conflict to inflict a psychological blow that degrades U.S. support and embarrasses it as a world power. Tactical: Daesh seizes the largest city that resides in the safe zone established by 1st MEB, and inflicting as many casualties as possible against the U.S. and JAF would provide a symbolic achievement of this objective.
Enemy conventional and irregular formations	Conventional (NVA) and irregular (VC). The NVA exploited the ability of the VC to infiltrate the city as a shaping action.	Irregular Daesh forces augmented with captured conventional means. Daesh exploits the ability to infiltrate into the city.
Enemy misdirection and shaping actions to achieve surprise	The NVA exploited the Tet holiday to achieve operational surprise. Pre-Tet shaping actions included sieging Khe Sanh several days in advance to misdirect senior U.S. leaders. Pre-Tet Offensive infiltration enabled decisive action.	Timing of an offensive with the holy month of Ramadan and exploitation of a severe desert sandstorm catch Marines off guard. Infiltration of As-Suwayda to enable a decisive action by Daesh would accomplish an effective shaping action.
Complexity of command relationships in Multinational Operations	Republic of Vietnam Armed Forces	Jordanian Armed Forces
Mission Swing: "[a] change in mission in response to the quick deterioration or improvement of the operational environment unrelated to the intervening forces' presence or efforts."[184]	From jungles and rice paddies to urban environment. From stability operations and counterinsurgency to the intensity of offensive operations.	From the conduct of a theater security cooperation exercise (EAGER LION) in the southern desert of Jordan to a noncombatant evacuation operation and embassy reinforcement;[185] From the mountains of Bridgeport, CA and home station training to deployment as a Global Response Force; From stability and peacekeeping operations to the intensity of offensive operations.
Three Block War[186]	Marines balanced the spectrum of intensity in the urban environment.	Game players must factor the spectrum of intensity in the urban environment.

Context and pressure from higher headquarters	TF Xray, Military Advisory Command Vietnam, and Presidential political pressure to win the operation quickly.	Game player must balance mission requirements with pressure from MEB Commander and the combatant commander. Emphasis of political attention stemming from fast dissemination of the situation on televised media adds pressure to act.
Influence of media and the CNN effect	Walter Cronkite and the media's influence on the American public opinion.	Daesh uses social media to achieve strategic effects in the information domain to influence global and American public opinion. By extension, this creates a cognitive and temporal advantage relative to the game player.
Missing people	1st Marines balanced clearing Hue with recovering various U.S. government and civilian personnel captured or hiding in the city.[187]	Game player must balance employment of lethal means in the city while considering the unknown location of missing Marines in the city.
Size and complexity of urban environment	The city of Hue comprised a city of approximately 116,00 civilian residents. Complex urban environment.	As-Suwayda represents the largest city in southern Syria and comprises approximately 100,000 residents in the metro area. The city approximates the complexity of the urban environment encountered in Hue.[188]
Weather degraded environment that precluded air support	Heavy fog and rain season	Sandstorm[189]
Compelling reason to act fast	Failure to liberate the city decisively and fast risked loss of strategic perseverance in South Vietnam and the American public. The Tet Offensive inflicted unexpected surprise in light of General Westmoreland's comments a month earlier. Hue symbolized the impact of the Tet Offensive.	Failure to not recover captured Marines or re-secure a city residing in a U.S. maintained "safe zone" for a new multinational force peacekeeping operation would risk an adverse strategic impact.
Fog of War	Senior leaders had difficulty orienting on the enemy early in Operation HUE CITY. The sense of uncertainty continued throughout the operation. Not until well after the aftermath did analysis of the operation and captured enemy documents enable reconstruction of the enemy actions and size of enemy encountered.	Game player must observe, orient, decide, and act based on unclear and limited information. Attempt to replicate sense of disbelief in game player by commencing game with approximated situation as 31 January 1968. Provide indications of a large enemy force, but maintain the composition, disposition, and size as unclear.
Confront an adversary with limited or degraded supporting arms	Poor weather and restrictions on rules of engagement	Poor weather and restrictions on rules of engagement

Table 1: Operational decision game design. Summary of problem-set and themes.

Proposed Fifth-Generation Ground Combat Element Centaur Concepts

EAGER COLT 20YY included three proposed concepts for game players to experiment with and provide feedback on. These concepts included:

> (1) *Ender's Command Post of the Future*. A reference to the book *Ender's Game*, the purpose for this concept is to provide the means to sense, make sense, and re-make sense faster than an adversary and maintain a shared mental model of the operating environment.[190] The proposed benefit of these capabilities envisions enhancing harmony of action and generating tempo in complex urban terrain and an information saturated environment.
>
> (2) *Infantry ISR-PGM Strike*. This concept envisions modular, expendable, multi-domain, small unmanned systems for intelligence, surveillance, and reconnaissance (ISR), and strike with precision-guided munitions (PGM) at the squad to battalion level. The purpose for this concept is to provide the infantry an expeditionary, lightweight, and organic capability to collect intelligence and rapidly prosecute targets from protected positions in the urban environment, while minimizing risks of fratricide to friendly forces and civilians.
>
> (3) *Centaur Hunter-Killer Teams.* This concept represents a reinvigorated attempt to pair a formation that compliments Marine armor as the M50 Ontos did for M48 Tanks in 1968. The purpose for this concept is to provide tank formations an unmanned capability to scout forward, develop the situation, and then fix and disrupt enemy formations prior to employing manned tanks for their desired purpose.

These concepts provided suggestive concepts as a means to enable game players to envision how the Ground Combat Element could employ unmanned systems teamed with manned formations. To balance the playing field, this ODG also afforded the enemy some advanced capabilities starting to emerge on the battlefield. In *EAGER COLT 20YY,* Daesh employs a swarm of fifty unmanned aerial systems (UAS) armed with improvised explosive devices. This represents a continued evolution of a developing capability for Daesh based on current UAS employment.[191]

This ODG also emphasized several information warfare capabilities that the group may leverage to offset U.S. military technological superiority in a future competition.

Conclusion

In summary, the purpose of an ODG with proposed centaur concepts for the Fifth-Generation Ground Combat Element is to envision, test, and refine new theories of victory. The transposed problem-set from Operation HUE CITY provided a basis to design *EAGER COLT 20YY* based on a relevant and plausible future involving the deployment of 1st Marine Expeditionary Brigade in response to a resurgent Daesh. The results of game player solution-sets will provide the inputs for concept analysis. The ODG also provides game players an opportunity to exercise decision-making when faced with uncertainty and sharpen their mind utilizing a plausible scenario where they could find themselves in the future.

Operational Decision Game
Analysis of EAGER COLT 20YY Solution-Sets

The following analysis summarizes the relevant trends or noteworthy insights pertinent to concept development. The Operational Decision Game (ODG), *EAGER COLT 20YY,* provided a means to envision, test, and refine theories of victory involving proposed centaur concepts for the Fifth-Generation Ground Combatant Element. These concepts included *Ender's Command Post of the Future, Infantry ISR-PGM Strike, and Centaur Hunter-Killer Teams*. The structure for this analysis draws on John Schmitt's "A Practical Guide for Developing and Writing Military Concepts." Part I summarizes relevant insights on game player visions for a Synopsis of their Central Idea; Part II discusses how game players considered the Application and Integration of Military Functions; Part III captures Necessary Capabilities; and Part IV addresses associated Spatial and Temporal Dimensions.[192]

Synopsis of the Central Idea

1. Generating and exploiting tempo to use speed and time as a weapon reflected a consistent trend.[193]
2. Three players discussed the employment of unmanned formations in advance of manned formations to enable manned formations to exploit their shaping actions.[194]
3. Influencing the operating environment through information warfare tools or disrupting the enemy's ability to employ their tools reflected a consistent trend.[195]
4. To deny the enemy the ability to employ unmanned systems and information warfare tools, one player envisioned employing electronic warfare to jam everything. In this theory, when speed, surprise, and uncertainty have ceded the advantage to the enemy, a countermeasure may include denying the enemy the means he uses to gain an advantage. For the Marines, success returns to reliance on the competency and resilience of the individual Marine with the organic capabilities and supporting arms of the Ground Combat Element.[196]
5. As an interesting observation, only two players thought to integrate partnered Jordanian Armed Forces into their plan.[197]

Application and Integration of Military Functions

1. Command and Control: Autonomy of unmanned systems enables rapidity of action and prevents loss of tempo attributed to Marines preoccupied with the control of unmanned systems.[198]

2. Intelligence: The ability to visualize and understand the information domain to support operations.[199]
3. Intelligence: Tools that enable Marines to orient on the enemy faster.[200]
4. Intelligence: The ability to collect intelligence when a weather degraded environment prevents the employment of aviation assets. Intelligence drives decision-making and operations.[201]
5. Fire Support: Information Related Capabilities that can influence the local population.[202]
6. Fire Support The ability to disrupt the enemy in the information and cyber domains.[203]
7. Fire Support to enable Maneuver: The ability to employ fires despite a weather degraded environment and restrictive rules of engagement.[204]
8. Fire Support: Precision. Must balance desired effects with discriminate lethality to minimize civilian fratricide and collateral damage.[205]
9. Sustainment: Expendable unmanned systems requires capacity in logistical supply chain to resource them.[206]
10. Sustainment: High performance computing requires big servers and people to maintain them.[207]
11. Protection: Must protect friendly employment of the electromagnetic spectrum to enable employment of unmanned system.[208]
12. Protection: Employment of unmanned systems from tactical standoff distances achieves protection.[209]

Necessary Capabilities

1. The ability to network, process, and communicate big data, while protecting information assurance.[210]
2. This mission requires more people.[211]
3. The ability to generate tempo.[212]
4. Autonomy. Centaur concepts should reduce friction and not add friction. The cognitive human-machine interface matters. Autonomy also enables unmanned systems to operate despite a communications and global positioning system degraded or denied environment.[213]
5. To train with unmanned systems prior to operational employment.[214]
6. To employ information and cyber warfare capabilities, requires the ability to breach foreign cell and computer networks.[215]
7. The ability to maintain centaur concepts in austere settings and expeditionary environments.[216]
8. The ability to deceive and misdirect the enemy. One player suggested inflatable unmanned platforms for this purpose.[217]
9. The ability to spin the narrative in the information domain to inverse the psychological advantage the enemy gained at the strategic level by capturing and broadcasting their capture of U.S. Marines.[218]

Spatial and Temporal Dimensions

1. Employment of unmanned systems from tactical standoff distances achieves protection.[219]

2. Urban environment risks heavy casualties due to close proximity of friendly actions and density of civilians.[220]
3. Generating and exploiting tempo can exploit use of speed and time as a weapon.[221]
4. Actions in the information domain happen fast. Information warfare tools in support of centaur concepts must enable friendly actions to out cycle the 24-hour news coverage cycle.[222]
5. Spread load of centaur concepts across all echelons enables breadth in their employment.[223]
6. Moving too fast without an accurate visualization of the battlespace risks an incoherent response.[224]

Conclusion

This analysis has discussed the relevant trends or noteworthy insights pertinent to concept development. These observations reinforce fundamental characteristics of maneuver warfare: the importance to orient on the enemy to support sound and timely decision-making, conducting shaping actions in preparation for decisive actions, the value of combined arms to place the enemy in a no-win situation, and creating and exploiting gaps to exploit with opportunistic maneuver. These game player insights and fresh perspectives will inform development of the final concept, *Centaurs for the Fifth-Generation Ground Combat Element.*

Future Concept
Centaurs for the Fifth-Generation Ground Combat Element

Figure 8: Marine + Robotic and Autonomous Systems = Centaur.[225]

In classical Greek mythology, a centaur represented, "a creature with the head, arms, and torso of a man and the body and legs of a horse."[226] Similar to how this mythological creature exploited the benefits of a liminal being, *Centaurs for the Fifth-Generation Ground Combat Element* conceptualizes human-machine collaboration and manned-unmanned teaming as various manifestations of a centaur.[227] In this construct, emerging battle networks integrate the best of humans with the best of machines by exploiting commercial advances in autonomy and narrow artificial intelligence to achieve a comparative advantage relative to adversaries.

