

Fighting in the Unknown: Lawful Measures to Neutralize Subterranean Threats

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INTRODUCTION

In January of 1966, the war in Vietnam was expanding as the United States had begun to send regular combat units as opposed to advisers as in previous years. In one engagement, eight thousand U.S. and Australian forces descended on an area that had been heavily bombed in the hopes of cleaning up remnants of the Viet Cong suspected to be in the area. However, when the joint forces arrived, they only found some deserted fortifications, rice, and other evidence that suggested a large force had once been there. No one could figure out where the Viet Cong had gone. This puzzle was solved when one American Soldier sat down to rest and thought he had been stung or bitten by something. As he searched to find what bit him, he discovered it was a nail protruding from a wooden hatch. This accidental discovery of the hatch uncovered a massive underground complex known as the Cu Chi tunnels, which spanned over fourteen miles. This series of tunnels was just one of many tunnel complexes that U.S. forces would discover during the conflict in Vietnam.¹

Subterranean operations have been an aspect of warfare since the beginning of recorded history. For thousands of years, cities were constructed with large defensive walls to provide protection for its citizens. Castles and fortresses built during the Middle Ages provided protection for the population while invaders would build tunnels to collapse walls and breach the city's defenses. The American Civil War saw Union forces dig sabotage tunnels beneath Confederate lines and detonate large amounts of explosives. On the island of Gibraltar, the British constructed tunnels for almost two hundred years. In World War II, the Germans did much of their V-2 rocket production in underground facilities. More recently, tunnels have been used by drug smugglers across the borders of the United States and by the Palestinians across the borders in Israel and Egypt.²

Subterranean threats do not simply come from tunnels. Urban populations are continuing to rise and, if current trends continue, the United Nations projects

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1. Nelson Smithwick, *Down and Dirty: The Tunnel Rats of Vietnam*, STMU HISTORY MEDIA (Apr. 28, 2017), <https://perma.cc/5YB7-7STR>.

2. U.S. DEP'T OF ARMY, TECHNIQUES PUB., No. 3-21.51, SUBTERRANEAN OPERATIONS vii (Nov. 01, 2019) [hereinafter ATP 3-21.51].

two-thirds of the world's population will reside in large, metropolitan areas, or megacities.³ By 2030, the United Nations predicts the world's thirty megacities will also double to sixty. Large-scale cities will increase from forty-five to eighty-eight.⁴ Megacity combat is much different than fighting in open terrain. Cities have subways and sewers – often multiple layers of them that cross the entire city. These factors make the environment far more complex. When operating within these megacities, soldiers are very likely to only think in two dimensions, but they must learn to think and fight in three dimensions.⁵ Subway entrances and tunnels as well as manholes and sewer systems will afford an adversary numerous opportunities to strike unexpectedly. Additionally, many adversaries will have subterranean facilities that function as national command and control centers, communication facilities, and protection for civilian leaders.

One of the most well documented tunnel systems is the one running directly between North and South Korea. North Korea not only has tunnels for troops to come across the demilitarized zone (DMZ), but there are tunnel systems for artillery as well as nuclear, chemical, and biological weapons. These tunnels, which were first discovered in 1974, were built as a means to invade South Korea.⁶ For example, the first tunnel was large enough to move two thousand troops per hour under the DMZ. In 1978, in response to a tip from a North Korean defector, a larger tunnel that was over a mile long and nearly seven feet wide was discovered.⁷

As the U.S. Department of Defense shifts its focus from counter-insurgency and counter-terrorism operations to future peer-to-peer or near-peer conflicts, it must also consider that subterranean systems will likely play an increasing role both in friendly and adversary operations.⁸ Several countries, such as Russia,⁹

3. Joe Lacdan, *Warfare in Megacities: A New Frontier In Military Operations*, U.S. ARMY (May 24, 2018), <https://perma.cc/9RKW-XYV6>.

4. *Id.*

5. Nick Nethery, *Prepare to Fight in Megacities*, U.S. NAVAL INST. (Aug. 2018), <https://perma.cc/S3UB-AYCD>.

6. Kyle Mizokami, *North Korea's Secret Weapon: Underground Air Bases*, NAT'L INT. (Jan. 31, 2018), <https://perma.cc/9X95-B5Y3>.

7. *Id.*

8. DEP'T OF DEF., SUMMARY OF THE 2018 NATIONAL DEFENSE STRATEGY OF THE UNITED STATES OF AMERICA 4 (2018), <https://perma.cc/8DJ3-PGMF> (“Long-term strategic competitions with China and Russia are the principal priorities for the Department, and require both increased and sustained investment, because of the magnitude of the threats they pose to U.S. security and prosperity today, and the potential for those threats to increase in the future. Concurrently, the Department will sustain its efforts to deter and counter rogue regimes such as North Korea and Iran, defeat terrorist threats to the United States, and consolidate our gains in Iraq and Afghanistan while moving to a more resource-sustainable approach.”).

