

Light at the End of the Tunnel: Considerations for Operational Level Commanders Involving the SUB-T Environment

A Monograph

by

MAJ Scott U. Roett

US Army



School of Advanced Military Studies
US Army Command and General Staff College
Fort Leavenworth, KS

2021

Approved for public release; distribution is unlimited

REPORT DOCUMENTATION PAGE			<i>Form Approved</i> <i>OMB No. 0704-0188</i>		
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.					
1. REPORT DATE (DD-MM-YYYY) 20-05-2021		2. REPORT TYPE SAMS Monograph		3. DATES COVERED (From - To) JUNE 20-MAY 21	
4. TITLE AND SUBTITLE Light at the End of the Tunnel: Considerations for Operational Level Commanders Involving the SUB-T Environment			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S) Major Scott U. Roett			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 The US Army faces an increasing threat from subterranean environments (SUB-T) near population centers. As population centers grow and living areas become denser, the US Army's likelihood of conducting subterranean warfare is exceptionally high. By utilizing the subterranean environment as part of a layered defense plan, adversaries can delay corps and theater Army's operational timelines, prevent the cessation of military operations, and inhibit the implementation of the elements of operational art. History is rife with examples where operational commanders and planners failed to account for the subterranean environment, and their subordinates suffered the consequences. As an understanding of the subterranean environment's relationship to the broader operational environment becomes clear, commanders and planners can develop operational plans to mitigate the threat and ensure operational and strategic success.					
15. SUBJECT TERMS Subterranean Warfare, Underground Warfare, Tunnel Warfare, SUB-T					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Scott U. Roett
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. PHONE NUMBER (include area code)
(U)	(U)	(U)	(U)	54	757-784-1267

Monograph Approval Page

Name of Candidate: MAJ Scott U. Roett

Monograph Title: Light at the End of the Tunnel: Considerations for Operational Level
Maneuver Commanders Involving the SUB-T Environment

Approved by:

_____/signed/12 MAR 21/JAS/_____, Monograph Director

Jacob A. Stoil, PhD

_____/signed 07 APR 21/VRS/_____, Seminar Leader

Richard V. Satterlund, COL

//signed 20 APR 21/BAP//_____, Director, School of Advanced Military Studies

Brian A. Payne, COL

Accepted this 20th day of May 2021 by:

_____, Assistant Dean of Academics for Degree Programs and Research

Dale F. Spurlin, PhD

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the US Army Command and General Staff College or any other government agency. (References to this study should include the foregoing statement.)

Fair use determination or copyright permission has been obtained for the inclusion of pictures, maps, graphics, and any other works incorporated into this manuscript. A work of the US government is not subject to copyright, however further publication or sale of copyrighted images is not permissible.

Abstract

Light at the End of the Tunnel: Considerations for Operational Level Commanders Involving the SUB-T Environment, by MAJ Scott U. Roett, 51 pages.

The US Army faces an increasing threat from subterranean (SUB-T) environments near population centers. As population centers grow and living areas become denser, the US Army's likelihood of conducting SUB-T warfare is exceptionally high. By utilizing the SUB-T environment as part of a layered defense plan, adversaries can delay corps and theater Army's operational timelines, prevent the cessation of military operations, and inhibit the implementation of the elements of operational art. History is rife with examples where operational commanders and planners failed to account for the SUB-T environment, and their subordinates suffered the consequences. As an understanding of the SUB-T environment's relationship to the broader operational environment becomes clear, commanders and planners can develop operational plans to mitigate the threat and ensure operational and strategic success.

Contents

Acknowledgments	v
Abbreviations	vi
Introduction: Subterranean Warfare on the Modern Battlefield.....	1
Literature Review	2
Methodology	3
Warsaw Ghetto Uprising and Vilna, Lithuania Ghetto Uprising, Warsaw Uprising	3
Battle of Grozny of 1994.....	11
Battle of Grozny of 1999.....	15
Second Lebanon War	20
Operation Protective Edge 2014.....	27
Common Planning Considerations.....	36
Recommendations	38
Bibliography.....	41

Acknowledgments

I would like to thank my wife Jennifer Roett and my children, Kennedy and Graham, for their understanding and support while writing this monograph which I am extremely passionate about. It required many hours of reading, researching, and writing, but their support and love brought this project to fruition. I would also like to thank Dr. Jacob Stoil for his unwavering passion and commitment to improve the collective knowledge of subterranean warfare, and for pushing my research, thinking, and writing to a high caliber. Finally, I would like to thank COL Richard Satterlund, who has continuously supported my professional development and growth as an Infantry officer during this academic year.

Abbreviations

AK	Armia Krajowa
ATP	Army Techniques Publication
FPO	Fareinikte Partisaner Organizatzie
FSCL	Fire Support Coordination Line
HUMINT	Human Intelligence
IDF	Israeli Defense Force
OMON	Отряд Мобильный Особого Назначения
POW	Prisoner of War
SS	Schutzstaffel
SUB-T	Subterranean
UNIFIL	United Nations Interim Force's in Lebanon
ZOB	Zydowska Organizacja Bojowa

Introduction: Subterranean Warfare on the Modern Battlefield

Those who have lowered themselves into a dark tunnel during battle understand subterranean (SUB-T) warfare's complexity and gravity. Those that have not experienced SUB-T warfare may often dismiss the idea as a tactical problem or one that armies can avoid by merely bypassing a SUB-T environment. The growth of large cities makes it increasingly likely that the US Army will fight in or around population centers which by their nature lend themselves to significant SUB-T construction.¹ For this reason, planners and commanders at the operational level must acknowledge that their formations will encounter SUB-T networks on the modern battlefield and plan accordingly. Yet, a critical and dangerous underestimation of the risk posed by the SUB-T still permeates much of operational planning.

The US Army recently acknowledged the threat that SUB-T warfare poses to the future force when in 2017, the US Army released Army Techniques Publication (ATP) 3-21.51, *Subterranean Operations* which focused on tactical planning.² Despite this effort, there remains a critical gap for division and corps when mitigating the SUB-T environment's threat. TRADOC Pamphlet 525-3-1, *The US Army in Multi-Domain Operations 2028* outlines the concepts strategic objectives as Compete, Penetrate, Dis-integrate, and Exploit. An operational defense that leverages the SUB-T environment in populated areas, presents a risk to the US Army's ability to achieve these objectives due to the inability to shape the deep fight or consolidate gains.³

¹ Downtown Houston, "Downtown Tunnels," Downton Houston Management District, accessed October 10, 2020, <https://www.downtownhouston.org/district/downtown-tunnels/>.

² US Department of the Army, Army Techniques Publication (ATP) 3-21.51, *Subterranean Operations* (Washington, DC: Government Publishing Office, 2019), 2.

³ US Department of the Army, TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028* (Washington, DC: Government Publishing Office, 2018), 4.

The physical, human, and virtual complexity that a built-up environment presents, can challenge the best trained formations.⁴ The operational risk increases when an adversary leverages the SUB-T environment as part of a defense in a densely populated area. This has wide ranging impacts on an operational commander's ability to contain an adversary, shape the deep fight or disrupt sustainment, command, and control. To achieve true convergence at the operational level, the integration of the SUB-T environment into planning is critical.

Literature Review

While the literature on SUB-T warfare spans a broad range from individual accounts to the strategic implications SUB-T warfare creates the operational level remains neglected. At the most tactical level, sources such as *Tunnel Rats vs. the Taliban* by Sandy Macgregor and Jimmy Thompson and *Tiradores* by Francis Villanueva provide personal accounts of combatting tunnels in Southern Afghanistan, and Marawi, Philippines.⁵ There are exceptional studies like Dr. Simon Jones' *Underground Warfare 1914-1918* which are broader but still limited to a single conflict. At the strategic level, a leading subject matter expert on SUB-T operations, Dr. Daphne Richemond-Barak wrote *Underground Warfare*, and legal scholar Alan Dershowitz's *Terror Tunnels* focused on SUB-T legal implications and international policy.⁶ These works build an understanding of the SUB-T problem but do not address the SUB-T's operational challenges for planners. A notable exception to this gap is MAJ Haley Mercer's "Shaping the Deep Fight:

⁴ Phil Williams and Werner Selle, *Military Contingencies in Megacities and Sub-Megacities* (Carlisle, PA: US Army War College Press, 2016), 1.

⁵ Sandy Macgregor and Jimmy Thomson, *Tunnel Rats vs the Taliban* (New South Wales: Allen and Unwin, 2015), 3; Francis U. Villanueva, *Tiradores: Missions and the Men of the Phillipine's Light Reaction Regiment* (CreateSpace Independent Publishing Platform, 2020), 370. Additional sources on the subject: Hiromichi Yahara and Frank Gibney, *The Battle for Okinawa* (New York: J. Wiley, 1995), 184; H. D. Trounce, *Fighting the Boche Underground* (New York: Charles Scribner's Sons, 1918), 9.

⁶ Daphne Richemond-Barak, *Underground Warfare* (New York: Oxford University Press, 2018), 30; Alan Dershowitz, *Terror Tunnels: Case for Israeli Just War Against Hamas* (New York: Rosetta Books, 2014), 7.

Operational Implications for the 21st Century Subterranean Conflict” monograph, which established a basic framework upon which this monograph builds to consider operational planning considerations in populated areas.⁷ This monograph begins to fill the literature gap at the operational level by providing operational level planners and commanders methods to support conceptual and detailed planning considerations for SUB-T warfare in populated areas.

Methodology

This study employs a comparative case method to demonstrate that understanding SUB-T warfare is critical to commanders and staff officers at the operational level in future conflicts. It considers a diverse body of cases, including the Warsaw Ghetto Uprising, the Warsaw Uprising, the Battles of Grozny, the Second Lebanon War, and Operation Protective Edge. The diversity of these cases across time and space controls for variables such as time, geography, and type of combatants which allows for a consideration of the phenomenon and effect of SUB-T constructs in populations in isolation from the particularities of historical contingencies. The comparison of the cases provides the basis of the findings which in turn are the foundation of the operational level recommendations for encountering SUB-T defenses. The research includes primary sources that vary from firsthand accounts of those who experienced SUB-T warfare to unit after action reports.

Warsaw Ghetto Uprising and Vilna, Lithuania Ghetto Uprising, Warsaw Uprising

The Warsaw Ghetto Uprising of 1943, Vilna Ghetto Uprising of 1943, and Warsaw Uprising of 1944 highlighted the operational advantage the underground provided a partisan force against a well-resourced German Army. These uprisings demonstrated the underground

⁷ Haley E. Mercer, “Shaping the Deep Fight: Operational Implications for the 21st Century Subterranean Conflict” (Monograph, School of Advanced Military Studies, Command and General Staff College, Fort Leavenworth, KS, 2019), 37.

environment's criticality to the defense and the operational impacts on the German Army's operations on Eastern Europe.

Hitler and Stalin signed the secretive Molotov-Ribbentrop Nonaggression Pact on August 23, 1939, agreeing to Poland's parceling between the two. Less than a year and a half later, the German Army launched Operation Barbarossa.⁸ The German invasion of the Soviet Union utilized the Schutzstaffel (SS) units and Einsatzgruppen mobile killing teams to gain "lebensraum" or living space for the growing German nation.⁹

The Germans established 1,143 ghettos in Eastern Europe to hold the growing population of detained Jews and serve as collection points before transportation to extermination camps. The Warsaw Ghetto was the largest and transported 300,000 Jewish residents to the Treblinka Death Camp in three years.¹⁰ On June 21, 1943, SS Chief Heinrich Himmler ordered all ghetto detainees deported to death camps to support Hitler's Final Solution.¹¹ Himmler's order was a significant catalyst to the future ghetto uprisings.

The Warsaw Ghetto Uprising and Vilna Ghetto Uprising of 1943 were the two most prominent examples of the underground environments impacting operational level decisions. Many ghetto residents used tunnels to smuggle contraband into the ghettos, but Warsaw and Vilna's resistance organizations incorporated the SUB-T into their operational defensive plans.¹² The decision to conduct uprisings using the underground countered the German Army's numerical superiority.

⁸ Rupert Butler, *The Black Angels* (Yorkshire: Hamlyn Paperbacks, 1978), 98.