Centaurs for the Fifth-Generation Ground Combat Element addresses service level direction found in the *Marine Corps Operating Concept*, the Commandant of the Marine Corps' task to reinvigorate a maneuver warfare mindset for the 21st Century, and task to provide a fifth-generation capability for the Ground Combat Element.[228] The method to explore these directions involved a literature review on centaurs in war, a historical case study on Operation HUE CITY to examine a problem-set unique to the Ground Combat Element, and testing of initial concept hypotheses through an operational decision game.

> *We will reinvigorate a Maneuver Warfare mindset for the 21st Century.*
>
> **General Robert B. Neller**
> 37th Commandant of the Marine Corps
> FRAGO 01/2016: Advance to Contact

> ***Task**: (New) Develop a comprehensive plan to modernize the Marine Ground Combat Element (GCE) NLT 31 December 2017.*
> ***Purpose**: To produce next generation Marine ground combat forces that are better networked and more resilient, capable, and lethal.*
>
> **General Robert B. Neller**
> 37th Commandant of the Marine Corps
> 2017 CMC Institutional-Level Task List for Deputy Commandants (DCs) and Commanders

MARINE CORPS OPERATING CONCEPT LINKAGES

6.2.2 Integrating Command, Control and Informational Tools
6.2.7 Exploiting Automation
6.3.1 Role of Signature in Offense and Defense
6.3.2 Networking for Rapid/Precise Fires
6.3.3 Pushing Processing Power to the Tactical Edge
6.3.4 Enhanced Concept of Intelligence
6.4.2 Broader Concept of Combined Arms/Information Warfare
6.4.3 Urban Operations/Complex Terrain
6.4.4 Infantry and Mobility
6.5.3 Developing Marines for Complexity
6.5.4 Developing Leaders at Every Echelon

Centaurs for the Fifth-Generation Ground Combat Element addresses the challenge of how the Ground Combat Element can create the most effective combinations of Marines and robotic and autonomous systems to increase tempo, maneuver options, and protection to Marines. By conceptualizing how these centaur formations should operate at a functional level, the Ground Combat Element can provide a shared vision that informs development of centaur enabling concepts, inspires adjacent concepts in other elements of the Marine Air Ground Task Force (MAGTF), and provides focus to the combat development process. This concept should stimulate discussion and debate for Marines of all ranks to imagine, war game, and develop new theories of victory involving centaur concepts for the Ground Combat Element as part of the MAGTF in future military campaigns. Reference Appendix B for illustrative examples of centaur enabling concepts.

THE CHALLENGE AND OPPORTUNITY

The *Marine Corps Operating Concept's* challenge of how to put people and things together in the most effective pairings presents an opportunity to provide a fifth-generation capability for the ground combat element, and reinvigorate a maneuver warfare mindset for the 21st Century.

CENTAURS FOR THE FIFTH-GENERATION GROUND COMBAT ELEMENT

The Fifth-Generation Ground Combat Element should leverage and reinforce the warfighting philosophy of maneuver warfare in how it conceptualizes the employment of Human-Machine Collaboration (HM-C) and Manned-Unmanned Teaming (MUM-T) to achieve and

exploit psychological, temporal, and spatial advantages relative to adversaries. The symbiosis of emerging technology and doctrine to leverage and reinforce the other, provides a vehicle to reinvigorate a maneuver warfare mindset, and achieve increased tempo, maneuver options, and protection for Marines.

Maneuver warfare recognizes that the moral forces and human dimension reflect a fundamental characteristic of war's nature. It advocates leveraging the competency, adaptability, and resilience of Marines at all levels through the use of mission tactics, commander's intent, and assigning a main effort. These tools enable Marines to create gaps to exploit opportunistic maneuver to gain and maintain the initiative as the uncertainty, fluidity, disorder, and friction of the battlefield unfolds. Seen from this perspective, the value offered from recent technological advances to achieve a relative advantage lies in human-machine combat teaming to enhance the effectiveness of human warfighters, rather than replace them.

Human-machine collaboration reinforces the Ground Combat Element's ability to create temporal advantages, exploiting speed and time as a weapon. High performance computing, autonomy, and narrow artificial intelligence connected to battle networks help filter the noise of large amounts of data to help surface relevant cues, outliers, and anomalies in the operating environment. This machine-assisted function assists commanders, and their staffs, to orient on the enemy to support sound decision-making faster relative to the enemy, or competing factors relevant to the operating environment.

Manned-unmanned teaming reinforces the Ground Combat Element's ability to create spatial advantages, exploiting enemy gaps and critical vulnerabilities. Unmanned systems employed as advance guards and flank screens for manned formations, find, fix, and disrupt enemy formations. The main effort maneuvers to exploit these shaping actions with speed,

surprise, and focused decisive action. The tactical standoff afforded by the employment of unmanned systems achieves increased protection for the paired manned formation.

Manned-unmanned teaming reinforces the Ground Combat Element's ability to create psychological advantages, exploiting deception as a weapon. Multi-domain unmanned systems expand the capability to deceive and misdirect the enemy in order to disrupt the speed and accuracy of enemy decision-making. This enables Marines to exploit uncertainty and ambiguity of friendly intentions in conjunction with temporal and spatial advantages.

Centaurs for the Fifth-Generation Ground Combat Element does not alleviate the need for or replace the value of the MAGTF's Aviation Combat Element or Logistical Combat Element. Ground centaur formations compliment the MAGTF construct as an expansion of the combined arms team that seeks to place the enemy off-balance and into a no-win dilemma. Creating effective combinations of Marines enhanced by robotic and autonomous systems, increases tempo, maneuver options, and protection to Marines.

ORIENTING ON THE ENEMY

Human-machine collaboration can improve the ability of commanders and their staffs to orient on the enemy faster. Through high performance computing, autonomy, and narrow artificial intelligence connected to battle networks, these tools help units filter the noise of large amounts of data to surface relevant cues, outliers, and anomalies in the operating environment. Attacking the enemy's system is a fundamental component of maneuver warfare. Orienting on the enemy enables Marines to cue in on the information that matters most. This enables Marines to anticipate the enemy's thought processes and generate an understanding of the enemy's most likely and possible courses of action. By framing the problem and anticipated direction it may

head, Marines can design a sound scheme of maneuver that focuses its efforts at decisive points, with the right force, at the right time.[229]

At higher headquarters levels where myriads of diverging reports can create more disorientation than clarity, commanders would benefit from human-machine collaboration concepts that assist them in observing, orienting, deciding, and acting faster than adversaries. The increasing digital connectedness of the operating environment compounds the challenge with an increasing amount of reports and data to process. More information does not equate to improved decision making, just as the ability to see the whole chess board does not translate to improved game play. How a chess player thinks, anticipates, and deciphers relevant cues of his opponent enables the employment of a sound strategy. Capabilities that help commanders filter the noise from the relevant cues necessary to make sound decisions would enable them to accelerate the unit's tempo relative to the enemy.

ORIENTING ON THE ENEMY

Expeditionary vertical take-off and landing (VTOL) unmanned aerial systems (UAS), able to employ modular sensor payloads would afford a fifth-generation regiment, battalion, or company greater employment options. In the month-long adverse weather conditions of 1968 in Operation HUE CITY that prevented manned aircraft from aerial reconnaissance, 1st Marines could have launched one or several UAS to assess the situation in the city versus sending a company in blind. Commercially available, miniaturized sensors can provide electro-optical (EO), infrared (IR), synthetic aperture radar (SAR), auto-target detect (ATD), moving target indicator (MTI), and light detection and ranging (LIDAR) capabilities while maintaining an expeditionary footprint. Supported by high performance computing (HPC), narrow artificial intelligence (AI), and big data analytics, UAS collections could support rapid synthesis of three-dimensional mapping and models for mission planning. Organic UAS with auto-image recognition software that utilizes the same cameras and processing chips of multiple smart phones could have geo-located all weapons and military equipment by type down to the size of a person's face. Balancing capabilities across the Ground Combat Element reinforces the ability of leaders at all levels to orient on the enemy and shape their understanding of the operating environment prior to committing forces.

With the increasing connectedness and activity in the information and cyber domains, the ability to visualize the system dynamics of the battlefield becomes more difficult. The capability to construct a visualization of the information domain, cyber domain, and electromagnetic spectrum through high performance computing, and modeling and simulation tools, would add

depth to a commander's visualization of the battlefield. Reduced abstraction and increased fidelity, aided by the noise filtering capability of automation and narrow artificial intelligence, can provide commanders a missing ability to observe and orient on relevant decision-making cues.

ORIENTING ON THE ENEMY IN THE INFORMATION DOMAIN

Human-machine collaboration used to process collections from the physical terrain, could also comb social media feeds and security cameras to geo-locate faces of known enemy key leaders, weapons, and military equipment. The emerging "internet of things" provides an array of sensors and communicators already pre-positioned throughout an urban setting. Measuring changes in public sentiment on social media similar to how politicians use big data analytics to support their campaigns, and applications such as Waze that can detect unusual traffic pattern changes could serve as 'pulse points' for Marines to assess changes to the environment.

Some mission sets across the range of military operations may not include an enemy, such as in humanitarian assistance and disaster relief operations. In these instances, the opposing forces working against the will and objectives of the multinational effort may take the form of environmental factors, weather, public opinion, and time itself. Centaur concepts should refrain from rigidness and remain adaptable across the range of military operations. In this regard, human-machine collaboration may not help the commander and his staff orient on the enemy. Rather, it may help them orient on the dynamics of the "system" that makes the "problem" a problem.

PHILOSOPHY OF COMMAND

Centaurs for the Fifth-Generation Ground Combat Element reinforces the warfighting philosophy of maneuver warfare. It advocates decentralized command and control to enable Marines to cope with the uncertainty, fluidity, disorder, and friction encountered in war.[230] The human dimension in war remains relevant as the Ground Combat Element adopts centaur concepts. Despite humankind's unbridled fascination with technology, war reflects a clash of human wills as part of its fundamental nature. The technologies that enables centaur concepts as a means, do not serve as ends in themselves.