9. Michael R. Gordon, *Despite Cold War's End, Russia Keeps Building a Secret Complex*, N.Y. TIMES (Apr. 16, 1996), <https://perma.cc/Y5ZW-L2PG>. In the 1950s, Russia began constructing a massive underground military complex inside the Yamantau mountain in the southern Ural mountains. Construction was still ongoing into the 1990s. There are also other underground complexes that were built during the Soviet era. *Id.*

China,¹⁰ North Korea,¹¹ and Iran¹² are actively constructing underground facilities. In 2018, Daphné Richemond-Barak published her book, *Underground Warfare*, which provides a comprehensive overview of the various issues surrounding underground warfare and fighting in tunnels.¹³ One of her main points is that “all states, especially but not only those that have experienced underground warfare, should elaborate a strategy to contend with subterranean threats.”¹⁴ In her view, underground warfare strategy includes four steps: (1) detection and mapping; (2) neutralization and/or destruction; (3) prevention and monitoring; and (4) cooperation.¹⁵

In early 2018, as tensions increased with North Korea, there was real concern of a conflict. As then U.S. Army Chief of Staff General Mark Milley noted, “[a] full-blown war on the Korean Peninsula will be horrific by any stretch of the imagination.”¹⁶ A major concern for the United States was North Korea’s massive network of underground tunnels, so the U.S. Army began increasing its training efforts in tunnel warfare. In addition to increased training of soldiers, the Department of Defense purchased equipment that would specifically assist those forces who would have to fight in the tunnels. Although the Army normally trains one to two divisions for tunnel warfare, the North Korean threat necessitated an increase in the number of trained units. In a report to National Public Radio (NPR), retired Army Colonel Dave Maxwell said of the training, “I think it’s necessary, not just for U.S. troops but for South Korean troops as well. There are about 5,000 of these tunnels. The North Koreans are like mole people.”¹⁷

As a result, the U.S. Army launched an effort to train twenty-six of its thirty-one active combat brigades to fight in large-scale subterranean facilities. Although the Army has been aware it might have to secure and clear underground facilities, that operation previously went to Special Forces units. With renewed concern over North Korea and other near-peer militaries, such as Russia and

10. Robert Johnson, *China has More Than 40 of These Underground Air Bases And They’re Nearly Impossible to Destroy*, BUS. INSIDER (Feb. 24, 2012, 4:10 PM), <https://perma.cc/WBG2-C743>. China began construction of hidden air bases in the 1950s and though some are no longer in use, many are still operational and contain China’s newest fleet of aircraft. *Id.*

11. Mizokami, *supra* note 6. For example, North Korea is believed to have three different underground air bases at Wonsan, Jangjin, and Onchun. At Wonsan, the base reportedly includes a 5,900 foot runway capable of supporting MiG-29 fighters and Su-25 Frogfoot ground-attack aircraft. *Id.*

12. Leon Sverdlov, *Iran’s Secret Underground “Missile City” Unveiled*, JERUSALEM POST (Jan. 15, 2020, 6:31 AM), <https://perma.cc/SM6Y-LCYW>. In January 2020, the Iranian Tansim news agency released images of the Islamic Republic’s underground “missile cities,” which can hold hundreds of missiles and solid-fuel rockets. The Iranian Republican Guard Airspace Commander, Ali Hajizadeh, claimed that Iran’s missile depots are scattered in bunkers hidden 500 meters underground in the mountains of Iran. *Id.*

13. DAPHNÉ RICHEMOND-BARAK, *UNDERGROUND WARFARE* (2018).

14. *Id.* at 86.

15. *Id.* at 86-87.

16. Robbie Gramer & Paul McLeary, *US Generals: War with North Korea would be “Horrific,”* MERCURY NEWS (Oct. 10, 2017, 10:12 AM), <https://perma.cc/V7LD-R7R7>.

17. Greg Price, *U.S. Preparing for Tunnel Warfare with North Korea as Talks Open with South*, NEWSWEEK (Jan. 9, 2018, 8:21 AM), <https://perma.cc/3NLX-AEHR>.

China, however, that mission has begun to change. It is estimated there are 10,000 large-scale underground military facilities around the world intended to function as subterranean cities.¹⁸ The Army's Asymmetric Warfare Group, which is an organization tasked to identify future threats, advised military leaders that special operations forces alone will not be enough to deal with this threat and conventional forces must be trained and equipped to fight underground.¹⁹

This article will explore the lawful measures that can be taken to neutralize subterranean threats. In the first part, the article will review how Richmond-Barak and the U.S. Army classify the various types of tunnels, subterranean spaces, and structures. The second part will look at the applicable law with respect to subterranean operations. Finally, the third part will focus on the second prong of Richmond-Barak's strategy by looking at the various methods to neutralize and destroy tunnels and other subterranean systems and applying the law to them.

