Shaping the *Deep* Fight: Operational Implications for the 21st Century Subterranean Conflict

A Monograph

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2019

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
23-05-2019	Master's Thesis	JUNE 2018– MAY 2019

4. TITLE AND SUBTITLE
Shaping the *Deep* Fight: Operational Implications for the 21st Century Subterranean Conflict

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Major Haley E. Mercer

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Command and General Staff College
ATTN: ATZL-SWD-GD
Fort Leavenworth, KS 66027-2301

8. PERFORMING ORG REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Advanced Military Studies Program

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution is Unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Through historical analysis and the development of a subterranean typology, this study provides the operational planner with a better understanding of the operational implications of a subterranean fight. It allows the operational level planner to better understand the operating environment, estimate the enemy's capabilities, and provide the combatant commander with more suitable options. The subterranean threat is not an army problem, but a defense problem requiring combined resources and assets at all echelons. However, physical effects are only cogent when they are followed by deliberate cognitive design and virtual shaping effects. The United States must reshape their mental model and reframe the problem to shape the deep fight against an enemy whose subterranean networks make them impervious to our traditional, lethal, deep-fires effects. The answer to the subterranean threat is not in the next technological or tactical solution, rather in the operational artist's creative thinking and ability to reframe the problem, apply systematic thinking, and provide better solutions to the commander.

15. SUBJECT TERMS
Subterranean Operations, Operational Typology, Surprise, Operational Art, Shaping the Deep Fight, Large-Scale Combat Operations, World War I, World War II, Vietnam War, North Korea, Hamas, ISIS

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
					Haley E. Mercer
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. PHONE NUMBER** *(include area code)*
(U)	(U)	(U)	(U)	48	

Monograph Approval Page

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Monograph Title: Shaping the *Deep* Fight: Operational Implications for the 21st Century Subterranean Conflict

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Abstract

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Over time, underground warfare continues to maintain its allure in conflict as combatants seek a competitive edge over their opponent. Currently, most US doctrine addressing the subterranean environment is from a tactical perspective, focusing on technology, techniques, and procedures to combat a subterranean threat. Understanding subterranean operations remains critical as the United States endeavors to understand themselves, its enemies, and the future environment while preserving the American way of life.

Through historical analysis and the development of a subterranean typology, this study provides the operational planner with a better understanding of the operational implications of a subterranean fight. This understanding is critical to the success of the United States in large scale combat operations. It will allow the operational level planner to better understand the operating environment, estimate the enemy's capabilities, and provide the combatant commander with more suitable options for success. The subterranean threat is not an army problem, rather a defense problem requiring combined resources and assets at all echelons. However, physical effects are only cogent when they are followed by deliberate cognitive design and virtual shaping effects. At the operational level, the United States must reshape their mental model and reframe the problem in order to shape the deep fight against an enemy whose subterranean networks make them impervious to our traditional, lethal, deep-fires effects. While still an important facet, the answer to the subterranean threat is not in the next technological advancement or tactical solution, rather it is in the operational artist's creative and critical thinking and ability to reframe the problem, apply systematic thinking, and provide better solutions to the commander.

Acknowledgements

Most importantly, I would like to thank my husband, Jake Lohr for his grace, understanding, and support throughout this time consuming and arduous process. Your constant love and support never go unnoticed. To my children, John Michael and Hannah Grace, thank you for your constant display of pure joy and reminder of life's true blessings. I would like to thank Dr. Jacob Stoil for his professional guidance, direction, and humor as my monograph evolved. I would also like to thank Colonel David Meyer for his mentorship and commitment to the profession. I could not ask for a better seminar leader to guide me through the past year. Finally, I would like to thank the staff and faculty at the School of Advanced Military Studies for the countless development opportunities, as well as the supportive staff at the Combined Arms Research Library for their research assistance. True success is always a team effort.

Acronyms

A2AD	Anti-Access Aerial Denial
AAR	After Action Review
ADRP	Army Doctrine Reference Publication
DMZ	Demilitarization Zone
FM	Field Manual
IDP	Internally Displaced Person
IED	Improvised Explosive Device
IDF	Israeli Defense Force
OPT	Operational Planning Team
ROE	Rules of Engagement
TC	Training Circular
ISIS	Islamic State in Iraq and Syria
US	United States
WWI	World War I
WWII	World War II

Illustrations

Introduction

> No matter how clearly one thinks, it is impossible to anticipate precisely the character of future conflicts. The key is to not be so far off the mark that it becomes impossible to adjust once the character is revealed.
>
> —Sir Michael Howard

The operational planning team (OPT) gathers in a windowless sultry room conceptualizing the operational approach for the next critical phase of the campaign. However, this operating environment is so complex and ambiguous that experience and mental models are useless. It is strikingly clear where they are going, there are no maps, GPS does not work, deep fires are ineffective, operational reach is problematic, and there are severe limitations to communication. Meanwhile, the incalculable enemy anxiously awaits the arrival of their next victim. Welcome to the underground, your future operating environment.

To some, the solution to the subsurface problem lies at the tactical level of war. In 2017, the US Army allocated $572 million into training and equipping active duty brigades to fight in large scale subterranean facilities.[1] While tactical training and equipping is important, the deeper and more perilous threat of the subterranean domain lies at the operational level of war and the ability to effectively design, plan, and execute operations to meet strategic objects while avoiding unintended culmination. Tactical success does not equate to an operational victory. Ignorance of the operational implications of the subterranean domain results in tragic strategic and tactical failures.

From the beginning of recorded history, combatants routinely strove to exploit enemy vulnerabilities to gain a competitive edge over their opponent. The subsurface continues to offer multiple opportunities to gain and maintain an advantage while minimizing the effects of lethal weapons. In 396 BC, the Roman Republic demolished the city of Veii by exploiting the

[1] Matthew Cox, "Army Is Spending Half a Billion to Train Soldiers to Fight Underground," *Military.Com*, last modified June 24, 2018, accessed August 30, 2018, https://www.military.com/daily-news/2018/06/24/army-spending-half-billion-train-troops-fight-underground.html.

underground. With an innovative idea and tenacious will, the Roman Commander, Camillus, organized his army into four different groups to tunnel underneath the city, leverage the element of surprise, destroy the city's defenders, and seize the city of Veii.[2] This effort brought the Romans one step closer to becoming a supreme power in the Mediterranean. Over 2,000 years later, subterranean operations continue to evolve, increasing the ambiguity and lethality of the modern battlefield. While the subterranean domain presents many complicated and challenging tactical problems, it is the complex operational challenges that pose the greatest threats to the US military.

As the US Army transitions its focus to the conduct of large-scale combat operations against a peer threat, current doctrine references five operational domains, land, maritime, air, space, and cyber. Subterranean operations reside within the land domain, yet US Army doctrine often minimizes its importance and capabilities at the operational level. The subterranean threat is greater than a tactical level, land component threat, found beneath mega cities. It is a complex, joint force, operational problem requiring a different cognitive framework to combat a threat that effectively exploits the subterranean domain. Most current US doctrine is from a tactical perspective, focusing on technology, techniques, and procedures while ignoring the operational and strategic implications. At the operational level, combating a subterranean threat contradicts all commonly used mental models, planning considerations, and time horizons. Overall, the political, military, legal, and historical fields have also neglected to analyze the operational implications of subterranean operations on the outcome of conflict. Understanding subterranean operations remains critical as the United States endeavors to understand themselves, its enemies, and the environment while preserving the American way of life.

[2] Andrew Knighton, "Underground Warfare: Great Military Mines From Ancient Times To World War One," *War History Online*, November 15, 2016, accessed November 1, 2018, https://www.warhistoryonline.com/history/6-great-military-mines.html.

North Korea and Russia, in addition to their numerical superiority and artillery range overmatch, have vastly more experience with subterranean operations. They maintain a robust underground network to enhance their ground combat operations and mitigate the lethal effects of their adversaries. According to US Army Training Circular 3-21.50, *Small Unit Training in Subterranean Environments*, North Korea can currently accommodate the transport of 30,000 heavily armed troops per hour via underground networks in an effort to enter Seoul undetected.[3] Additionally, Russia is postured to employ intricate underground networks inherited from the Soviet era to gain an advantage. Furthermore, ISIS and other terrorist organizations continue to bolster their ideology, capabilities, project lethality, evade capture, and threaten western democracy through the vast underground world.[4] Historical examples from across the globe demonstrate the potential for an adversary to exploit the subterranean domain against their enemy. Throughout the conflicts and regions of World War I, World War II, The Vietnam War, North Korea, Gaza-Egypt, and Iraq, underground operations have significantly bolstered an adversary's capabilities. Subterranean operations provide a belligerent with the ability to move resources and personal undetected while extending their mobility and lines of communication. Tunnels can also provide discreet basing, lodgment, and protection. Most importantly, the subterranean domain allows a belligerent to maximize the element of surprise against their adversary.

Underground warfare continues to appear in all major military conflicts around the globe. Yet, the United States has minimal experience combating underground threats and places little emphasis on the importance of underground warfare. This lack of focus has resulted in an anemic doctrine, few recent historical studies, inadequate literature, and inadequate mental models to

[3] Korean Overseas Information Service, *Secret Tunnel Under Panmunjom: North Korea's Third Invasion Passage Discovered* (Seoul, Republic of Korea, 1978), 15.

[4] US Department of the Army, *Training Circular 3-21.50*, *Small Unit Training in Subterranean Environments* (Washington, DC: Government Printing Office, November 2017), 5.

prepare the United States to combat a threat that has countless years of underground experience and capability.

The purpose of this monograph is to explore subterranean operations at the operational level. Through the research and analysis of primary and secondary sources, the project develops a typology of subterranean operations to answer the following research question. At the operational level, the US Army needs to reframe planning considerations in preparation for combat against an enemy that excels in subterranean operations.

Understanding the operational implications of a subterranean fight is critical to the success of the United States in large scale combat operations. It allows the operational level planner to better understand the operating environment, estimate the enemy's capabilities, and provide the combatant commander with more suitable options for success. Understanding the operational level implications also supports the decision of a tactician and strategic policy maker. This analysis also aids other researchers in understanding the full spectrum of the land domain, to include subterranean operations.

There are several key terms which appear throughout the monograph. The term operational level reflects the current definition in Field Manual 3-0, *Operations*. "The operational level links the tactical employment of forces to national and military strategic objectives, with the focus being on the design, planning, and execution of operations using operational art."[5] The term operational art reflects the definition in the Army Doctrine Reference Publication 3-0, *Operations*. Operational art is the "pursuit of strategic objectives, in whole or in part, through the arrangement of tactical actions in time, space, and purpose."[6] This monograph also employs several elements of operational art to analyze the operational implications of subterranean operation within large scale combat operations. Those terms include operational reach, tempo,

[5] US Army, *FM 3-0* (2017), 1-5.

