



Digging Into Israel: The Sophisticated Tunneling Network of Hamas

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Digging Into Israel: The Sophisticated Tunneling Network of Hamas

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Abstract

By the end of Operation Protective Edge in August 2014, the Israel Defense Force (IDF) claimed to have discovered and destroyed more than 30 tunnels spanning from beneath Gaza into Israeli territory. Hamas officials have praised these tunnels as an innovative approach to fighting an asymmetric war with a far more conventionally powerful Israel. The purpose of this case study is to examine the complexity of Hamas' vast tunneling network by assessing the motivations behind the group's decision to construct the network, to identify the factors that enabled Hamas to engage in such a complex engineering task, and to assess the level of effectiveness of the tunnel network both strategically and tactically against the IDF.

Disclaimer

Editor's Note: This article forms part of a series of related case studies collected in this Special Issue and should be viewed in the context of the broader phenomenon of complex engineering by violent non-state actors. Readers are advised to consult the introductory and concluding papers for a full explanation and comparative analysis of the cases.

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Introduction

Underground tunnels have long been used in wartime as both an offensive and defensive military strategy.¹ The motivations underlying groups' decision to engage in tunnel warfare may vary, but oft cited reasons include the inherent difficulty associated with finding subterranean structures, and the convenient freedom of movement allowed to those who use them.² The purpose of this case study is to provide an exploratory look into why Hamas (*Harakat al-Muqāwamah al-Islāmiyyah*—Islamic Resistance Movement³) elected to engage in the complex engineering task of constructing a tunneling network into Israel, to describe how this process likely played out, and to assess the effectiveness of these tunnels as a strategy in Hamas' ongoing conflict with Israel. Using open sources, we argue that, whether intentional or not, the tunnel network was a successful undertaking by the organization in several regards: 1. the successful construction of the tunnels themselves,⁴ 2. the negative psychological impact the tunnels produced on Israeli citizens, and 3. the (limited) success the tunnels have brought in allowing Hamas militants entry into Israel. The following section describes the historical context of tunneling and Hamas' tunneling activity in Gaza. The Decision and Implementation sections will examine the plausible factors leading to Hamas' decision to engage in this complex engineering feat, and details of how the tunnel network was most likely constructed. The Analysis section discusses whether the group's decision to construct tunnels was a successful undertaking, while the Conclusion section offers some overarching remarks.

¹ Allen D. Reece, "A Historical Analysis of Tunnel Warfare and the Contemporary Perspective," *School of Advanced Military Studies*, December 18, 1997: 1-63, available at: <http://www.dtic.mil/dtic/tr/fulltext/u2/a339626.pdf>.

² Ibid.

³ Levitt, Matthew, *Hamas: Politics, Charity, and Terrorism in the Service of Jihad*. (New Haven: Yale University Press, 2006), 324.

⁴ For recent information on tunnel collapses during the first part of 2016, see: "Hamas Operative Killed in Fourth Gaza Tunnel Collapse in Recent Weeks," *Jerusalem Post*, February 9, 2016, available at: <http://www.jpost.com/Arab-Israeli-Conflict/Hamas-operative-killed-in-fourth-Gaza-tunnel-collapse-in-recent-weeks-444356>.

Context

Historical Use of Tunnel Warfare

Tunnels have long been used in times of conflict.⁵ The use of tunneling in historical conflicts has stemmed from a desire and/or need to remain difficult to detect.⁶ Perhaps one of the most familiar examples of tunnel warfare is the Viet Cong's use of underground tunnels during the Vietnam War. These tunnels sometimes connected villages and homes, and were the underground location for some public facilities, like hospitals.⁷ These subterranean structures enabled the Viet Cong to evade the U.S. military and conduct surprise attacks. Because they are inherently difficult to locate and target, tunnels can provide a valuable defensive asset for groups that are capable of constructing them. Upon their discovery, it is also difficult to accurately assess the extent of tunnel networks without proper and specialized equipment.⁸ This difficulty in developing an adequate and accurate assessment of an opponent's tunneling network impacts the destruction process; this may not always be a straightforward task, as parts of a tunnel may remain intact even if entrances are seemingly destroyed.⁹ The many difficulties associated with locating, assessing, and fully destroying a tunnel system, in conjunction with the historical precedence of tunneling in Gaza for smuggling purposes, is likely to have influenced Hamas' decision to construct its own tunnel system into Israel.

Hamas' Historical Use of Tunnels

In October 2013, the Israeli Defense Forces (IDF), acting upon information received from an unidentified source, discovered a subterranean tunnel leading from Gaza into Israeli territory.¹⁰ The tunnel, with a total length of 1,800 meters, stretched 300 meters into Israel, and was later claimed to be the work of Hamas, the current governing organization in the Gaza strip and a

⁵ Donald M. Heilig, "Subterranean Warfare: A Counter to U.S. Airpower," *Air University*, April, 2000: 1-34, available at: <http://www.specwar.info/taktika-strategie/podzemne-operacie-v-mestskom-prostredi/subterranean-warfare-a-counter-to-us-airpower.pdf>.

⁶ Ibid.

⁷ Reece, "A Historical Analysis of Tunnel Warfare and the Contemporary Perspective."

⁸ Heilig, "Subterranean Warfare: A Counter to U.S. Airpower."

⁹ Ibid.

¹⁰ Gilli Cohen, "Where Did the Cement Come From? Leak Leads to Discovery of Mega-tunnel From Gaza to Israel," October 23, 2013, available at: <http://www.haaretz.com/news/diplomacy-defense/.premium-1.552162>.

U.S. Department of State-designated terrorist organization.¹¹ It was later discovered that this was just one of many tunnels credited to Hamas for infiltrating the Israeli border.