Leaders lead from the front. This premise does not change. The moral forces in war animated by the warfighting spirit of individual Marines, led by competent leaders, in cohesive units, provides credence to Napoleon Bonaparte's often quoted maxim, "In war, the moral is to the material as three to one."[231] Though intangible and difficult to measure, the moral forces in war matter just as much as the mental and physical forces. *Warfighting* states, "by demonstrating the willingness to share danger and privation…commanders [can] fully gain the trust and confidence of subordinates."[232]While centaur concepts offer advantages on the battlefield, the resilience of the individual Marine should remain as the cornerstone of the future force.

Commanding from the front enables commanders to remain forward where they can influence points of friction. Employing increased unmanned systems and formations may push the front farther forward in future war. Commanders may posture manned formations in close enough proximity to exploit shaping actions of their unmanned counterparts. In the dense urban environment, this distance may extend a few city blocks, or it could reside across the street depending on the echelon of the command. During ship to shore maneuver, the distance may reflect a greater distance as manned and unmanned formations maneuver over more open terrain. The inflexion point where manned formations exploit the shaping actions of unmanned formations will likely represent a potential friction point where leaders may choose to position themselves in the future.

Collaborative visualization tools that display an integrated common operating picture would serve as a valuable enabling concept for the Ground Combat Element. Through either an augmented reality heads up display or tablet based device, connected via infrastructure-less, mobile, ad-hoc network radios that create a self-forming, self-healing, scalable, and expeditionary network would enhance shared awareness and harmony of action. This concept

would also afford commander's greater flexibility on the battlefield to remain forward while retaining a topsight perspective of the larger picture.

The preparation for war phase represents an important part in how the Ground Combat Element employs unmanned systems in maneuver warfare. Before Marines operate in centaur formations on the battlefield, they must study, learn, and train with new means made available to them. At the same time, Marines should recognize that a machine represents only a technological means to enhance the warfighter. A continued investment into developing Marines to make sound, intuitive decisions amidst uncertainty and endure the harsh realities of combat warrants comparable attention as the effort made to develop the technology that assists them.

SHAPING THE ACTION

Planning with the end in mind allows Marines to develop a scheme for how to attack the enemy's system. To influence conditions and events in preparation for decisive action(s) that lead to mission accomplishment, Marines conduct shaping actions. Shaping actions may include disrupting an enemy strength, triggering an enemy reaction with an anticipated response, or anticipating and arranging for critical supplies.[233]

Centaurs for the Fifth-Generation Ground Combat Element envisions unmanned systems that shape conditions favorable for conduct of decisive actions. Important to deciding when and where to employ decisive actions, unmanned systems and formations employed as advance guards or reconnaissance elements, assist commanders and their staffs to develop the situation. Unmanned formations can create spatial and psychological advantages to shape conditions for follow-on decisive actions, while achieving increased protection for Marines due to the standoff distances afforded by their employment. Unmanned systems that support the other functional areas of logistics, engineering, and explosive ordnance disposal among others, team with existing

SHAPING THE ACTION

During ship to shore maneuver of a contested amphibious assault, unmanned amphibious vehicles could enable manned formations to bridge the gap from the amphibious ship through the surf zone and onto the beachhead with increased survivability. Employed as an advanced guard, the unmanned formation could sweep and hunt for littoral mines and obstacles. It would reduce them, find the enemy, and provide obscuration to disrupt the enemy's ability to orient on and target supported efforts traveling ashore. This could include manned formations or more valuable unmanned formations. Follow-on waves would exploit the gap of the cleared lane and disrupted enemy defenses to gain the initiative and conduct onward maneuver ashore.

Alternatively, unmanned amphibious demonstrations and feints can deceive the enemy, while affording less risk to Marines. In the physical domain, launching expendable unmanned amphibious waves at decoy landing sites prior to landing the main effort attack at a separate location would enable Marines to create and exploit psychological, spatial, and temporal gaps of the enemy's defenses. For an enemy relying on tracking and exploiting the electromagnetic spectrum, unmanned decoy emitters could saturate the decoy landing sites, reinforcing the fidelity of the deceptive shaping action. Employing an expendable unmanned formation for this purpose frees the command to achieve the shaping action without the requirement to retrieve the assets employed.

manned formations to reinforces their capabilities and capacities to shape and sustain conditions favorable for maneuver. For employment concepts that conceptualize swarms of expendable unmanned systems to achieve penetration and disruption to an enemy's defenses, the concept should plan for the supply-chain management and maintenance required to sustain operations with these capabilities. Human-machine collaboration can enhance the ability of staff planners to model and anticipate adequate support to sustain and exploit success at critical points. In all these examples, machine-assisted concepts help improve the ability of Marines to shape conditions for decisive action.

DECISION MAKING

Maneuver warfare emphasizes that decision making relative to the enemy and time matters. "A good plan violently executed *now* is better than a perfect plan executed next week."[234] In situations where the Ground Combat Element finds itself thrust into an expeditionary environment, matched against a larger foe, without the benefit of supporting arms and capabilities resident in the MAGTF, commanders can maneuver in the cognitive domain to turn the fog of war into an advantage. The human-machine collaboration that assists commanders orient on the enemy enables the Ground Combat Element to observe, orient, decide, and act

faster. Combining increased friendly decision-making tempo with employing manned-unmanned formations to deceive, misdirect, and disrupt the enemy's decision-making tempo allows the Ground Combat Element to turn speed and time into a weapon.

MISSION TACTICS

Mission tactics allow subordinates to operate on their own initiative, while freeing the senior Marine to maintain a larger perspective of the operating environment. Mission tactics convey what the subordinate must accomplish within the context of amplifying guidance or parameters, without specifying how to do it.[235] Balancing capabilities across the Ground Combat Element, from fire team to division, allows leaders at all levels to exploit the value of teaming with unmanned systems.

AUTONOMY AND MISSION TACTICS

Increases in autonomy would support increased effectiveness in human-machine interface and resiliency to operate in a communications and GPS denied environment. Autonomy is an important element to develop for the battle of signatures and enabling mission tactics.

Applying this construct to the employment of unmanned formations requires a sufficient level of trust in the technology that enables autonomy. In an idealized concept, Marines would employ unmanned formations with minimal persistent control in the execution of the assigned task. One day, these tasks may include the autonomous judgment and application of discriminate lethality. This may not be possible today, but warrants consideration before technology matures sufficiently to an inflection point where it is achievable, and exploitable. As adversaries develop and proliferate capabilities to disrupt and jam the electromagnetic spectrum, autonomy enables centaur formations to operate with greater resilience in communications and global positioning system degraded and denied environments.

The framework for developing autonomous unmanned systems and formations encompasses two models. First, unmanned systems operate with "human oversight *in the loop*",

whereas the second operates with "human oversight *on the loop* as needed."[236] Said differently, one model relies on a Marine to remain in the loop at all times, in essence "remotely controlling" the unmanned system. The second, more advanced model, extends greater trust and independence for the unmanned system to make decisions without human adjudication. The Marine monitoring the unmanned system or formation intervenes only when necessary, which represents the ideal synergy of combining human intuition and judgment, with the technological advantages of machines. The Ground Combat Element seeks to team man-machine combinations that achieve a synergy greater than the sum of the parts and not create a cognitive burden on the Marine operator. Advances in autonomy that enable Marines to extend greater trust to machines best applies mission tactics.

The trust to allow autonomous unmanned systems to employ lethality may trigger significant concern amongst military and non-military audiences. However, even in a contemporary force absent autonomous machines, some military service members have demonstrated that wise judgement and sound decision-making does not mature equally as innate qualities. The two models that describe levels of autonomy may very well provide an accurate description on how some senior and subordinate relationships develop over time. Developing Marines to operate in the complexity of combat and to make sound decisions requires an investment of training and education. Developing autonomous systems through machine learning to operate with mission tactics merits a comparable investment of time and resources towards this end.[237] Through advances in technology and time invested into machine learning, and *machine education*, the autonomous unmanned systems of 2030 fare to perform much more intelligibly than the systems of 2017.

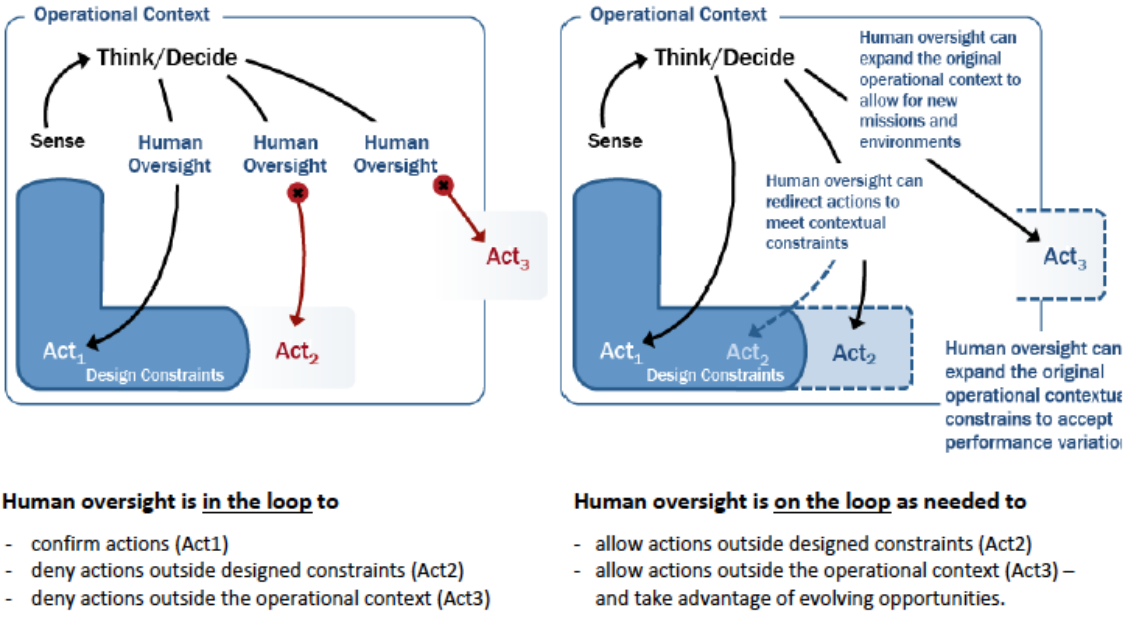


Figure 9: The two models above depict types of autonomy between human operators and autonomous systems.[238]

COMMANDER'S INTENT

Commander's intent provides the purpose and amplifying guidance that accompanies a task assigned to a subordinate. The simpler and more concise, the less complex and difficult to understand the vision of the commander. Commander's intent, combined with mission tactics, enables harmony of action across the larger unit as Marines exercise initiative to generate and exploit temporal advantages.[239]

With a common purpose to unify efforts toward a common end, commander's intent provides amplifying guidance, or the parameters, from which subordinates carry out their subordinate mission. Upon taking command, a commander publishes his or her command philosophy, which provides broad and enduring guidance and parameters for how he envisions the unit and Marines in it to think and operate. This may range from reinforcing the maneuver warfare philosophy, to ethical conduct, and matters unique to the commander's character and temperament. During exercises and operations, the commander articulates commander's intent unique to the particular mission. The same conceptual tool applies to tasks assigned to an

autonomous system or formation. For autonomous systems to operate with increasing autonomy, they require sufficient 'commander's intent' through programmed parameters to operate and perform in the way envisioned. This may include parameters, or *rules of engagement,* for employing lethality, how to perform a particular mission, and how to integrate with their Marine counterparts. To avoid a rise of the machines scenario in a far-off distant future, programming parameters that de-value machine survivability would address this concern.