[6] US Department of the Army, *Army Doctrine Reference Publication (ADRP) 3-0, Operations* (Washington, DC: Government Printing Office, 2016), 2-1.

and risk. Operational reach refers to the ability to achieve successes through the balance of endurance, momentum and protection by extending and projected combat while avoiding culmination.[7] Tempo is the relative speed and rhythm of military operations over time with respect to the enemy.[8] Finally, risk is defined as the probability or severity of loss linked to a hazard.[9]

At the operational level, the US Army needs to reframe common planning considerations in preparation for combat against a threat that excels in subterranean operations. At the division and corps level, the US Army must reconsider effective processes for shaping the deep fight against an enemy abroad with an existing mature subterranean network and experience. The US Army must consider opportunities that exist by integrating friendly subterranean networks. Also, the US Army must delineate three dimensional operational boundaries when facing an enemy that conducts subterranean operations. Finally, the US Army must relook the continuum of acceptable rules of engagement when facing a belligerent that employs the subterranean domain.

Most current and historical studies on subterranean operations focus on the tactical level of subterranean operations within combat. This monograph focuses specifically on subterranean operations within the operational level of war to allow the operational level planner to better understand the environment, estimate the enemy's capabilities, and provide the commander with more suitable options for success.

The first phase of research examines several different historical examples of subterranean operations including: the WWI offensive tunnel mining, WWII and the integration of tunnels in the Pacific, the Viet Cong fight in Cu Chi, Vietnam, the North Korean underground cross boarder operations, the Israeli fight against Hamas, and ISIS terrorist operations in Iraq.

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[7] US Army, *ADRP 3-0* (2016), 2-9.

[8] Ibid., 2-7.

[9] Ibid., 2-10.

Having examined each case individually to understand the dynamics of subterranean operations in each, the project proceeds with a cross-analysis of these cases. By analyzing the cases together, commonalities surface across time and space. The comparative analysis of the different cases provides a typology on which this project develops its recommendations and conclusions.

The criteria include a trend analysis of subterranean operations in combat. Using current US Army doctrine, the project applies elements of operational art to determine the effectiveness of the different types of subterranean operations. It then summarizes impactful operational implications for the US Army as they prepare for large scale conflict against an enemy that excels in the subterranean environment.

The conclusions of this study highlight the key considerations for planning operations against an enemy experienced in subterranean operations. Through this analysis, the study develops a set of related, but distinct categories across a broad spectrum of subterranean operations. These build into recommendations for US Army operational planners to enhance their planning capabilities in preparation to combat an enemy that excels in subterranean operations. In addition, it proposes recommendations for shaping the deep fight against an enemy that may be impervious to US lethal effects.

Historical Analysis

World War I: Messines Ridge

The British sappers and tunnellers from Sir Herbert Plumer's Second Army in World War I (WWI) transformed the normal science of offensive mining operations from the fortress to the open maneuver battlefield, creating a paradigm shift in the use of subterranean operations. Operationally, offensive mining allowed British forces to disrupt the German enemy on an extended front to achieve results increasing mobility and tempo while minimizing the risks to the mission and forces on the ground.

On 7 June 1917, during the Third Battle of Ypres, the British Second Army executed the largest mining attack in history through the tunneling and detonation of Messines Ridge. When the British attacked the German controlled ridgeline of Ypres Salient, they simultaneously detonated the largest quantity of underground explosives ever used up until that point, instantly killing over 10,000 German soldiers.[10] Leveraging the offensive characteristic of surprise, the British Second Army tunnellers of Messines Ridge demonstrated the effectiveness of integrating subterranean operations into a simple offensive that enhanced their offensive posture and protection against German fires.

On Messines Ridge, the British emplaced nineteen mines at predetermined locations along a nearly 9,000-meter ridgeline. Figure 3 below depicts the location of the mines on the German occupied ridge with the corresponding explosive weight.

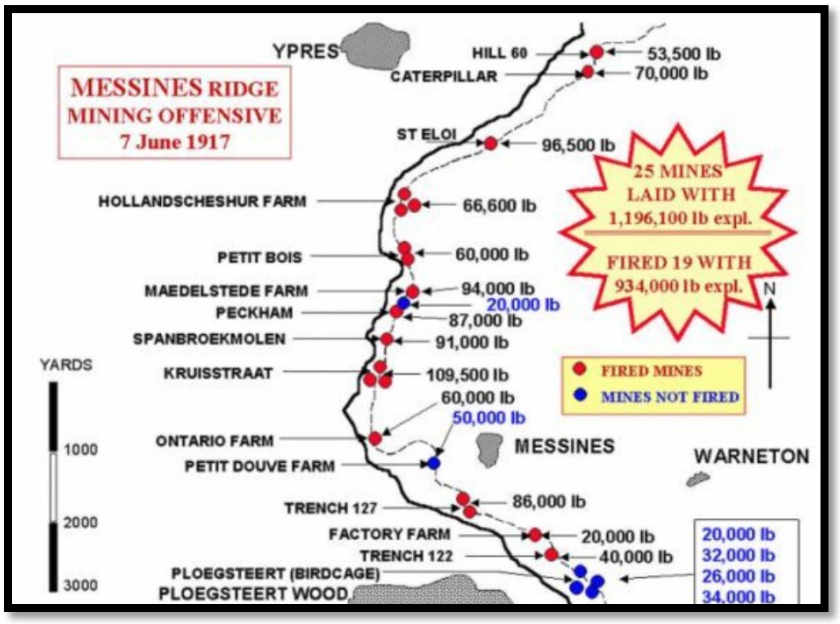

Figure 1. Messines Ridge Mining Offensive. *Source: Thursday 7 June 1917 – We Lost 3,888, Great War Lives Lost*, June 6, 2017, accessed September 20, 2018, https://greatwarliveslost.com/2017/06/06/thursday-7-june-1917-we-lost-3888/.

[10] Simon Jones, *Underground Warfare 1914-1918* (Barnsley: Pen & Sword Military, 2010), 145.

At “zero hour” nineteen mines accounting for almost 1,000,000 pounds of high explosive detonated simultaneously.[11] The explosion reverberated for miles in to the distance. Single charges ranged anywhere from 20,000 pounds to 109,500 pounds. The initial explosion served the critical purpose of destruction, shock, surprise, and set the conditions for the follow-on infantry assault. The integration of warfighting functions to include fire, movement and maneuver, and sustainment, permitted increased mobility and tempo post blast against the Germans.[12] As a result of the British subterranean offensive, the Germans retreated for almost one mile on the mine scattered front, and the initial objectives of the British were captured with minimal casualties.[13] Unlike most WWI offensives, which often failed from the onset, this mining operation allowed the British to achieve surprise through a simple offensive attack and achieve their objectives with minimal losses.

In one year, the British conducted 750 subterranean offensive mining attacks, altering the geography of the western theater and forever expanding the capabilities of subterranean warfare.[14] In the conduct of WWI offensive operations, subterranean mining played a key role in enhancing offensive operations and limited visibility raids.[15] The British attack on Messines Ridge and other similar offensives used mining operations to achieve surprise and increase the probability of success in subsequent stages of operations.[16] British tunnellers minimized detection by using small tunnels dug out and under the German defensive positions. Mining operations

[11] Trounce, *Fighting the Boche Underground*, 9.

[12] Jones, *Underground Warfare 1914-1918*, 254.

[13] Trounce, *Fighting the Boche Underground*, 10.

[14] Daphné Richemond-Barak, *Underground Warfare* (New York, NY: Oxford University Press, 2018), 5.

[15] H. D. Trounce, *Fighting the Boche Underground* (New York, New York: Charles Scribner’s Sons, 1918), 9.

[16] Jones, *Underground Warfare 1914-1918*, 162.

were particularly effective for destroying the enemy in place, gathering intelligence, or conducting surprise attacks.[17]

Massed subterranean explosives served the purpose of destroying enemy trenches and creating tactical and operational shock. Enemy soldiers suffering from the debilitating effects of the explosion had a diminished capacity to organize an effective defense.[18] This shock greatly inhibited both their physical and psychological responses and severely impaired cognitive thought. As a result, enemy resistance was uncoordinated, ineffective, and quickly collapsed.[19]

The Messines Ridge detonation and similar operations created a host of questions that left operational artists and planning staffs searching for immediate answers. At the operational level, the attacker had the ability to disrupt the enemy on a massive front and achieve results before the enemy could respond. This rapid offensive tempo left the enemy little time to refit and shore up defenses, adding yet another operational dilemma.[20] Operational planners lacked the training, equipment, and more importantly, the knowledge necessary to develop effective answers to the problems of mining. Staffs applied an outmoded thought process to a revolutionary problem set. Planning staffs misunderstood geological strata and water levels, leaving them shy of a solution to a problem they did not fully understand while soldiers on the battlefield continued to waste in large numbers.[21] Eventually, counter tunneling surfaced as a response to offensive tunnel mining.

Subterranean operations in WWI also served the purpose of protection. Massive industrial production combined with technological innovation created a highly lethal battlefield.

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[17] Alexander Barrie, *War Underground: The Tunnellers of the Great War* (Staplehurst: Spellmount, 2000), 30.

[18] Sean McLachlan and Charles River, *Underground Warfare in Wold War I: The History and Legacy of the Fighting Beneath the Trenches* (Ann Arbor, MI: Charles River Editors, 2017), 25.

[19] Shimon Naveh, *In Pursuit of Military Excellence: The Evolution of Operational Theory*, The Cummings Center series 7 (Portland, OR: Frank Cass, 1997), 16.

[20] US Army, *ADRP 3-90* (2012), 3-3.

[21] Jones, *Underground Warfare 1914-1918*, 28.

On the deadliest day of battle, the British suffered nearly 60,000 casualties in a single day.[22] World War I is a prime example of rapidly developing technology quickly deployed onto the battlefield while belligerents struggled to develop effective doctrines to counter these new technologies. The emergence of aircraft, tanks, and rapid-fire artillery revolutionized the modern battlefield. Unlike the Napoleonic era, deploying troops along a vast open front did not bode well in era of advancing weaponry.[23] Throughout the war, tens of millions of artillery shells and hundreds of millions of bullets decimated soldiers as they advanced across "No Man's Land."[24] German author, Erich Remarque describes the WWI Western Front as a display of the horrors of the world.[25] In August and September 1914, belligerents engaged in a war of movement in accordance with their doctrines that placed primacy on the offensive. Countless trenches and barbed wire obstacles emerged as a method to survive and slow the enemy's advance. It also proved extremely costly to defeat with artillery and infantry attacks. Within weeks, the underground came alive with sapping and mining attacks.[26] The most useful weapon was no longer the howitzer, the machine gun, or the rifle, but the humble spade.[27]

The British Second Army tunnellers of Messines Ridge employed the offensive characteristic of surprise to seize key terrain by integrating subterranean operations. Furthermore, this enhanced their offensive posture and protection against German fires. The tunnel mining operations on Messines Ridge resulted in the death of over 10,000 German soldiers and countless

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[22] "World War I - Killed, Wounded, and Missing, Britannica.com, accessed November 10, 2018, https://www.britannica.com/event/World-War-I/Killed-wounded-and-missing.

[23] Bill Rawling, *Surviving Trench Warfare: Technology and the Canadian Corps, 1914-1918* (Buffalo: University of Toronto Press, 1992), 3.