Over the past decade, Hamas in Gaza and Israel have been involved in an ever-increasing conflict, with 2008's Operation Cast Lead, 2012's Operation Pillar of Defense, and 2014's Operation Protective Edge marking periods of direct, intensified attacks between the two groups. Throughout this time of conflict, Hamas has ostensibly been building tunnels for the express purpose of increasing its military operational capabilities against the IDF, though it remains unclear if the tunnels are explicitly used more for offensive tactics or defensive tactics. During the 50-day Operation Protective Edge specifically, the destruction of this tunneling network beneath the Israeli border became the key avowed motivation for Israel's ground offensive.¹² Through the course of this operation, the IDF claimed it discovered more than 30 tunnels extending into Israel.¹³

However, it should be recognized at the outset that not all tunnels within Gaza are used for military operations, or even infiltrating Israel. Since the 1980s, smuggling tunnels routing from the Gaza Strip into Egypt have played a substantial role in the livelihood of Palestinians by providing supplies and employment opportunities for civilians in need of work.¹⁴ These smuggling tunnels were constructed in response to blockades imposed on the Palestinian territories by Egypt and Israel. Food, weapons, and other goods were and continue to be illegally trafficked through these tunnels, playing a significant role in Gaza's economy by generating approximately \$700 million per year.¹⁵

¹¹ U.S. Department of State, *Foreign Terrorist Organizations*, (Washington, D.C.: US Department of State) available at:

<http://www.state.gov/j/ct/rls/other/des/123085.html>.

¹² ICT Database Team, "Operation 'Protective Edge': A Detailed Summary of Events," International Institute for Counter Terrorism, July 12, 2014, available at: <http://www.ict.org.il/Article/1262/Operation-Protective-Edge-A-Detailed-Summary-of-Events>.

¹³ Anti-defamation League, "Operation Protective Edge: July-August 2014," 2015, available at: <http://www.adl.org/israel-international/israel-middle-east/content/AG/operation-protective-edge.html>.

¹⁴ Shlomi Eldar, "Gaza tunnels take IDF by surprise," *Al-Monitor*, July 20, 2014, available at: <http://www.al-monitor.com/pulse/originals/2014/07/israel-idf-tunnels-gaza-underground-network-failure-welfare.html>.

¹⁵ Hayes Brown, "What You Need To Know About The Tunnels That Bring Life — And Death — Into Gaza," *Think Progress*, July 2014, available at:

Known also as “economic tunnels,” more than 1,000 are thought to have been dug beneath the border between Egypt and Gaza under the authority mainly of Hamas, who took over the territory from Fatah in 2007.¹⁶ As detailed more fully below, Palestinians’ and Hamas’ historical experience in engineering and operating smuggling tunnels is likely a leading factor contributing to Hamas’ decision to dig and construct its tunnel network into Israel.

Although smuggling tunnels have been used since the late 1980s, it is unclear exactly how long operational tunnels have existed beneath the Gaza/Israeli border.¹⁷ The first smuggling tunnel discovery by Israel occurred in 1983;¹⁸ however it is believed that the use of the tunnels for military operations (such as the tunnel discovered in October 2013) only really began during the *al-Aqsa Intifada* (beginning in September 2000), with tunnel development expanding immensely after Hamas took control of Gaza.¹⁹ Following Hamas’ takeover of Gaza, the makeshift tunnels dug by Fatah during the *al-Aqsa Intifada* fell under the authority of Hamas’ military arm, the *Al-Qassam Brigades*. It is believed that they were transformed by the *Al-Qassam Brigades* into what have been called “Gaza’s longest, deepest, and most sophisticated tunnels” by Israeli engineers.²⁰ According to some commentators, many of the more advanced tunnels were constructed following the 2012 ceasefire agreement between Israel and Hamas, when Israel agreed to lift trade bans to allow humanitarian assistance to enter Gaza. It is at this point that the newly uninhibited flow of steel and concrete, intended for the building of above-ground infrastructure in Gaza, may have made the creation of the more sophisticated tunnels possible.²¹

<http://thinkprogress.org/world/2014/07/18/3461742/inside-the-tunnels-that-bring-life-and-death-into-gaza/a>.

¹⁶Karl Vick, “Hamas in Gaza takes war against Israel underground, literally,” *Time*, March 26, 2014, available at: <http://time.com/38627/hamas-gaza-tunnels-israel/>.

¹⁷ Ibid.

¹⁸ Nicholas Pelham, “Gaza’s Tunnel Phenomenon: the Unintended Dynamics of Israel’s Siege,” *Journal of Palestine Studies* 41:4 (2011/2012).

¹⁹ Shabak.gov, 2008, available at:

<http://www.shabak.gov.il/publications/study/Pages/hamas-tunnel-report.aspx>.

²⁰ Pelham, “Gaza’s Tunnel Phenomenon.”

²¹ Ariel Ben Solomon, “Exclusive: US Intelligence source claims Hamas has many more tunnels than Israel says,” *Mabat USA*, July 25, 2014, available at:

<http://mabatusa.com/evan/exclusive-us-intelligence-source-claims-hamas-has-many-more-tunnels-than-israel-says-by-ariel-ben-solomon/>.

The operational tunnels potentially serve many purposes, including the transfer and storage of weapons,²² facilitating border crossings (below the security fence that Israel installed to prevent infiltration), as well as functioning defensively as safety corridors for top leaders in the organization, affording them and their families mobility and sanctuary.²³ In addition, some tunnel networks are designed to serve as “war-rooms,” or underground bunkers in which leaders convene during times of emergency. Another feature of the operational tunnels is that they are able to serve as covert launching pads for rockets targeting Israel. Rocket launchers may be situated at designated tunnel openings to mitigate detection by Israeli surveillance. After a rocket launch, tunnel openings may be re-sealed by *Al-Qassam* militants to prevent the IDF from detecting the tunnel’s location.²⁴ Though it is unclear whether Hamas uses these launch pads from underground within Gaza or within Israel, it seems likely that the group would conduct these attacks from openings within Israel to maximize the potential damage caused by their mostly short-range (i.e. Qassam) rockets. Despite these many purposes, covert infiltration of Hamas fighters into Israel remains, according to many commentators, the key function of the operational tunnels.