SHARED AWARENESS TO ENHANCE HARMONY OF ACTION WITH COMMANDER'S INTENT

As situations on the battlefield continue to evolve, digitally networked collaborative visualization tools could help enable harmony of action through increased shared awareness. Maintaining a shared mental model of the situation through either augmented reality heads up displays or tablet based interfaces, supported by human-machine collaboration data filtering tools would aid in achieving shared awareness, which contributes to harmony of action towards a common objective. While these capabilities would not achieve predictive certainty, or lift the fog of war as some would portend, they would contribute significantly to a commander and his staff's ability to build a mental model of the larger battlefield and in turn share it with the unit. Providing leaders these tools enable them to remain forward at points of friction, and exercise the moral imperative of command, while maintaining a topsight perspective and portraying an accurate visualization of the larger fight to higher headquarters and supported commands alike.

Maintaining a common operating picture and conducting periodic in-person or radio touchpoints allow commanders and subordinates to recalibrate their collective understanding of the situation. Human-machine collaboration can help the Ground Combat Element maintain a shared mental model of an evolving situation in real-time. Centaur concepts that enable the Ground Combat Element to reconnoiter, generate, update, and rapidly aggregate the data that supports a common operational picture with shared multi-dimensional overlays of the situation would enhance horizontal awareness. Shared horizontal awareness by adjacent units, operating on the same commander's intent, enables them to exercise initiative with harmony of action without the necessity for explicit coordination.

MAIN EFFORT

Maneuver warfare uses the concept of a main effort to provide unity of effort in support of decisive actions critical for success.[240] In *Centaurs for the Fifth-Generation Ground Combat Element,* the use of a main effort can help align the efforts of unmanned systems operating on varying levels of autonomy. It provides a unifying parameter to guide their actions in addition to mission tactics and commander's intent. A commander may also weight his main effort with a higher quantity of unmanned assets, or assign the availability of a high-capability, low density, unmanned asset. As the main effort exploits an enemy critical vulnerability to attack the enemy's center of gravity, robotic and autonomous systems can also increase the economy of force available elsewhere.

SURFACE AND GAPS

Maneuver warfare conceptualizes surfaces as enemy strengths, and gaps as enemy weaknesses.[241] Essential to *Centaurs for the Fifth-Generation Ground Combat Element* is the premise that unmanned systems and formations operating forward of Marines find existing gaps or create new gaps for other formations to exploit. At the same time, unmanned formations screening to the flanks of Marines help protect friendly gaps by creating time or space for the manned formation to maneuver. Employing unmanned formations to deceive and misdirect the enemy can create friendly gaps when the enemy takes the bait. Deception can also protect friendly gaps by misdirecting the enemy away from them. Human-machine collaboration capabilities that enable increased tempo of decision-making contribute to the Ground Combat Element's ability to exploit temporal gaps.

COMBINED ARMS

On a fundamental level, *Centaurs for the Fifth-Generation Ground Combat Element* reflects a combined arms concept. The employment of combined arms integrates capabilities in such a way that they pose a no-win dilemma for the enemy, leaving him no choice but to make peace or die.[242] Manned-unmanned teaming represents a 21st century evolution of how Napoleon employed his light cavalry formations to find, fix, and disrupt enemy forces prior to committing his main effort. Similar to a bait and ambush tactic on a larger scale, Napoleon employed his light cavalry to find the enemy and force him to react, thereby exposing gaps to exploit. His cavalry also screened his flanks with pickets to provide early warning, and provided a fast means to exploit success by pursuing a fleeing enemy.[243]

COMBINED ARMS

Small unmanned aerial systems (UAS) make effective collections platforms. They can also provide companies, platoons, squads, and fire teams with an organic, stand-off, precision-guided munition (PGM) capability by attaching a modular explosive payload. Compared to a 500-pound Joint Direct Attack Munition, a squad organic PGM capability would afford the ability to achieve a 'Close Air Support-like' solution while also minimizing risk of fratricide to Marines, and collateral damage to nearby civilians. The "assistant to the squad leader" in the new Marine infantry squad structure could employ one or more small UAS or small unmanned ground systems (UGS) with a mixture of ISR and strike payloads to achieve a rapid ISR-Strike solution. Alternatively, individual Marines could employ small unmanned systems similar to how the AT-4 anti-tank rocket is a core skill and capability for an infantryman. Multi-domain employment (i.e. air, land, subterranean) would present multiple thrusts towards the adversary that limit his freedom of action for supported efforts to exploit.

Employing small unmanned systems as collective unmanned formations, or 'swarms', could disrupt an enemy's ability to orient on the right cues. Payloads designed to affect the electromagnetic spectrum can disrupt enemy command and control. A battalion fire support coordination center (FSC) working with company Fire Support Teams (FiST) could shape the 'company's deep fight' with swarms and hunter-killer 'packs', while platoons and squads exploit the conditions set by small unmanned systems. This centaur concept would provide the Fifth-Generation Ground Combat Element with organic squad-level CAS and battalion-level DAS equivalents.

As an illustrative example, the Ground Combat Element could employ organic, expeditionary, and disposable unmanned systems with modular payloads to fly, drive, or swim ahead to find, fix, and disrupt the enemy prior to committing a supported effort at a time and position of advantage. This conceptual approach to employment holds true whether the

unmanned formation teams with dismounted infantry or mounted armored formations, at the fire team level, or in larger formations. Backpacks of small unmanned aerial systems may represent the platform of choice for an infantry squad leader, whereas a regimental commander may employ platoons of unmanned systems to conduct shaping actions in preparation for his manned formations to exploit.

CONCLUSION

Centaurs for the Fifth-Generation Ground Combat Element leverages, reinforces, and serves as a vehicle to reinvigorate the warfighting philosophy of maneuver warfare. This concept has discussed the central idea and main characteristics for how the Ground Combat Element can effectively integrate the best of humans with the best of machines to achieve and exploit psychological, temporal, and spatial advantages relative to adversaries. Like maneuver warfare itself, the employment of centaur concepts applies equally from the fire team leader to the division commander. Whether operating from the sea against a conventional foe, in the desert or jungle against a transnational threat employing irregular means, or balancing the complexity of the Three Block War in the city, centaur concepts leverage and reinforce maneuver warfare for the Ground Combat Element to achieve and exploit comparative advantages relative to the enemy. As "the only MAGTF element that can seize and occupy terrain," the Fifth-Generation Ground Combat Element should be the main effort in developing the attributes of the combined arms team of the 21st Century MAGTF.[244]

Ultimately, no singular piece of technology guarantees success on the battlefield. As robotic and autonomous systems continue to advance and proliferate, Marines must fight the alluring appeal of relying solely on "push-button warfare."[245] The human dimension and moral forces remain just as important. Tough, thinking Marines, with the ingenuity to adapt available

means to overcome a numerically larger foe, and with strength of character and endurance win battles. From Belleau Wood to Guadalcanal, to the Chosen Reservoir and Hue City, the exploits of Marines in these operations and campaigns reaffirm the importance that the *Marine Corps Operating Concept* places on developing Marines for complexity and developing leaders at every echelon of the Marine Corps.[246]

Conclusion

The Ground Combat Element should leverage and reinforce the warfighting philosophy of maneuver warfare in how it conceptualizes the employment of human-machine collaboration and manned-unmanned teaming to achieve and exploit increased tempo, maneuver options, and protection for Marines. *Centaurs for Maneuver Warfare* has explored how the Marine Corps' Fifth-Generation Ground Combat Element can leverage human-machine collaboration and manned-unmanned teaming to achieve the synergistic benefits of employing robotic and autonomous systems to make Marines more effective on the battlefield. The resulting concept, *Centaurs for the Fifth-Generation Ground Combat Element,* addresses service level direction found in the *Marine Corps Operating Concept*, the Commandant of the Marine Corps' task to reinvigorate a maneuver warfare mindset for the 21st Century, and task to provide a fifth-generation capability for the Ground Combat Element.[247] This concept should promote additional discussion and debate to inform further concept development, experimentation, and refinement in the combat development process. As "the only MAGTF element that can seize and occupy terrain," the Fifth-Generation Ground Combat Element should be the main effort in developing the attributes of the combined arms team of the 21st Century MAGTF.[248]

Preparing for war in the future represents a central component of the Marine Corps' philosophy of warfighting. In the Preface to *Warfighting* in 1997, former Commandant of the Marine Corps, General Alfred M. Gray, stated, "'War is both timeless and every changing. While the basic nature of war is constant, the means and methods we use evolve continuously.' Like war itself, our approach to warfighting must evolve. If we cease to refine, expand, and improve our profession, we risk becoming outdated, stagnant, and defeated."[249] War will come again one day. It is going to be different, unpredictable, and it's going to have surprises. It is

incumbent on Marines and warfighting professionals to cast their nets widely, think about and study the lessons of history, anticipate the character of future war, and be ready for it.

Endnotes

[1] Oxford Living Dictionaries, "centaur," date accessed: April 3, 2017, https://en.oxforddictionaries.com/definition/centaur.

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capabilities, and the spatial and temporal dimensions—together provide the essential description of how the force will operate. The synopsis of the central idea provides context for the functions, capabilities and dimensions. The descriptions of functions, capabilities and dimensions provide substance to the synopsis. The synopsis is a top-down description of the concept, while the others describe the concept from the bottom up. The four are complementary elements, and a tight and direct linkage should exist between them. In the case of the functions, capabilities and dimensions, it may not be possible, or even desirable, to describe these elements separately of one another."

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[197] *EAGER COLT 20YY*, Respondent 4, Field Grade Officer, April 28, 2017; *EAGER COLT 20YY*, Respondent 8, Field Grade Officer, April 28, 2017.

[198] *EAGER COLT 20YY*, Respondent 7, Field Grade Officer, April 28, 2017.