⁹ Ihor Kamenetsky, "Lebensraum in Hitler's War Plan: The Theory and the Eastern European Reality," *The American Journal of Economics and Sociology* 20, no. 3 (April 1961): 313-26, accessed December 22, 2020, <http://www.jstor.org/stable/3484695>.

¹⁰ United States Holocaust Memorial Museum, "Deportations to and from the Ghetto," *Holocaust Encyclopedia*, December 4, 2019, accessed November 30, 2020, <https://encyclopedia.ushmm.org/content/en/article/deportations-to-and-from-the-warsaw-ghetto>.

¹¹ Rachel Margolis, *A Partisan From Vilna* (Brighton, MA: Academic Studies Press, 2010), 39.

¹² Dan Kurzman, *The Bravest Battle* (New York: First Da Capo Press, 1976), 163.

The Warsaw Ghetto Uprising occurred from April 19, 1943, to May 16, 1943, when Jewish resistance groups attacked German soldiers as they began deporting residents to Treblinka.¹³ The uprising consisted of 500 Jewish Zydowska Organizacja Bojowa (ZOB) and 250 Zdowski Zwiazek Wojskowy members.¹⁴ ZOB utilized small arms, homemade explosives and leveraged hundreds of underground bunker complexes interconnected with the Warsaw sewer system to create a complex SUB-T defense.¹⁵

The Fareinikte Partisaner Organizatzie (FPO), a group of Jewish resistance fighters, also resisted deportation on September 1, 1943 from Vilna Ghetto.¹⁶ FPO attacked a German patrol, forcing them to retreat from the ghetto. The Germans feared a similar uprising as Warsaw and established a cordon until more forces arrived.¹⁷ Three hundred FPO partisans escaped through a two-mile-long sewer tunnel outside of Vilna before the German Army returned.¹⁸ The Jewish partisans reorganized and conducted attacks on German-held infrastructure, rail lines, and liberated prisoners from labor camps.¹⁹

The German Army abandoned Just War Theory during the ghetto uprisings to exterminate the Jewish population. This national policy meant that the destruction of whole cities, mass executions, and other war crimes were acceptable for operational and tactical commanders to defeat the underground defenses.

¹³ Barbera Engelking and Jacek Leociak, *The Warsaw Ghetto: A Guide to a Perished City*, trans. Emma Harris (New Haven, CT: Yale University Press, 2009), 47.

¹⁴ United States Holocaust Memorial Museum, "Warsaw Ghetto Uprising," *Holocaust Encyclopedia*, December 4, 2019, accessed November 23, 2020, <https://encyclopedia.ushmm.org/content/en/article/warsaw-ghetto-uprising#:~:text=Although%20initially%20there%20was%20tension,the%20ZZW%20had%20about%20250>.

¹⁵ Robert Forczyk and Peter Dennis, *Warsaw 1944: Poland's Bid For Freedom* (Oxford: Osprey Publishing, 2009), 10.

¹⁶ Carmello Lisciotto, "The Vilnius Ghetto," Holocaust Education and Archive Research Team, 2007, accessed October 15, 2020, <http://www.holocaustresearchproject.org/ghettos/vilnius.html>.

¹⁷ Margolis, *A Partisan From Vilna*, 39.

¹⁸ Ibid.

¹⁹ Lisciotto, "The Vilnius Ghetto."

The German Army attempted several tactics to mitigate the resistance fighters' SUB-T defenses. They used collaborators to identify a bunker, drilled through the ceiling, and funneled poisonous gas into the underground.²⁰ After the collaborator identified an opening to the ZOB command bunker, the German's executed him.²¹ The Germans suffered several hundred casualties on the second day of clearance and set fire to the ghetto to force fighters from SUB-T defenses, killing thousands of Jews.²²

ZOB believed the SUB-T environment mitigated the overwhelming German Army's superiority in soldiers and resources.²³ The sewers were critical to achieving the organization's strategic end state of degrading German soldiers and receiving support from the Polish Home Army and Allies.²⁴ The resistance maximized underground movement to avoid encirclement during the battle. The most critical tunnels for the resistance ran beneath the German security perimeter to greater Warsaw. These tunnels allowed escape attempts and re-supply from external resistance groups.²⁵

The SUB-T construct's presence exponentially multiplied the number of forces the Germans had to commit to the ghetto. The ghetto was 1.3 square miles segregated within Warsaw.²⁶ SS General Jurgen Stroop, commander in charge of suppressing the ghetto uprising, had a force of 821 German soldiers and Jewish collaborator police during the initial clearance of the ghetto. The complexity of the operation drastically increased when German forces

²⁰ Kurzman, *The Bravest Battle*, 305.

²¹ *Ibid.*, 289.

²² Marek Edelman, *The Ghetto Fights* (Warsaw: Bookmarks, 1945), 109.

²³ Kurzman, *The Bravest Battle*, 45.

²⁴ *Ibid.*, 53.

²⁵ *Ibid.*, 63.

²⁶ United States Holocaust Memorial Museum, "Warsaw Ghetto," *Holocaust Encyclopedia*, December 4, 2019, accessed November 23, 2020, <https://encyclopedia.ushmm.org/content/en/article/warsaw>.

encountered the ZOB defenders in SUB-T defenses. These underground defenses required Stroop to request additional forces to clear the enclave.²⁷

ZOB used existing and hastily created tunnels to support their freedom of maneuver. Sewer tunnels within Warsaw were one meter tall, allowing most adults to transit in a low crouch.²⁸ Additional hand-dug tunnels and bunkers augmented the existing network. The complex system connected various individual networks to the more extensive system, creating a layered defense throughout the ghetto.²⁹

German forces continued to encounter pockets of resistance for several weeks following the uprising. ZOB sheltered in underground bunkers during the day and conducted hit and run attacks at night.³⁰ The underground tunnels provided ZOB the capability to remain undetected to emerge for engagements of their choosing. The SUB-T network prevented the German Army's ability to transition security to local police forces, creating additional security requirements for a German Army already in crisis on the Eastern Front.

The sewers created operational challenges outside the immediate battle area of the ghetto. Commander Stroop received multiple reports of fighting around sewer entrances leading out of the ghetto. Fearing a larger uprising, Stroop requested additional support from the German Gestapo to prevent escape attempts.³¹ Sixty Jewish partisans still escaped the ghetto through the sewers and established a separate resistance organization. This partisan group conducted multiple attacks outside of Warsaw against rail lines and police stations.³²

²⁷ Engelking and Leociak, *The Warsaw Ghetto*, 775.

²⁸ Alexandra Richie, *Warsaw 1944: Hitler, Himmler, and the Warsaw Uprising* (New York: Farrar, Straus, and Giroux, 2013), 446.

²⁹ Kurzman, *The Bravest Battle*, 64.

³⁰ Edelman, *The Ghetto Fights*, 111.

³¹ Kurzman, *The Bravest Battle*, 288.

³² *Ibid.*, 338.

The Warsaw Uprising followed the Ghetto Uprising a year later, in August 1944 when the Armia Krajowa (AK) launched their surprise offensive against German defensive positions around the city. The AK fielded 45,000 fighters and 2,500 additional fighters from Narodowe Sily Zbrojne and Armia Ludowa, armed mostly with small arms.³³ The AK's light infantry force composition quickly adapted their defensive plan to employ the SUB-T to their advantage.

The SUB-T proved to be an invaluable component of the AK's layered defense strategy during the Warsaw Uprising. It was critical to the resistance's strategic goal of attriting the German clearance forces while preserving their limited combat power. During the first few days of the battle, the AK's high casualty rate forced them to transition to a layered defense utilizing the Warsaw sewers as a lynchpin in their operational plan. The AK leveraged several ZOB fighters who fought in the Ghetto Uprising to help adapt their SUB-T defense operations.³⁴

The AK utilized the sewers as a mass transit system. On August 25, 1944, the AK's commander, General Tadeusz Bor-Komorowski, Deputy Prime Minister Jan Stanislaw Jankowski, Chairman of the National Unity Council Kazimierz Puzak, and 40 other Polish resistance leaders utilized a sewer entrance in Krasinski Square to evacuate to the City Center. General Bor and his staff's escape was critical in delivering continued command and control to the Polish resistance fighters and a significant information operation victory for the remaining defenders.³⁵ The AK also moved over 100 German prisoners of war (POW) through the sewer to prevent their repatriation. The German Army's inability to repatriate captured POWs caused significant consternation between German tactical elements and SS-Gruppenfuhrer Heinrich Reinefarth, the commander in charge of clearance.³⁶

³³ Forczyk and Dennis, *Warsaw 1944: Poland's Bid for Freedom*, 24.

³⁴ Richie, *Warsaw 1944: Hitler, Himmler, and the Warsaw Uprising*, 446.

³⁵ *Ibid.*, 447.

³⁶ Forczyk and Dennis, *Warsaw 1944: Poland's Bid for Freedom*, 69.

The German Army was unable to cordon the AK because of the SUB-T. In August 1944, 3,000 Polish civilians and 1,500 AK fighters transited through one sewer tunnel in groups of 50 from the Krasinski Square to the more robust defenses in Old Town, with German soldiers only a few hundred meters away.³⁷ On September 1, 1944, the AK Battalion Chrobry successfully withdrew 4,500 fighters from Old Town Warsaw through a 1,700 meter-long sewer tunnel to another position held by the AK.³⁸ On September 27, the 19th Panzer Division shelled AK forces in the Mokotow area, forcing 600 AK fighters to withdraw through the sewers back to AK held terrain.³⁹ The German Army's inability to destroy concentrated amounts of AK fighters was an operational failure by the Germans, denying a rapid victory and draining German resources needed on the Eastern Front.

Despite no operational constraints to the German Army's conduct during the three uprisings, the German Army could not decisively destroy the defenders without a vast commitment of soldiers, weapons, and equipment that German operational planners could not afford to commit. The US, its allies, and coalition partners will operate in much more restrictive operating environments.

The German Army maintained an overwhelming advantage in both the land and air domains, but ZOB, FPO, and AK maintained dominance in the sewers and tunnels. The German Army ceded the subsurface to the defenders, which provided protection, sustainment, intelligence, movement, and maneuver. The SUB-T has a minimal entry requirement for adversaries but a massive effect in mitigating operational planning efforts. Non-state actors can rapidly establish a layered defense and utilize the SUB-T to achieve operational and strategic objectives.

³⁷ Richie, *Warsaw 1944: Hitler, Himmler, and the Warsaw Uprising*, 448.

³⁸ Forczyk and Dennis, *Warsaw 1944: Poland's Bid for Freedom*, 69.

³⁹ Richie, *Warsaw 1944: Hitler, Himmler, and the Warsaw Uprising*, 558.

The German Army was unable to cordon the ghettos or city during their operational clearance. This inability to effectively cordon the cities because of the sewers resulted in attacks against German support areas. If employed today, the SUB-T prevents the achievement of decisive battle to contain the enemy force and destroy it in detail. The underground's extensive complexity creates challenges for armies, even with numerical superiority to prevent a defender's withdrawal to another area of operation.

The Warsaw Uprising demonstrated the underground's capability to transit large groups of soldiers and equipment undetected. The defender's ability to rapidly repurpose the systems for a layered defense, reflects the likelihood of future insurgents using similar means when confronted by a larger force. High-value individuals, brigade-size formations, and POWs freely maneuvering around the battlefield has an operational implication, causing a fundamental surprise.

SUB-T provides non-state actors with an asymmetric advantage to challenge traditional operational planning considerations. An adversary's employment of the SUB-T as part of their defense magnifies its ability to prevent the rapid achievement of securing operational objectives. The presence of a SUB-T increases the defender's survivability and concealment underground. An adversary can then disrupt a transition to civil authorities, extending the operational timeframe to secure an area.

The SUB-T is an abstract concept. A planner may understand it exists but may not fully grasp the functions, systems, or extent to which it exists in an operational area. The SUB-T challenges Army Design Methodology because operational planners lack the understanding to conduct conceptual and detailed planning for an underground. ATP 5-0.1 states, "Effective planning requires integrating the conceptual and detailed components."⁴⁰ If planners lack a

⁴⁰ US Department of the Army, Army Techniques Publication (ATP) 5-0.1, *Army Design Methodology* (Washington, DC: Government Publishing Office, 2015), 1-3.

detailed or conceptual understanding of the SUB-T, the US Army will struggle in developing operational plans that account for the advantages it provides the defender.