Decision

Several factors are likely to have motivated Hamas’ decision making in digging an extensive tunnel network into Israel. For instance, the decision might be noted as one of many responses to Israel’s military superiority to compensate for a perceived power imbalance. According to one Hamas commander, Abu Laith, the 2008 air strikes and air surveillance conducted by Israeli forces during Operation Cast Lead cost the group significantly, spurring it to dig operational tunnels into Israeli territory as a way of moving

²² Nidal Al-Mughrabi, “Exclusive: Hamas fighters show defiance in Gaza tunnel tour,” *Reuters*, August 19, 2014 available at:

<http://www.reuters.com/assets/print?aid=USKBN0GJ1HS20140819>.

²³ Shane Harris, “Extensive Hamas Tunnel Network Points to Israeli Intelligence Failure,” *Foreign Policy*, July 31, 2014, available at:

<http://foreignpolicy.com/2014/07/31/extensive-hamas-tunnel-network-points-to-israeli-intelligence-failure/>.

²⁴ Jonathan Halevi, “Hamas’ Attack Tunnels: Analysis and Initial Implications,” Jerusalem Center for Public Affairs, July 22, 2014, available at: <http://jcpa.org/hamas-attack-tunnels/>.

the battle underground.^{25,26} Reaching depths of at least 30 feet, the tunnels enable Hamas militants to evade detection and provide covert storage of the groups' weaponry and equipment, demonstrating the defensive advantage in tunneling. A dominant narrative that seems to underlie the group's decision to construct these resource-intensive tunnels is this power imbalance between Hamas and the IDF. This decision to engage in tunnel construction is often justified by Hamas specifically as a means of leveling the playing field.

Hamas leader Khaled Meshal described the motivation behind the construction of the tunnel network as a response to Israel's greater military capabilities: "In light of the balance of power which shifted towards Israel, we had to be creative in finding innovative ways. The tunnels were one of our innovations. As they say, necessity is the mother of invention."²⁷ In addition, at a March 2014 rally in Gaza, Hamas leader Ismail Haniyeh announced:

"The tunnels we are inaugurating today are the new Hamas strategy in the war against Israel--the strategy of the tunnels. From belowground and aboveground, you, the occupiers, will be dismissed. You have no place in the land of Palestine...What the resistance forces are preparing secretly for the next confrontation with Israel is beyond imagination for Israel."²⁸

The tunnels have thus also been touted by Hamas leadership as the secret to their successful attacks and their new strategic warfare.²⁹ Indeed, a document that was disseminated to other Palestinian factions, describing the purpose of the tunnels, claimed that the tunnels would pose an unprecedented challenge

²⁵ Rois Kais, "Hamas fighter: We have more weapons, can hit more Israeli cities," *Ynet News*, August 7, 2014, available at: <http://www.ynetnews.com/articles/0,7340,L-4555937,00.html>.

²⁶ Lazar Berman, "Tunnels still intact, say Hamas, Al-Jazeera," *The Times of Israel*, August 8, 2014, available at: <http://www.timesofisrael.com/tunnels-still-intact-say-hamas-commander-al-jazeera/>.

²⁷ Daniel Rubenstein, "Hamas' tunnel network: A massacre in the making," *Jerusalem Center for Public Affairs*, available at: <http://jcpa.org/hamas-tunnel-network/>.

²⁸ Maayan Lubell, "Tunnel attack fear turn Gaza border kibbutzim into a ghost town," *Reuters*, July 22, 2014, available at: <http://www.reuters.com/article/2014/07/22/us-palestinians-israel-tunnels-idUSKBNofR1KV20140722>.

²⁹ Vick, "Hamas in Gaza takes war against Israel underground, literally."

to Israel. The document revealed the group's intentions to deliver a surprise attack that would leave Israel with limited opportunity to defend itself.³⁰

However, the opportunity provided by Hamas' prior experience constructing smuggling tunnels is likely the lead motivating factor in the group's decision to construct tunnels for operational purposes. As described above, these smuggling tunnels played a role in facilitating imports of fuel, vehicles, weapons, explosives, rockets, and other strategic tools used by Hamas to fight the IDF.³¹ However, they also at one time provided Hamas with strategic positioning for attacking IDF operation centers situated within Gaza. Before Israel pulled out of Gaza in 2005, there were several reported instances of attacks on the IDF carried out by planting explosive devices in tunnels situated beneath IDF positions.³² The detonation of an explosive device planted beneath an IDF base in 2001 resulted in injury to three IDF soldiers. Another instance where explosives were planted underneath IDF positions resulted in the death of one IDF soldier and injured five others.³³ Scenarios such as these possibly served as the genesis for the decision to use tunnels extending from Gaza into Israel.

Finally, there has been some suggestion that one motivation for the development of the tunnels system stems from the desire to provide work for the movement's thousands of armed men who have nothing to do when not fighting. According to Shlomi Eldar, a columnist for *Al-Monitor's Israel Pulse*, digging tunnels provides an operational occupation for thousands of Hamas members with a strong desire to fight.³⁴ Digging tunnels thus provides these men with a distraction and hope that their ability to conduct operations against Israel will be enhanced in the future.³⁵

Organization

³⁰ Adnan Abu Amer, "Tunnel May Signal Shift in Hamas-Israel Conflict," *Al-Monitor*, October 22, 2013, available at: <http://www.al-monitor.com/pulse/originals/2013/10/gaza-tunnel-israel-shift-hamas-war.html#>.

³¹ Rubenstein, "Hamas' tunnel network: A massacre in the making.."

³² Terrence McCoy, "How Hamas uses its tunnels to kill and capture Israeli soldiers," July 21, 2014, available at: <http://www.washingtonpost.com/news/morning-mix/wp/2014/07/21/how-hamas-uses-its-tunnels-to-kill-and-capture-israeli-soldiers/>.

³³ Rubenstein, "Hamas' tunnel network: A massacre in the making."

³⁴ Shlomi Eldar, "Hamas Spends Downtime Digging Tunnels," *Al-Monitor*, October 15, 2013, available at: <http://www.al-monitor.com/pulse/originals/2013/10/hamas-gaza-tunnels-israel-jihad.html>.