[24] McLachlan and River, *Underground Warfare in Wold War I: The History and Legacy of the Fighting Beneath the Trenches*, 1.

[25] Rawling, *Surviving Trench Warfare*, 4.

[26] Jones, *Underground Warfare 1914-1918*, 29.

[27] Grant Grieve and Bernard Newman, *Tunnellers* (Great Britain: Wyman & Sons Ltd., London, 1936), 23.

others rendered physically and mentally ineffective.[28] Following the tunneling attack on Messines Ridge, German soldiers suffered mental strain from the mere suspicion that a tunnel mine might be below them.[29] Numerous German sources attest to the psychological and physical toll that tunnel operations exacted on soldiers.[30] The sophistication, complexity, and expanded purpose of underground warfare continued to advance throughout the inter-war period and reemerged again in WWII in the Pacific theater as a dominant threat.

Offensive tunnel mining forever altered the mental models of the operational planners in WWI. Effecting the enemy on an extended front from the subsurface was now a reality. Massing effects at decisive points was now more lethal than ever before. The British Second Army created a paradigm shift in the use of subterranean operations increasing operational tempo and extending operational reach while avoiding culmination and minimizing risks.

World War II: Japanese in the Pacific

Most battles of World War II (WWII) occurred as large-scale operations, with large armies, operating over open terrain. However, battles on the islands of the Pacific were much different. The topography varied from island to island ranging from the rock covered mountains of Iwo Jima to dense jungle canopies on New Guinea. Advancing forces measured progress in inches as they tried to overcome an enemy entrenched deep inside elaborate tunnel networks.

The Japanese integration of subterranean operations were more diverse and advanced, than those of WWI. They exploited the advantages provided by both naturally and man-made underground structures to mitigate US force strength and capabilities.[31] They keenly understood the operational problem of space in three dimensions. Due to limited depth on the horizontal plane, the Japanese exploited the vertical plane and dug deep into the earth's surface to create a

[28] Richemond-Barak, *Underground Warfare*, 6.

[29] Trounce, *Fighting the Boche Underground*, 11.

[30] Jones, *Underground Warfare 1914-1918*, 162.

[31] Richemond-Barak, *Underground Warfare*, 8.

literal “defense-in-depth.” Emphasizing the element of surprise, the Japanese defenders attempted to retain the islands of Peleliu and Okinawa through subterranean operations enhancing their defense-in-depth and providing protection against the advancing US land forces.

The battles that occurred between the 1st Marine Division and the Japanese 14th Infantry Division on the Pacific island of Peleliu clearly displayed the evolving Japanese defensive doctrine. To avoid American firepower, the Japanese abandoned their traditional defensive tactics and opted for a defense that heavily employed subterranean operations. The advancing marines faced a perfectly constructed defense-in-depth where the front line consumed the entire beach front.[32] The Japanese placed their defensive positions on reverse slopes and in locations screened to the front by higher ground.[33]

Their defense-in-depth formed a complex set of mutually supporting and fortified subterranean positions including caves and pill boxes occupied by one and up to a hundred Japanese defenders.[34] The Japanese selected secondary defensive positions to provide depth and extend their defense deep into the interior of the island. The secondary positions covered other defensive positions, movement routes, key terrain, and dead space not covered by the primary positions. This Japanese style of defense severely degraded the tempo of the advancing 1st Marine Division.[35] While the marines were successful in controlling the airfield on Peleliu, which further extended the operational reach of the United States in the Pacific, it was not without significant bloodshed. In the seventy-day fight on the small Pacific Island of Peleliu, the Japanese 14th

[32] E. B. Sledge, *With the Old Breed, at Peleliu and Okinawa* (New York: Oxford University Press, 1990), 53.

[33] Gordon L. Rottman and Ian Palmer, *Japanese Pacific Island Defenses 1941-45*, Fortress 1 (Oxford: Osprey, 2003), 19.

[34] Sledge, *With the Old Breed, at Peleliu and Okinawa*, 53.

[35] Rottman and Palmer, *Japanese Pacific Island Defenses 1941-45*, 15.

Infantry Division lost over 10,000 men and inflicted 6,526 casualties on the 1st Marine Division and another 3,278 casualties on the Army's 81st Infantry Division.[36]

The Japanese defense of Okinawa employed similar tactics to that of Peleliu, yet on a much larger scale. The island of Okinawa was sixty miles long and eighteen miles wide with a central mountain ridgeline peaking at 1,500 feet in elevation.[37] Due to the limited battlefield depth that the beaches provided, the Japanese viewed the battlespace in three dimensions and expanded the effectiveness of their defense-in-depth through literal depth within the subsurface. The Japanese learned from their defeat at Peleliu and refined their underground defense-in-depth methods. The men of the 32nd Japanese Army prepared a network of mutually supporting positions linked by a system of protected tunnels to absorb the assault of the advancing US 10th Army.[38] COL E.S. Johnston reported, in an US Army AAR dated, 28 August 1945, "the continued development and improvement of cave warfare was the most outstanding feature of the enemy's tactics in Okinawa."[39] Weeks before the United States landed on Okinawa, the senior staff officer of the 32nd Japanese Army, Colonel Hiromichi Yahara, informed his leaders, "the key factor of the upcoming battle is completion of cave fortifications. If we fail in this, we will surely lose the battle, and end up as tragic corpses under the Stars and Stripes.[40] According to US Army combat notes publish in June 1945, each dominant hill mass on Okinawa constituted a self-sustaining fortress with mutually supporting fires forming an extensive defense-in-depth. The Japanese used both forward and reverse slopes to dig underground structures connected by inner

[36] Sledge, *With the Old Breed, at Peleliu and Okinawa*, 155.

[37] Ibid., 181.

[38] Ibid., 182.

[39] E. S. Johnston, Headquarters Army Ground Forces, Army War College, *Information on Japanese Defensive Installations and Tactics on Okinawa, 28 August 1945,* report 1569-45, Ike Skelton Combined Arms Research Library, Fort Leavenworth, KS, 4.

[40] Hiromichi Yahara and Frank Gibney, *The Battle for Okinawa* (New York: J. Wiley, 1995), 184.

communication tunnels.[41] While the Marines fought to clear each Japanese defensive position, their efforts held only momentary success. At night, the Japanese reoccupied defensive fighting positions and postured themselves to fight again at first light.[42] Now, the Marines faced another operational dilemma. Colonel Hiromichi Yahara stated that his Japanese soldiers "remained quietly in their caves while they took the fire of enemy barrages. When the enemy guns stopped firing, our men dashed from their caves and engaged the enemy in hand-to hand fighting."[43] Their operational approach was simple, leverage their fortifications and wage a war of attrition.

According to ADRP 3-90, the element of protection preserves a unit's capabilities so that the commander can use those capabilities to apply maximum combat power at the desired time and space.[44] Although the Japanese understood the terrain better than their adversary, they lacked firepower. Their use of underground caves and networks allowed the Japanese to mitigate the United States advantage in artillery, naval bombardment, and aerial attacks while maximizing their only possible tactical advantage over the advancing US forces. The Japanese understood United States tactics and remained hidden in pillboxes, bunkers, bomb shelters, caves, tunnels, and trenches patiently waiting to attack the advancing marines. Most of the Japanese subterranean defensive positions survived the massive US bombardments inflicted minimal damage to the protected Japanese soldiers.[45] An AAR published by the assistant G-2 of the US Island Command, Peleliu in July 1945 acknowledges that the Japanese caves can withstand our superior firepower and flame thrower attacks. In a later statement he cautioned, "we cannot depend on naval and aerial bombardment or field artillery to dislodge him from his prepared position but

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[41] G-3 Section, Headquarters 6th Army Chief of Staff, *Combat Notes 8 June 1945*, Ike Skelton Combined Arms Research Library, Fort Leavenworth, KS, 32.

[42] Rottman and Palmer, *Japanese Pacific Island Defenses 1941-45*, 53.

[43] Yahara and Gibney, *The Battle for Okinawa*, 60.

[44] US Department of the Army, *Army Doctrine Reference Publication (ADRP) 3-90*, *Offense and Defense* (Washington, DC: Government Printing Office, 2012), 4-20.

[45] Rottman and Palmer, *Japanese Pacific Island Defenses 1941-45*, 53.

will have to assault and reduce them one by one."[46] The underground not only provided protection for the Japanese, but it also provided protection for their weapon systems and supply depots. This technique made it extremely difficult for US intelligence and advancing forces to distinguish enemy strength and capabilities until Japanese revealed themselves in an offensive attack.

Between 1 April and 21 June 1945, supported by subterranean networks, the Japanese inflicted 14,191 causalities on the US 1st Marine Division and expanded the effective purpose of subterranean operations.[47] Similar to WWI, subterranean operations in WWII were again employed against combatants between two belligerent state actors. Yet, the purpose of the underground was no longer employed for offensive mining, but an intricate defense-in-depth and protection.

Vietnam War: Vietcong in Cu Chi

From maternity wards to movie theaters and weapons caches, the Vietcong and Vietnamese citizens leveraged the capabilities of the underground. Motivated out of the need for protection, the tunnels in Vietnam supplied the combatants and non-combatants the necessities of life. They transformed the underground into kitchens, hospitals, entertainment centers, dormitories, munition factories, and of most importance, facilities to maintain an enduring fight against the Americans.[48] Some vast underground networks contained enough provisions to allow the Vietcong to reside underground for up to five years.[49] Many of the early tunnels were dug by the Viet Minh nationalist guerrillas engaged in an anticolonial struggle against France.[50] The

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[46] W. C. Phelan, Headquarters United States Navy Island Command, *After Action Report, Peleliu Japanese Military Caves on Peleliu: Know Your Enemy, 23 July 1945*, Ike Skelton Combined Arms Research Library, Fort Leavenworth, KS, 42.

[47] Sledge, *With the Old Breed, at Peleliu and Okinawa*, 312.

[48] Tom Mangold and John Penycate, *Tunnel Warfare*, Illustrated history of the Vietnam War (Toronto ; New York: Bantam Books, 1987), 43.

[49] Ibid., Introduction.

[50] Richemond-Barak, *Underground Warfare*, 10.

Vietnamese improved and expanded the existing tunnels throughout the 1960's digging over 130 miles of underground passages within the Cu Chi district.[51] The intricacies and sophistication of the Vietnamese underground efforts brought new meaning to the capabilities of subterranean operations. Ultimately, the underground networks provided the Vietnamese the ability to contend with superior military power leveraging both defensive and offensive capabilities of the subterranean domain. Capitalizing on the element of surprise, the Vietnamese in South Vietnam transformed the Cu Chi district into a Communist redoubt and lifeline for Vietcong guerrillas providing mobility, basing, and protection against the advancing US ground forces. In the words of Sun Tzu, "war is based on deception."[52] For the Vietnamese, necessity drove their dedication to deception through subterranean operations. Their strategy demanded it, the soil allowed it, and history encouraged it.[53]

The Phu My Hung tunnel complex was the most sophisticated and largest underground network in Vietnam, located within the Cu Chi district of South Vietnam.[54] The Cu Chi district became a symbol of endurance as the Vietnamese tried to achieve Ho Chi Minh's political aim of freedom and independence.[55] Connecting the main land and river lines of communication into Saigon and providing supply routes from Cambodia, the Cu Chi city held strategic importance.[56] On 24 September 1976, a Korean detachment from the 28th Infantry Regiment discovered the Viet Cong "Tunnel" manual that detailed the primary purpose and role of their tunnel networks. The underlying purpose of the underground networks were "for strengthening combat vitality of their villages. They also provide more safety for their political and armed units, and for the

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[51] Richemond-Barak, *Underground Warfare*, 11.