Battle of Grozny of 1994

In 1991 while campaigning for president, Boris Yeltsin famously encouraged 88 of Russia's republics to declare sovereignty from Russia.⁴¹ Following Yeltsin's campaign, the Republic of Chechnya claimed independence. Chechnya's newfound freedom was short-lived because the central Caucasus region was crucial to Russian economic and military-strategic objectives. On December 11, 1994, President Yeltsin authorized the Russian military to invade Chechnya and restore a Russian-friendly government. The clearance and seizure of Grozny began on December 26, 1994.⁴²

A combined task force of 19,000 Russian Army soldiers and 5,000 internal security forces consisting of five motorized rifle battalions, two tank battalions, seven airborne battalions, and a host of complimentary artillery, engineer, aviation, and support elements invaded Chechnya. The Chechen defense consisted of light infantry wielding anti-tank munitions and light mortars.⁴³ The Chechen resistance gradually lost all their significant cities, forcing them to transition to insurgent tactics in the forests. Under increased pressure to end the conflict, President Yeltsin granted Chechen independence in 1997.⁴⁴

Chechen defenders understood the overmatch the Russian forces possessed across warfighting functions. The Chechens sought to mitigate these disadvantages through a prepared

⁴¹ Fred Hiatt, "As Yeltsin Strengthens, Region's Hope for Autonomy Fades," *Washington Post*, November 22, 1993, accessed October 10, 2020, <https://www.washingtonpost.com/archive/politics/1993/11/22/as-yeltsin-strengthens-regions-hopes-for-autonomy-fade/9e6162c5-2900-4c34-862a-c6b90eec13a1/>.

⁴² Ibid.

⁴³ Louis DiMarco, *Concrete Hell* (Oxford: Osprey Publishing, 2012), 158.

⁴⁴ Dodge Billingsley, *Fangs of the Lone Wolf: Chechen Tactics in the Russian-Cheche War 1994-2009* (West Midlands, England: Helion, 2013), 3.

defense leveraging Grozny's extensive sewer network and underground bunkers. Many Chechens were Soviet-Afghan War veterans and understood Russian Army doctrine. The Chechens chose to "hug" the Russian formations by remaining underground until they could launch a complex ambush on trapped formations. The Russian Army's 131st Armored Brigade, tasked with penetrating the city center, suffered 4,800 casualties of 6,000 soldiers, 20 of 26 tanks destroyed, and 102 of 120 armored vehicles destroyed in 72 hours.⁴⁵ The Chechens successfully countered the numerically superior mechanized formations through concealed movement in the underground network.

The Russian Army found small successes in combating the SUB-T in Grozny. The RPO-A Shmel flamethrower rocket was a shoulder-fired thermobaric munition that suffocated fighters in underground bunkers.⁴⁶ The Russians were also successful in isolating SUB-T positions in the town of Chiri Yurt at a large cement factory. The sizable but closed off SUB-T network underneath the cement plant did not provide the Chechens with an advantage because the Russians focused their artillery and aerial bombardments on the facility itself, restricting Chechen maneuver, ultimately collapsing the factory.⁴⁷

Grozny's underground network was a "city beneath a city," giving the Chechen defenders an operational advantage due to their familiarity with the vast web of Soviet-era bunkers and tunnels. These hardened structures were impenetrable to many Russian artillery rounds and bombs. The SUB-T served as rest points, transit lines, medical facilities, and supply points bolstering the layered Chechen defense.⁴⁸ This existing underground network shortened

⁴⁵ John H. Poole, *Tactics of the Crescent Moon* (Emerald Isle, NC: Posterity Press, 2004), 67.

⁴⁶ Olga Olikier, *Russia's Chechen Wars 1994-2000* (Santa Monica, CA: Rand Corporation, 2001), 26.

⁴⁷ Thomas Goltz, *Chechnya Diary* (New York: St. Martin's Press, 2003), 194.

⁴⁸ Olikier, *Russia's Chechen Wars 1994-2000*, 66.

Chechen's defense preparation time by allowing them to more effectively occupy and easily incorporate the terrain within their defense plans.

The Chechen operational commanders used the SUB-T to attrit Russian forces and preserve their force. Reporter Thomas Goltz described the use of SUB-T by a Chechen operational commander: "Maskhadov had his men travel through the city's sewer system to pop up behind enemy lines for lightning strikes, before disappearing down the drains once again."⁴⁹ Chechen fighters maneuvered undetected around the city, maintained the initiative using the SUB-T to protect their force and prevented massing of Russian air and artillery assets.

Using a mobile defense strategy that traded space for time, Chechen defenders evaded defeat by rapidly withdrawing through the sewers to more defensible or previously cleared positions to mitigate the Russian Army's vastly superior military capabilities.⁵⁰ This operational decision helped prevent the large-scale destruction of Chechen units, while disrupting Russian support areas. Psychological warfare also became a factor as fear increased among the Russian soldiers about the potential for kidnappings by Chechen fighters emerging in rear areas.⁵¹

The Russian Army could not effectively cordon Grozny due to the Chechen's sewers and tunnels. The Chechens had an uninterrupted flow of sustainment, particularly in the northern Grozny suburb of Sunzha. These tunnels allowed for the evacuation of wounded Chechen fighters to safer field hospitals in the mountains and the flow of men, weapons, and equipment into Grozny.⁵² Underground passages were vital in extending the battle's duration and improving the Chechen defense's overall strategic objective of degrading the Russian forces.

⁴⁹ Goltz, *Chechnya Diary*, 196.

⁵⁰ Poole, *Tactics of the Crescent Moon*, 70.

⁵¹ DiMarco, *Concrete Hell*, 162.

⁵² Olikier, *Russia's Chechen Wars 1994-2000*, 66.

Russian operational commanders suspended Just War Theory and sought to mitigate losses through unchecked artillery and close air support bombardments. Following 131st Independent Motor Rifle Regiment destruction, the Russian Army resorted to overwhelming firepower to mitigate the SUB-T. Artillery bombardments and bunker-busting bombs preceded Russian ground maneuver at a high cost to Grozny's civilian population. The Organization for Security and Cooperation in Europe reporting 35,000 civilians killed and the operation as an "unimaginable catastrophe."⁵³

The presence of media in Grozny amplified the Russian Army losses into a resounding information operation victory for the Chechen defenders. Unfettered media access captured detailed accounts of Russian soldier and Chechen civilian casualties.⁵⁴ The use of the sewers and tunnels were essential to crippling Russian soldier morale and dictating the strategic narrative.

Grozny's SUB-T supported the Chechen objectives of bloodying the Russians while preserving their forces. The Russian Army sought to control terrain, not understanding that the terrain itself was not crucial for the Chechens. Author Olga Olikier summarized the differences: "To the Russians territory captured was territory won. To the Chechens, territory lost was a temporary retreat to regroup and attack once again."⁵⁵ The Chechen mobile defense strategy supported their strategic objective of forcing a Russian withdrawal combined with enhanced domestic pressure and international scrutiny.

The SUB-T provided enhanced protection, maneuver, and sustainment capabilities to the vastly overmatched Chechen force. It provided the Chechens an asymmetric advantage allowing them to cause extensive operational delays in the Russian Army's clearance of Grozny. The 131st

⁵³ Mark Galeotti, *Russia's Wars in Chechnya 1994-2009* (Oxford: Osprey Publishing, 2014), 38.

⁵⁴ Associated Press Archive, "Russia: Chechnya: Russian Conscripts 'Tired of War,'" YouTube, July 21, 2015, accessed October 10, 2020, https://www.youtube.com/watch?v=PycROYEf_ko&list=PLyCIq-EpPgYri1ynLOaTpBRmrzTcNQQDn&index=63.

⁵⁵ Olikier, *Russia's Chechen Wars 1994-2000*, 73.

Independent Motor Rifle Brigade's loss forced the Russians to conduct heavy artillery and aerial bombardments of the city before initiating further ground force clearance. This operational change had a strategic effect on international and domestic opinion, shifting in favor of the Chechens.

The SUB-T prevented the Russians from isolating the city. The Russian Army's inability to cut the Chechen ground lines of communication using SUB-T delayed the strategic and operational objectives. The Chechens maintained freedom of maneuver during the battle and denied effective pursuit and targeting of their forces, constraining the Russian Army's operational plans to seize Grozny rapidly.

The Russian operational and strategic end states to seize Grozny resulted in a pyrrhic victory, because the SUB-T altered how the Chechens defended their forces against the Russians. While the Russians viewed terrain captured as terrain cleared, the Chechens utilized the SUB-T to ambush Russian Army support areas and disrupt their operational reach and tempo.

The SUB-T creates new operational planning challenges that no longer equate to a tactical problem but an operational one with strategic implications. If divisions and corps do not prioritize the SUB-T operations as part of their lines of operation when conducting large scale combat operations, the risk to mission and risk to force will exponentially increase.

Battle of Grozny of 1999

President Vladimir Putin ordered a second invasion of Chechnya to prevent terror attacks in Russia in 1999.⁵⁶ On October 12, Russian forces crossed the Terek River into Chechnya to seize Grozny. By December 12, 5,000 conventional and special operation forces and 2,000 Pro-Moscow Chechen forces assaulted Grozny, where 2,500 Chechen rebels waited in their

⁵⁶ Galeotti, *Russia's Wars in Chechnya 1994-2009*, 54.

underground defenses.⁵⁷ Russia rapidly seized Grozny within two months and completed significant combat operations by February 2000.⁵⁸

Northern Caucasus Joint Force Commander, General-Lieutenant Gennadi Troshev was aware of the SUB-T defenses and attempted to target Grozny's underground network with close air support, reconnaissance elements, and sappers to destroy underground tunnels and bunkers with some success. These methods were employed sparingly due to the Russian's limited specialized reconnaissance assets and difficulty identifying tunnel entrances.⁵⁹

Russian commanders did not emphasize underground operations between the conflicts despite an understanding of the threat. Russian doctrine empathized preventing fighting in populated areas at all costs.⁶⁰ As a result, artillery, and close air support sorties to destroy populated areas emerged as the de-facto preferred clearance strategy to mitigate casualties. The Russians conducted 643 bombing sorties and an unknown number of artillery and rocket attacks to soften the Chechen SUB-T defense before ground forces entered Grozny from November 6 to November 30.⁶¹ During the Soviet-Afghan War, the Soviets employed 6,000 bullets and 55 artillery shells on average to destroy an Afghan fighter. In Grozny, the average rose to 7,500 bullets and 70 artillery rounds.⁶² One Chechen commander remarked in an interview with *The Guardian* that the Russian shelling was devastating ordinary Grozny citizens: "The Federals are killing their own people."⁶³

⁵⁷ Galeotti, *Russia's Wars in Chechnya 1994-2009*, 58.

⁵⁸ *Ibid.*, 11.

⁵⁹ Olikier, *Russia's Chechen Wars 1994-2000*, 66.

⁶⁰ *Ibid.*

⁶¹ C. W, Blandy, "Chechnya: Dynamics of War Brutality and Stress" (Paper, Conflict Studies Research Centre, Camberley, England, July 2001), accessed November 2, 2020, <https://www.files.ethz.ch/isn/87402/01jul.pdf>.

⁶² *Ibid.*, 66.

⁶³ Mayerbek Nunayev, "Chechnya's Tales of the Underground," *The Guardian*, January 25, 2000, accessed October 12, 2020, <https://www.theguardian.com/world/2000/jan/26/chechnya>.

The Battle of Minutka Square in Grozny was a significant loss for Russian forces. Minutka Square was a critical intersection controlling Grozny with multiple underground access points two kilometers from the city center.⁶⁴ A Russian armored column entered the square on December 16, and immediately encountered a complex ambush from Chechen defenders hidden in the sewers. After the initial three-hour battle, the Chechen defenders had killed 100 Russian soldiers.⁶⁵ At the battle, a reporter saw 15 Russian soldiers killed after entering an underground tunnel to clear Chechen defenders.⁶⁶ Minutka Square's engagement was the first significant loss for Russian forces during the war and became a significant information operation defeat. The Russian Army spent much of January 2000 attempting to seize the square, but routinely found their efforts rebuffed by Chechen fighters maneuvering underground.⁶⁷

Minutka Square was an operational and strategic failure for Russia. Operationally, the Russian troops spent nearly a month securing several city blocks, delaying the command's operational objectives to secure Grozny. At the strategic level, the Russian forces inability to rapidly seize Grozny risked politically hurting President Vladimir Putin's re-election effort. The Chechen insurgency's pacification was part of Putin's election campaign. Increasing Russian casualties and delayed clearance efforts, mainly attributed to the SUB-T, began to affect Putin's political standing. A Chechen Commander, stated: "It is clear the Russians are bogged down up to their ears in the war in Chechnya. There is no chance the war will be over before March 26, the

⁶⁴ Timothy Thomas, "Grozny 2000: Urban Combat Lessons Learned" (Monograph, Foreign Military Studies Office, Fort Leavenworth, KS, Article appeared in *Military Review* (July-August 2000), accessed November 1, 2020, <https://community.apan.org/wg/tradoc-g2/fmso/m/fmso-monographs/243762>.