³⁵ Ibid.

The identities of the key figures in charge of making the decision to embark on the tunnel construction as an operational strategy against Israel are not definitively known. This is largely due to the complex leadership structure and decision making within Hamas. The ultimate authority to decide the broader agenda of the movement ostensibly belongs to the *Shura* Council within Hamas, the leadership body at the apex of the organizational chain of command.³⁶ However, day-to-day operations by the group fall within the scope of the political bureau within Hamas, with military operations more specifically falling within the scope of the group's military wing, the *Al-Qassam Brigades*. While some have claimed that there is no single leader within the movement who makes all decisions, it has been acknowledged that the *Al-Qassam Brigades* have a high degree of autonomy to operate and carry out missions as they see fit.³⁷ Indeed, despite the ambiguity regarding the group's leadership structure, some experts claim that the decision to implement the tunnel strategy was pushed by Mohammed Deif, the current head of the *Al-Qassam Brigades*.³⁸ It is thus suspected that the tunnels are constructed, maintained, and operated by the members of the *Al-Qassam Brigades*. Some fighters have even described these tunnels as being synonymous with their own homes, as they built the tunnels "with their own hands."³⁹

This indoctrination of *Al-Qassam* militants with respect to Hamas' mission of engaging in tunnel warfare might provide a certain degree of risk tolerance for the organization in this regard. Hamas takes a significant risk of disenchanting their militants and alienating the Gazan people with their tunnel strategy, as Israel's response to Hamas attacks has often resulted in many thousands of casualties, including civilians, as well as widespread destruction of infrastructure within Gaza. Furthermore, tunnel construction has been acknowledged as a highly dangerous job, with casualties resulting

³⁶ Bertie, Benedetta, *Armed Political Organizations: From Conflict to Integration*, (Johns Hopkins University Press, 2013).

³⁷ Hroub, Khaled, *Hamas: A Beginner's Guide*, (London: Pluto Press, 2010).

³⁸ "Deep underground, Mohammed Deif shapes Hamas war with Israel" *The Jordan Times*, August 14, 2014, available at: <http://www.jordantimes.com/news/region/deep-underground-mohammed-deif-shapes-hamas-war-israel>.

³⁹ Al-Mughrabi, "Exclusive: Hamas fighters show defiance in Gaza tunnel tour."

from cave-ins being not uncommon.^{40,41} Therefore, the dedication towards the overarching cause remains an important factor in whether and how resilient Hamas can be—as it is the *Al-Qassam* militants who perform the tunnel construction and carry out the attacks through the tunnels. As evidenced by reports of Hamas resuming its tunnel digging immediately following Operation Protective Edge,⁴² its leaders seem willing to accept the risks associated with the tunnel program.

Implementation

As noted above, though not officially identified, the individuals responsible for implementing the tunnel network are believed to be Mohammed Deif, the current leader of the *Al-Qassam Brigades*, as well as (formerly) Ahmed al-Jaabari, the former operational head of the Brigades who was killed by IDF forces in 2012.⁴³ Given the degree of complexity involved in coordinating such an operation, it is likely that the effort has had many members involved in the planning and execution process. While much of the implementation process mirrored that of the smuggling tunnels, some sources note other influences on the development of the tunnel system into Israel, namely those tracing back to influences stemming from Hezbollah, Iran, and North Korea.⁴⁴ Resources from Qatar and the United Arab Emirates have also reportedly aided Hamas in the funding and the construction of tunnels.⁴⁵

The implementation of this complex project requires many types of technical expertise, likely including individuals with specialized knowledge in structural engineering, geology, electrical engineering, and mining. There is insufficient information to state with any certainty whether the organization sought out specific expertise to inform its attack tunneling efforts or whether it acquired

⁴⁰Xinhua, “Tunnel cave-in kills five Hamas militants in Gaza: security officials,” *Globaltimes*, June 19, 2014, available at: <http://www.globaltimes.cn/content/866651.shtml>.

⁴¹ “Hamas Operative Killed in Fourth Gaza Tunnel Collapse in Recent Weeks.”

⁴² Shlomi Eldar, “Hamas focuses on rebuilding tunnels as Gazans Suffer,” *Almonitor*, March 5, 2015, available at: <http://www.al-monitor.com/pulse/originals/2015/05/hamas-digging-tunnels-attack-israel-blockade-gaza-strip.html>.

⁴³ “Deep underground, Mohammed Deif shapes Hamas war with Israel.”; “Ahmed Jaabari: elusive Hamas military chief,” *The Jordan Times*, November 14, 2012, available at: <http://www.jordantimes.com/news/region/ahmed-jaabari-elusive-hamas-military-chief>.

⁴⁴ Halevi, “Hamas’ Attack Tunnels: Analysis and Initial Implications.”

⁴⁵ *Ibid.*

the expertise via an iterative process of trial and error. However, one individual, Akram Juda, was designated by Israel as Hamas' lead electrical and mechanical engineer. Juda was indicted by Israel, which held him responsible for the assembly of engines for drills, assembly of weapons such as rockets and bombs, for rectifying electrical issues, and solving additional engineering complications within the attack tunnels. According to his indictment in 2009, a Hamas commander offered him to work on electricity in the tunnel network, paying him \$300 a month.⁴⁶

Although the number of states supporting Hamas' combat operations remains limited, Hamas' tunnel engineering task has likely been greatly influenced by Hezbollah and Iran. In the period leading up to the Second Lebanon War, which lasted from July 12, 2006 through August 14, 2006, Iran provided guidance to Hezbollah to assist in its development of subterranean tunnels to gain leverage against Israel.⁴⁷ North Korea also assisted Hezbollah by providing engineers to aid with the planning and creation of the tunnels. The attack tunnels that exist beneath the Gaza strip appear to reflect the same sophistication and ingenuity as those constructed by Hezbollah under southern Lebanon. The collaboration among these actors with respect to tunnel construction was likely driven by the same factors underlying their general collaboration—the common objective of undermining Israel (in this case, quite literally). Although past collaborations among these actors are believed to have provided Hamas with influential assistance in taking on its attack tunnel engineering tasks, Hamas' failure to support Bashar Al-Assad in the Syrian Civil War (March 2011 to Present) resulted in some distancing between Hamas and Hezbollah / Iran.⁴⁸ Despite the differences in their

⁴⁶ Yonah Jeremy Bob, "Israel indicts Hamas tunnel engineer," *The Jerusalem Post*, November 11, 2014, available at: <http://www.jpost.com/Arab-Israeli-Conflict/Israel-indicts-Hamas-tunnel-engineer-381466>.