I. TYPES OF SUBTERRANEAN SPACES AND STRUCTURES

There are many reasons states or non-state actors will build subterranean structures. For example, the use of subterranean systems and underground structures can provide less technologically advanced belligerents a way to covertly maintain the initiative against a militarily superior opponent. These subterranean systems and structures, despite some limitations, offer many advantages. Tunnels, caves, and aquifers have often been used for movement and transport of equipment and personnel, conducting military operations, and protection from observation and attack. As the construction of subterranean systems improve, their usefulness correspondingly increases. Richmond-Barak notes that there are various types of tunnels and each raise distinct issues and challenges. Therefore, it is important to first determine what she refers to as the "typology" of tunnels.²⁰ Her analysis is through the "5 W's" of who, what, when, where, and why. These questions assist in identifying the threat, assessing the risks, and devising the operational and legal tools to neutralize the threat from the tunnel.²¹

The first question in considering the type of tunnel is "where." Richmond-Barak notes that it is important to know the location of the tunnel.²² Is the tunnel located within the territory of the state or does it cross the border to a neighboring state? For example, if the tunnel is located on the territory of a single state during an armed conflict, then it can be easier to determine who created the tunnel and the purpose for it. If it is peacetime and the tunnel crosses the border into an adjoining state, then there are different possibilities such as smuggling drugs or

18. Matthew Cox, *Army is Spending Half a Billion to Train Soldiers to Fight Underground*, MILITARY.COM (June 24, 2018), <https://perma.cc/NME6-XDA5>.

19. *Id.*

20. RICHMOND-BARAK, *supra* note 13, at 44.

21. *Id.*

22. *Id.*

other contraband across the border. Such a tunnel will also raise questions regarding sovereignty.²³

The second question to consider is “when” the tunnel is discovered. Similar to the question of “where,” the discovery of a tunnel during an armed conflict raises different legal issues than a tunnel discovered in peacetime.²⁴ During an armed conflict, the discovery of a tunnel will affect military operations as this will impact the availability of intelligence with respect to the opposing force and its combat capabilities.

The third question with respect to tunnels is the “what” aspect, which includes the items found in the tunnel and the how the tunnel was made. This question most closely aligns with how the U.S. Army categorizes tunnels. Is the tunnel man-made with rudimentary features or is it a complex structure? According to Richemond-Barak, the ultimate purpose of a tunnel will determine how it is constructed and the features it contains. If it is a short-term use tunnel meant to be used in a few days, it will be easier to conceal than an underground facility that can take weeks, months, or years to build.²⁵

The fourth question is “why” was the tunnel built. Although there are often various types and functions of a tunnel, the primary purpose is generally to gain a military advantage to the user.²⁶ The intended purpose is not always going to be apparent, but the characteristics of a particular tunnel certainly assist in ascertaining why it was built.

Richemond-Barak’s fifth question is “who” built the tunnel? Once a tunnel is discovered it raises two questions: who built it and who is using it? Authorities or the armed forces will want to know if it is the work of an opposing military force or the work of a couple of individuals. Then, are those using the tunnel an armed group or civilians? The answer to these questions will determine how to legally respond to this threat.

Richemond-Barak notes that the typology of tunnels will provide a framework for thinking about tunnels and countering the threat. Being able to distinguish among the various types of tunnels allows for a credible assessment of the threat and helps craft the appropriate response.²⁷

As noted above, the U.S. Army looks at many of the same factors discussed by Richemond-Barak but uses a different methodology. In a recently published Army Techniques Publication, *Subterranean Operations*, the U.S. Army classifies subterranean environments into three categories: (1) tunnels, caves, and natural cavities; (2) urban subsurface systems; and (3) underground facilities (military purposed).²⁸

23. *Id.* at 45.

24. *Id.*

25. *Id.* at 47.

26. *Id.* at 48.

27. *Id.* at 49.

28. ATP 3-21.51, *supra* note 2, ¶ 1-43 tbl.1-1.

The first category – tunnels, natural cavities, and caves – is further broken into two subcategories: rudimentary or sophisticated systems. A rudimentary system is one that lacks support, such as shoring made of wood, brick, or concrete slabs to help prevent a collapse of the tunnel. Sophisticated systems are shored, which provides advantages such as power outlets, lighting, ventilation shafts, and drainage pipes and pumps, and allows for greater dimensions within the tunnel.²⁹

The second type of subterranean system is an urban subsurface system, which also has two subcategories. The first is substructures, which will include basements and parking garages, and can include all of the infrastructure associated with sophisticated tunnels, like shoring, drainage, and power. The second subcategory of urban subterranean systems is civil works, including subways, sewers, aqueducts, and aquifers.³⁰

The third type of subterranean systems is military purposed underground facilities. Underground facilities vary widely by size, construction technique, and purpose, and are designed to be unobserved and to provide maximum protection. They are frequently human-made, and in the case of military and other government facilities, are generally hardened and protected by a variety of measures. Commanders and operators must make every effort to assess and understand these protective measures, if they are present, to allocate appropriate resources and mitigate risk to one's forces.³¹

Underground facilities can be shallow or deep and have redundant power, water, ventilation, and communications infrastructure. These facilities may also have blast doors for the protection of forces or critical infrastructure. Not all underground facilities are designed to protect mission command nodes or weapons of mass destruction. In fact, many countries will protect artillery, short-range rocket systems, and anti-aircraft artillery in such facilities while others merely house harmless civilian infrastructure.³²

The amount of earthen material, such as rock and soil, between the top of the functional area of an underground facility and the surface of the ground is called overburden. In addition to providing concealment, a larger amount of overburden provides a greater level of protection from explosive blasts. Underground facilities can be defined as shallow or deep based on the amount of overburden. A shallow facility is one that has twenty meters or less of overburden. Examples include cut-and-cover facilities, basement bunkers, and smuggling or escape tunnels. A deep facility is one with more than twenty meters of overburden. Examples include mines and subway systems as well as most military purposed facilities.³³

Most subterranean systems will have some level of access control to protect against unauthorized access in the form of barricades. The term "barricade" refers to doors, gates, hatches and framing, as well as the presence of any reinforcement

29. *Id.* ¶ 1-44.