⁶⁵ Michael Wines, "Rebels Hit Russian Troops Hard in Battle in the Chechen Capital," *The New York Times*, December 16, 1999, accessed November 10, 2020, <https://archive.nytimes.com/www.nytimes.com/library/world/europe/121699russia-chechnya.html>.

⁶⁶ Oliker, *Russia's Chechen Wars 1994-2000*, 49.

⁶⁷ Ibid.

day of Russia's presidential elections. What Putin expected would bring him to power will become his undoing."⁶⁸

The Chechens used the sewers to disrupt Russian tempo by emerging from the city's previously cleared areas.⁶⁹ This method presented numerous dilemmas to Russian operational commanders. The security gap posed by Chechen forces re-occupying previously cleared areas forced Russian commanders to re-task maneuver elements conducting offensive operations to adjust to static security in support areas to protect ground communication lines. This consistent requirement stressed Russian manpower, limiting Russian operational commanders' options to clear contested neighborhoods, and delaying clearance timelines. It also elevated risk to Russian clearance forces because they no longer maintained a superior combat ratio to conduct offensive operations against the Chechen defenses in the urban environment and found larger Chechen forces using tunnels to attack Russian static positions.⁷⁰

Following the Russian seizure of Grozny in February 2000, Russian Ministry of Interior security forces, Отряд Мобильный Особого Назначения (ОМОН), assumed security for the city.⁷¹ Capitalizing on the change in security posture, Chechen fighters emerged from the sewers and underground bunkers, ambushing a convoy of OMON officers within the city, resulting in 37 officers killed.⁷² This attack demonstrated the protection and concealment capabilities SUB-T continued to provide the Chechens efforts to disrupt Russia's transition of Grozny to civil authority.

⁶⁸ Nunayev, "Chechnya's Tales of the Underground."

⁶⁹ Oliker, *Russia's Chechen Wars 1994-2000*, 73.

⁷⁰ Robert Schaefer, *The Insurgency in Chechnya and the North Caucasus: From Gazavat to Jihad* (Westport, CT: Praeger, 2011), 192.

⁷¹ Poole, *Tactics of the Crescent Moon*, 74.

⁷² *Ibid.*, 75.

Russian forces continued their clearance south in March 2000 and encountered well-prepared underground defenses in small villages. Komsomolskoye, a small town of 1,000 inhabitants and one-story houses, proved especially difficult to clear and further delayed Russian objectives of clearing south to the critical Argun Gorge.⁷³ Chechen commanders established underground bunkers and basements augmented with additional “wells” and tunnels to connect defensive positions. The Chechens utilized hit and run tactics to attrit the Russian assault force and retreat into the underground network’s safety.⁷⁴ Russian mechanized troops with air and artillery support took three weeks to secure the small village destroying most of it.⁷⁵

Despite the Russian Army awareness of the SUB-T after 1994, the Russian campaign plan did not account for the underground’s complexity. The SUB-T impacted Russian efforts to seize terrain, exacerbated costs, and constrained their operational tempo. The increase in the operational timeline and the decision to re-task combat elements for static security in the support area had a cumulative effect on the overall operational success. The Russian Army’s inability to secure their interior lines and ensure success of forward ground clearance efforts directly tied to Chechen defenders’ use of Grozny’s sewer network to strike freely.

Grozny’s established fallout shelters, sewers, and utility tunnels allowed the Chechen defenders to develop a layered defense with minimal resources rapidly. Many cities and towns have similar SUB-T networks below the surface. The US Army will encounter similar systems during a future conflict. The proliferation of these systems among adversaries, and limited knowledge/experiences within Army formations will contribute to operational challenges. This

⁷³ Associated Press Archive, “Russia/Chechnya: Conflict: Fighting,” YouTube, March 10, 2000, accessed October 10, 2020, <http://www.aparchive.com/metadata/youtube/dfb1add58cd337767055e073fa1a8084>.

⁷⁴ Olikier, *Russia’s Chechen Wars 1994-2000*, 78.

⁷⁵ *Ibid.*, 79.

shortfall requires an operational approach from corps and division headquarters that conceptually understands SUB-T's opportunities and challenges.

The attack on the OMON patrol demonstrates the long-term protection and resilience the SUB-T provides the defense. Planners must broaden their aperture to understand that an adversary's effective SUB-T use can directly threaten interior lines and delay a transition from combat operations to stability operations, an operational headquarters desired end state during large scale combat operations. US Army doctrine should re-evaluate the impact of the SUB-T as an operational domain in Multi-Domain Operations. The underground is a separate, complex, and adaptive system with limited interaction to Space, Cyber, Air, Maritime, and Land. Control of the Land domain does not mean control of the SUB-T domain. Like cyber or the space domain, SUB-T is not always apparent that an adversary is operating in the domain, yet they may still possess the capability to impact operations and place strategic objectives at risk.

Second Lebanon War

On July 12, 1982, the Israeli Defense Force (IDF) initiated Operation Peace for Galilee in Southern Lebanon to disrupt militant groups from attacking Northern Israel.⁷⁶ For two decades, Israel and Hezbollah engaged in minor low-level conflicts until 2000 when both sides signed a multi-national peace agreement, which saw the IDF's withdrawal from Lebanon.⁷⁷ By January 2006, the United Nations Interim Force in Lebanon (UNIFIL) monitored the border area for cross-border violations.⁷⁸ By the summer of 2006, two high profile cross border attacks triggered the Second Lebanon War.

⁷⁶ Raphael D. Marcus, *Israel's Long War with Hezbollah* (Washington, DC: Georgetown University Press, 2018), 37.

⁷⁷ Emmanuel Kotia and Fiifi Edu-Afful, "The Lebanon-Israel War of 2006: Global Effects and Its Aftermath," *Small Wars Journal*, June 11, 2014, accessed December 2, 2020, <https://smallwarsjournal.com/jrnl/art/the-lebanon-israel-war-of-2006-global-effects-and-its-aftermath>.

⁷⁸ United Nations Interim Forces Lebanon, "UNIFIL Background," United Nations, accessed December 1, 2020, <https://unifil.unmissions.org/unifil-background#para6>.

Hamas, a separate militant organization, located in the Gaza Strip on Israel's southern border, employed an attack tunnel a month before the Second Lebanon War. On June 25, 2006, Hamas' militants utilized a half-mile-long tunnel to ambush an IDF patrol within Israel, killing two soldiers and successfully kidnapping Corporal Gilad Shalit. Hamas exfiltrated Shalit to Gaza under the security border using a tunnel.⁷⁹ Hamas exchanged Corporal Shalit five years later for the release of 1,027 Palestinian prisoners held in Israeli detention.⁸⁰

The second attack that initiated the conflict occurred when Hezbollah commandos infiltrated the UNIFIL demarcation line on July 12, 2006. The specialized Hezbollah unit attacked an IDF patrol along the border fence. The initial attack resulted in three IDF soldiers killed and four wounded, it rapidly escalated with the abduction of two wounded IDF soldiers using the cross-border tunnel.⁸¹ The month-long war resulted in 158 IDF soldiers, 43 Israeli civilians, 270 Hezbollah fighters, and nearly 1,200 Lebanese civilians deaths.⁸² Hezbollah's preparation and successful incorporation of the SUB-T were critical to accomplishing Hezbollah's strategic objective of defeating the IDF offensive operations into Southern Lebanon and garnering recognition for their organization.

The IDF was aware of Hezbollah's extensive SUB-T operations before the conflict began. In 2003, the IDF arrested an Israeli officer in charge of a specialized tracker unit in Israel's Northern Command for providing detailed intelligence to Hezbollah operatives. As a result of the breach, the IDF consolidated SUB-T information on Hezbollah's underground

⁷⁹ Scott Wilson, "Palestinians Use Tunnel To Attack Israeli Post 2 Soldiers Killed, One Kidnapped in Raid at Gaza Border," *Washington Post*, June 26, 2006, accessed October 12, 2020, <https://www.washingtonpost.com/archive/politics/2006/06/26/palestinians-use-tunnel-to-attack-israeli-post-span-classbankhead2-soldiers-killed-one-kidnapped-in-raid-at-gaza-borderspan/8b3392af-7474-44c7-b5f1->

⁸⁰ Yaacov Ayish, "The Underground Arms Race in the Middle East," *Real Clear World*, June 12, 2019, accessed October 10, 2020, <https://jinsa.org/the-underground-arms-race-in-the-middle-east/>.

⁸¹ Marcus, *Israel's Long War With Hezbollah*, 185.

⁸² Reuters Staff, "Cost of War and Recovery in Lebanon and Israel," *Reuters*, July 9, 2007, accessed October 16, 2020, <https://www.reuters.com/article/us-lebanon-war-cost/factbox-costs-of-war-and-recovery-in-lebanon-and-israel-idUSL0822571220070709>.

facilities to select military intelligence units and Northern Command Intelligence Headquarters. The IDF constructed an underground mockup facility to train for SUB-T operations, and prepositioned specialized tunnel equipment for distribution to Israeli Reserve units if mobilized for operations in Lebanon.⁸³

Despite these preparations, many IDF units only received generalized information on Hezbollah's underground defensive positions, referred to as *nature reserves*. An intelligence officer with the Israeli 401st Armored Brigade stated: "The information provided to me was extremely general. . . . The important information on the subject of "nature preserves" was also too general."⁸⁴ The IDF was aware of Hezbollah's underground defenses but failed to ensure mass dissemination to tactical units.

Hezbollah adopted an operational plan to leverage the SUB-T as the cornerstone of their strategy. Hezbollah received design support from both the Iranian Revolutionary Guard Corps and North Korean People's Army between 2003 and 2004 to advise on SUB-T defenses.⁸⁵ A high-ranking Iranian Revolutionary Guard officer confirmed that North Korean officials assisted Hezbollah with building tunnel infrastructure, including a 25-kilometer tunnel used to maneuver to various defensive positions along the border.⁸⁶

A separate complex extended 40 meters underground, connected multiple positions in a two-kilometer defensive belt and included life support activities, including supplies, sleeping

⁸³ Amos Harel and Avi Issacharoff, *34 Days: Israel, Hezbollah, and the War in Lebanon*, trans. Ora Cummings and Moshe Tlamim (New York: Palgrave MacMillan, 2008), 133.

⁸⁴ Ilan Sahar, (COL), *Movements of the 401st Brigade in the Second Lebanon War* (Latrun: Israel: Yad L'shiryon-Latrun, 2017), 34.

⁸⁵ Scott Farquhar, ed., *Back to Basics: A Study of the Second Lebanon War and Operation CAST LEAD* (Fort Leavenworth, KS: Combat Studies Institute Press, 2009), 9.

⁸⁶ Tasnim News Agency Staff, "IRGC General: Iran has Elaborate Underground Arms Depots," Tasnim News Agency, October 1, 2019, accessed November 20, 2020, <https://www.tasnimnews.com/en/news/2019/10/01/2108829/irgc-general-iran-has-elaborate-underground-arms-depots>.

areas, and water delivery systems.⁸⁷ Hezbollah created a layered underground sustainment network of over 600 ammunition bunkers. Hezbollah commanders had a primary and two secondary bunkers to re-supply their units to prevent the identification of multiple sustainment caches if captured.⁸⁸ This operational sustainment planning created multiple closed-loop sustainment networks capable of supporting prolonged combat operations.