⁴⁷ Emily Harris, "The Long History of the Gaza Tunnels," *NPR*, July 26, 2014, available at: <http://www.npr.org/sections/parallels/2014/07/26/335332220/the-long-history-of-the-gaza-tunnels>.

⁴⁸ Mariam Karouny, "Hamas calls on Hezbollah to unite fight against Israel," *Al Arabiya News*, January 22, 2015, available at: <http://english.alarabiya.net/en/News/middle-east/2015/01/22/Hamas-calls-on-Hezbollah-to-unite-fight-against-Israel.html>; Con Coughlin, "Iran Rekindles Relations with Hamas," *The Wall Street Journal*, April 21, 2015, available at: <http://www.wsj.com/articles/iran-rekindles-relations-with-hamas-1429658562>.

positions on supporting Al-Assad, Hamas appears to have recently improved relations with Iran⁴⁹ and is still seeking to improve relations with Hezbollah.⁵⁰

Security

An important part of any complex engineering endeavor is to ensure the safety and security of those who are implementing the project and the project itself. The precise safety measures, if any, applied to those constructing the tunnels is difficult to ascertain from open sources. However, it may be reasonable to assume that Hamas incorporated some safety regulations to protect its tunnel workers, as members tasked with tunnel digging are held in very high esteem within the organization. The group seems to take significant precautions to conceal the locations of the tunnels and to thwart IDF intelligence gathering. Tunnels are strictly supervised by Hamas members, and civilians are kept at a great distance from the sites.⁵¹ To ensure that tunnel workers did not record any aspects of tunnel work, Hamas conducts strip searches for recording devices.⁵² Some diggers are instructed to cover their faces and use code names. These security measures were enacted to reduce the risk of diggers acquiring information that could be shared with Israel. Some sources have also indicated that tunnel workers may have been executed to prevent intelligence leaks to Israel.⁵³

Digging Process

The need for security remains perhaps one of the most critical underlying differences between the development of previous smuggling tunnels and the tunnels constructed for military operations. There is an imperative to remain inconspicuous and complete the work undetected by the IDF so as to maximize the potential use of the tunnels. During Operation Protective Edge,

⁴⁹ Karouny, "Hamas calls on Hezbollah to unite fight against Israel."

⁵⁰ "Losing Ground in Arab World, Hamas Seeking Iranian Support and New Front Against Israel," *The Tower*, February 19, 2015, available at: <http://www.thetower.org/16430c-losing-ground-in-arab-world-hamas-seeking-iranian-support-and-new-front-against-israel/>.

⁵¹ Marissa Newman, "Hamas said to have executed dozens of tunnel diggers," *The Times of Israel*, August 11, 2014, available at: http://www.timesofisrael.com/hamas-said-to-have-executed-dozens-of-tunnel-diggers/?fb_comment_id=754502417921880_755631041142351#fid7925a8c.

⁵² *Ibid.*

⁵³ *Ibid.*

for example, Israel deployed drone surveillance over Gaza for the purpose of keeping a watchful eye for tunnel diggers and, consequently, tunnels.⁵⁴ To offset the general risk posed by Israel's comprehensive surveillance, Hamas operatives have taken measures to ensure the sites of tunnel entrances were inconspicuous, and that the excavation process was done as subtly as possible. This need for clandestine operations translated to the group's use of excavation tools that make little noise relative to high-powered machines with loud engines.⁵⁵⁻⁵⁶ Tunnel diggers mainly use their hands in the digging process,⁵⁷ only wielding electric or pneumatic jackhammers to break through hard rock or solidly packed dirt.^{58,59} Most of the digging is done in softer soil or sand, using shovels.⁶⁰ Diggers take pains to excavate the dirt as inconspicuously as possible, often removing the sand in boxes or bags slowly to mitigate the potential for detection.⁶¹ As diggers progress through the tunnel, removing dirt and rock, the sides and ceiling are reinforced by concrete panels produced near the location of the dig sites.

The total cost of excavating the tunnels has been estimated to have claimed about forty percent of Hamas' total budget since construction began.⁶² Where each tunnel is estimated to have cost about \$60,000 to \$200,000 to construct initially, the total cost of excavating and maintaining the tunnels is estimated to cost approximately \$1 million each.⁶³ Though very costly to maintain, the

⁵⁴ Jonathon Cook, "Life and Death Under Israel's Drones," *Al-Jazeera*, Nov 28, 2013, available at: <http://www.aljazeera.com/indepth/features/2013/11/gaza-life-death-under-israel-drones-20131125124214350423.html>.

⁵⁵ Jack Khoury, "Hamas shows off tunnel-digging unit," *Haaretz*, Nov 17, 2013, available at: <http://www.haaretz.com/news/diplomacy-defense/.premium-1.558568>.

⁵⁶ Felice Friedson, "The tunnel trap," *Kuwait Times*, Aug 11, 2014, available at: <http://news.kuwaittimes.net/pdf/2014/aug/11/p06.pdf>.

⁵⁷ Khoury, "Hamas shows off tunnel-digging unit."

⁵⁸ Mitch Ginsburg, "How Hamas Dug its Gaza 'Terror Tunnel' and How the IDF Found it," *The Times of Israel*, October 16, 2013, available at:

<http://www.timesofisrael.com/how-the-tunnels-in-gaza-are-dug-and-detected/>.