30. *Id.* ¶ 1-46.

31. *Id.* ¶ 1-47.

32. *Id.* ¶ 1-51.

33. *Id.* ¶ 1-48.

to hinges, locking mechanisms, or the barrier itself to control entry and exit.³⁴ The term “portal” refers to the rough opening in a wall, tunnel, and so forth that provides the means to access a space.³⁵ With these obstacles in mind, the U.S. Army has developed three “accessibility levels” to help characterize, in general terms, the type of breach and equipment needed to gain entry based upon portal construction and barrier design.³⁶

A Level 1 barricade includes systems with a range of access point concealment techniques. These may include simple measures, such as a rug, piece of wood, furniture, foliage, and the use of residential or commercial grade entry-control barriers. Level 1 portals include openings in walls made of sheetrock, cinder block, or brick, in building-type structures and tunnels constructed in dirt and rock. A Level 1 portal does not contain any additional reinforcement or hardening. Barriers are standard-use, made of wood or metal and have a hollow or solid core. They possess standard locking mechanisms, such as deadbolts, door chains, padlocks, hinges, handles, or fasteners. They do not possess any special reinforcement against access. Entry is possible through forced-entry on the barrier or surrounding wall using basic breaching techniques, which is discussed below in section IV. While explosive and thermal breaching techniques will work, their use would likely be excessive.³⁷

Level 2 barricades contain more advanced access point concealment techniques, such as false floors and walls or special elevator floor access, and reinforced residential or commercial grade entry-control barriers to include double-barrier usage in the same portal as a security gate and door. They serve to restrict or control access to public areas normally associated with public utilities, law enforcement, other secure government buildings, and private commercial businesses.³⁸

A Level 2 portal, for example, will have reinforced framing as well as sturdier walls constructed of material such as concrete, brick, and steel studs for additional support. A Level 2 barricade will likely have locking mechanisms with heavier gauge metal, deadbolt and latch points with metal plating to prevent prying, and modified hinges to prevent removal, and reinforced handles/fasteners. The barricade may also contain a security bar or internal re-locking bars to reinforce against ramming-type entries. Entry is possible through forced entry on the barrier or surrounding wall using extensive mechanical or basic explosive and thermal breaching techniques, or any combination of techniques. Manual and ballistic breaching techniques will likely be insufficient to gain access.³⁹

Finally, a Level 3 barricade will have hardened access points, such as nuclear blast doors specifically designed to prevent unauthorized access and/or protect against blast effects. These underground facilities are generally national level

34. *Id.* ¶ 1-36.

35. *Id.*

36. *Id.*

37. *Id.* ¶ 1-38.

38. *Id.* ¶ 1-39.

39. *Id.*

command centers, leader protection facilities and often have armed security forces. Governments use this type of access point to protect national-level assets whether it is a command-bunker facility, a critical communications facility, or a weapons of mass destruction program facility. Portal sizes can vary from personnel size to vehicle size, and barricades can vary in thickness and overall reinforcements. Portals generally have heavily reinforced wall construction or can be existing bedrock. Framing is typically an insert-design of very thick heavy-gauge composite metal anchored into bedrock or very thick concrete walls. Initial entrances may contain multiple barriers. Locking mechanisms are generally large diameter internal locking bolts/plungers with or without hydraulic latches. Barricades may or may not be associated with electromechanical or personal recognition-access control systems like badge, personal identification number code, or biometrics. Entry requires specialized breaching techniques and personnel, including the use of multiple explosive charges and extensive use of thermal cutting techniques.⁴⁰

Similar to the “5 W’s” that Richemond-Barack uses to gather information about a tunnel, the U.S. Army also looks at the attributes of a subterranean system when assessing it. These attributes include the function of the system, the mobility of forces in the system, accessibility, the support structure, and the potential threats that forces may face in the subterranean system.⁴¹ For example, an opposing force or group may use a subterranean system for a purpose other than the original design. It could be used as a command and control center, a base for operations, production of equipment and arms, storage of material, or protection from military strikes.⁴²

Subterranean systems protect and conceal valued personnel, equipment, functions, materials, and capabilities. The nature of the system can indicate whether it is made by a state or non-state actor, and whether it serves a strategic or tactical purpose. States will likely use underground facilities for protection and concealment, for command and control functions, or for storage of weapons, including weapons of mass destruction and ballistic missiles, and other resources such as fuel. State underground facilities designated for a military purpose will likely present a number of substantial challenges for an opposing force as these facilities are often large, potentially containing dozens of rooms, may have multiple portals, and are generally protected by Level 3 barriers. An attempt to forcibly enter and search such a facility will usually require a substantial number of personnel as well as specialized breaching capabilities. Facilities used to manufacture or store resources such as ammunition, fuel, or weapons of mass destruction can also pose significant hazards to a military force, civilians, and civilian objects in the vicinity.⁴³

40. *Id.* ¶ 1-40.

41. *Id.* ¶ 1-2 fig. 1-1.