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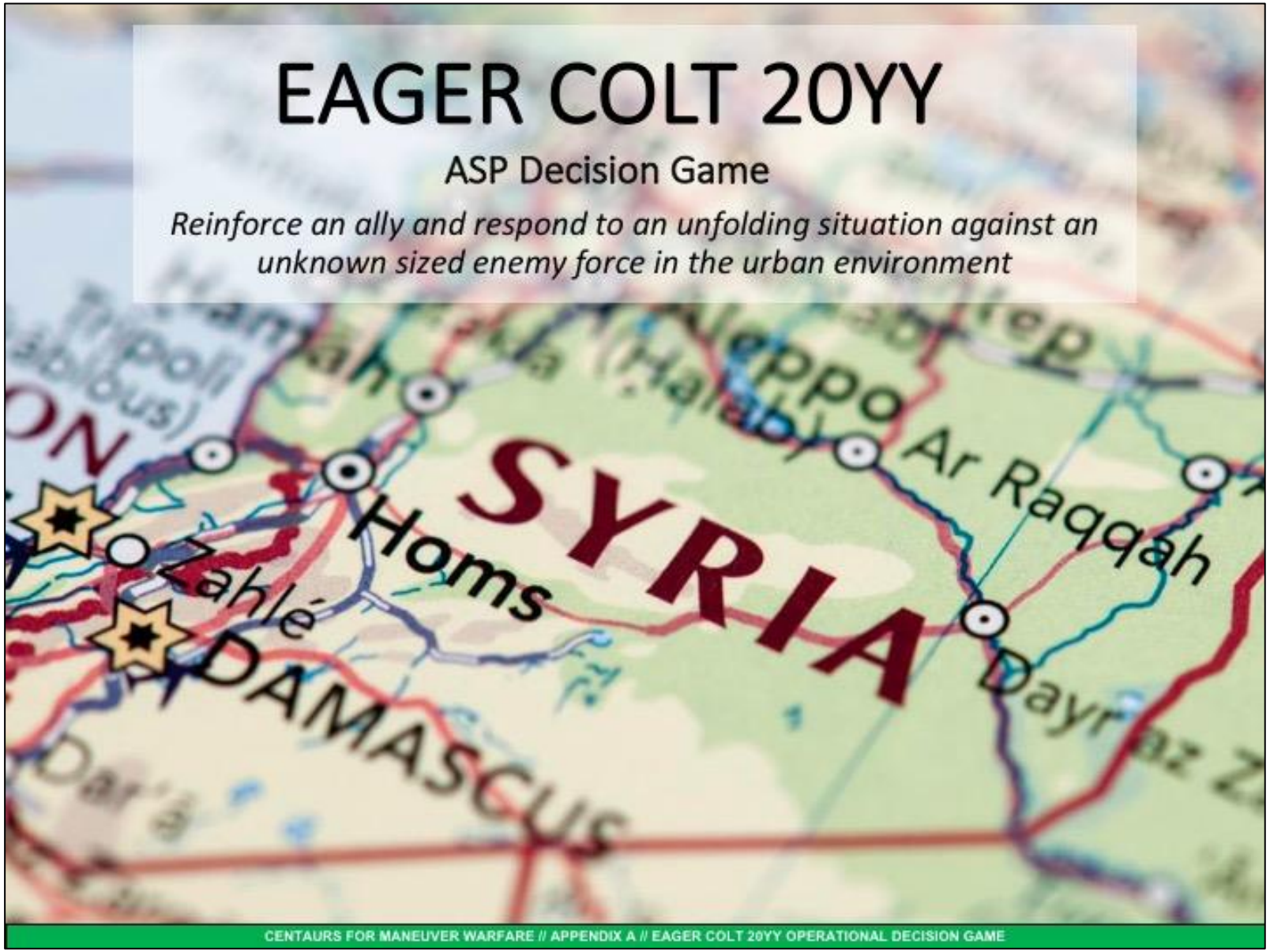
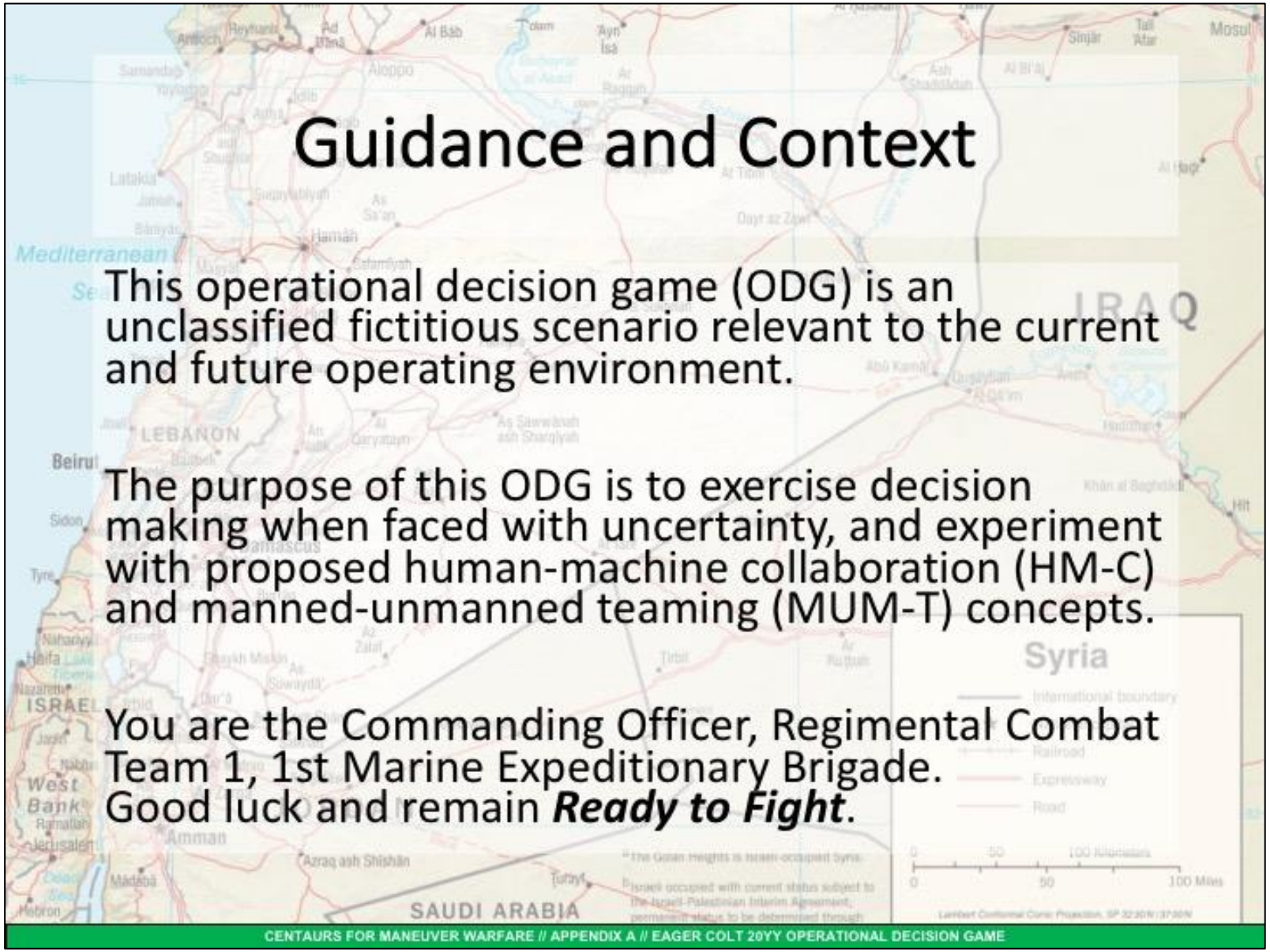
APPENDIX A: EAGER COLT 20YY


EAGER COLT 20YY
ASP Decision Game
Reinforce an ally and respond to an unfolding situation against an unknown sized enemy force in the urban environment
SYRIA
Homs
Zahlé
DAMASCUS
Ar Raqqah
CENTAURS FOR MANEUVER WARFARE // APPENDIX A // EAGER COLT 20YY OPERATIONAL DECISION GAME


Guidance and Context
This operational decision game (ODG) is an unclassified fictitious scenario relevant to the current and future operating environment.
The purpose of this ODG is to exercise decision making when faced with uncertainty, and experiment with proposed human-machine collaboration (HM-C) and manned-unmanned teaming (MUM-T) concepts.
You are the Commanding Officer, Regimental Combat Team 1, 1st Marine Expeditionary Brigade. Good luck and remain ***Ready to Fight***.
Syria
SAUDI ARABIA
IRAQ
LEBANON
ISRAEL
CENTAURS FOR MANEUVER WARFARE // APPENDIX A // EAGER COLT 20YY OPERATIONAL DECISION GAME

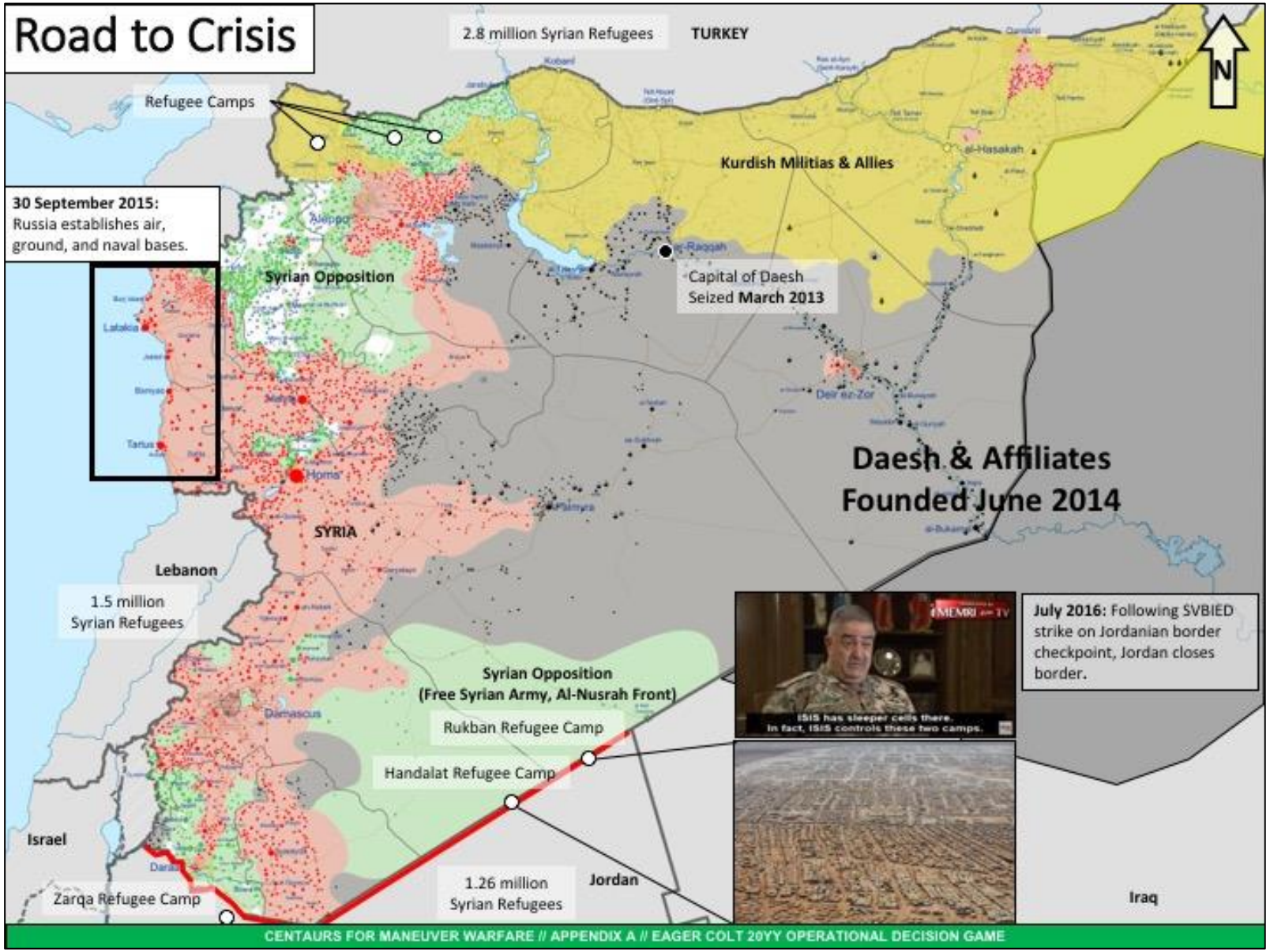
Road to Crisis

- **March 2011:** The *Arab Spring* spreads to Syria which launches the country into a sectarian civil war, pitting President Bashar al-Assad's government against a loose alliance of Sunni Arab rebel groups. Primary belligerents include: Free Syrian Army, Syrian Democratic Forces (Kurdish), and Salafi Jihadist groups that include al-Nusra Front.
- **April 2011:** US, Jordan, and partner nations conduct the first iteration of Exercise EAGER LION, an annual theater security cooperation exercise to build multilateral interoperability amongst partner forces.
- **June 2014:** Islamic State of Iraq and Al-Shem (Daesh) declares restored Caliphate under leadership of Abu Bakr Al-Baghdadi. By 2015, Daesh sweeps across Eastern Syria and Al-Anbar Province, Iraq. It seizes Raqqa as its new capital in addition to Ramadi, Fallujah, Mosul, and threatens Baghdad. Affiliate Islamic State Provinces emerge in Libya, Algeria, Khorasan (Afghanistan, Pakistan), Yemen, Gaza, the Sinai, Russian Caucasus, West Africa (Boko Haram), and Southeast Asia. Daesh conducts operations in the Beqaa Valley (Lebanon), Jordan, India, and inspires attacks in Brazil, Europe, and the United States.