⁵⁹ Tom Cohen, "CNN's Wolf Blitzer goes into a Hamas tunnel," *CNN*, July 30, 2015, available at: <http://www.cnn.com/2014/07/28/world/meast/israel-gaza-tunnels-wolf/index.html>. According to a deputy commander for the Israeli Southern Gaza Brigade, Hamas obtains the requisite electricity from Israel to power the jackhammers and lighting used during the excavation process.

⁶⁰ Khoury, "Hamas shows off tunnel-digging unit."

⁶¹ Vick, "Hamas in Gaza takes war against Israel underground, literally."

⁶² Elhanan Miller, "From tunnels to R-160s, a primer on Hamas and its deadly capabilities," *The Times of Israel*, July 31, 2014, available at: <http://www.timesofisrael.com/from-tunnels-to-r-160s-a-primer-on-hamas-and-its-deadly-capabilities/>.

⁶³ Abu Amer, "Tunnel May Signal Shift in Hamas-Israel Conflict."

group's rapid resumption of tunnel building activity directly following Operation Protective Edge appears to indicate that the organization has sufficient financial resources to both construct tunnels and recover from losses caused by Israeli attacks.

Sources suggest that between five and seven militants are involved in the actual digging process at a time.⁶⁴ These individuals are able to stay underground for significant lengths of time due to certain provisions they are afforded. Often, the tunnels are packed with sufficient amounts of food and water so that the diggers are able to work uninterrupted for extended periods of time. Some reports about the tunnels noted the presence of several months' worth of food and provisions.⁶⁵ The tunnel diggers are considered to be elite members of the *Al-Qassam Brigades*, and are viewed as "members of a profession."⁶⁶ They most likely are drawn from the Engineering Unit of the Qassam Brigades, the arm that is charged with constructing the tunnels used in military operations.⁶⁷ Due to the dangers associated with their job, tunnel diggers are generously compensated by the organization.⁶⁸ Barring any disasters during the digging process, such as collapses, diggers are able to advance an average of approximately four to five meters a day⁶⁹ and can complete an operational tunnel in nine to ten months,⁷⁰ though tunnels have been found that have taken upwards of two years to construct.⁷¹

Tunnel Characteristics

Hamas' operational tunnels consist of a single main shaft, connected to multiple offshoots that lead elsewhere in Gaza, or that spawn different exits into Israel to facilitate the group's surprise attacks from different locations. The tunnels themselves typically begin from an inconspicuous location in

⁶⁴ Vick, "Hamas in Gaza takes war against Israel underground, literally."

⁶⁵ McCoy, "How Hamas uses its tunnels to kill and capture Israeli soldiers."

⁶⁶ Yaakov Lappin, "Analysis: The hidden picture in Gaza," *The Jerusalem Post*, July 31, 2014, available at: <http://www.jpost.com/landedpages/printarticle.aspx?id=369501>.

⁶⁷ "The 'Izz Al-Din Al-Qassam Brigades' Weapons And Units," *The Middle East Media Research Institute*, September 2, 2014, available at: <http://www.memri.org/report/en/print8132.htm>.

⁶⁸ Jack Khoury, "Hamas Says it Has Resumed Digging Tunnels Throughout Gaza", *Haaretz*, October 19, 2014, available at: <http://www.haaretz.com/israel-news/.premium-1.621706>.

⁶⁹ Miller, "From tunnels to R-160s, a primer on Hamas and its deadly capabilities."

⁷⁰ Vick, "Hamas in Gaza takes war against Israel underground, literally."

⁷¹ Ibid.

Gaza, a few hundred meters from the border with Israel.⁷² Typically, these are civilian structures, such as a chicken coop or the home of individuals who are paid by Hamas. During Operation Protective Edge, the IDF reported that all of the tunnels that they located and destroyed began within buildings.⁷³ Hamas may build from or near civilian infrastructure because of Israel's reticence to deploy air strikes on civilian locations. However, even the entrances that are located outside and not within these structures are difficult to find, the search for them having been equated by IDF officials as trying to locate a "needle in a haystack."⁷⁴ Tunnel entrances have been described as "tiny," with openings less than one meter in width, which probably aids in this camouflage.⁷⁵

The main shaft of the tunnel may be reached by descending ladders extending from the opening, or by foot. Tunnels vary in depth and length, but some of the tunnels that have been found by IDF forces during Operation Protective Edge were reported to range from depths of about forty-five feet to one hundred feet underground.⁷⁶ Tunnels that are dug to depths closer to the one hundred feet range are typically done so in response to the threat of detection that is posed by sonar devices.⁷⁷

The ceilings of the tunnels are normally tall enough to allow soldiers to walk through with a slightly stooped posture,⁷⁸ though some areas of the tunnel are raised enough to allow for walking while fully erect.⁷⁹ Additionally, the tunnels are reported to be wide enough for militants to walk through, single-file. While these tunnels are equipped with light sources throughout, enabling militants to see for some distance ahead, visibility tends to be

⁷² Ibid.

⁷³ John Batchelor, "Hamas' attack tunnels are transforming war with Israel," *Al-Jazeera*, July 29, 2014, available at: <http://america.aljazeera.com/opinions/2014/7/gaza-tunnels-hamasisraelidf.html>.

⁷⁴ Harriet Sherwood, "Inside the tunnels Hamas built: Israel's struggle against new tactic in Gaza war," *The Guardian*, August 2, 2014, available at: <http://www.theguardian.com/world/2014/aug/02/tunnels-hamas-israel-struggle-gaza-war>.

⁷⁵ Halevi, "Hamas' Attack Tunnels: Analysis and Initial Implications."

⁷⁶ Ibid.; Friedson, "The tunnel trap."; Alan Dershowitz, "Terror Tunnels: The Case for Israel's Just War Against Hamas", Gatestone Institute, September 12, 2014, available at: <http://www.gatestoneinstitute.org/4695/hamas-terror-tunnels>.

⁷⁷ Matthew Levitt, "Hamas' Hidden Economy", *The LA Times*, July 3, 2007, available at <http://www.washingtoninstitute.org/policy-analysis/view/hamass-hidden-economy>.

⁷⁸ Friedson, "The tunnel trap."