42. *Id.* ¶ 1-3.

43. *Id.* ¶¶ 1-4, 1-5.

Non-state uses for underground facilities include a legitimate business purpose, such as climate-controlled storage, tourism, and mining of raw materials. However, non-state actors may also use subterranean systems for illegal purposes, such as smuggling. Terrorist or insurgent organizations may use underground facilities to protect their activities from observation and attack.⁴⁴

Strategic uses for underground facilities include tunnel complexes supporting theater and national military objectives including mission command, weapons of mass destruction storage, and storage or concealment of other national, strategic, or military assets.⁴⁵ Subterranean facilities for tactical purposes may include caves, shallow tunnel systems, bunkers, or other underground structures supporting battlefield operations used for concealment and movement of personnel, weapons storage and transport, command and control, and medical treatment.⁴⁶

Finally, other characteristics of subterranean facilities may include some or all the following categories. Natural subterranean facilities, such as caves and caverns, can be adapted for human use or military purposes.⁴⁷ People take shelter from the elements in caves, but they also hide in caves to escape adversaries. The Japanese used caves in World War II as hiding places for both civilian government and military personnel.⁴⁸ Operation Enduring Freedom saw both Taliban and Al Qaeda fighters using the vast cave network between Afghanistan and Pakistan to hide from U.S. and coalition military forces.⁴⁹

Human-made facilities are constructed by hand or machine for specific purposes. Human-made facilities include subways, sewers, roads and rail, but they can also be used for military purposes.⁵⁰ Tunnel systems, like those used in Vietnam, can be dug by hand with small tools over a period of weeks, months, or years. These systems are fairly shallow and range from short point-to-point tunnels to large multilevel complexes. Construction of these types of facilities is often easy to conceal from reconnaissance assets because sophisticated equipment is not required to make the system, and only small amounts of earth are displaced.⁵¹ Certain underground facilities are constructed using a “cut and cover” process. Crews will excavate an area, build a structure, and then cover with the original earth. These facilities will frequently have down ramps providing access from the surface to the facility and may have thick, reinforced concrete walls and ceilings. Their locations will look like any other large construction project and are noticeable by the presence of large earth moving equipment like bulldozers, front-end loaders, excavators, and dump trucks. Facilities located deeper underground or inside mountains are often excavated using drill jumbos, road-headers,

44. *Id.* ¶ 1-6.

45. *Id.* ¶ 1-8.

46. *Id.* ¶ 1-7.

47. *Id.* ¶ 1-56.

48. *Japan's Secret Navy Bunker Gives Glimpse of WWII's Final Days*, NEW YORK POST, (June 24, 2015, 10:01 AM), <https://perma.cc/JS5F-8QPN>.

49. ATP 3-21.51, *supra* note 2, at viii.

50. *Id.* ¶¶ 1-46, 1-61.

51. *Id.* ¶ 1-58.

and tunnel-boring machines. The displaced earth should be moved away to prevent the enemy from determining the size of the tunnel based on the amount of removed earth.⁵²

Once a tunnel is discovered, the question then turns to the purpose of why it was created. It is important to try and determine its purpose to determine the law applicable with respect to the potential neutralization and destruction of the subterranean system.

II. APPLICATION OF THE LAW TO SUBTERRANEAN OPERATIONS

In May of 1990, a tunnel was discovered crossing under the border between Mexico and the United States. It was 270 feet long, five feet high, and four feet wide with electricity, concrete reinforcement, and various storage areas. The tunnel was used to smuggle drugs into the United States.⁵³ In December 2018, the Israeli Defense Forces (IDF) launched Operation Northern Shield to detect and destroy cross-border attack tunnels dug by Hezbollah, the Iranian-backed Shi'ite organization. Since that time, at least six tunnels have been found and destroyed, which Israel believes "would have been used by the Hezbollah's elite Radwan unit to infiltrate into Israel in an attempt to take control of several communities and kill as many civilians and troops as possible."⁵⁴ The IDF expects the operation to discover and destroy the tunnels could take weeks or months to complete. As these two examples demonstrate, there are not only physical and structural differences in subterranean systems, but also differences in why they were built. Accordingly, it is important to understand the law applicable to the subterranean system. Each of these scenarios involve an entity digging a cross-border tunnel into the territory of another state outside of an armed conflict, meaning during peacetime. However, the former scenario is not likely to trigger an armed conflict while the latter could constitute an unlawful use of force.

With respect to the drug tunnel from Mexico to the United States, human rights law would be applicable to the detection and neutralization of the tunnel. This body of law contains its own set of principles and obligations placed on the government, such as restrictions on the use of lethal force, which is limited to self-defense, and violations of the right to life must not be arbitrary. Lethal force is permitted only as a last resort in deference to less lethal methods of neutralizing a threat.⁵⁵ The destruction of the tunnel from Mexico to the United States must take into consideration the domestic laws of both states. The tunnel going from Lebanon to Israel, or those found in South Korea on the other hand, could be viewed as a use of force by Hezbollah and North Korea, respectively, and raise issues under *jus ad bellum*, the law governing when states may resort to force.

52. *Id.* ¶ 1-61.