Hezbollah's strategic objective was to strike a high-profile blow to the IDF and increase Hezbollah's standing as a militant organization. Hezbollah operational commanders understood that they did not need to retain terrain to achieve their strategic objective but had to attrit the Israeli forces in a protracted and costly operation. Hezbollah's complex network of underground tunnels and bunkers stymied many initial Israeli operational plans. Israeli special operation forces began their initial penetration across the border but quickly encountered Hezbollah tunnels at Maroun al-Ras. Many of the lead IDF clearance elements became encircled by Hezbollah fighters utilizing underground tunnels.⁸⁹ Hezbollah created additional fog and friction for IDF clearing forces by emerging from tunnels donning Israeli uniforms. Hezbollah fighters infiltrated Israeli perimeters in IDF uniforms using tunnels to quickly attack the unsuspecting IDF soldiers and withdraw through the tunnel.⁹⁰ The tunnels' complexity and surprise provided Hezbollah's operational commanders with more impactful operations against the better-equipped IDF.

The SUB-T defense provided increased protection for Hezbollah's critical assets and command and control nodes. The IDF Northern Command decided against conducting a kinetic strike against Hezbollah's Secretary-General, Hassan Nasrallah, located in Beirut. Nasrallah remained in a deeply buried command center that prevented munition penetration and would have

⁸⁷ Anthony H. Cordesman, George Sullivan, and William D. Sullivan, *Lessons of the 2006 Israeli-Hezbollah War* (Washington, DC: Center for Strategic and International Studies, 2007), 137.

⁸⁸ Harjeet Singh, *Asymmetric Conflict* (New Delhi: Pentagon Press, 2018), 55.

⁸⁹ *Ibid.*, 92.

⁹⁰ *Ibid.*, 73.

resulted in high civilian casualties. Hezbollah's operational commanders in Southern Lebanon commanded their layered defense with relative safety from their deeply buried underground bunkers. They issued orders and controlled units as needed due to the tunnels providing safe passage for couriers.⁹¹

The IDF realized their aerial munitions did not penetrate Hezbollah's nature preserves after receiving multiple front-line reports. Israel requested an expedited shipment of 100 Guided Bomb Unit-28 munitions from the United States. The US designed the Guided Bomb Unit-28 for destroying deeply buried bunkers.⁹² The ineffectiveness of standard Israeli tactical munitions to neutralize Hezbollah command and control located underground, required the Israeli Ministry of Foreign Affairs to intervene on the IDF's behalf.

The SUB-T provided Hezbollah the capability to infiltrate support areas and initiate conflicts with a relatively low signature. Hezbollah's extensive construction efforts remained mostly unnoticed before the conflict. Hezbollah built one tunnel with 18 inches of overhead concrete within 20 meters of UNIFIL observer position and 100 meters from the IDF observation post.⁹³ A UNIFIL officer stated, "We never saw them build anything. They must have brought the cement in by the spoonful."⁹⁴ Hezbollah's ability to prepare its layered defense without international observers or the IDF observing the size and scope set conditions for Hezbollah's victory.

The SUB-T layered defense afforded Hezbollah the ability to constrain the IDF's operational reach and tempo. Following the high IDF casualties at Maroun al-Ras, Head of

⁹¹ Jennifer Dunn, "Subterranean Environment: Tunnel to Victory, the 2006 Lebanon War," *Red Diamond* 5, no. 4 (April 2014): 9-17, accessed December 11, 2020, https://community.apan.org/cfs-file/_key/docpreview-s/00-00-11-56-60/OEE-Red-Diamond-APR14.pdf.

⁹² David Cloud and Helene Cooper, "US Speeds Up Bomb Delivery for Israel," *The New York Times*, July 22, 2006, accessed October 14, 2020, <https://www.nytimes.com/2006/07/22/world/middleeast/22military.html>.

⁹³ Cordesman, Sullivan, and Sullivan, *Lessons of the 2006 Israeli-Hezbollah War*, 138.

⁹⁴ *Ibid.*, 137.

Northern Command, Major General Udi Adam temporarily banned IDF units from attacking nature preserves due to the increased casualties.⁹⁵ While conducting operations in the vicinity of Markaba from August 1 to August 9, the 401st Brigade routinely found their logistical lines and support zones disrupted due to nature preserves scattered across the operational area.⁹⁶

Hezbollah's underground defensive network at the tactical level impacted IDF operational decisions, which limited the operational reach and tempo due to attacks in the IDF support area.

Operational headquarters support the tactical fight by shaping the deep fight through intelligence and fires to attrit an enemy's defenses. Hezbollah's underground layered defense prevented the IDF senior leaders' ability to shape the deep fight. Hezbollah constructed and camouflaged many of their underground rocket positions that fired on the Israeli cities in dense vegetation areas or near civilian homes. The entrances' placement denied IDF's air asset's ability to strike Hezbollah's strategic rocket sites, the leading cause of Israeli civilian casualties during the war.⁹⁷

Hezbollah aligned its operational defense plan with its doctrinal principles. These principles included: "protecting our fighters is more important than causing enemy casualties. The surprise is essential to success. If spotted, you have failed. Keep the enemy on constant alert, at the front, and in the rear."⁹⁸ Hezbollah's nesting its doctrinal principles to the SUB-T defense provided Hezbollah the opportunity to avoid the IDF during the initial clearance and emerge later after the main assault.⁹⁹ The underground network preserved Hezbollah's forces and allowed them to disrupt the IDF operations in Southern Lebanon.

⁹⁵ Marcus, *Israel's Long War with Hezbollah*, 193.

⁹⁶ Sahar, *Movements of the 401st Brigade in the Second Lebanon War*, 4.

⁹⁷ Marcus, *Israel's Long War with Hezbollah*, 206.

⁹⁸ Singh, *Asymmetric Conflict*, 26.

⁹⁹ Cordesman, Sullivan, Sullivan, *Lessons of the 2006 Israeli-Hezbollah War*, 136.

The threat of tunnels initiating another cross-border conflict is still present today. As recently as December 2018, the IDF conducted Operation Northern Shield to detect and destroy Hezbollah cross border attack tunnels. Rather than a full-scale ground invasion, the IDF utilized improved technology and specialized tunnel units to locate and destroy the tunnels originating from Ramyeh, Lebanon, under the UNIFIL demarcation line.¹⁰⁰ The IDF discovered six industrial-size tunnels equipped with electricity, lighting, and a small train.¹⁰¹ Operation Northern Shield demonstrated a dramatic increase in the IDF's ability to target and destroy cross-border attack tunnels as part of its strategic national defense.

Adversaries of the US can weaponize tunnels and the underground for strategic purposes of initiating a large-scale conflict. The kidnapping of Israeli soldiers by Hamas and Hezbollah using tunnels across internationally monitored borders created a flashpoint for conflict. These tunnel attacks caused Israel's political and military leaders to activate the Israeli Reserve Force, a strategic level decision only initiated in times of national defense emergencies. Both organizations' tunnels provided the means to start and escalate a conflict with Israel to achieve their strategic goals.

Division and corps headquarters combatting an adversary using SUB-T will find their ability to shape the deep fight hindered. Many of Hezbollah's SUB-T defenses were on the IDF's pre-planned strike list.¹⁰² Despite knowing their location, the kinetic strikes were ineffective at neutralizing Hezbollah's strategic rocket assets and command and control nodes. Hezbollah's rocket attacks on Israeli border cities applied enhanced political pressure on the Israeli government to escalate Israeli operations in Southern Lebanon.

¹⁰⁰ Israeli Defense Forces, "Operation Northern Shield," Israeli Defense Force, accessed December 10, 2020, <https://www.idf.il/en/minisites/wars-and-operations/operation-northern-shield/>.

¹⁰¹ Judah Gross, "Finding '6th, Biggest and Last' Hezbollah Tunnel, IDF Ends Northern Shield Op," The Times of Israel, January 19, 2019, accessed December 11, 2020, <https://www.timesofisrael.com/finding-final-hezbollah-attack-tunnel-idf-wraps-up-operation-northern-shield/>.

¹⁰² Sahar, *Movements of the 401st Brigade in the Second Lebanon War*, 8.

The war was a strategic information operation loss for the IDF. The well-prepared underground network provided the necessary protection and maneuver for Hezbollah's force to avoid destruction while attriting Israeli forces. While Hezbollah suffered more casualties than Israel, the Israeli public viewed each death as a strategic loss.

The Hezbollah effectively employed their SUB-T network to survive Israeli fires and maneuver forces. Field Manual (FM) 3-94, *Corps and Division* states: "A Fire Support Coordination Line (FSCL) is used for maximum flexibility from the supporting air component, the corps establishes the FSCL beyond the effective cannon range of the committed BCTs and then adjusts the FSCL as maneuver dictates."¹⁰³ If the US and coalition partners cannot effectively neutralize prepared defenses between before tactical formation engagements, casualties will exponentially rise during the operation. The US military's asymmetric advantage over the last three decades has been its ability to shape the deep fight and significantly degrade adversaries' defenses before the employment of ground forces. If an adversary employs the SUB-T system as part of a layered defense, the US military will find themselves fighting on the same tactical level, inevitably suffering increased casualties. Significant casualties in conflicts with limited objectives could place increased pressure on governments to withdraw or suspend an operation if the losses are high in an ever-increasing information environment.

Operation Protective Edge 2014

After the Second Lebanon War, the IDF found themselves combatting the SUB-T environment on their southern border against Hamas. Hamas, an organization against Israel, assumed control over the Gaza Strip in 2006, but quickly found themselves politically and

¹⁰³ US Department of the Army, Field Manual (FM) 3-94, *Theater Army, Corps, And Division Operations* (Washington, DC: Government Printing Office, 2014), 5-13.

economically isolated.¹⁰⁴ Smuggling tunnels became critical to bypassing the Israeli border security measures in the Gaza Strip. Nearly 800 tunnels facilitated contraband, construction material, and weapons for Hamas' military arm.¹⁰⁵ Hamas understood the blockades were reducing their influence as a regional adversary to Israel and rapidly developed extensive defensive and offensive attack tunnels to challenge IDF incursions into Gaza and strike Israeli civilian communities.¹⁰⁶

The IDF began preparations for Operation Protective Edge following several cross-border attacks. On July 17, 2014, 13 Hamas fighters killed two IDF soldiers near the Israeli village of Sufa. The IDF stopped a group of Hamas fighters from infiltrating near a Kibbutz using a tunnel that extended 1.8km into Gaza and cost \$10 million and two years to build. The IDF discovered a separate cross border tunnel near Nativ Hasara Kibbutz. On July 21, ten Hamas fighters attacked an IDF patrol using a tunnel, killing two IDF's near the village of Sderot.¹⁰⁷ The discovery of the tunnels and Hamas's intention to conduct similar attacks began Israeli mobilization to enter Gaza and destroy the tunnels.¹⁰⁸

Operation Protective Edge was a two-phase operation by the IDF from June 12 to July 6, 2014, to target Hamas' rocket sites and prevent future border attacks.¹⁰⁹ The IDF discovered 100

¹⁰⁴ Zachary Laub, "Hamas," Council on Foreign Relations, August 1, 2014, accessed December 4, 2020, <https://www.cfr.org/background/hamas>.

¹⁰⁵ Farquhar, *Back to Basics: A Study of the Second Lebanon War and Operation CAST LEAD*, 56.

¹⁰⁶ Gaza Conflict Task Force, "2014 Gaza War Assessment" (Report, The Jewish Institute for National Security of America, March 2015), 13, accessed December 10, 2020, <https://jinsa.org/wp-content/uploads/2018/10/2014GazaAssessmentReport.pdf>.

¹⁰⁷ Israel Ministry of Foreign Affairs, "Operation Protective Edge: The Facts," State of Israel, accessed November 24, 2020, <https://mfa.gov.il/MFA/ForeignPolicy/FAQ/Pages/Operation-Protective-Edge-The-facts.aspx>.

¹⁰⁸ Raphael Cohen, David Johnson, David Thaler, Brenna Allen, Elizabeth Bartels, James Cahill, and Shira Efron, *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza* (Santa Monica, CA: RAND Corporation, 2017), 75.

¹⁰⁹ Israel Ministry of Foreign Affairs, "Operation Protective Edge: The Facts."

tunnels with 32 tunnels exiting in Israeli territory.¹¹⁰ Operation Protective Edge demonstrated a modern chess match between two adversaries employing and countering the SUB-T.