⁷⁹ Cohen, "CNN's Wolf Blitzer goes into a Hamas tunnel."

somewhat limited by the ambient light.⁸⁰ The interior provisions of the tunnels often include things that facilitate the movement of heavy objects (weaponry,⁸¹ abductees,⁸² or other materials), such as tracks, carts, and pulley systems.⁸³ The interior of the tunnels are also characterized by networks of visible wires and cables that comprise electrical and communications systems.⁸⁴ Installing separate communication lines as opposed to using the established cellular network is done because of the unreliable network coverage that exists when operating at certain depths below ground, in addition to the vulnerabilities to IDF intelligence that exist when using cellular lines to communicate.⁸⁵

Analysis

The purpose of this case study was to provide an exploratory look into why Hamas chose to engage in the complex engineering task of constructing a tunneling network into Israel, to describe the process of tunnel construction, and to assess the effectiveness of these tunnels as a strategy in Hamas' ongoing conflict with Israel. In line with other groups that have historically used tunnels to engage in covert military operations (i.e. moving undetected between locations, conducting surprise attacks, using underground facilities as a storage point for both weapons and people), Hamas has taken up tunneling under its enemy's territory as a means of increasing its operational capabilities. Up to this point, we have delineated several likely motivations behind Hamas' decision to engage in tunnel construction. Most prominent, we think, is the historical precedence of tunneling, albeit for smuggling purposes, in the Gaza strip. After examining the intricacies involved in the actual construction process, the question that must be addressed next is whether Hamas' development of the tunnel network was successful for the group in terms of both task execution and strategy. Drawing our conclusions from the open-source literature, we propose that Hamas was successful in the execution of the tunneling itself, and also that the group enjoyed strategic success through the negative psychological impact instilled in Israeli citizens. In terms of overall success conducting ground offensives and infiltration of

⁸⁰ Ibid

⁸¹ Sherwood, "Inside the tunnels Hamas built."

⁸² Batchelor, "Hamas' attack tunnels are transforming war with Israel."

⁸³ Cohen, "CNN's Wolf Blitzer goes into a Hamas tunnel."

⁸⁴ Sherwood, "Inside the tunnels Hamas built."

⁸⁵ Vick, "Hamas in Gaza takes war against Israel underground, literally."

Israeli territory (again, an ostensible goal of the tunnels), Hamas has enjoyed less success.

1. *Successful construction of tunnels*—The use of tunnels in warfare has proven to be a viable defensive tactic throughout history, especially due to the difficulties associated with successful location and assessment of scope. The above discussion has shown that (notwithstanding some collapses), Hamas has been successful in constructing and maintaining a multitude of tunnels. Moreover, even if located, tunnel destruction could prove difficult, as there is no guarantee that the tunnel would be fully destroyed. Some segments may remain intact, even after detonating an explosive to trigger a collapse. Following the IDF's campaign to eliminate the tunnels during Operation Protective Edge, Hamas claimed that the IDF's destruction of 30 tunnels was only a portion of the total number of tunnels it constructed into Israel.⁸⁶ Furthermore, it claimed that the tunnels that were reportedly destroyed by IDF forces were not completely destroyed, and that they were able to rebuild sections that were collapsed.⁸⁷ However, there is no guarantee that this information is not the product of Hamas propaganda. Regardless of how many tunnels Hamas has retained, the execution of the task of building military tunnels should be regarded overall as successful, given that the tunnels were well-equipped with the requisite technology and weaponry that would turn a simple smuggling tunnel into an operational tunnel for military purposes.
2. *Negative psychological impact on Israeli citizens*—One could also argue that Hamas was successful in a less direct sense, specifically, through the side effect of fear produced amongst Israeli citizens, especially those living near the Gaza border.⁸⁸ The discovery of the

⁸⁶ Ari Yashar, "Hamas says IDF didn't Destroy all Terror Tunnels," *Israel National News*, October 3, 2014, available at:

<http://www.israelnationalnews.com/News/News.aspx/185778>.

⁸⁷ Hazem Balousha, "Undeterred by Closures, Hamas still boasts of Tunnel Advantage," *Al-Monitor*, February 8, 2016, available at: <http://www.al-monitor.com/pulse/originals/2016/02/gaza-hamas-strategic-weapon-tunnels-against-israel.html#>.

⁸⁸ Maayan Lubell, "Tunnel attack fear turn Gaza border kibbutzim into a ghost town," *Reuters*, July 22, 2014, available at: <http://www.reuters.com/article/2014/07/22/us-palestinians-israel-tunnels-idUSKBN0FR1KV20140722>.

complexity of the tunnel system has succeeded in raising great concern in the IDF, and in Israeli citizens. Several sources portraying Israeli civilians' reactions to the discovery have suggested a negative psychological impact resulting from fear of the tunnels, and of being kidnapped.⁸⁹ Indeed, one could relate prior research conducted on fear of victimization and crime that suggests that perceived risk, and not necessarily actual risk, is sufficient to affect individuals' fear of victimization.⁹⁰ This notion was examined in a study conducted with Israeli university students attending school in an area undergoing constant rocket attacks in 2008. The study revealed that actual risk of being victimized by rocket attacks was not necessarily a predictor of taking precautionary safety actions. For instance, students who lived within the attack zone generally had less concern about their personal risk and taking precautionary actions than those who lived outside of the attack zone.⁹¹ This supports the notion that, regardless of the actual risk of being attacked, whether via missile attacks or tunnel infiltrations, the perceived risk is sufficient to produce fear amongst a populace, especially when supplemented with widespread Israeli (and international) media coverage on the tunnels. Though we would be remiss in equating fully the fear of victimization with actual victimization, fear has been associated with a host of negative outcomes, including detrimental effects on mental and physical health and quality of life in general.⁹² Thus, the tunnels under the Israeli border, and the uncertainty they bring with them in terms of location, length, and number of openings, may potentially inflict much more damage on Israel than any single ground attack on IDF posts could achieve.