53. RICHEMOND-BARAK, *supra* note 13, at 119.

54. Anna Ahronheim, *Meet the IDF Unit that is the Eyes and Ears of Operation Northern Shield*, JERUSALEM POST (Dec. 23, 2018, 7:58 PM), <https://perma.cc/Q5C2-WDC9>.

55. RICHEMOND-BARAK, *supra* note 13, at 76-77.

The starting point for determining whether a particular action constitutes a use of force can be found in Article 2(4) of the United Nations Charter, which provides that “[a]ll Members shall refrain in their international relations from the threat or use of force against the territorial integrity or political independence of any state, or in any other manner inconsistent with the Purposes of the United Nations.”⁵⁶ Accordingly, any resort to the use of force by a state must have a legal basis that is assessed in light of the facts and circumstances to overcome this prohibition.⁵⁷

This prohibition is not absolute; there are several recognized exceptions. The first exception to the prohibition on the use of force would be an action under Chapter VII of the Charter of the United Nations.⁵⁸ Article 42 provides that the UN Security Council may take such action by air, sea, or land forces as may be necessary to maintain or restore international peace and security, including demonstrations, blockades, or other military operations.⁵⁹ Accordingly, the Security Council could authorize a Chapter VII action where a member state, such as North Korea, or a non-state armed group, such as Hezbollah, is discovered to have built cross-border tunnels and North Korea or Hezbollah have moved its forces close to the borders of the Republic of Korea or Israel, respectively.

The second exception to the prohibition on the use of force is when it is undertaken with the consent of the territorial state.⁶⁰ For example, the United States is using force against the Islamic State of Iraq and Syria (ISIS) in Iraq with the consent of the Iraqi government.⁶¹

Finally, a state is authorized to use force in self-defense pursuant to Article 51 of the UN Charter, which provides that “nothing in the present Charter shall impair the inherent right of individual or collective self-defense if an armed attack occurs against a Member of the United Nations, until the Security Council has taken measures necessary to maintain international peace and security.”⁶² The right of self-defense under the UN Charter does not supersede a state’s inherent right of individual or collective self-defense under customary international law.⁶³ A state’s right of self-defense is not unlimited. The actions taken by the state in self-defense must be necessary to address the threat authorizing the use of force.⁶⁴ Further, self-defense does not automatically justify “all-out” armed conflict to destroy the enemy, but instead permits only those actions necessary to

56. U.N. Charter art. 2, ¶ 4.

57. OFF. OF GEN. COUNS., U.S. DEP’T OF DEF., DEPARTMENT OF DEFENSE LAW OF WAR MANUAL § 1.11.3 (2015) [hereinafter DOD LAW OF WAR MANUAL], <https://perma.cc/2X6P-GSSE>.

58. U.N. Charter ch. VII.

59. U.N. Charter art. 42; see DOD LAW OF WAR MANUAL, *supra* note 57, § 1.11.4.2.

60. *Id.* § 1.11.4.3.

61. THE WHITE HOUSE, REPORT ON THE LEGAL AND POLICY FRAMEWORKS GUIDING THE UNITED STATES’ USE OF MILITARY FORCE AND RELATED NATIONAL SECURITY OPERATIONS (Dec. 2016), <https://perma.cc/LRE6-44J8>.

62. U.N. Charter art. 51; see DOD LAW OF WAR MANUAL, *supra* note 57, § 1.11.5.

63. DOD LAW WAR MANUAL, *supra* note 57, § 1.11.5.

64. *Id.*

defend the state from the continuation of attack or imminent attacks.⁶⁵ Finally, the action taken in self-defense must be proportionate to the use of force that preceded it.⁶⁶

This issue is complicated by the fact that while states agree every threat or use of force would be prohibited under Article 2(4) of the UN Charter, states have different views on whether every use of force will rise to the level of an armed attack that triggers the right of self-defense.⁶⁷ Some states, in accordance with the plain reading of Article 51, assert that the right of self-defense is triggered only when a state has suffered an armed attack.⁶⁸ Other states, including the United States, take the view that self-defense is available against any illegal use of force.⁶⁹

There is no agreed upon definition of what constitutes an armed attack, but rather it is a consideration of various factors.⁷⁰ In the *Nicaragua* case in the International Court of Justice (ICJ), that court found that only the “most grave forms of the use of force” would constitute an armed attack and there must be a significant scale of violence above “mere frontier incidents.”⁷¹ This does not mean that an armed attack requires a large scale attack, as even a single attack can rise to the level of an armed attack.⁷² The ICJ also noted it would be dangerous to unnecessarily restrict a state’s right to self-defense as it could limit that state’s ability to legally respond to threats to its sovereignty.⁷³ For example, in 2019 Israel discovered six “attack tunnels” along its northern border with Lebanon.⁷⁴ Prime Minister Benjamin Netanyahu declared, “This is not merely an act of aggression. It is an act of war.”⁷⁵ Israel warned it could take action based on the discovery of the tunnels as hundreds of fighters could have streamed through the tunnels in order to kidnap or kill civilians and soldiers. In addition, Hezbollah has an estimated 100,000 rockets and missiles in its arsenal that could be used to attack Israel.⁷⁶ Under the *Nicaragua* test, the factors that Israel would need to be consider to determine whether the “attack tunnels” constitute an armed attack would be the number of Hezbollah fighters crossing the border, the number

65. Int’l L. Ass’n, *Report on Aggression and the Use of Force*, 76 INT’L L. ASS’N REP. CONF. 648, 657 (2014).

66. *Id.*; cf. *Oil Platforms (Iran v. U.S.)*, Judgment, 2003 I.C.J. 161, ¶ 72 (Nov 6).