The IDF previously encountered tunnels during the Second Lebanon War, Operation Cast Lead in 2008 and Operation Pillar of Defense in 2012.¹¹¹ The IDF established tunnel units, dog teams, and issued equipment to support ground forces in a SUB-T fight.¹¹² The Israeli Airforce struck many sites during the first phase of the operation, hitting 223 targets consisting of underground rocket launching sites, 11 tunnel entrances, and several Hamas command and control nodes.¹¹³ The Israeli Intelligence Service relied on Human Intelligence (HUMINT) to further refine additional airstrikes and intelligence for ground forces.¹¹⁴ The air campaign did not have the desired effect, because it merely struck the entrances and did not collapse the whole tunnel.¹¹⁵ The IDF initiated the ground campaign to destroy the underground complexes.

A lack of specialized equipment slowed the IDF's tempo. Specialized engineers' units were short excavators, drillers, and sappers with required explosives to collapse the tunnels.¹¹⁶ The IDF used a gel-like explosive called emulsa to completely collapse tunnels. It took 16 tons of emulsa and 60 explosive mines to collapse one kilometer of tunnel.¹¹⁷ The IDF used specially trained dog teams attached to infantry platoons known as *Oketz* or Sting to identify tunnel

¹¹⁰ Cohen et al., *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*, 101.

¹¹¹ Nicole Watkins and Alena James, "Digging into Israel: The Sophisticated Tunneling Network of Hamas," *Journal of Strategic Security* 9, no. 1 (Spring 2016): 86, accessed December 10, 2020, <https://scholarcommons.usf.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1508&context=jss>.

¹¹² Yoram Cohen and Jeffrey White, *Hamas in Conflict: The Military Performance of the Palestinian Islamic Resistance Movement* (Washington, DC: The Washington Institute for Near East Policy, October 2009), 13, accessed December 10, 2009, <https://www.washingtoninstitute.org/uploads/Documents/pubs/PolicyFocus97.pdf>.

¹¹³ Cohen et al., *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*, 92.

¹¹⁴ *Ibid.*, 14.

¹¹⁵ Gaza Conflict Task Force, "2014 Gaza War Assessment," 56.

¹¹⁶ *Ibid.*

¹¹⁷ *Ibid.*

entrances. After identification, a D9 bulldozer would raze the area to remove debris and confirm other access points.¹¹⁸ The IDF also employed tactical robots to clear tunnels, providing a clearance range of 100 meters.¹¹⁹

Despite the intelligence, equipment, and ground force awareness of Hamas' SUB-T defenses, the IDF still found Gaza's clearance time consuming and lethal. The Shin Bet, Israel's Intelligence Service was aware of the tunnels but viewed it as an isolated system instead of a complex system.¹²⁰ An Israeli engineer officer commented the tunnels were part of Hamas' strategy: "We knew there were tunnels, though we didn't know where they all were. What was surprising was what the head of Hamas did. He took the underground medium and turned it into an operational tool."¹²¹

Hamas utilized their tunnel network to provide freedom of maneuver and routinely strike the IDF in previously cleared areas. The network's extensive length and complexity prevented the IDF from securing a tunnel system because of its various branches. Hamas launched six infiltration attacks during the operation, killing 11 Israeli soldiers, including the IDF's 188th Armored Brigade Commander.¹²²

Defensive tunnels allowed Hamas the element of surprise during engagements with the IDF. A Hamas spokesperson said: "Our defense plan is based . . . on a network of ditches and tunnels dug under a large area of the strip. The [Israeli] army will be surprised when it sees fighters coming up out of the ground and engaging it with equipment and weapons"¹²³

¹¹⁸ Russell W. Glenn, "Short War in a Perpetual Conflict Implications of Israel's 2014 Operation Protective Edge for the Australian Army" (Army Research Paper, Commonwealth of Australia, May 2015), 22, accessed December 10, 2020, https://researchcentre.army.gov.au/sites/default/files/arp9_glen_short_war_in_a_perpetual_conflict.pdf.

¹¹⁹ Ibid., 18.

¹²⁰ Cohen et al., *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*, 98.

¹²¹ Ibid., 99.

¹²² Gaza Conflict Task Force, "2014 Gaza War Assessment," 56.

¹²³ Farquhar, *Back to Basics: A Study of the Second Lebanon War and Operation CAST LEAD*, 14.

Hamas sought to kidnap Israeli soldiers and civilians using the tunnels to achieve the same strategic effect as Corporal Shalit's abduction in 2006.¹²⁴ Hamas killed an IDF battalion commander after he pursued a Hamas fighter into a tunnel following a surprise attack, but was unsuccessful at retrieving his body.¹²⁵

The tunnels' utility became a strategic issue because of its ability to initiate conflicts. During the operation, Hamas and Israel agreed to a four-day ceasefire on July 31, 2014. Ninety minutes after the ceasefire went into effect, Hamas fighters emerged from a tunnel in Palestinian controlled Rafah, killing two IDF soldiers and kidnapping a third who later died of his wounds.¹²⁶

Hamas' reliance on the underground constrained the IDF's ability to employ operational art. The Israeli General Staff and Southern Command planners anticipated the operation would take seven to ten days based on Operation Pillar of Defense's success two years earlier. This operational timeline increased when the IDF ground forces encountered the SUB-T. A planner within Southern Command stated: "We did not have a plan for just taking control of the tunnels."¹²⁷ This missed planning priority was due to overconfidence in the air campaign to mitigate the tunnels and a shortfall in recognizing tunnel employment as part of Hamas' military doctrine.¹²⁸

The Battle of Shuja'iya neighborhood saw the most intense fighting of the operation. The IDF believed Shuja'iya was a significant support area for Hamas to launch attacks from underground access points. Israel's Golani Brigade initially discovered 21 assault tunnels during the operation, but encountered significant resistance from Hamas' specialized Qassam Brigade.

¹²⁴ Farquhar, *Back to Basics: A Study of the Second Lebanon War and Operation CAST LEAD*, 14.

¹²⁵ Cohen et al., *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*, 100.

¹²⁶ Dershowitz, *Terror Tunnels: Case for Israeli Just War Against Hamas*, 98.

¹²⁷ Cohen et al., *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*, 85.

¹²⁸ *Ibid.*, 87.

Hamas fighters utilized the defensive tunnels to emerge from the underground and launch lethal anti-tank guided missiles at the IDF. Hamas also employed deception by emerging from tunnels wearing IDF uniforms to conduct surprise attacks, further adding to confusion among the IDF.¹²⁹

On July 20, an IDF armored personnel carrier broke down in Shujayia while patrolling. A Hamas anti-tank guided missile team used the tunnels to emerge near the vehicle and initiated an ambush, killing seven IDF soldiers. The IDF found the tunnel exit six days later hidden in a house.¹³⁰ Following the attack, the IDF began increasing its shelling of the area to protect the force.¹³¹

The IDF suffered 16 killed and over 50 wounded during the battle and the clearance did not completely extinguish the threat. On July 28, a week after the major fighting in Shujayia ended, nine Hamas operatives infiltrated the Israeli neighborhood of Nahal Oz, killing five IDF soldiers. The IDF found an additional tunnel equipped with motorcycles and weapons prepared for a similar attack originating from Shujayia.¹³²

The Gaza SUB-T provided Hamas the means to mitigate the IDF capabilities. The Gaza strip had an extensive, ready to use sewer network that Hamas could leverage as part of their defense.¹³³ The availability of sewer networks and Hamas augmented tunnels created a complex problem for the IDF operational planners. Hamas occupied defensive tunnels with little notice and mounted an effective defense against the IDF. An IDF engineer officer stated: “If you try to

¹²⁹ Gaza Conflict Task Force, “2014 Gaza War Assessment,” 25.

¹³⁰ Glenn, “Short War in a Perpetual Conflict Implications of Israel’s 2014 Operation Protective Edge for the Australian Army,” 48.

¹³¹ Office of the High Commissioner, “Report of the Detailed Findings of the Independent Commission of Inquiry Established Pursuant to Human Rights Council Resolution S-21/1,” United Nations, Human Rights Council, June 23, 2015, accessed December 10, 2020, <https://undocs.org/pdf?symbol=en/A/HRC/29/CPR.4>.

¹³² Cohen et al., *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*, 108.

¹³³ Robert Bunker, Dave Dilege, John Sullivan, and Alma Keshavarz, *Blood and Concrete: 21st Century Conflict in Urban Centers and Megacities* (Small Wars Journal Foundation, 2019), 358.

understand the phenomenon of the underground medium, it is the tool of the weak. You can vanish, protect yourself, and not deal with the Army of the state.”¹³⁴

Hamas leveraged the SUB-T to protect its critical assets from Israeli strikes. Hamas established their operational level command center under the Shifa Hospital in Gaza, one of the area’s largest hospitals. The IDF did not strike the hospital to avoid collateral damage and negative international attention.¹³⁵ Many of the tunnel entrances were also located in a densely populated area versus in less populated areas to protect Hamas from IDF targeting.¹³⁶

Hamas weaponized the tunnels to terrorize the Israeli civilian population. Ten Hamas fighters emerged from a cross border tunnel on July 19 near the Israeli settlement of Be’eri. The fighters equipped with small arms, tranquilizers, and handcuffs demonstrated intent to kidnap Israeli civilians. The IDF eventually neutralized the Hamas fighters but not after an extensive search that placed five neighboring communities in lockdown status.¹³⁷

Hamas’s desire to kidnap IDF soldiers placed an additional operational strain on IDF operations. The Hannibal Directive was the IDF’s standing protocol for kidnapped or missing soldiers. The missing soldier became the IDF’s number one priority, directed resources to search for the soldier, and elevated the acceptable risk for actions to recover the soldier. The IDF initiated the Hannibal Directive multiple times during the operation, diverting combat assets to search for the missing soldiers.¹³⁸

Following Protective Edge, the IDF continued to refine the IDF modernization to combat tunnels. The *Yahalom* SUB-T battalion reorganized to combine the *Yael* commando unit with the

¹³⁴ Cohen et al., *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*, 162.

¹³⁵ Bunker et al., *Blood and Concrete: 21st Century Conflict in Urban Centers and Megacities*, 359.

¹³⁶ Dershowitz, *Terror Tunnels: Case for Israeli Just War Against Hamas*, 182.

¹³⁷ Cohen et al., *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*, 113.

¹³⁸ *Ibid.*, 118.

highly specialized *Samoor* explosive ordnance company and doubled in size from 400 to 800 soldiers. The unit's primary task is to surveil and locate tunnel entrances, clear, and rapidly destroy the shafts.¹³⁹ This self-contained element provides a capability to the IDF to specifically target the underground as a combined force.

The SUB-T network is a strategic information operational weapon. Hamas utilized tunnels to infiltrate Israeli communities and terrorize the Israeli population. The low cost of entry for non-state actors to use tunnels increases their likelihood of proliferation on the battlefield and against civilian populations.

Hamas deliberately built tunnels around Palestinian civilian infrastructure to draw the Israelis into kinetic strikes in the vicinity of structures with civilians. If the IDF struck a site near civilian infrastructure, the media severely scrutinized the strike. This example demonstrates how the SUB-T limits the operational commander's options for a conflict.

The IDF was aware of many of the tunnel locations, had the tactics, techniques, procedures, and equipment to combat the Hamas' tunnels, but it was not enough. As a system, the Hamas tunnel network was so complex that the IDF could not achieve convergence on the tunnels to mitigate their effect. Even when well prepared for the SUB-T fight at the tactical level, it still requires an operational view to mitigate as part of a cohesive operational plan.

The Gaza tunnels were an essential part of Hamas' strategic layered defense. Despite the Israeli clearance of the Shuja'iya neighborhood, Hamas still conducted lethal strikes against the IDF. The ability to re-infiltrate an area cleared by offensive forces to conduct attacks extends the operational timeline and prevents a transition to civil authorities.

Operation Protective Edge demonstrates the SUB-T's use to initiate a conflict and how its employment can cause rapid alteration to operational plans. Hamas used the tunnels to initiate the

¹³⁹ Omer Dostri, "The Buildup of Forces for IDF Underground Warfare" (Paper, The Jerusalem Institute for Strategy and Security, Israel, January 1, 2019, accessed December 11, 2020, https://jiss.org.il/en/dostri-idf-underground-warfare/#_edn1).

operation and extended the conflict by attacking IDF soldiers using the tunnels during ceasefires. Hamas' employment of tunnels to kidnap IDF soldiers forced the IDF to change their operational plans and divert resources to support the Hannibal Directive. This example demonstrates how SUB-T can disrupt operational plans and create a political dilemma for the clearing forces.