CENTAURS FOR MANEUVER WARFARE // APPENDIX A // EAGER COLT 20YY OPERATIONAL DECISION GAME

Road to Crisis

- **October 2014:** The U.S. establishes CJTF Operation Inherent Resolve (OIR) with 64 member countries, formalizing an international commitment to combat Daesh in Iraq. Advisors, aviation, and fire support enablers from U.S. Special Operational Forces (SOF) and General Purpose Forces grow to 5,262 in Iraq, based out of Baghdad and former Coalition Force Bases. The U.S. later introduces SOF into Syria beginning in August 2016, expanding the force by 300 more.
- **30 September 2015:** Russia intervenes in Syria on behalf of Syrian President Bashar Al-Assad, establishing a permanent lodgment based out Latakia.
- **July 2016:** Jordan closes border with Syria following SVBIED attack at border site.
- By **January 2017**, more than *six million* Syrian refugees have poured across the borders into Turkey, Lebanon, and Jordan. Most remain in refugee camps. Some make the trek abroad. As of this month, Daesh had successfully undertaken seven attacks on Jordanian soil.
- **February 2017:** The U.S. begins a dialogue with regional partners to establish 'safe zones' in Syria. Saudi Arabia, Jordan, Lebanon, and Turkey concur with the plan broadly defined. Russia requests more information, leaving the door open for consideration.


Road to Crisis
2.8 million Syrian Refugees
TURKEY
N
Refugee Camps
Kurdish Militias & Allies
al-Hasakah
30 September 2015:
Russia establishes air, ground, and naval bases.
Syrian Opposition
Capital of Daesh
Seized March 2013
Daesh & Affiliates
Founded June 2014
SYRIA
Lebanon
1.5 million
Syrian Refugees
Syrian Opposition
(Free Syrian Army, Al-Nusrah Front)
Rukban Refugee Camp
Handalat Refugee Camp
ISIS has sleeper cells there.
In fact, ISIS controls these two camps.
July 2016: Following SVBIED strike on Jordanian border checkpoint, Jordan closes border.
Israel
Zarqa Refugee Camp
1.26 million
Syrian Refugees
Jordan
Iraq
CENTAURS FOR MANEUVER WARFARE // APPENDIX A // EAGER COLT 20YY OPERATIONAL DECISION GAME

Crisis Emerges 20YY

- **20 April:** The U.S. and Jordan commence Exercise EAGER LION 20YY. 13th MEU deploys ashore to conduct bilateral training, a command post exercise, and rehearse a MPF Offload.
- **13 May:** EAGER LION concludes. After re-embarking all equipment on ship, Marines and Sailors receive two days liberty ashore to visit Petra, Wadi Rum, and nearby tourist locations near the port of Aqaba.
- **15 May:** At sunset the first day of Ramadan 20YY, Daesh launches systemic attacks throughout Jordan, striking 30 major cities, military bases, tourist sites and the Allenby Bridge crossing to Israel. Attacks result in more than 20,000 killed and wounded Jordanians and foreign visitors. Jordanian Armed Forces (JAF) mobilize and respond.
- **16 May:** Daesh and Affiliate organizations praise the jihadists who, "killed the crusaders and apostates that support the dwarf tyrant. *Al-dawlah Al-Islamiyah* will soon liberate Jerusalem from the Zionists." The message explodes on social media and international press. Israel and Saudi Arabia mobilize their forces to reinforce their borders with Jordan.
- **16 May:** King Abdullah requests direct military assistance from the United States and International Community to quell the attacks and secure its borders. 13th MEU reinforces U.S. Embassy AMMAN and commences NEO.

EAGER COLT 20YY

- **19 May:** The U.S. activates 1st MEB enabled by MPF augmentation already present in theater to serve as the Global Response Force to Jordan. RCT-1 forms the GCE of the MEB, pulling 1/1, 1/5 and 2/5 out of home station training and the mountains of Bridgepoint, CA.
- **CENTCOM Guidance and Coordinating Instructions for Operation EAGER COLT**:
  - **MISSION**: In coordination with the JAF, 1st MEB conducts stability operations and creates a 'safe zone' in southern Syria to support the restoration of stability in Jordan.
  - Set conditions to enable follow-on forces to establish a future multinational peacekeeping force that will protect Syrian refugees from Daesh and the Syrian Civil War, and enables international aid organizations to provide relief.
  - The U.S. Department of State has negotiated concurrence from neighboring states. Russia and Syria agree to establishing a southern safe zone, provided an exchange of U.S. and Russian liaisons embed at the brigade level.
- **20 June:** 1st MEB and JAF establish initial 'safe zone' in southern Syria. MEB CE established at an airbase in north Jordan with ACE and MLRS. RCT-1 supported by LCE (-) occupy positions forward in the safe zone. RCT-1 AO remains quiet with the exception of occasional IEDs and harassing small arms fire. Daesh appears to remain engaged north near Damascus and Raqqa.
  - JAF: 2x Mech Inf Bdes with enablers assigned 'OPCON' to 1st MEB (with Artillery Battalion, Anti-Tank Company, Air Defense Battalion, Engineer Company, logistical sustainment)







Enemy Situation

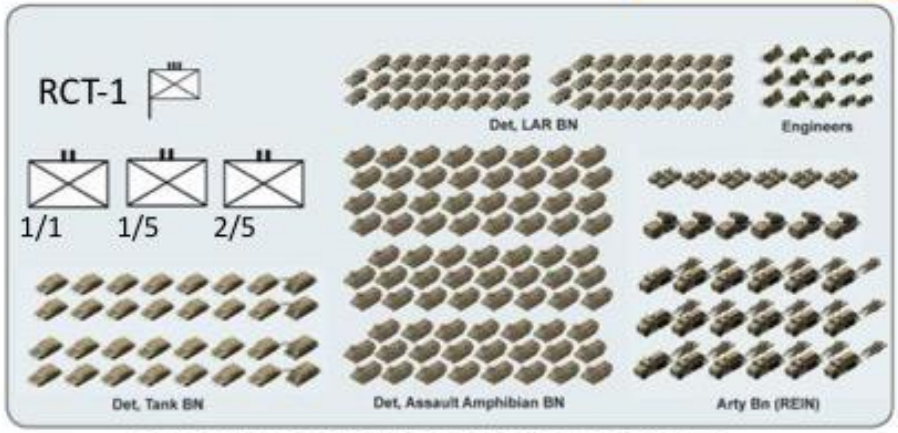
- **CENTCOM estimates as many as 15,000 fighters across greater Syria and Iraq.** Daesh is predominately engaged in contact with Syrian Forces near Damascus and Raqqa, and Iraqi Forces in Western Al-Anbar Province. Organization is mixed along conventional military formations and irregular forces. Exact disposition uncertain.
- **Confirmed capabilities in Syria and Iraq:**
  - Vehicles: T55 and T72 Tanks, M113 APCs, BMP-1s, MRAPs, HMMWVs, Technical Vehicles.
  - Indirect fires : M198 155mm howitzer, D-30 122mm howitzer, 82mm mortars.
  - Anti-Air: ZSU-23-2, FIM-92 Stingers, SA-18.
  - UAS: Reverse engineered Mohajer-4, GRP-1 sUAS employed for ISR and close air support.
  - Soviet style small arms, medium and heavy machine guns, snipers, RPGs (7&29) ATGMs.
  - Irregular Means: IEDs and suicide borne operations (Personnel, Children, Females, Vehicles, Dogs, Chickens).
  - Information Warfare: Cyber Caliphate Webpage, ISIS TV Official Channel, Social Media, GPS Jammers.

1st MEB Table of Organization

Next three slides:
5th Generation
GCE Future Concepts

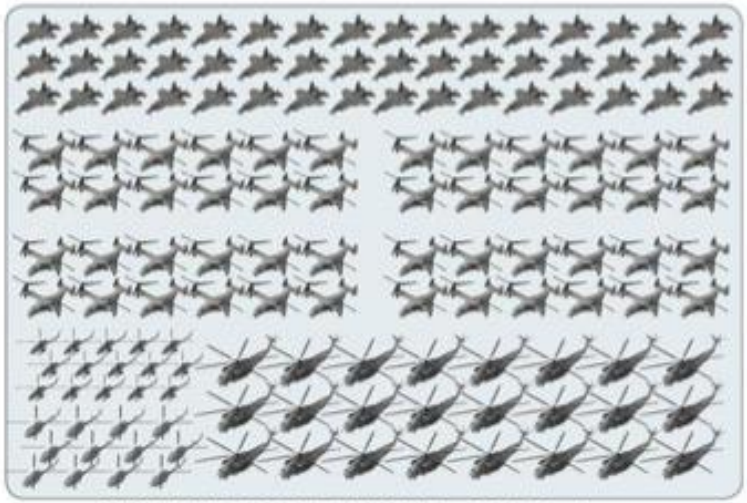
RCT-1 provides the following for each Infantry Battalion:
ATT Artillery Battery
ATT 2 Tank Platoons
ATT Engineer Platoon
ATT Truck Platoon
ATT AAV Platoon