[52] Sunzi and Samuel B. Griffith, *The Illustrated Art of War* (New York: Oxford University Press, 2005), 161.

[53] Tom Mangold and John Penycate, *The Tunnels of Cu Chi* (New York: Berkley Publ., 1997), 55.

[54] Mangold and Penycate, *Tunnel Warfare*, 17.

[55] Mangold and Penycate, *The Tunnels of Cu Chi*, 17.

[56] Ibid., 18.

masses as well. But their sheltering purpose is only significant when they serve our soldiers in combat activities."[57]

According to FM 3-0, *Operations*, mobility and the freedom of maneuver are essential to the application of combat power and achieving results across the range of military operations.[58] Successful mobility allows a unit to secure and defend a lodgment, develop support infrastructure and base camps, and build combat power. The tunnels of Cu Chi supplied the Vietnamese all the attributes of enhanced mobility and extended lines of communication described in FM 3-0.

In an AAR written by US Army Military Assistance Command, Vietnam, they describe the Cu Chi tunnel networks as multileveled, with storage and hiding rooms. Tunnel entrances were superbly camouflaged, including concealed trapdoors and secondary tunnels. The main tunnel lengths were 700 meters, with the longest straight stretch ranging from one to ten meters in length. There were fifty-foot side tunnels, or offshoots, located about every fifty meters. The average tunnel size was two feet wide and two and a half feet high. Each tunnel employed the use of air or water locks which acted as firewalls preventing blast, fragments or gas from passing from one section of the tunnel complex to another.

The tunnel networks allowed the Viet Cong to move large numbers of combatants underground from one fighting complex to another undetected.[59] This provided the Viet Cong freedom of maneuver and the ability to mass effects at decisive points. Furthermore, the tunnels allowed the Viet Cong to move supplies and equipment necessary to fight the Americans. Within the Cu Chi district, each underground hamlet had a production team that constructed mines, made

[57] Mangold and Penycate, *Tunnel Warfare*, 32.

[58] US Army, *FM 3-0* (2017), 5-16, 1-23.

[59] Howard Schulze, *Vietnam Lessons Learned No. 56: Operations Against Tunnel Complexes,* (Vietnam: Headquarters US Military Assistance Command, 18 April 1966), Ike Skelton Combined Arms Research Library, Fort Leavenworth, KS, 4-5.

hand grenades, and repaired firearms. On average, one Vietnamese supporter could produce three to five mines a day.[60]

The Vietcong developed elaborate command centers. In one instance, a command center was constructed around a stolen M-48 tank buried six feet under the earth surface with operational lights, batteries, and radios.[61] United States forces struggled to keep tunnel networks cleared due to the Viet Cong's ability to discreetly reoccupy previously cleared tunnels.[62] The lines of communication and mobility afforded by the Viet Cong tunnels allowed them to capitalize on their internal endurance and wage a war of attrition against a technologically superior American force.

The underground tunnels provided all the necessary life support measures to maintain adequate basing and lodgment. Air, ventilation, sanitation, water, and cooking facilities were sufficient to maintain long-term inhabitants.[63] According to ADRP 3-0, a base camp is an evolving military facility that supports the military operations of a deployed unit and provides the necessary support and services for sustained operations.[64] The Viet Cong tunnel manual stated that the underground must provide more than just protection, they must serve as secure baseing. "As mere shelters, their greatest advantage is wasted. There must be combat posts and equipment inside the underground tunnels for providing continuous support to our troops-even if the enemy occupies the village."[65] Part of sustaining operations from the subsurface was the Viet Cong's ability to create lethal weapons out of American waste and unexploded ordinance. In one month, the American's fired over a trillion bullets, 10 million mortar rounds, and 4.8 million rockets in

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[60] Mangold and Penycate, *The Tunnels of Cu Chi*, 73.

[61] Ibid., 75.

[62] Ben Crosby, *Hole Huntin' Techniques to Detect, Neutralize and Destroy Enemy Tunnels*, (Vietnam: Headquarters US Army Military Assistance Command, 20 December 1968), Ike Skelton Combined Arms Research Library, Fort Leavenworth, KS, 1.

[63] Mangold and Penycate, *Tunnel Warfare*, 34.

[64] US Army, *ADRP 3-0* (2016), 2-6.

[65] Mangold and Penycate, *Tunnel Warfare*, 32.

the South Vietnam area of operations.[66] Much of the ordnance that fell over Cu Chi became unexploded ordinance (UXO) confiscated by the Viet Cong and refurbished as improvised explosive devices. Captain Linh, a Viet Cong officer said, "The Americans used their weapons to fight us and we used their weapons to fight back."[67] The Viet Cong stored weapons caches and munitions in the second and third subterranean levels. These levels were seldom penetrated or discovered by US forces.[68]

The underground bases also included aid stations and surgical level hospitals. Again, the Viet Cong stole most of the materials used to support the underground hospitals from the American forces. The aid stations could accommodate thirty patients and the hospitals could assist over 100 injured Vietnamese. The surgical rooms were partitioned with American T-10 parachute nylon. Doctors fabricated surgical tools out of downed helicopter parts and the plastic detonating wire on the American claymore mine was used for blood transfusions during surgeries.[69] The Cu Chi tunnels also housed the living and the dead. On some occasions, the Viet Cong would dispose of American casualties with the tunnel networks resulting in wasted United States resources as they continued to search for their war heroes. In addition, this made United States attempts at battle damage estimations extremely difficult and inaccurate, blurring any signs of success.[70] Joined under a united purpose with the civilian populace, the underground world created beneath the city of Cu Chi fueled the war above with endless sustainment resulting in perplexed American troops searching for immediate counter action.

The Vietnamese subterranean networks also provided protection against an enemy with superior firepower. What the Vietnamese lacked in technology, firepower, and aerial

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[66] Mangold and Penycate, *Tunnel Warfare*, 45.

[67] Ibid.

[68] Ibid., 46.

[69] Ibid. 53.

[70] Mangold and Penycate, *The Tunnels of Cu Chi*, 78.

bombardment, they made up with will power, psychological warfare, and skillful tactics. In the Cu Chi district, the guerrillas held the initiative. Based on their elaborate and clever operational techniques, the Viet Cong could choose the time and place of battle. The Viet Cong's technological inferiority forced them to resort to ambush, hit and run attacks, and close-in fighting.[71] The Viet Cong tunnel manual admits inferiority stating, "the enemy may be several times superior to us in strength and modern weapons, but he will not chase us from the battlefield, because we will launch surprise attacks from within the underground tunnels….we can see that underground tunnels are very favorable for armed forces as limited as ours, in strength and weaponry."[72]

While the sophisticated, multi-level, underground networks provided countless benefits, it was the individual fighting holes and hasty fighting positions that provided the Viet Cong rapid protection and the ability to capitalize on surprise attacks. According to a September 1968 AAR published by the US Military Assistance Command, Vietnam, the Viet Cong individual fighting holes provided rapid protection from fire and shelter from the elements for the occupants. A typical individual fighting hole measured 3x6x4 feet with skillful camouflage. A Viet Cong soldier would occupy an individual hole in complete silence for up to three days as they waited patiently for the best opportunity to attack advancing US forces.[73] In addition to the obvious difficulties these keenly camouflaged fighting positions placed upon the US military, it also resulted in complications of target acquisition and problems determining the type and amount of ordnance to destroy the positions.[74] Overall, the Viet Cong displayed the ability to rapidly counter

[71] Mangold and Penycate, *The Tunnels of Cu Chi*, 51.

[72] Mangold and Penycate, *Tunnel Warfare*, 32.

[73] Headquarters US Military Assistance Command, *Vietnam Lessons Learned No. 69: Analysis of Enemy Positions at Khe Sanh and Zvaluation of the Effectiveness of Weapons Systems Against Enemy Fortifications,* September 10 1968, Ike Skelton Combined Arms Research Library, Fort Leavenworth, KS, 2.

[74] Ibid., 32.

asymmetric advantages of the US military. Driven by unprecedented will and desire for survival combined with ingenious use of the underground, anything is possible.

By the end of the Vietnam War there were over 4,800 documented tunnels used by the Viet Cong.[75] According to the commander of the Viet Cong 7th Battalion, the battle in Cu Chi resulted in the loss of 12,000 guerrillas and civilians.[76] Throughout the war, the United States continued to struggle with the underground threat, and no tunnel complex could ever be completely cleared.[77] Capitalizing on the element of surprise, the Vietnamese in South Vietnam transformed the Cu Chi district into a Communist redoubt and lifeline for Vietcong guerrillas providing discreet mobility, basing, and protection against the advancing US ground forces. According to Carl von Clausewitz, "only the commander that imposes his will, can take the enemy by surprise."[78] The Vietnamese use of surprise forced US forces to live in a constant state of vigilance. In the end, will prevailed and the feeble challenged the stout in an enduring fight that resulted in permanent scars on history.

North Korea: Cross Border Operations

North Korea's military strategy against the Republic of Korea is to unify the land by communizing the South by force. Digging invasion tunnels along the entire stretch of the front line was an integral part of their military strategy aimed at conquering the Republic of Korea by force.[79] The North Koreans developed an operational approach that leveraged the element of surprise. The plan relied on a network of secret tunnels that ran under the demilitarized zone

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[75] US Department of the Army, *Training Circular (TC) 3-21.50, Small Unit Training in Subterranean Environments* (Washington, DC: Government Printing Office, 2018), 4.

[76] Mangold and Penycate, *The Tunnels of Cu Chi*, 53.

[77] Headquarters US Military Assistance Command, *Vietnam Lessons Learned No. 56: Operations Against Tunnel Complexes,* April 18 1966, Ike Skelton Combined Arms Research Library, Fort Leavenworth, KS, 13.

[78] Carl von Clausewitz, Michael Howard, and Peter Paret, *On War* (Princeton, NJ: Princeton University Press, 1976), 200.

[79] Korean Overseas Information Service, *Undermining Peace: North Korea's Infiltration Tunnels* (Seoul, Republic of Korea, 1996), 3.

(DMZ). The establishment of the DMZ was a result of the 1953 Armistice Agreement prohibiting military munitions and basing within the 155-mile zone.[80] Since the inception of the armistice, North Korea continues to disregard the statues of the agreement and has committed over 42,000 Armistice violations.[81] From 1974 to present, North Korea has dug four unauthorized tunnel networks, each with increasing sophistication and depth.[82] By utilizing subterranean operations, the North Koreans enhanced their mobility and capitalized on discreet basing and lodgment to evade their adversaries and obtain a strategic advantage.