67. Molly McNab & Megan Matthews, *Clarifying the Law Relating to Unmanned Drones and the Use of Force: The Relationship between Human Rights, Self-Defense, Armed Conflict, and International Humanitarian Law*, 39 DENV. J. INT’L L & POL’Y 661, 675 (2011).

68. *Id.*

69. DoD LAW OF WAR MANUAL, *supra* note 57, § 1.11.5.2; Harold Hongju Koh, Legal Adviser, U.S. Dep’t of State, *The Obama Administration and International Law*, Speech to the Annual Meeting of the American Society International Law (Mar. 25, 2010), <https://perma.cc/X2TS-GMNV>.

70. McNab & Matthews, *supra* note 67, at 675.

71. *Id.* at 676.

72. *Id.*

73. *Id.*

74. F. Brinley Bruton & Paul Goldman, *Discovery of Hezbollah ‘Attack Tunnels’ Rattles a Northern Israeli Town*, NBC NEWS (Jan. 28, 2019), <https://perma.cc/8TP5-DRRQ>.

75. *Id.*

76. *Id.*

of tunnels, and the use of rockets or missiles in conjunction with the use of the tunnels.

Although there are numerous instances where subterranean systems, such as the tunnels described above, have been used prior to an armed conflict, they may also be used during an armed conflict, especially when operating in an urban environment. Therefore, a commander will need to plan for and conduct attacks against an adversary in these subterranean systems in compliance with the law of armed conflict (LOAC), which is that part of international law regulating the conduct of hostilities and protection of war victims both in international and non-international armed conflicts.⁷⁷

One of the most difficult tasks for combatants in armed conflict under LOAC is making targeting decisions and conducting an attack. Parties to a conflict must conduct attacks in accordance with the principles of distinction and proportionality. Accordingly, LOAC authorizes combatants to attack military objectives but prohibits directing attacks against civilians not taking a direct part in hostilities, the civilian population, civilian objects, or other protected persons or objects.⁷⁸

The principle of distinction obligates each party to a conflict, in its use of force and conduct of military operations, to distinguish between military objectives on the one hand and the civilian population and other protected persons and civilian objects on the other. The principle applies to each party to a conflict, whether its armed forces are engaged in offensive or defensive operations. While subterranean operations may occur in areas nearly devoid of civilians or civilian objects, such as deserts or mountains, they may also occur in areas where members of the civilian population are likely to be found and the presence of civilian objects is certain, such as an urban environment. No matter the operating environment, commander must apply the principle of distinction and established targeting methods based on an assessment of the reality on the ground.

Distinguishing between a civilian or civilian object and a military objective requires intelligence and an understanding of what constitutes a military objective.⁷⁹ A military objective is synonymous with persons who constitutes a lawful target. A military objective, insofar as objects are concerned, is “any object which by its nature, location, purpose or use makes an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage.”⁸⁰ This definition may be viewed as a way of evaluating whether military necessity exists to attack an object. It may also be applied outside the context of conducting attacks to assess whether the seizure or destruction of an object is justified by military necessity. There are two elements inherent in a military objective. Both elements

77. DoD LAW OF WAR MANUAL, *supra* note 57, § 1.3.

78. *Id.* § 5.4.2; Protocol Additional to the Geneva Conventions of 12 August 1949 and Relating to the Protection of Victims of International Armed Conflicts arts. 51(2), 52(2), June 8, 1977, 1125 U.N.T.S. 3 [hereinafter Additional Protocol I].

79. DoD LAW OF WAR MANUAL, *supra* note 57, § 5.5.

80. Additional Protocol I, *supra* note 78, art. 52(2).

must be satisfied before an object that is normally a civilian object may be considered a military objective: (1) that the object somehow “makes an effective contribution to military action”; and (2) that attacking the object, in the circumstances ruling at the time, offers a definite military advantage.⁸¹

The definition of military objective incorporates considerations beyond whether an object’s destruction is justified. It also incorporates considerations of whether the object’s capture or neutralization would offer a military advantage. “Capture” refers to the possibility that seizure during the attack (rather than destruction) would confer a military advantage. For example, as discussed further in section IV, a subterranean system within an urban area may be a military objective and thereby captured because of its location or use. “Neutralization” refers to a military action that denies an object to the enemy without capturing or destroying it. For example, a tunnel or other subterranean system may be neutralized by flooding or sealing the entrance, and thus denying it to the enemy. “Definite” means a concrete and perceptible military advantage, rather than one that is merely hypothetical or speculative. A military commander may regard this requirement as met in seeking to attack, capture, or neutralize objects with a common purpose to deny their use to the enemy. An example is the attack of subway systems the enemy is using within an urban environment to reinforce or resupply its forces. The advantage need not be immediate but can be established by the overall effort to deny the enemy use of subterranean systems to isolate enemy military forces on the battlefield.⁸²

Military commanders must be prepared for the possibility of civilians intermingling with military objectives. There may be subterranean systems that are commonly used by both the civilian population and military forces. The mere presence of civilians or intermingling or common use, however, will not render a military objective immune from attack. An object used concurrently for civilian and military purposes is liable to attack if it is a military objective.