Israel leveraged HUMINT to identify and understand Hamas's operational defense plan at the surface and the SUB-T level. HUMINT has its shortfalls, but with an extensive source network, improved situational awareness of the SUB-T can help mitigate the threat. Additionally, MAJ Haley Mercer developed a method of identifying a tunnel's typology to understand its purpose.¹⁴⁰ If a planner understands the tunnel's purpose, operational planning can array assets at the division and corps level to deconstruct the defense.

The modern planner must understand that a traditional operational approach when planning for the underground is not enough. ATP 5-0.1, *Army Design Methodology* states an operational approach requires both conceptual and detailed planning to accomplish the mission.¹⁴¹ Although the IDF was aware of the SUB-T and took some measures to mitigate it, they did not understand the complex system and its importance to Hamas. If an adversary is employing the SUB-T as a layered defense, a planner cannot separate the defender's operational plan from their tactical actions. The system's complexity challenges a clearing force's ability to employ operational art because of a lack of experience with the system and the effects at the operational and strategic levels it creates.

¹⁴⁰ Mercer, "Shaping the Deep Fight: Operational Implications for the 21st Century Subterranean Conflict," 37.

¹⁴¹ US Army, ATP 5-0.1. *Army Design Methodology*, 5-1.

Common Planning Considerations

Adversaries of the US observed the effectiveness of employing SUB-T warfare as part of their operational defense plans for future conflicts.¹⁴² This illustrates the criticality of comprehending and mitigating the modern battlefield's SUB-T environment. This monograph has a role to play in this as despite their differences the case studies demonstrate salient commonalities that are unconnected to the contingencies of time, underground network structures, geography, and type of combatants.

When confronted with the underground environment in a built-up area, commanders must understand that regardless of whether they choose a methodical clearance of a SUB-T environment or to bypass the tunnels, significant underground constructs slow operational tempo, impede operational reach, and delay transitions among phases. These factors will determine whether an operation is successful or a pyrrhic victory.

A methodical clearance decreases tempo and requires a large force to secure the area. The German Army in Warsaw, the Russian Army in Grozny, and the IDF's experiences in Lebanon and Gaza demonstrated the loss of tempo when their forces encountered a SUB-T defense. The Russian and German Army chose to overcome this limitation through indiscriminate bombardments, but still found their maneuver and operational success constrained by fighters employing the SUB-T network. The IDF in both Southern Lebanon and Gaza attempted to mitigate the SUB-T with precision fires, but were still unable to neutralize the tunnels without ground clearance forces.

During both Warsaw Uprisings, the German Army required far more soldiers to support the city's clearance than anticipated. The re-allocation of combat units also came at a critical time

¹⁴² Combined Joint Task Force-Operation Inherent Resolve, "Operation Lions of Jazeera," Facebook, October 9, 2020, accessed October 12, 2020, <https://www.facebook.com/mod.mil.iq/videos/341870856896937>.

as the German Army fought on multiple fronts. The Russian Army's continually tasked combat units to provide rear area security because of SUB-T attacks on Russian interior lines in Grozny. The resilience of Hamas and Hezbollah's SUB-T defenses forced a strategic level decision for the IDF to conduct mass mobilization of their reserve force. Taken together this demonstrates that a SUB-T network present in populated areas will significantly increase the force requirement when conducting Multi Domain Operations.

If a commander decides to bypass the SUB-T environment, the operation will still require many troops and hinder a rapid transition to civilian authorities. In Warsaw, the protection the SUB-T provided the defenders allowed the irregular force to continually egress and emerge at a secondary or supplementary battle position which meant that the German Army was unable to quickly contain and destroy large ZOB or AK elements during both Warsaw Uprisings. Hezbollah's SUB-T complexes were so effective against the IDF maneuver that Northern Command ordered all IDF units to avoid the nature preserves. The IDF reversed its initial guidance as the realization of SUB-T defenses' density in Southern Lebanon made this an unfeasible course of action. As the case studies indicate, SUB-T defenses in populated areas provide significant advantages across warfighting functions to an operational defense and a commander must address the SUB-T construct to mitigate the adversary's capacity for a credible and enduring threat.

Bypassing the SUB-T also hinders a transition to civil authorities and stability operations. The persistent attacks on German Soldiers, OMON, and IDF soldiers emanating from the underground environment during periods of low-intensity conflict signify the underground system's resiliency. Operational commander's risk mission success if they bypass a SUB-T network, because when transitioning to Phase IV, Stability Operations, the adversary still maintains a capable combat force underground to disrupt civil authorities for extended durations.

The case studies reveal that there is no shortcut to rapid victory against significant SUB-T constructs even through abandoning *jus in bello* considerations. While the IDF employed precision weapons and attempted to limit collateral damage, the Russians and the Germans chose to abandon classical Christian understanding of Just War Theory entirely. Despite these varied approaches, the SUB-T construct remained a critical factor impeding division and corps ground maneuver and operational success across all cases.

Recommendations

SUB-T network proliferation on the future battlefield is unavoidable. The growth of cities and population centers causes the growth of SUB-T infrastructure to support that population and makes it increasingly likely the US Army will have to fight in that terrain and in the SUB-T networks below.¹⁴³ This correlation increases the likelihood the US Army and Joint Force will conduct combat operations in populated areas with SUB-T networks below. The future force must be prepared to compete in the SUB-T space.

A city is a complex system. As such, planners and commanders cannot view the SUB-T as a closed system. The numerous access points and miles of tunnel mean that when corps or divisions conduct operations with a SUB-T environment, an operational headquarters must incorporate the underground as part of conceptual and detailed planning. A planner should view the underground network as a nervous system that cannot detach from the body; it is part of one system. If the adversary emerges from a tunnel to conduct an attack, placing assets at the one location will only help “localized pain.” An operational planner should assess the entire patient (population center) to understand where the pain originates. Using this approach will help a headquarters treat the disease rather than a symptom.

¹⁴³ Michelle Tan, “Army Chief: Soldiers Must Be Ready to Fight in Megacities,” *Defense News*, October 5, 2016, accessed February 10, 2021, <https://www.defensenews.com/digital-show-dailies/ausa/2016/10/05/army-chief-soldiers-must-be-ready-to-fight-in-megacities/>.

An adversary employing a SUB-T defense in a population center may employ either a hasty or a deliberate defense based on whether the defenders were able to adapt the SUB-T environment to their overall plan or adapted their plan to existing SUB-T construct. Whereas, the ZOB, FPO, and AK utilized the existing structure as part of a hasty defense, Hezbollah utilized tunnels as part of a long-term defensive plan. These two types of networks are not mutually exclusive, and if provided adequate time before or during an operation, an adversary may augment the pre-existing underground system with additional SUB-T tunnels. A planner must therefore conduct a reasonable assessment of the general location, soil content, and scale of the local infrastructure.

A planner can expect repurposed sewer networks and utility tunnels when conducting operations in more densely populated areas like Grozny or Warsaw. If conducting operations in more sparsely populated areas, like Southern Lebanon, one can assume a deliberately dug tunnel network as part operational defensive plan. It is possible to make an initial assessment when employing Army Design Methodology to understand if an adversary has the means or intent to engage in an underground defense. Once a planner determines how the SUB-T environment will factor into an operation, they must conduct detailed analysis of the SUB-T environment during Intelligence Preparation of the Battlefield as part of Mission Analysis during the Military Decision-Making Process. This detailed planning will inform assessing relative combat power and arraying forces during course of action development.

To understand how an adversary might employ pre-existing Sub-T constructs, the planner must understand the fundamental nature of the construct. For example, if an adversary uses a sewer as part of an operational defensive plan, a clearing force must learn the sewer's functions. Sewer and drainage systems share similar functions, even in underdeveloped cities. Sewers must flow uninhibited, which typically means gravity flow to a river or runoff area. By leveraging a division or corps geospatial intelligence section to determine the natural highpoints and low water

runoffs in an operational area, one can predict the area where an adversary would infiltrate the system to provide sustainment or additional fighters.

Sewers typically follow a trunk and branch system, with smaller branches consolidating into larger arteries. This commonality provides a narrower area to focus resources and assets at a division or corps level. The main ground lines of communication in urban environments will also have a significant sewer artery below. Focusing on securing this line of communication preserves combat power and forces an adversary to leave the outlying branches' safety if they want to conduct an attack. This method denies the SUB-T defense, disrupting an adversary's initiative. While this particular generality applies to sewers many forms of SUB-T infrastructure have their own logic a planner can anticipate.

Once a clearing force controls or isolates pre-existing SUB-T networks in a populated area, the planner can then identify the remaining deliberately dug defensive tunnels through persistent change analysis from intelligence sources, and ground forces reporting tunnel locations. Through these means, an operational planner will better understand the SUB-T and the adversary's most likely course of action as part of their defense.

In the end, commanders have a binary choice when facing SUB-T operations in the future. A commander can deliberately plan, resource, and execute an operation accounting for the underground environment to provide their formations the best opportunity to survive and win against a SUB-T defense, or discount SUB-T as not a factor requiring detailed planning. The latter choice will see their formations suffer from an elusive enemy operating just below the surface. Those commanders will then find themselves joining a large cohort of commanders who discounted the SUB-T threat and sent soldiers into dark tunnels unprepared for the threat lying below.

Bibliography

- Associated Press Archive. "Russia/Chechnya: Conflict: Fighting." YouTube, March 10, 2000. Accessed October 10, 2015. <http://www.aparchive.com/metadata/youtube/dfb1add58cd337767055e073fa1a8084>.
- . "Russia: Chechnya: Russian Conscripts Tired of War." YouTube, July 21, 2015. Accessed October 10, 2020. https://www.youtube.com/watch?v=PycROYEf_ko&list=PLyCIq-EpPgYri1ynLOaTpBRmrzTcNQQDn&index=63.
- Ayish, Yaacov. "The Underground Arms Race in the Middle East." Real Clear World, June 12, 2019. Accessed October 10, 2020. <https://jinsa.org/the-underground-arms-race-in-the-middle-east/>.
- Billingsley, Dodge. *Fangs of The Lone Wolf: Chechen Tactics in the Russian-Cheche War 1994-2009*. West Midlands, England: Helion, 2013.
- Blandy, C. W. "Chechnya: Dynamics of War Brutality and Stress." Paper, Conflict Studies Research Centre, Camberley, England, July 2001. Accessed November 2, 2020. https://www.files.ethz.ch/isn/87402/01_jul.pdf.
- Breaking the Silence. *This is How We Fought in Gaza*. Tel Aviv: Breaking the Silence, 2014.
- Bunker, Robert, Dave Dilegge, John Sullivan, and Alma Keshavarz. *Blood and Concrete: 21st Century Conflict in Urban Centers and Megacities*. Small Wars Journal Foundation, 2019.
- Butler, Rupert. *The Black Angels*. Yorkshire: Hamlyn Paperbacks, 1978.
- Cloud, David, and Helene Cooper. "US Speeds Up Bomb Delivery for Israel." *The New York Times*, July 22, 2006. Accessed October 14, 2020. <https://www.nytimes.com/2006/07/22/world/middleeast/22military.html>.
- Cohen, Raphael, David Johnson, David Thaler, Brenna Allen, Elizabeth Bartels, James Cahill, and Shira Efron. *From Cast Lead to Protective Edge: Lessons from Israel's Wars in Gaza*. Santa Monica, CA: RAND Corporation, 2017.
- Cohen, Rich. *The Avengers: A Jewish War Story*. New York: Random House, 2000.
- Cohen, Yoram, and Jeffrey White. *Hamas in Conflict: The Military Performance of the Palestinian Islamic Resistance Movement*. Washington, DC: The Washington Institute for Near East Policy, October 2009. Accessed December 10, 2009. <https://www.washingtoninstitute.org/uploads/Documents/pubs/PolicyFocus97.pdf>.
- Combined Joint Task Force-Operation Inherent Resolve. "Operation Lions of Jazeera." Facebook, October 9, 2020. Accessed November 15, 2020. <https://www.facebook.com/mod.mil.iq/videos/341870856896937>.
- Cordesman, Anthony H., George Sullivan, and William D. Sullivan. *Lessons of the 2006 Israeli-Hezbollah War*. Washington, DC: Center for Strategic and International Studies, 2007.