The tunnel networks in Korea enhance the North Korean's military strategy of a quick victory in a blitzkrieg fashion by enhancing their lines of communication and mobility.[83] At the time, the first leader of North Korea, Kim Il-sung, denied the real intent behind the tunnel networks. He perpetuated the idea that the tunnels were natural cavities or abandoned mines. In 1978, he articulated their purpose as avenues for North Korean patriots in the South to escape in case of emergency.[84] Upon discovery of the fourth tunnel network in 1990, the North Korean's acknowledged ownership indicating their efforts were to "facilitate peaceful reunification" by "replacing the concrete wall."[85] According to South Korean military experts, the tunnels hold several operational purposes. First, they extend the North Korean's operational reach by allowing for the discreet and rapid movement of men and equipment. Second, they provide protection from belligerent aerial bombardment. Third, the tunnels enable a surprise attack on Seoul.[86]

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[80] Korean Overseas Information Service, *Secret Tunnel Under Panmunjom: North Korea's Third Invasion Passage Discovered* (Seoul, Republic of Korea, 1978), 3.

[81] Ibid., 31.

[82] Richemond-Barak, *Underground Warfare*, 13.

[83] Korean Overseas Information Service, *Undermining Peace,* 1.

[84] Ibid., 3.

[85] Ibid.

[86] Korean Overseas Information Service, *Secret Tunnel Under Panmunjom,* 27.

North Korean strategic leaders recognize the symbolic and practical importance of the capital. Not only does it serve as an industrial hub, but it is also a symbol of strength and legitimacy in the region. Seoul is home to twenty percent of nation's population, fifty percent of its industrial base, and 100 percent of its government.[87] The four detected tunnel networks end within proximity to the heart of Seoul. The third tunnel discovered in 1978, opens along the Munsan corridor, a direct avenue of approach to Seoul and within twenty-five miles of the city. Not surprisingly, this was a similar avenue of approach the North Korean's employed in 1950 when they advanced across the 38th parallel in a surprise offensive that constituted the first military incursion of the Cold War.[88] Each subsequent tunnel increased the North Korean's capacity to project military power. The first tunnel, detected in 1974, integrated the use of a narrow-gauge railway enhancing the North Korean's capability to transport one regiment per hour under the DMZ and into South Korea. The second tunnel, discovered in 1975, increased their capacity to two divisions per hour, plus the addition of small armored vehicles. The third and fourth tunnels, discovered in 1978 and 1990 respectively, again increased their capacity to 30,000 fully armed men per hour into South Korea.[89] While their tunnels and underground bases serve as an equalizer for lesser military capabilities, they undoubtedly offer invisibility and stealth.[90] Overall, the tunnels intend to open uncontested lines of communication, allowing infantry and commando units access to the consolidation areas of South Korea, while rapidly neutralizing the threat of large front-line units. Subsequently, the advancing North Korean forces could cut the South's logistical supply routes isolate Seoul.[91]

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[87] Korean Overseas Information Service, *Secret Tunnel Under Panmunjom,* 13.

[88] Ibid., 8.

[89] Ibid., 15.

[90] Daphne Richemond and John Spencer, "While the North Korean Nuclear Button Cools, the Threat of the Underground Lingers," Modern War Institute, August 31, 2018, accessed October 27, 2018, https://mwi.usma.edu/north-korean-nuclear-button-cools-threat-underground-lingers/.

[91] Korean Overseas Information Service, *Undermining Peace,* 1.

North Korea has the most sophisticated and elaborate underground basing and lodgment facilities in the world. The capital city of North Korea, Pyongyang is home to most of the Kim family's underground masterpieces. Buried deep within the subsurface are a vast number of defense industries, chemical and biological-weapons production, and other military and government installations.[92] Kanggye, the largest underground facility, is in Pyongyang. This facility manufactures missiles, rockets, torpedoes, antisubmarine bombs, and landmines through the diligent work of 20,000 workers.[93] By 1990, the North Korean's had constructed between 8,000 and 15,000 underground bases, factories, and installations, dug over 500 miles of subterranean networks, and employed over 500,000 people in 150 different subterranean factories impervious to direct hits and nuclear strikes.[94] They built aircraft hangers suitable for fifty to sixty fighter aircraft with the ability to accelerate underground before take-off.[95] The North Korean's construct and store over 10,600 artillery pieces underground. Additionally, 10,000 underground facilities serve the primary purpose of stockpiling food, equipment, and munitions to support a multi-domain fight unaided for at least six months. The military underground command post can assemble 100,000 people at any given time.[96]

After five years in power, North Korean's Kim Jong Un continues to evade international sanctions for his country's behavior and reinforce his authority through purges, executions, and leadership shuffles, reform fundamental freedoms, and restricting information access.[97] By utilizing subterranean operations, the North Koreans continue to enhance their mobility and

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[92] Bertil Lintner, "North Korea's Tunnels, Guns and Kimchi," Asia Sentinel, June 11, 2009, accessed December 10, 2018, https://www.asiasentinel.com/politics/north-koreas-tunnels-guns-and-kimchi/.

[93] "Kanggye - North Korean Special Weapons Facilities," Federation of American Scientists, accessed December 11, 2018, https://fas.org/nuke/guide/dprk/facility/kanggye.htm.

[94] Becker, *Rogue Regime*, 151.

[95] Ibid., 152.

[96] Ibid., 143.

[97] US Army, *TC 3-21.50* (2018), 102.

capitalize on discreet basing and lodgment to evade their adversaries and obtain a strategic advantage. Several North Korean defectors have reported that the North Korean's have constructed twenty-one infiltration tunnels under the DMZ and into South Korea.[98] To date, authorities have only found four. North Korea is not shy about perpetuating their underground tunneling skills. Their techniques and expertise have become a valuable export commodity with various acceptable payments conditional to the support of the international regime of outcasts.[99] Today, North Korea continues to threaten United States global security and the American way of life. Their subterranean networks provide the North Korean military with options that must be scrutinized at all levels of war from the tactical to the strategic level.

Hamas: Egypt-Gaza Cross Border Operations

The Gaza strip shares a border with the Mediterranean Sea to the west, Egypt to the south, and Israel to the north and east. As of 2007, a religious militant group, Hamas, gained control of the Gaza territory and methodically transformed themselves into a hybrid actor serving as both a state player and terrorist organization.[100] Due to adversarial overmatch, Hamas leverages the subterranean domain for simple offensive attacks, extending their lines of communication, and establishing discreet basing to advance their operational objectives. Thus, forcing their primary adversary, Israel, to face multiple dilemmas at the operational, and strategic levels of conflict.

Primitive tunneling in this region began in 1982 as a counter to the restrictive 1979 Israel-Egypt Peace Treaty, which divided the populated city of Rafah between Gaza and Egypt. As a result, the divided families began constructing underground tunnels connecting Gaza and

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[98] Benjamin Runkle, "Preparing for Warfare's Subterranean Future," *War on the Rocks*, 6, last modified April 16, 2015, accessed July 23, 2018, https://warontherocks.com/2015/04/preparing-for-warfares-subterranean-future/.

[99] Lintner, "North Korea's Tunnels, Guns and Kimchi."

[100] Raphael S. Cohen et al., "Lessons from Israel's Wars in Gaza," Product Page, 4, last modified 2017, accessed January 22, 2019, https://www.rand.org/pubs/research_briefs/RB9975.html.

Egypt to foster mobility and communication between extended family members.[101] Over time, the utility of the tunnels served an economic purpose with minimal detrimental effect on Israel. Residents in Egypt would sell products such as gasoline, cigarettes, drugs, construction materials, gold, car parts, and weapons for a substantial profit within the Gaza market. For example, a common Kalashnikov weapon would sell for $200 dollars within the Egyptian market and over $2,000 dollars in the Gaza black market. With a common delivery of 1,000 Kalashnikovs, a single smuggler can deliver a $1,800,000-dollar profit.[102]

When Israel withdrew from the Gaza Strip in 2005, the smuggling of goods for economic prosperity escalated into the clandestine transfer of weapons and people with criminal motives.[103] Today, Hamas controls the subterranean world that resides under the city of Rafah and connects Egypt to Gaza. Hamas occupies and patrols the tunnels twenty-four hours a day. As a result, the tunnels allow Hamas to continue their military buildup, improve their economic prosperity, bypass Israeli and Egyptian restrictions, and strengthen their political control over the Gaza Strip.[104]

According to the Israel Ministry of Foreign Affairs, the cross-border tunnels are constructed by the military component of Hamas for the purpose of conducting "terrorists attacks" on the people of Israel.[105] Hamas' strategy is simple yet effective. They hide among civilians, forcing national democratic armies to maximize their collateral damage by killing the

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[101] Jeremy M Sharp, *CSR Report for Congress: The Egypt-Gaza Border and Its Effect on Israeli-Egyptian Relations*, RL34346 (Washington, DC: US Foreign Affairs, Defense, and Trade Division, 2008), accessed September 10, 2018, http://vfp143.org/lit/Gaza/RL34346.pdf, 3.

[102] Sharp, *CSR Report for Congress,* 4.

[103] Richemond-Barak, *Underground Warfare*, 22.

[104] Intelligence and Terrorism Information Center at the Israel Intelligence Heritage & Commemoration Center, *Hamas has lately regulated the flourishing tunnel industry in the Gaza Strip. Hamas is sending a message to the media that smuggling goods from Egypt is a way of lifting the Israeli "blockade," ignoring the continued smuggling of weapons and terrorist operatives*, October 28, 2008, Ike Skelton Combined Arms Research Library, Fort Leavenworth, KS, 6.

[105] Dan Inbar, "Israel Tunnel Warfare-2015," Homeland Security Research Corporation, (2015), 4, https://homelandsecurityresearch.com/download/Israel_Tunnel_Warfare.pdf.

innocent while attempting to place lethal effects on Hamas' facilities and supporters. The atrocities are further perpetuated as the media broadcasts the loss of innocent lives lost by the democratic nation trying to put an end to a terrorist organization.[106]

Hamas is aware of their overwhelming limitations in military capabilities, technologies, resources, and manpower. In addition, they understand the values that are inherent to democratic societies and how to exploit those values to advance their strategic objectives. Supported by the vast underground tunnel network, Hamas conducts simple cross-border offensive attacks with devastating effects on Israel's sovereignty and global opinion. In 2006, Hamas employed the clandestine nature of their tunnel networks to kidnap Gilad Shalit, an Israeli Defense Force (IDF) soldier. Leveraging Israel's value of life, Hamas held Shalit ransom for five years until they finalized a prisoner negotiation deal with the IDF. Hamas agreed to Shalit's release in exchange for 1,000 Palestinian terrorists detained in IDF prison camps.[107] To Israel, the life of a soldier is priceless, and Hamas exploited Israel's intrinsic values and beliefs to advance their objectives and overall strategic vision. Today, Hamas continues to wreak havoc in Israel through simple offensive attacks to harass, kidnap, and kill IDF soldiers and innocent Israeli citizens manipulating their core values to gain the asymmetric advantage.