3. *Limited success in ground offensives*—The tunnels have been used by militants in several successful operations against Israeli forces that

⁸⁹ Jodi Rudoren, "Tunnels Lead Right into the Heart of Israeli Fear," *NY Times*, Jul 28, 2014, available at: http://www.nytimes.com/2014/07/29/world/middleeast/tunnels-lead-right-to-heart-of-israeli-fear.html?_r=0.

⁹⁰ Ferraro, KF, *Fear of Crime*, (Albany, NY: State University of New York Press, 1995).

⁹¹ Mosi Rosenboim, Uri Benzoin, Shosh Shahrabani, and Tal Shavit, "Emotions, Risk Perceptions, and Precautionary Behavior Under the Terror Attacks: A Field Study Among Israeli College Students," *Journal of Behavioral Decision Making*, 25 (2012): 248-256.

⁹² Mai Stafford, Tarani Chandola, and Michael Marmot, "Association Between Fear of Crime and Mental Health and Physical Functioning," *American Journal of Public Health*, 97(11), (November 2007): 2076-2081.

included the detonation of explosives beneath IDF positions in Gaza, or small teams of Hamas militants leading surprise attacks on IDF positions in Israel. However, these were limited in scope and impact. Several July 2014 infiltrations near the Israeli villages of *Sufa* and *Nir-Am* and at Israeli security post *Nahal Oz* ended in the total deaths of 11 IDF soldiers, though Hamas experienced casualties as well.⁹³ In another incident in 2013, Hamas fighters disguised as members of the IDF killed two soldiers after attacking an army patrol car.⁹⁴ The abduction of Gilad Shalit in 2006 appears to be the most notable instance of a successful operation led by Hamas using tunnels. In June 2006, Hamas militants entered Israel via the underground network and abducted Gilad Shalit, an IDF soldier.⁹⁵ In 2011, Shalit was traded to Israel in an exchange for 1,027 Palestinian prisoners.⁹⁶ A senior Israeli intelligence official described the exchange as “one of the most asymmetrical incidents in recent memory.”⁹⁷

The evidence of successful attacks provided here may lead one to argue that the tunnel network amounted to an overall operational failure due to the limited number and scope of these attacks—i.e. the number of IDF members killed or injured relative to the number of Hamas militants killed. One could also argue that the number of Gaza civilians who were killed during each response by the IDF, and the reinstatement of the blockade by Israel⁹⁸ in response to finding a tunnel system in October 2013, is further evidence of this overall failure. Considered in such a purely rational calculus, the task of tunneling was therefore not successful in meeting Hamas’ likely intended goal of conducting effective ground offensives and potentially mimicking the

⁹³ Jeffrey White, “The Combat Performance of Hamas in the Gaza War of 2014,” *CTC Sentinel* 7:9 (September, 2014): 9-13.

⁹⁴ McCoy, “How Hamas uses its tunnels to kill and capture Israeli soldiers.”

⁹⁵ Lee Glendinning, Warren Murray, Matthew Weaver, Haroon Siddique and Ben Quinn, “Gilad Shalit exchange for Palestinian prisoners – as it happened,” *The Guardian*, October 19, 2011, available at:

<http://www.theguardian.com/world/blog/2011/oct/18/gilad-shalit-release-palestinians-live>.

⁹⁶ *Ibid.*

⁹⁷ Adam Ciralsky, “Did Israel Avert a Hamas Massacre?,” *Vanity Fair*, October 21, 2014, available at: <http://www.vanityfair.com/news/politics/2014/10/gaza-tunnel-plot-israeli-intelligence>.

⁹⁸ Rasha Abou Jalal, “Cement Shortage in Gaza Leaves Thousands Jobless,” *Al-Monitor*, March 3, 2014, available at: <http://www.al-monitor.com/pulse/originals/2014/03/cement-blockade-siege-israel-egypt-gaza-construction.html#>.

singular incident involving Gilad Shalit, as the heavy costs associated with construction and IDF retaliation amount to more than the benefits realized by using the tunnels for offensive and defensive purposes.

If not subscribing to a strict cost/benefit calculation, however, it can be alternatively argued that the tunnel network was an operational success in light of the power imbalance at the outset. The idea that Hamas was able to carry out several successful ground offensives on IDF military posts and inflict casualties of any number could be considered a success for the organization and its larger cause, given the fact that the tunnel network was never expected to meet Israel's military force one to one. The idea that the group has been able to cause what little damage it has may be even more meaningful given the extensive resources that go into Israel's maintaining a very capable and sophisticated military operation,⁹⁹ including substantial resources devoted to locating and eliminating Hamas tunnels.

Conclusion

In this case study, we have set forth several reasons why Hamas may have decided to construct a network of tunnels into Israel. We propose that the decision was a culmination of several factors, but was mainly due to the historical use and knowledge of building smuggling tunnels in Gaza. Despite the limited success associated with the use of attack tunnels as an offensive tool in its conflict with Israel, Hamas was very successful in the *construction* of these advanced tunnels, and in consequently instilling a certain degree of fear within its enemy. Structurally, the tunnels are well built and have allowed Hamas to carry out several offensive operations against the IDF. The idea that the group was able to inflict damage upon Israel, whether that be physically, psychologically, or politically,¹⁰⁰ could, in our view, be considered a successful undertaking. Nevertheless, our analysis and conclusions must be tempered by the fact that this study relies almost entirely on open-source material, much of it stemming from Israeli sources. Taking this into consideration, we propose that Hamas' decision to construct these operational tunnels, and the level of structural sophistication achieved,

⁹⁹ For example, see Michael Martinez and Josh Levs, "How Iron Dome Blocks Rockets From Gaza, Protects Israelis," *CNN*, July 9, 2014, available at: <http://www.cnn.com/2014/07/09/world/meast/israel-palestinians-iron-dome/>.

¹⁰⁰ "Israel to 'Resist International Pressure' Over Gaza," *BBC*, July 12, 2014, available at: <http://www.bbc.com/news/world-middle-east-28271546>.

certainly represents a successful effort, at least from the perspective of a complex engineering task.