- Dershowitz, Alan. *Terror Tunnels: Case for Israeli Just War Against Hamas*. New York: Rosetta Books, 2014.
- DiMarco, Louis. *Concrete Hell*. Oxford: Osprey Publishing, 2012.
- Dostri, Omer. "The Buildup of Forces for IDF Underground Warfare." Paper, The Jerusalem Institute for Strategy and Security, Israel, January 1, 2019. Accessed December 11, 2020. https://jiss.org.il/en/dostri-idf-underground-warfare/#_edn1.
- Downtown Houston. "Downtown Tunnels." Downton Houston Management District. Accessed October 10, 2020. <https://www.downtownhouston.org/district/downtown-tunnels/>.
- Dunn, Jennifer. "Subterranean Environment: Tunnel to Victory, the 2006 Lebanon War." *Red Diamond* 5, no. 4 (April 2014): 9-17. Accessed December 11, 2020. https://community.apan.org/cfs-file/__key/docpreview-s/00-00-11-56-60/OEE-Red-Diamond-APR14.pdf.
- Edelman, Marek. *The Ghetto Fights*. Warsaw: Bookmarks, 1945.
- Engelking, Barbera, and Jacek Leociak. *The Warsaw Ghetto: A Guide to a Perished City*. Translated by Emma Harris. New Haven, CT: Yale University Press, 2009.
- Farquhar, Scott, ed. *Back to Basics: A Study of the Second Lebanon War and Operation CAST LEAD*. Fort Leavenworth, KS: Combat Studies Institute Press, 2009.
- Forczyk, Robert, and Peter Dennis. *Warsaw 1944: Poland's Bid For Freedom*. Oxford: Osprey Publishing, 2009.
- Galeotti, Mark. *Russia's Wars in Chechnya 1994-2009*. Oxford: Osprey Publishing, 2014.
- Gaza Conflict Task Force. "2014 Gaza War Assessment." Report, The Jewish Institute for National Security of America, March 2015. Accessed December 10, 2020. <https://jinsa.org/wp-content/uploads/2018/10/2014GazaAssessmentReport.pdf>.
- Glenn, Russell W. "Short War in a Perpetual Conflict Implications of Israel's 2014 Operation Protective Edge for the Australian Army." Army Research Paper, Commonwealth of Australia, May 2015. Accessed December 10, 2020. https://researchcentre.army.gov.au/sites/default/files/arp9_glen_short_war_in_a_perpetual_conflict.pdf.
- Goltz, Thomas. *Chechnya Diary*. New York: St. Martin's Press, 2003.
- Gross, Judah. "Finding '6th, Biggest and Last' Hezbollah Tunnel, IDF Ends Northern Shield Op." *The Times of Israel*, January 19, 2019. Accessed December 11, 2020. <https://www.timesofisrael.com/finding-final-hezbollah-attack-tunnel-idf-wraps-up-operation-northern-shield/>.
- Harel, Amos, and Avi Issacharoff. *34 Days: Israel, Hezbollah, and the War in Lebanon*. Translated by Ora Cummings and Moshe Tlamim. New York: Palgrave MacMillan, 2008.

- Hiatt, Fred. "As Yeltsin Strengthens, Region's Hope For Autonomy Fades." *Washington Post*, November 22, 1993. Accessed October 10, 2020. <https://www.washingtonpost.com/archive/politics/1993/11/22/as-yeltsin-strengthens-regions-hopes-for-autonomy-fade/9e6162c5-2900-4c34-862a-c6b90eec13a1/>.
- Israeli Defense Forces. "Operation Northern Shield." Israeli Defense Force. Accessed December 10, 2020. <https://www.idf.il/en/minisites/wars-and-operations/operation-northern-shield/>.
- Israel Ministry of Foreign Affairs. "Operation Protective Edge: The Facts." State of Israel. Accessed November 24, 2020. <https://mfa.gov.il/MFA/ForeignPolicy/FAQ/Pages/Operation-Protective-Edge-The-facts.aspx>.
- . "Operation Protective Edge - Q&A." State of Israel, August 14, 2014. Accessed November 24, 2020. <https://mfa.gov.il/MFA/ForeignPolicy/Issues/Pages/Operation-Protective-Edge-QA.aspx>.
- Kamenetsky, Ihor. "Lebensraum in Hitler's War Plan: The Theory and the Eastern European Reality." *The American Journal of Economics and Sociology* 20, no. 3 (April 1961): 313-26. Accessed December 22, 2020. <http://www.jstor.org/stable/3484695>.
- Kotia, Emmanuel, and Fiifi Edu-Afful. "The Lebanon-Israel War of 2006: Global Effects and Its Aftermath." *Small Wars Journal*, June 11, 2014. Accessed December 2, 2020. <https://smallwarsjournal.com/jrnl/art/the-lebanon-israel-war-of-2006-global-effects-and-its-aftermath>.
- Kurzman, Dan. *The Bravest Battle*. New York: First Da Capo Press, 1976.
- Laub, Zachary. " Hamas." Council on Foreign Relations, August 1, 2014. Accessed December 4, 2020. <https://www.cfr.org/backgroundunder/hamas>.
- Lisciotta, Carmello. "The Vilnius Ghetto." Holocaust Education and Archive Research Team, 2007. Accessed October 15, 2020. <http://www.holocaustresearchproject.org/ghettos/vilnius.html>.
- Macgregor, Sandy, and Jimmy Thomson. *Tunnel Rats vs the Taliban*. New South Wales: Allen and Unwin, 2015.
- Marcus, Raphael D. *Israel's Long War with Hezbollah*. Washington, DC: Georgetown University Press, 2018.
- Margolis, Rachel. *A Partisan from Vilna*. Brighton, MA: Academic Studies Press, 2010.
- Mercer, Haley E. "Shaping the Deep Fight: Operational Implications for the 21st Century Subterranean Conflict." Monograph, School of Advanced Military Studies, Command and General Staff College, Fort Leavenworth, 2019.
- Nunayev, Mayerbek. "Chechnya's Tales of the Underground." *The Guardian*, January 25, 2000. Accessed October 12, 2020. <https://www.theguardian.com/world/2000/jan/26/chechnya>.

- Office of the High Commissioner. "Report of the Detailed Findings of the Independent Commission of Inquiry Established Pursuant to Human Rights Council Resolution S-21/1." United Nations, Human Rights Council, June 23, 2015. Accessed December 10, 2020. <https://undocs.org/pdf?symbol=en/A/HRC/29/CPR.4>.
- Oliker, Olga. *Russia's Chechen Wars 1994-2000*. Santa Monica, CA: Rand Corporation, 2001.
- Poole, John H. *Tactics of the Crescent Moon*. Emerald Isle, NC: Posterity Press, 2004.
- Reuters Staff. "Cost of War and Recovery in Lebanon and Israel." *Reuters*, July 9, 2007. Accessed October 16, 2020. <https://www.reuters.com/article/us-lebanon-war-cost/factbox-costs-of-war-and-recovery-in-lebanon-and-israel-idUSL0822571220070709>.
- Richmond-Barak, Daphne. *Underground Warfare*. New York: Oxford University Press, 2018.
- Richie, Alexandra. *Warsaw 1944: Hitler, Himmler, and the Warsaw Uprising*. New York: Farrar, Straus, and Giroux, 2013.
- Rozman, Jeremiah. "The Army is Preparing to Go Underground." *Real Clear Defense*, July 3, 2019. Accessed October 26, 2020. https://www.realcleardefense.com/articles/2019/07/03/the_army_is_preparing_to_go_underground_114555.html.
- Sahar, Ilan (COL). *Movements of the 401st Brigade in the Second Lebanon War*. Latrun, Israel: Yad L'shiron-Latrun, 2017.
- Schaefer, Robert. *The Insurgency in Chechnya and the North Caucasus: From Gazavat to Jihad*. Westport, CT: Praeger, 2011.
- Singh, Harjeet. *Asymmetric Conflict*. New Delhi: Pentagon Press, 2018.
- Tan, Michelle. "Army Chief: Soldiers Must Be Ready to Fight in Megacities." *Defense News*, October 5, 2016. Accessed February 10, 2021. <https://www.defensenews.com/digital-show-dailies/ausa/2016/10/05/army-chief-soldiers-must-be-ready-to-fight-in-megacities/>.
- Tasnim News Agency Staff. "IRGC General: Iran has Elaborate Underground Arms Depots." Tasnim News Agency, October 1, 2019. Accessed November 20, 2020. <https://www.tasnimnews.com/en/news/2019/10/01/2108829/irgc-general-iran-has-elaborate-underground-arms-depots>.
- Thomas, Timothy. "Grozny 2000: Urban Combat Lessons Learned." Monograph, Foreign Military Studies Office, Fort Leavenworth, KS. Article appeared in *Military Review* (July-August 2000). Accessed November 1, 2020. <https://community.apan.org/wg/tradoc-g2/fmso/m/fmso-monographs/243762>.
- Trounce, H. D. *Fighting the Boche Underground*. New York: Charles Scribner's Sons, 1918.
- United Nations Interim Forces Lebanon. "UNIFIL Background." United Nations. Accessed December 1, 2020. <https://unifil.unmissions.org/unifil-background#para6>.

- United States Holocaust Memorial Museum. "Deportations to and from the Ghetto." *Holocaust Encyclopedia*, December 4, 2019. Accessed November 30, 2020. <https://encyclopedia.ushmm.org/content/en/article/deportations-to-and-from-the-warsaw-ghetto>.
- . "Warsaw Ghetto." *Holocaust Encyclopedia*, December 4, 2019. Accessed November 23, 2020. <https://encyclopedia.ushmm.org/content/en/article/warsaw>.
- . "Warsaw Ghetto Uprising." *Holocaust Encyclopedia*, December 4, 2019. Accessed November 23, 2020. <https://encyclopedia.ushmm.org/content/en/article/warsaw-ghetto-uprising#:~:text=Although%20initially%20there%20was%20tension,the%20ZZW%20had%20about%20250>.
- US Department of the Army. Army Techniques Publication (ATP) 3-21.51, *Subterranean Operations*. Washington, DC: Government Publishing Office, 2019.
- . Army Techniques Publication (ATP) 5-0.1, *Army Design Methodology*. Washington, DC: Government Publishing Office, 2015.
- . Field Manual (FM) 3-94, *Theater Army, Corps, And Division Operations*. Washington, DC: Government Printing Office, 2014.
- . TRADOC Pamphlet 525-3-1, *The U.S. Army in Multi-Domain Operations 2028*. Washington, DC: Government Publishing Office, 2018.
- Villanueva, Francis U. *Tiradores: Missions and the Men of the Phillipine's Light Reaction Regiment*. CreateSpace Independent Publishing Platform, 2020.
- Watkins, Nicole, and Alena James. "Digging into Israel: The Sophisticated Tunneling Network of Hamas." *Journal of Strategic Security* 9, no. 1 (Spring 2016). Accessed December 10, 2020. <https://scholarcommons.usf.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1508&context=jss>.
- Williams, Phil, and Werner Selle. *Military Contingencies in Megacities and Sub-Megacities*. Carlisle, PA: US Army War College Press, 2016.
- Wilson, Scott. "Palestinians Use Tunnel To Attack Israeli Post 2 Soldiers Killed, One Kidnapped in Raid at Gaza Border." *Washington Post*, June 26, 2006. Accessed October 12, 2020. <https://www.washingtonpost.com/archive/politics/2006/06/26/palestinians-use-tunnel-to-attack-israeli-post-span-classbankhead2-soldiers-killed-one-kidnapped-in-raid-at-gaza-borderspan/8b3392af-7474-44c7-b5f1->.
- Wines, Michael. "Rebels Hit Russian Troops Hard in Battle in the Chechen Capital." *The New York Times*, December 16, 1999. Accessed November 10, 2020. <https://archive.nytimes.com/www.nytimes.com/library/world/europe/121699russia-chechnya.html>.
- Yahara, Hiromichi, and Frank Gibney. *The Battle for Okinawa*. New York: J. Wiley, 1995.