Hamas' extensive network provides concealed lines of communications allowing for concentrated effects at their objective target, Israel. The tunnels exist with advanced technological innovations equipped with tracks, telephone and electrical lines all tunneled deep beneath densely civilian populated areas to include schools, mosques, hospitals, and private homes.[108] Their extensive underground networks make it impossible for Israel to leverage their

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[106] Alan Dershowitz, *Terror Tunnels: The Case for Israel's Just War against Hamas*, (New York: RosettaBooks, 2014), 101.

[107] Judah Ari Gross, "Army Believes Hamas Focusing Tunnels More on Defense than Attack," accessed January 26, 2019, http://www.timesofisrael.com/army-believes-hamas-focusing-tunnels-more-on-defense-than-attack/.

[108] Dershowitz, *Terror Tunnels*, 4.

ISR (Intelligence, Surveillance, Reconnaissance) capabilities. The tunnels serve as a way to minimize the technological advantages of Israel's military while placing undetectable lethal effects on Israel.[109]

By July 2014, Hamas established thirty-two underground mobility corridors conducive to a rapid infiltration into Israeli. To avoid detection, many of these tunnels transcend 115 feet below the earth's surface. Half of these subterranean routes provided an extended operational reach of one and a half miles into the heart of Israeli territory.[110] The mobility corridors created by these subterranean networks also allow Hamas to bypass Israel's close combat zone with concentrated effects and attack their rear area or support area. The support area provides sustainment assets and headquarters command and control nodes required to execute close area operations.[111]

Hamas' selection for underground basing and lodgment is not random and supports their operational and strategic objectives. Much of their subterranean basing is located under sites deemed protected by the United Nations. One of Hamas' primary operations centers is located beneath the Shifa Hospital in Gaza City.[112] This location, a central command and control node, orchestrates the fight above. Not only is this operational center of gravity protected by the earth's depth, it protects every patient that makes up the largest medical facility in Gaza. While facing a democratic humanistic national threat, Hamas keenly exploits the tenants of *Jus in bello* forcing Israel to heed lethal action or suffer global backlash. Hamas also employs subterranean basing for their long-range fires capabilities. Hamas uses their long-range rockets to shape their tactical offensives and place harassing fires into Israeli territory. Their rockets are only exposed during

[109] Inbar, "Israel Tunnel Warfare-2015," 11.

[110] Runkle, "Preparing for Warfare's Subterranean Future," 4.

[111] US Army, *FM 3-0* (2017), 1-35.

[112] Runkle, "Preparing for Warfare's Subterranean Future," 4.

the launch phase and return immediately underground preventing the Israeli IDF detection systems to identify the rockets at the point of origin.[113]

During Operation Protective Edge, Hamas intentionally constructed tunnel entrances and exits in populated areas to further complicate Israel's efforts to destroy them. Hamas established their basing and firing positions within civilian buildings, private homes, hospitals, refugee centers, and mosques forcing Israel to maximize their undesired collateral damage.[114]

A cleared tunnel is only momentarily rendered secure. Without the permanent destruction of an entire tunnel network, dismounted tunnel exploitation is an act of futility with a high cost. Due to the systematic and interconnected nature of Hamas' tunnel networks, they also serve as a defense-in-depth mechanism. The countless entry and exit points within the tunnels allow Hamas' operatives to reinfiltrate any tunnel network rendered cleared by the IDF. In addition, Hamas' advanced tunneling technology allows them to reconstitute any partly damaged tunnel network.

In July 2014, Hamas displayed the effectiveness of their subterranean networks for defensive operations. With political, social, and economic tensions reaching its summit, Israel executed Operation Protective Edge. Israel prepared a three-phase operational approach with the stated purpose of ending Hamas' harassing rocket fire and eliminating the threat of attacks by militants tunneling under the border.[115] Phase one included shaping fires targeting Hamas' operatives, tunnels, and infrastructure. With minimal effect on the subterranean facilities and corridors, the IDF optimistically followed with an extensive ground campaign in phase two. During the ground campaign, the IDF faced insurmountable resistance, gaining minimal ground,

[113] Runkle, "Preparing for Warfare's Subterranean Future," 4.

[114] Dershowitz, *Terror Tunnels*, 98.

[115] "'War Crimes by Both Sides' in Gaza," *BBC*, June 22, 2015, sec. Middle East, accessed January 26, 2019, https://www.bbc.com/news/world-middle-east-33223365.

and forcing the withdraw of all IDF forces from Gaza. Phase three concluded the conflict with sporadic cease-fires and continued air strikes. [116]

Israel's deliberate efforts to minimize Hamas' tunnel networks and terrorist activity resulted in the loss of blood, treasure, and public support with little benefit. Not only did Hamas' tunnels accommodate their defensive needs, they also continued to serve their overall strategic objectives. For Israel, the cost of conflict far outweighed its benefits. This seven-week conflict resulted in sixty-six IDF soldier deaths, $55 million-dollar loss of infrastructure, $443 million-dollar loss of economic activity, and a devastating UN war crime allegation.[117] Due to the intentional and strategic location of Hamas' bases and command and control nodes, destruction without civilian collateral damage is a tremendous challenge. The United Nations estimates that Operation Protective Edge resulted in 2,133 Palestinian deaths and 500,000 internally displaced persons questioning the proportionality of the IDFs offensive action.[118]

Hamas continues to keenly exploit western morals and values gaining an asymmetric advantage that is difficult to counter. Hamas continues to leverage the subterranean domain to advance their operational objectives through simple offensive attacks, extending their lines of communication, and establishing discreet basing, forcing their primary adversary, Israel, to face multiple dilemmas at the operational and strategic levels of conflict. From shaping US Air-Land Battle doctrine to combating the current ISIS threat, Israel continues to provide the United States with invaluable lessons. The current fight they face with Hamas and the subterranean threat should be no different.

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[116] Raphael S. Cohen et al., "Lessons from Israel's Wars in Gaza," Product Page, 7-8, last modified 2017, accessed August 29, 2018, https://www.rand.org/pubs/research_briefs/RB9975.html.

[117] Ibid.

[118] Ibid., 8.

ISIS in Iraq

Throughout history, terrorism continues to prevail as an effective tactic. Terrorism supported by a subterranean network is not only effective, but also a difficult threat to counter. Consistent with the earlier five historical case studies, ISIS continues to seek the asymmetric advantage by leveraging the underground. The underground networks are essential to ISIS's operational objectives, allowing them to extend their lines of communication, establish basing and lodgment, and conduct simple offensive attacks while maintaining protection and detection from adversarial forces. Today, through the clandestine underground, ISIS continues to recruit, expand their network, and execute focused offensive attacks. In December 2018, an ISIS fighter stated in the New York Times, "do you think the Americans can defeat the caliphate? This is a war of attrition. We didn't leave for good. We still have our suicide bombers ready to attack and our informers are active."[119]

Similar to the tunnel mining employed in WWI on Messines Ridge, ISIS fighters carry out simple offensive attacks through rudimentary tunnel networks. These simple offensive subterranean attacks played a significant role in ISIS's control over the city of Ramadi in 2015. Over a two-month period, ISIS dug an 800-foot-long tunnel ending under the heart of the Iraqi Army headquarters. On 11 March, ISIS packed the underground with 14,000 pounds of explosives and decimated the Iraqi central command and control node killing twenty-two Iraqi Army leaders. Four days later, ISIS employed a similar technique to attack an Iraqi Security Force outpost. Two months later, Ramadi fell, and ISIS gained control.[120]

The underworld also played a significant role in the control over the fifth most populated city in Iraq, Mosul. Mosul is home to nearly two million citizens and in 2014, 10,000 ISIS

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[119] "ISIS Not Defeated, Just Hiding, Adapting: Experts," *The Straits Times*, last modified December 15, 2018, accessed February 7, 2019, https://www.straitstimes.com/world/isis-not-defeated-just-hiding-adapting-experts.

[120] "ISIS Is Using Tunnel Bombs in Iraq," *Defense One*, accessed January 31, 2019, https://www.defenseone.com/threats/2015/06/isis-using-tunnel-bombs-iraq/114730/.

fighters entrenched the underground and seized control.[121] ISIS shaped the battlefield with simple tunnel networks. Their techniques provided deadly effects on their adversary with a clandestine escape while never physically contacting the enemy. At the time, the United States and partnered Iraqi forces had no effective countering techniques leaving the United States and coalition forces at the mercy of the insurgents' ingenuity and lethality.[122]

These types of simple offensive tunneling attacks not only served their tactical objective, but they also enhanced their strategic objective through a perpetuated narrative. Because their tunneling was so effective and destructive, ISIS routinely recorded and displayed the devastation across social media and local television networks. ISIS bolstered their message of control and fear by posting videos of the carnage on YouTube and other social media websites.[123] Due to the success of their narrative, millions of dollars in hostage ransom payouts continue to fuel their terrorist organization and relentless brutality. The money enhanced recruiting through bargaining leverage in a country that provided very little.[124]

Like Hamas, ISIS is also exploiting the underground to extend their lines of communication and mobility across national boundaries. In 2013, local Iraqi authorities discovered three tunnels connecting the Iraqi al-Anbar province with the Syrian al-Kamal region. The following year, another underground cross-border complex was discovered extending four miles into Iraq from Syria.[125] ISIS entering Iraq from Syria uncontested makes the border almost

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[121] Andrew Tilghman, "Tunnel Warfare: In Mosul, the ISIS Fight Is Likely to Go Underground," *Military Times*, 1, last modified August 8, 2017, accessed February 8, 2019, https://www.militarytimes.com/news/your-military/2016/10/01/tunnel-warfare-in-mosul-the-isis-fight-is-likely-to-go-underground/.

[122] Andrew Tilghman, "Tunnel Warfare," 1.

[123] "ISIS Is Using Tunnel Bombs in Iraq," *Defense One*, accessed February 7, 2019, https://www.defenseone.com/threats/2015/06/isis-using-tunnel-bombs-iraq/114730/.

[124] Dershowitz, *Terror Tunnels*, 194.

[125] Richemond-Barak, *Underground Warfare*, 35.

obsolete.[126] With extended lines of communication connecting the two countries, ISIS can transport weapons, materials, and personnel undetected. They can establish underground basing in Syria and project lethal effects into Iraq. In addition, they can reconstitute forces and dictate a conflict tempo that aligns with their operation objectives. With ISIS's ability to traverse the underground undetected, local Iraqi forces continue to struggle to secure any city from infiltration.[127]

Within Iraq, ISIS employs subterranean tunnels for discreet interior lines of communication to gain and maintain control of major population centers. In 2016, The Iraqi counterterrorism forces discovered the most extensive underground networks beneath Mosul. The deeply buried tunnels extended over two miles in length connecting the east of Mosul to the west. The tunnels contained all the necessary amenities for prolonged inhabitation.[128] Many of the existing tunnels are extensions of Saddam Hussein's underground evasion plan. Within a six-month period, the US military conducted 600 targeting operations, 300 interrogations, and twelve raids dedicated to the capture of Saddam Hussein.[129] Each time, Saddam stayed one step in front of the US military as he traversed the underground from one safe house to another.[130] While the underground aided Saddam's evasion, it all came to an end on 13 December 2003 when he was

[126] "Taking on ISIS—and Assad," *Democracy Journal*, last modified March 14, 2016, accessed February 10, 2019, https://democracyjournal.org/magazine/40/taking-on-isis-and-assad/.