COMMAND ELEMENT - 1,158 Marines

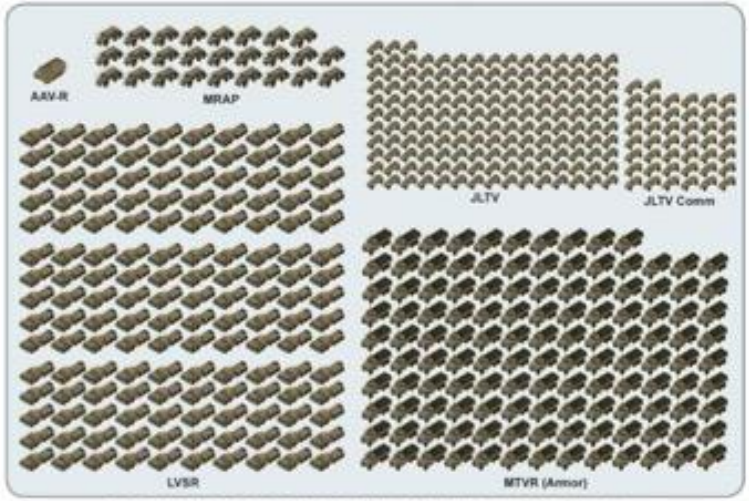


GROUND COMBAT ELEMENT - 5,842 Marines

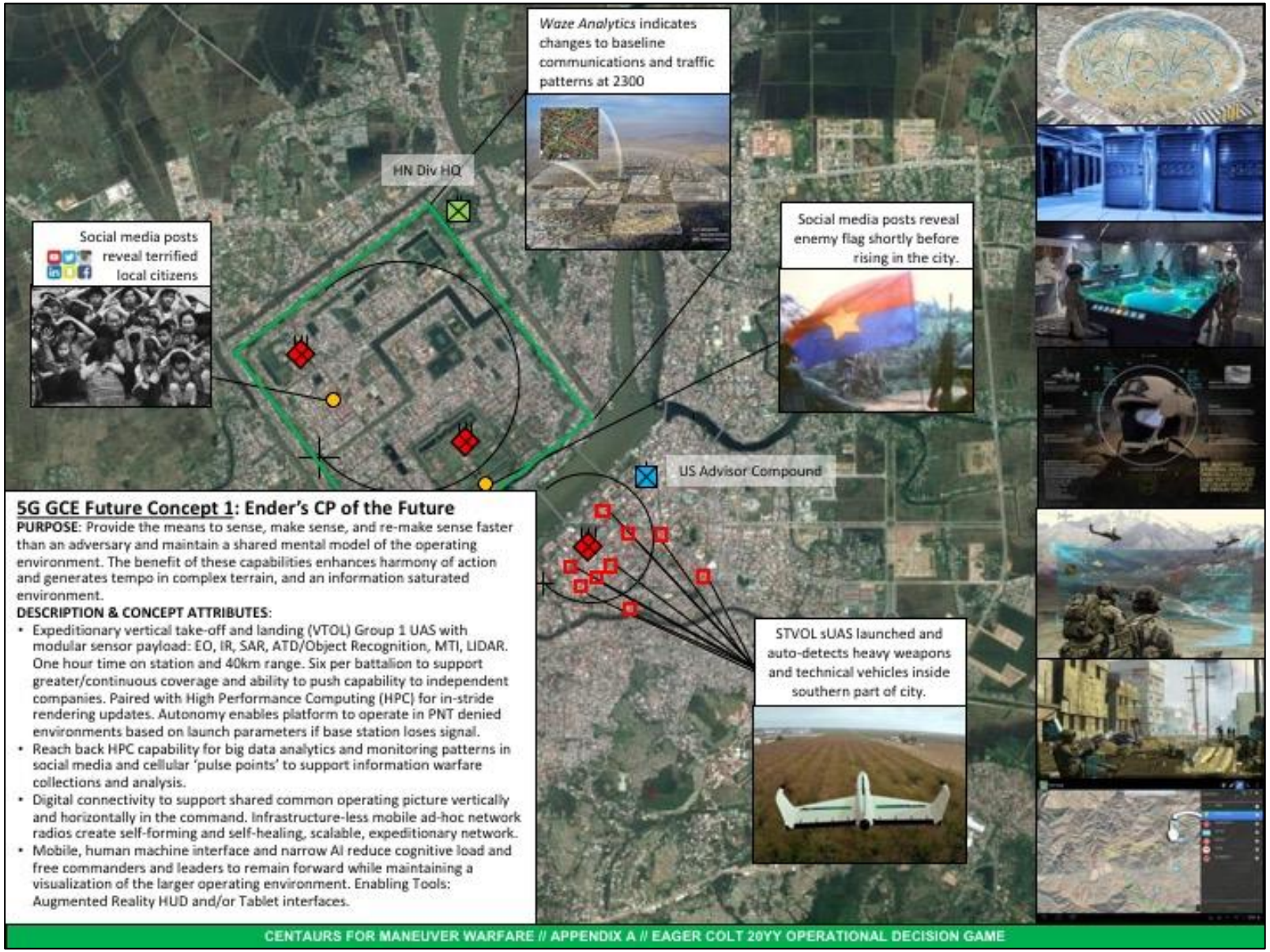
Joint Augmentation: Patriot Missile Battery



AVIATION COMBAT ELEMENT - 5,560 Marines



LOGISTICS COMBAT ELEMENT - 2,732 Marines


Waze Analytics indicates changes to baseline communications and traffic patterns at 2300
HN Div HQ
Social media posts reveal terrified local citizens
Social media posts reveal enemy flag shortly before rising in the city.
US Advisor Compound
STVOL sUAS launched and auto-detects heavy weapons and technical vehicles inside southern part of city.
5G GCE Future Concept 1: Ender's CP of the Future
PURPOSE: Provide the means to sense, make sense, and re-make sense faster than an adversary and maintain a shared mental model of the operating environment. The benefit of these capabilities enhances harmony of action and generates tempo in complex terrain, and an information saturated environment.
DESCRIPTION & CONCEPT ATTRIBUTES:
• Expeditionary vertical take-off and landing (VTOL) Group 1 UAS with modular sensor payload: EO, IR, SAR, ATD/Object Recognition, MTI, LIDAR. One hour time on station and 40km range. Six per battalion to support greater/continuous coverage and ability to push capability to independent companies. Paired with High Performance Computing (HPC) for in-stride rendering updates. Autonomy enables platform to operate in PNT denied environments based on launch parameters if base station loses signal.
• Reach back HPC capability for big data analytics and monitoring patterns in social media and cellular 'pulse points' to support information warfare collections and analysis.
• Digital connectivity to support shared common operating picture vertically and horizontally in the command. Infrastructure-less mobile ad-hoc network radios create self-forming and self-healing, scalable, expeditionary network.
• Mobile, human machine interface and narrow AI reduce cognitive load and free commanders and leaders to remain forward while maintaining a visualization of the larger operating environment. Enabling Tools: Augmented Reality HUD and/or Tablet interfaces.
CENTAURS FOR MANEUVER WARFARE // APPENDIX A // EAGER COLT 20YY OPERATIONAL DECISION GAME

5G GCE Future Concept 2: Infantry ISR-PGM Strike

PURPOSE: Provide infantry expeditionary, lightweight, organic capability to collect intel and rapidly engage targets from protected positions in the urban environment, while minimizing risks of fratricide to friendly forces and civilians.

DESCRIPTION: Modular and expendable small unmanned systems (sUxS) for ISR-PGM Strike at the squad to battalion level. Think squad level CAS, battalion level DAS equivalents.

METHOD: *Battalion* employs 'hunter-killer packs' of several sUxS to locate and strike enemy positions to shape the environment for subordinate maneuver elements a block or more in advance. *Companies* support *platoons/squads* on employment of sUxS for ISR-PGM Strike for street-to-street fight. Squads can employ similar to an AT-4 and/or company fire support team can conduct shaping fires for subordinate platoons.

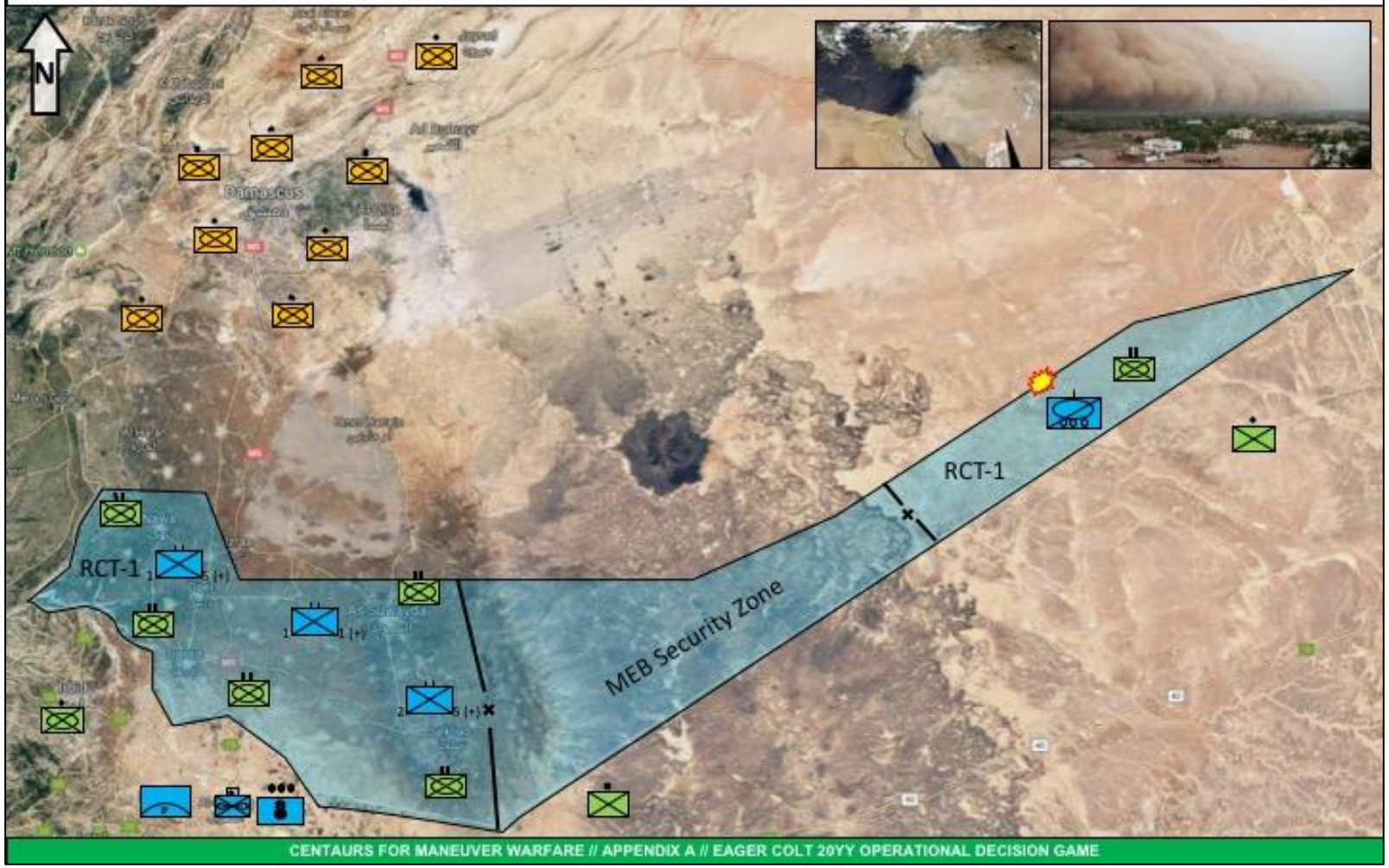
Coordinating Instructions & Concept Attributes:

- Airspace Coordination Area (ACA) ~500' and below for battalion sUAS.
- Ground platforms support multi-domain thrusts and subterranean capability.
- Base platform supports ISR. Modular payloads support high explosive warheads to kill enemy personnel, EW payloads to support disruption of the EMS, or nonlethal munitions to force personnel from protected structures.
- Autonomy enables platform to operate in GPS degraded/denied environment based on launch parameters if base controller loses signal.
- Provides organic ISR-PGM Strike capability when weather limits aviation combat element capabilities.