[127] Richemond-Barak, *Underground Warfare*, 35.

[128] "Iraq's Elite Counterterrorism Forces Uncover Network of ISIS Tunnels," *NBC News*, accessed February 7, 2019, https://www.nbcnews.com/storyline/isis-terror/iraqi-forces-fighting-isis-near-mosul-uncover-large-network-tunnels-n674381.

[129] "Operation Red Dawn, Saddam Hussein Captured 13 December 2003," SpecialOperations.com, last modified December 13, 2017, accessed February 11, 2019, https://specialoperations.com/32136/operation-red-dawn-saddam-hussein-captured-13-december-2003/.

[130] John F. Burns and Eric Schmitt, "The Struggle for Iraq: The Underground; As a Fugitive, Hussein Stayed Close to Home," *The New York Times*, December 21, 2003, sec. World, 6, accessed February 10, 2019, https://www.nytimes.com/2003/12/21/world/the-struggle-for-iraq-the-underground-as-a-fugitive-hussein-stayed-close-to-home.html.

captured in an hasty underground tunnel outside of Tikrit by the US Army's 4th Infantry Division and elements from Task Force 121.[131]

Subterranean operations remain a critical tactical and operational technique for ISIS within Iraq and Syria. ISIS continues to extend their lines of communication and transport their most valuable assets underground.[132] The more resistance ISIS faces above ground, the deeper they submerge themselves underground. Due to its successful nature, belligerents continue to expand the subterranean domain through diffusion of innovation across time, space and social network.[133]

The subterranean domain supplies ISIS with discrete basing to build and project combat power. In 2003, a US Marine element south of Baghdad discovered multiple underground labs, warehouses, and bomb proof offices assigned to the Iraqi Atomic Energy Agency. Many of these underground facilities emitted threatening levels of radiation and nuclear residue.[134] In addition, Iraq's counterterrorism group located one of ISIS's largest suicide car bomb factories buried deep beneath the surface outside of Mosul.[135] Underground IED factories provide ISIS with a low risk strategic advantage and protection from adversary detection and lethal effects.[136] It also allows ISIS to integrate their most critical assets amongst the protected civilian population.

In recent years, ISIS may have lost the battle on the surface, but they continue to leverage their clandestine roots and reconstitute and grow underground with the ability to reemerge again

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[131] "Operation Red Dawn, Saddam Hussein Captured 13 December 2003."

[132] "Levantine Labyrinth: Preparing for Subterranean Warfare in Iraq and Syria," *War on the Rocks*, 4, last modified May 19, 2016, accessed February 8, 2019, https://warontherocks.com/2016/05/levantine-labyrinth-preparing-for-subterranean-warfare-in-iraq-and-syria/.

[133] Richemond-Barak, *Underground Warfare*, 38–39.

[134] Robert Tanner, "Underground Operations," *The Guardian*, April 9, 2003, sec. World news, 1, accessed February 10, 2019, https://www.theguardian.com/world/2003/apr/09/iraq5.

[135] "Iraq's Elite Counterterrorism Forces Uncover Network of ISIS Tunnels."

[136] "ISIS Is Using Tunnel Bombs in Iraq."

in large scale conflict more lethal than ever before.[137] In 2016, ISIS's chief of foreign operations, Abu Muhammas Al Adnani stated, "Whoever thinks that we fight to protect some land or some authority, or that victory is measured thereby, has strayed far from the truth."[138] On the surface, ISIS operations may have dwindled, but their underground operations continue to prosper and permeate other terrorist organizations. The subterranean domain remains an essential element to ISIS's operational objectives, allowing them to extend their lines of communication, establish basing and lodgment, conduct simple offensive attacks.

Operational Typology: Understanding the Subterranean Threat

Subterranean threats continue to play a critical role in major conflicts worldwide. The purpose of subterranean use varies depending on the region, time-period, and conflict. As seen from the historical analysis, some belligerents exploit the underground to enhance their offensive capabilities, enhance protection, extend their lines of communication, and provide discreet basing and lodgment. Others employ the subsurface to minimize their vulnerabilities and strengthen their defense. Analysis of conflicts from WWI to the twenty first century Iraq war, demonstrate the versatility and persistence of the subterranean threat on the modern battlefield. The United States must understand the implications of subterranean operations as it prepares for large scale combat operations. The historical case studies provide support to a comprehensive typology of subterranean use over the last hundred years. The resulting typology categorizes subterranean use at the operational level of war.

The operational subterranean typology below in Figure 2 is a result of the analysis of belligerent's subterranean use in six different conflicts across a broad spectrum of time and space.

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[137] "'We're Entering a Very Risky Period': Experts Say ISIS Not Defeated, Just Transforming," *The Straits Times*, last modified December 14, 2018, accessed February 5, 2019, https://www.straitstimes.com/world/middle-east/were-entering-a-very-risky-period-experts-say-isis-not-defeated-just-transforming.

[138] "ISIS Guerrilla War Slows Coalition Battle in Iraq and Syria," *The National*, accessed February 7, 2019, https://www.thenational.ae/world/mena/isis-guerrilla-war-slows-coalition-battle-in-iraq-and-syria-1.761525.

From the operational analysis of each conflict, a typology ensured revealing categorial purposes of subterranean operations. The typology provides the operational planner with a better understanding of the environment and enemy allowing the commander to mitigate risk and capitalize on narrow windows of opportunity.

In the construction of tunnel networks, form follows function. At the operational level, challenges vary with complexity, level of permanence, location of construction, and non-state actor integration. Nevertheless, surprise remains the nucleus of the typology. In every instance, subterranean operations leverage the element of surprise. The advantage of surprise affords opportunities at all levels of war from the tactical to the strategic level. The element of surprise effects both the physical and the psychological components of warfare, weighing heavily on the opponents will to fight and succumb mental culmination.[139] Surprise is an element in both the art and science of war, in both the tangible and intangible. Without it, initiative against a keen enemy is often elusive.

[139] B. H. Liddell Hart, *Strategy*, 2nd ed. (New York, NY: First Signet Books, New American Library, 1974), 323.

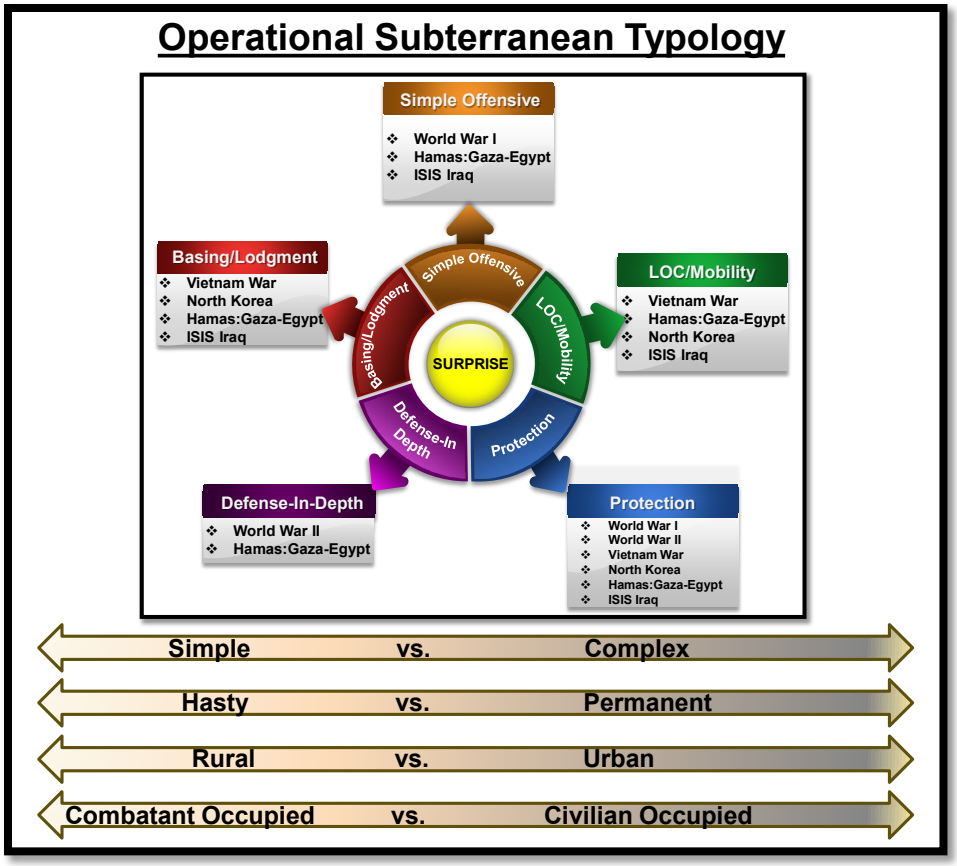

Figure 2. Operational Subterranean Typology. *Source:* MAJ Haley E. Mercer

Common Planning Considerations

The construction and complexity of underground networks often reveal the underlying purpose of the tunnel. At the operational level, challenges vary with complexity, level of permanence, location of construction, and non-state actor integration. Through the understanding of the subterranean typology, the operational military planner can better understand the environment, make assumptions about the enemy, and ultimately provide better options to the commander. Understanding the critical planning requirements begins with reframing the operational deep fight from the horizontal plane to a horizontal and vertical dimensional battlespace.

The Rules of Engagement (ROE) that justified actions in the Iraq/Afghanistan counterinsurgency fight are no longer valid against a cross-border and urban subterranean threat.

The enemy no longer provides the solider on the ground time to analyze the target and cycle the internal "shoot, don't shoot" debate. As noted in five of the six case studies above, the underground world is only possible with civilian support. The enemy relies on established civilian infrastructure to advance their operational objectives. Hospitals, churches, residential homes, and industrialized city centers serve as established bases extending the enemy's operational reach. Civilians will meet their demise as the United States projects lethal effects on the enemy. While still valid, the *jus in bello* tenants of proportionality and discrimination, and the loss of life, require a different lens against a subterranean threat. The ROE must not restrict the United States from gaining the element of surprise, seizing the initiative, and maintaining contact with the enemy across distinct boundaries in time and space. Understanding the systematic and holistic effects of offensive actions in the subterranean domain plays a significant role in operational planning.

Sustainment planning that allows for extended operational reach against a subterranean threat requires a mental framework that is in stark contrast to recent US experiences. The routine planning considerations for basing, decontamination, maintenance, causality evacuation, and transportation are no longer valid forcing new assumptions and additional risks for planning staffs and commanders.

An enemy that uses the subterranean for secure basing and lodgment challenges the US military's ability to conduct capability and damage assessments. The act of assessing the enemy's capabilities is a continuous process within US Joint planning and execution. The assessment process helps the commander by evaluating enemy capabilities, vulnerabilities, and intentions.[140] However, most of the techniques and technology used by the US joint forces are not

[140] Joint Staff, J-7, *Commander's Handbook for Assessment Planning and Execution*, Version 1.0 (Suffolk, VA: Joint and Coalition Warfighting, 2011), I-9.

effective against an enemy that buries most of its assets beneath the earth's surface. This incongruency also results in difficulties assessing enemy damage after offensive kinetic action.

An enemy that extends their subterranean lines of communications across national borders creates potential violations of sovereignty. As an operational planner, violations of sovereignty should ignite legal concerns about self-defense under international law.[141] In addition, planners must also consider the difference between sovereignty violations committed by state actors, non-state actors, and hybrid threats.

Gaining and maintaining cleared territory requires dedicated planning and significant manpower against an enemy attempting a subterranean defense-in-depth. As displayed in the conflicts of WWII in the Pacific and Hamas in Gaza, underground networks aiding in a defense-in-depth allows an enemy to discreetly reinfiltrate previously cleared territory. To stop reinfiltration, an area must either be destroyed or occupied. Due to the vast nature of most subterranean networks, the physical task of occupation far exceeds US capabilities and destruction may result in catastrophic collateral damage. This is an operational dilemma with strategic implications.

While the subterranean enemy poses new challenges, they are not insurmountable. The future threat requires the United States to leverage their adaptable chameleon qualities to reframe the problem, shape the operational environment, and prevail in large scale ground combat.

Conclusion and Recommendations

Success against a subterranean threat begins at the operational level of war. While tactical implications must be addressed, it does not solve the larger problem of effectively designing, planning, and executing operations against an enemy that leverages the subterranean domain. A lack of preparedness at the operational level results in culmination short of strategic aims.

[141] Richemond-Barak, *Underground Warfare*, 45.

Over time, underground warfare continues to maintain its allure in conflict as combatants seek a competitive edge over their opponent. Similar to quantum mechanics, no one can ever project with certainty when, where, how, and with whom the next great conflict will occur. However, with historical trends and patters, a keen operational planner can embrace the reality of complexity and make predictions that focus future combat preparations.[142]

Despite the vast historical documentation of belligerent use of IEDs in conflict, the United States sustained sixty-four percent of their combat deaths as a direct result of IEDs from 2001-2007 combating the war on terror in Iraq and Afghanistan.[143] Operationally, there are many parallels between the future subterranean threat and the IED threat that the United States faced in the Global War on Terror. To minimize the risks to mission and the risks to force, the United States must understand and prepare for the operational implications of a subterranean fight before the first soldier meets his demise from the underground.

Today, the United States is more observable, predictable, and understandable than ever before. While still a critical part of the equation, superior military strength and might is no longer the sole path to victory. Twenty-First century information technology supplies instantaneous access to cultural patterns, values, beliefs, rationalities, and motivations. Today's operational artists cannot employ archaic thinking against future threats. They must display *coup d' oeil*, seeking answers beyond the basic assessments perpetuated by past experiences, heuristics, and expertise. The United States must reshape their mental model and reframe the problem in order to shape the deep fight against an enemy whose subterranean networks make them impervious to our traditional, lethal, deep-fires effects.

Shaping the deep fight against a subterranean threat in large scale conflict needs a distinctly different approach. Figure 3 below depicts the systematic approach necessary for

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[142] Everett C Dolman, *Pure Strategy: Power and Principle in the Space and Information Age* (New York: Frank Cass, 2005), 100.

[143] Runkle, *Preparing for Warfare's Subterranean Future*, 2.

effective deep area shaping against a subterranean enemy. Step 1, cognitive design. Cognitive design is the operational planners' ability to leverage creative and critical thinking to reframe and develop a plan that address the underlying problem and not a symptom. The design process requires a non-traditional systems approach involving a holistic understanding of the relationships and connections between all actors in the system. There must be a deep understanding of what reinforces the enemy's actions and behaviors through a relational understanding of their values, desires, morals, worldview, beliefs, and language. All of this cannot be accomplished without cognitive patience and the ability to communicate understanding to others resulting in action.

The subterranean also offers opportunities for the United States. The current mental model for the United States focuses on combating an adversary's use of the subterranean domain. The United States must begin to examine the benefits of leveraging subterranean capabilities. In January 2019, the Defense Advanced Research Project Agency (DARPA) announced the initiative to expand the combined arms maneuver space to include a vertical dimension, to exploit both natural and man-made subterranean environments.[144] The United States can benefit from the same subterranean opportunities that are afforded to our adversaries. A friendly subterranean infrastructure could supply secure basing and extend operational reach within an area of conflict while minimizing exposure to the enemy. It can mitigate the logistical challenges posed by the A2AD threat and decrease vulnerability to superior concentration of enemy fires. Advancing the idea of friendly subterranean networks requires a significant reframe of the current approach to subterranean operations.

Step 2, virtual effects. According to current US Army doctrine, FM 3-0, *Operations*, Joint force commanders gain and maintain the initiative by projecting fires, employing forces, and

[144] "The U.S. Military's Next Super Weapon: Tactical Tunnels," *The National Interest,* accessed March 27, 2019, https://nationalinterest.org/blog/buzz/us-militarys-next-super-weapon-tactical-tunnels-46027.

conducting information operations.[145] Capabilities within the virtual domain are viewed as a supporting role to projecting fires and employing forces. Against a subterranean threat, virtual effects must serve a primary role with traditional physical effects in support. Shaping the deep fight through virtual effects includes all capabilities inherent within electronic warfare, artificial intelligence, and both offensive and defensive cyber actions. With nested and synchronized objectives, all of these assets provide the friendly forces with deception opportunities and narrative control to shape the deep fight prior to arrival of any physical effects. A formulated narrative can promote proactive thinking, gain public support, and deliver false information in support of a deception plan.[146]

Step 3, physical effects. Against a subterranean threat, physical effects are most effective subsequent to cognitive design and virtual effects. Some common physical effects include lethal fires, anti-access aerial denial (A2AD), counter weapons of mass destruction (CWMD), boots on ground, intelligence, surveillance, reconnaissance (ISR), and humanitarian support. The physical effects include the actionable combined arms tasks that lead to enemy destruction, exploiting opportunities, minimizing risk, and ultimately shaping the deep fight for the lower echelon elements. Countering a subterranean threat is manpower intensive, exceeding availability in any one branch of military service. The solution lies in the partnerships and relationships with the joint, interagency, and multi-national forces. The subterranean threat is not an army problem, rather a defense problem requiring combined resources and assets at all echelons. However, physical effects are only cogent when they are followed by deliberate cognitive design and virtual shaping effects.

[145] US Army, *FM 3-0* (2017), 5-1.

[146] H. Porter Abbott, *The Cambridge Introduction to Narrative*, 2nd ed., Cambridge introductions to literature (Cambridge ; New York: Cambridge University Press, 2008), 12.

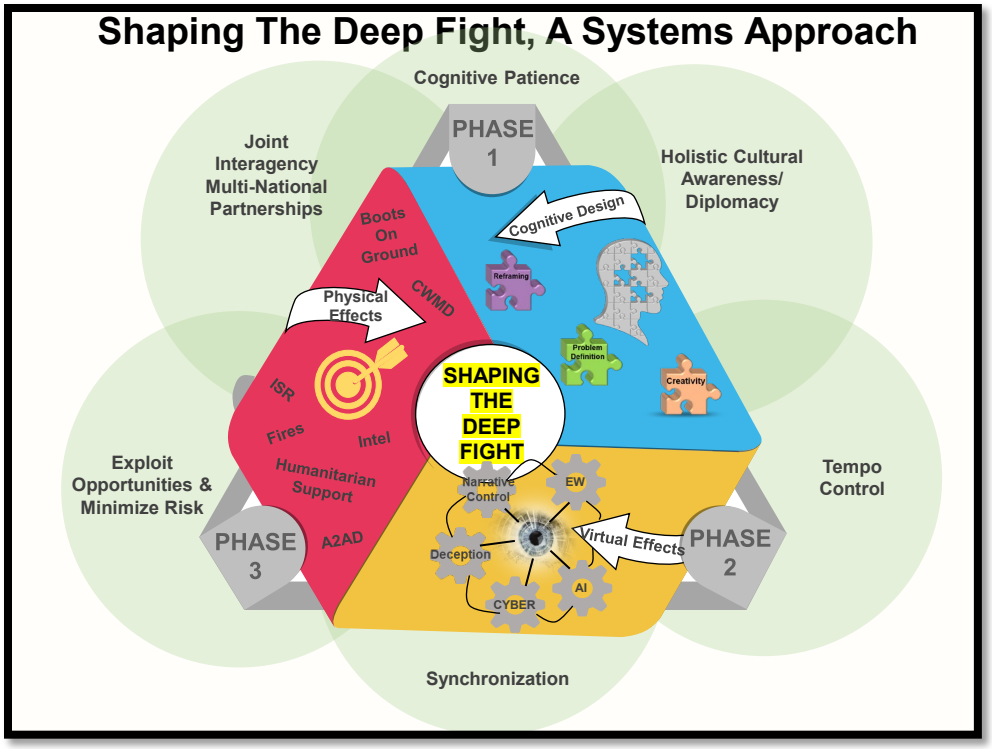

Figure 3. Shaping The Deep Fight, A Systems Approach. *Source:* MAJ Haley E. Mercer

As depicted by the operational subterranean typology in Figure 2, surprise is non-negotiable and necessary for gaining and maintaining contact with the enemy. Surprise is a primary principle of joint operations and creates the conditions for success at the tactical, operation, and strategic level of war. Surprise affords the attacker the ability to disrupt rival defensive plans by achieving rapid results and minimizing enemy reaction time.[147] According to Carl von Clausewitz, "surprise lies at the root of all operations without exception, though in widely varying degrees depending on the nature and circumstance of the operation."[148] Surprise is also essential to deception operations. Offensively, the United States must begin to effectively integrate their air defense systems into joint operations and leverage their electronic warfare capabilities, an uncommon but necessary practice. Deception operations must integrate electronic warfare capabilities and signature residue manipulation. Electronic signatures are everywhere on

[147] US Army, *ADRP 3-90 (*2012), 3-2.

[148] Clausewitz, Howard, and Paret, *On War*, 198.

the modern battlefield making it difficult to hide from the enemy. From Fitbits, to Apple watches, to RFID tags, to global positioning systems, surprise is difficult to achieve unless operational planners can creatively alter virtual fingerprints to affect enemy actions.

While still an important facet, the answer to the subterranean threat is not in the next technological advancement or tactical solution, rather it is in the operational artist's creative and critical thinking and ability to reframe the problem, apply systematic thinking, and provide better options to the commander. Success against a subterranean threat lies at the operational level of war.

Again, the OPT gathers in yet another windowless sultry room conceptualizing the operational approach for the next critical phase of the campaign. However, this time, the team embraces the level of ambiguity within the evolving complex operating environment. The staff leverages a new-found cognitive approach supported by their intellect, creativity, and judgement to anticipate opportunities, provide solutions, and minimize risks. This OPT epitomizes the concept of converting intellectual power into combat power. The underground, just another maneuver space.

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