CENTAURS FOR MANEUVER WARFARE // APPENDIX A // EAGER COLT 20YY OPERATIONAL DECISION GAME


5G GCE Future Concept 3: Centaur Hunter-Killer Teams
PURPOSE: Provide tank formations an unmanned capability to scout forward, develop the situation, and then fix and disrupt enemy formations prior to employing tank(s) for desired purpose.
DESCRIPTION: Autonomous scout platoon teamed with each tank company. Supports two scouts per M1A1 Abrams Main Battle Tank.
Coordinating Instructions & Concept Attributes:
• Optionally manned: Supports autonomous, remote controlled, or manned operations to support flexibility in employment options. AI/Augmented Reality support enhanced driving, navigation, vehicle, and weapon operations. Think F-35 equivalent experience for the GCE.
• Armament includes medium machine gun and anti-armor rockets for force protection.
• Lightweight and easily transportable. Capable of internal/external transport by Marine heavy lift helicopters for flexibility in employment options.
• Extreme speeds and advanced suspensions to support high mobility off-road unavailable in current military vehicles.
• Sensors: EO, IR, SAR, ATD, MTI, LIDAR. Trades heavier armor for sensors and increased speed and maneuverability to achieve increased survivability.
• Inertial Navigation System (INS) supports autonomy in GPS degraded/denied environments.
• Signature Management: Reduction of detectable signatures, including visible, infrared (IR), acoustic and electromagnetic (EM) to avoid detection and engagement by adversaries.
Adapted and modified from DARPA Ground X-Vehicle Technologies
HN Div HQ
US Advisor Compound
CENTAURS FOR MANEUVER WARFARE // APPENDIX A // EAGER COLT 20YY OPERATIONAL DECISION GAME

SITUATION: On **1 July 20YY**, a swarm of 50 UAS IEDs strike elements of 1st LAR, signaling the first significant contact with Daesh. RCT-1 shifts attention to eastern AO and avenues of approach, while forces remain alert in Western AO. On **2 July**, a sandstorm moves in and covers the Levant region. With limited visibility, CJTF OIR and MEB aviation remains grounded except for emergency requirements. RCT-1 limits movements to mission essential patrols. Combined US-JAF Civil Military Operations Centers remain open for local Civil-Military Operations. MEB G2 assesses sandstorm will remain for 7-10 days.



You are the *RCT-1 Commanding Officer*

SITUATION: 1/1 partners with JAF Mech Battalion to provide security for the conduct of a Combined Civil Military Operations center (CMOC) at Suwayda Stadium. Suwayda has population of 140k residents, mostly Druze and Greek Orthodox Christians with a small Sunni and Shia Muslim minority, targeted by Daesh since 2011.

1 At **1027 4 July**, 1/1 reports Co A is in contact and fixed by an unknown sized enemy force in the NE corner of Suwayda. At **1005**, Co A was sent to pickup the city police chief after the CMOC received a cryptic call for assistance indicating elements of Daesh had infiltrated the city. Co A reports 49 WIA/KIA and the Co GySgt is now in command. 1/1's Battalion Commander requests reinforcement, preparing for the worst case situation as he mobilizes his battalion to enable A/1/1 to break contact.

2 At **1040**, your PAO walks into the COC and turns on the TV. Al-Jazeera is streaming a live feed from Daesh TV which claims Daesh has seized the city of Suwayda and captured six U.S. Marines.

At **1046**, the MEB CG calls, references the news and the phone call he just received from the CENTCOM CG. The Combatant Commander prioritizes the following tasks: (1) Recover the Marines, (2) Liberate the city from enemy forces, and (3) Minimize damage to civilians and the city. He notes this situation has political attention around the world. ACE operations remain severely limited due to the persistent sandstorm. This is all the information you have available at this time.

What are your orders, Colonel?

REQUIREMENT

Frame the problem and give your solution in the form of a fragmentary order you would issue to your subordinates. Include your intent behind your plan, your focus of efforts, and any use of supporting arms/effects. Include an overlay sketch or descriptive narrative. Then give a brief explanation for your employment of 5G GCE Future Concepts.

Problem Framing

Problem Statement (incl. list of key facts and assumptions):
Tensions Between Current Conditions and Desired Conditions:
Elements that Must Change to Achieve the Desired Conditions:
Opportunities and Threats to Achieving the Desired Conditions:
Limitations:

COA Graphic and Narrative

COA Graphic or typed description	MISSION
	INTENT
	CONCEPT & TASKS


COA Graphic
Walgha
CMOC
CMOC
Police HQ
As Suwayda
Msad
Ar-Raha
Al Koum
0
1
2
3
Kilometers
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Theory of Victory

Synopsis of your Central Idea

Necessary Capabilities

Application & Integration of Military Functions

Spatial & Temporal Dimensions

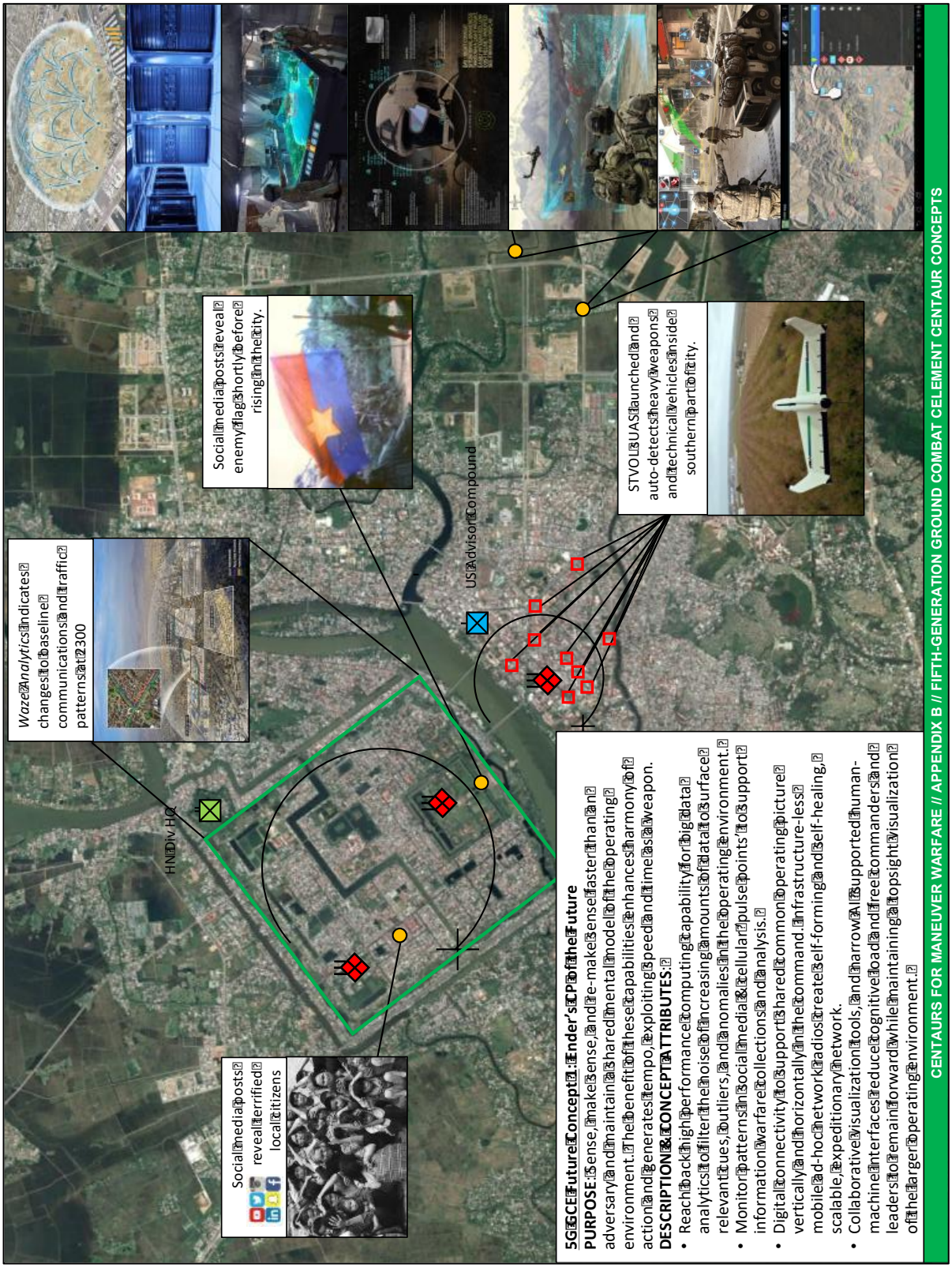
Complete ODG before proceeding to next slide

PRE-MORTEM

- Upon entering the city, contact with the enemy reveals a much larger force than imagined. Your S2 assesses a brigade sized force (~5,000) had somehow seized the city, likely beginning with infiltration months in advance to lay the groundwork. Your initial plan does not survive first contact. What do you do now?

- How do the 5G GCE Future Concepts fall short in their contribution to winning in the complex urban environment?

APPENDIX B: Fifth-Generation Ground Combat Element Centaur Concepts



5GGCE Future Concept 2: Infantry ISR-PGM Strike

PURPOSE: Provide infantry expeditionary, lightweight, organic capability to collect intel and rapidly engage targets from protected positions in the urban environment, while minimizing risks of fratricide to friendly forces and civilians.

DESCRIPTION: Modular and expendable small unmanned systems for ISR-PGM Strike at the squad to battalion level. Think squad level CAS, battalion level DAS equivalents.

METHOD: *Battalion* employs 'hunter-killer packs' of several small unmanned systems to locate and strike enemy positions to shape the environment for subordinate maneuver elements ad block or more in advance. *Companies* support *platoons/squads* on employment of small unmanned systems for ISR-PGM strike for street-to-street fight. Squads can employ similar to an AT-4 and/or company fire support team can conduct shaping actions for subordinate platoons.


5GGCE Future Concepts: Armored Centaurs
PURPOSE: Provide tank formations an unmanned capability to scout forward, develop the situation, and then fix and disrupt enemy formations for tanks to exploit.
DESCRIPTION: Autonomous scout platoon teamed with each tank company to support two scouts per M1A1 Abrams Main Battle Tank.
DESCRIPTION & CONCEPT ATTRIBUTES:
• Semi or fully autonomous scouts support flexibility in employment options.
• Armament includes medium machine gun and anti-armor rockets.
• Extreme speeds and advanced suspensions to support high mobility off-road unavailable in current military vehicles. Covers gaps where tanks cannot go.
• Lightweight and transportable. Capable of internal/external transport by Marine heavy lift helicopters for flexibility in employment options beyond pairings with tank formations.
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