III: REMEDIATION AND DESTRUCTION OF TUNNELS

After detecting a tunnel or other subterranean system, it becomes a matter of figuring out what the tunnel is or could be used for in the future. Is it a military objective?

There are various factors to consider when determining the appropriate action to take with respect to a subterranean facility, including the size, method of construction, and access points. Upon discovery of a subterranean system, a party to the conflict may determine that it could serve an operational need so that maintaining it might be the most practical alternative. If that course of action is not practical, a commander may determine the subterranean system must be rendered useless, remediated, or destroyed. This section will look at the various options available to lawfully neutralize a subterranean system.

81. See DOD LAW OF WAR MANUAL, *supra* note 57, § 5.6.5.

82. *Id.* § 5.6.7.

A. *Bypass*

Upon discovery of a subterranean system, one option is to bypass it. Bypass is a tactical mission task where a unit will maneuver around an obstacle, position or opposing force to maintain momentum of the operation and deliberately avoiding combat with an enemy force.⁸³ However, this entails the acceptance of a certain amount of risk. If there is a decision to bypass a subterranean system, especially if it is a system of tunnels, this may enable the adversary to attack one's forces from behind. Bypassing would likely require forces to defend its rear area in this situation potentially changing follow-on operations.

Even if a party to the conflict takes steps to do some remediation, such as sealing the opening that is discovered, the subterranean system may still be operable. To overcome these remediation measures, an adversary might dig new access points or around blocked sections. Therefore, as with bypassing alone, the attacking force will need to continually monitor the subterranean system to ensure there are no attempts by the adversary to restart its use. This would be an unacceptable risk for most commanders and should an adversarial attempt be detected, the subterranean system must be neutralized or destroyed.

B. *Flooding*

Flooding is another method to neutralize or destroy a subterranean system. Flooding a tunnel with water would act as a deterrence to combatants using it. As Richemond-Barak notes, both Israel and Egypt have, at times, destroyed cross-border tunnels using flooding.⁸⁴ Attempting to flood a subterranean system may not always be an available option depending on several factors, such as the size of the tunnel and, most importantly, the availability of water. For example, flooding may be a solution to tunnels, natural cavities, and caves, but is likely ineffective (or even impossible) against urban subsurface systems like parking garages or subways, or underground facilities such as large command and control centers. Further, destroying a tunnel by flooding comes with a certain amount of risk to the physical structure and people inside, especially in an urban environment.

The use of water may cause the tunnel to collapse, which then may cause damage to existing structures on the surface. Predicting whether a tunnel will collapse requires analysis on how the tunnel was constructed, the type of terrain, and the amount of water and level of water pressure necessary to flood the tunnel. Accordingly, any operation to flood the tunnel will require sophisticated engineering expertise and consideration of possible damage to civilians and civilian objects from the flooding.

With respect to individuals inside the tunnel, Richemond-Barak argues that flooding can raise the issue of "no quarter." Article 40 of Additional Protocol I provides that "[i]t is prohibited to order that there shall be no survivors, to

83. ATP 3-21.51, *supra* note 2, ¶ 3-43.

84. RICHEMOND-BARAK, *supra* note 13, at 235.

threaten an adversary therewith or to conduct hostilities on this basis.”⁸⁵ In Richemond-Barak’s view, entrapping “people in a tunnel, whether civilians or combatants, can amount to a declaration that there shall be no survivors.”⁸⁶ Although flooding may amount to “no quarter,” there are certainly circumstances when it may not.

It is forbidden to declare that no quarter will be given.⁸⁷ This means that it is prohibited to order that legitimate offers of surrender will be refused or that those detained will be summarily executed. Moreover, it also is prohibited to conduct hostilities on the basis that there shall be no survivors, or to threaten the adversary with the denial of quarter. Accordingly, a commander is prohibited from refusing to accept the surrender of individuals in a tunnel and intentionally drowning them by flooding the tunnel. The “no quarter” concept does not apply, if, either before or during the flooding of the tunnel, a commander provided opposing forces the opportunity to surrender, and it was not accepted.

C. Gas

During the Vietnam war, the Viet Cong used tunnels to maintain its guerrilla warfare against the United States. As discussed at the beginning of this article, the underground complex at Cu Chi was a set of tunnels that extended more than fourteen miles and contained ammunition storage areas, barracks, workshops, kitchens, hospitals, and even theaters for showing propaganda movies.⁸⁸ One of the methods that was attempted in clearing the Cu Chi tunnels was through the use of tear gas.⁸⁹ In order to kill or capture Viet Cong forces, American forces would pump tear gas into the tunnels to force the enemy out.⁹⁰ The use of such tactics today would be prohibited under LOAC.

The Chemical Weapons Convention (CWC) is a treaty outlawing the production, stockpiling, and use of chemical weapons and their precursors.⁹¹ It also provides that “[e]ach State Party undertakes not to use riot control agents as a method of warfare.”⁹² A “riot control agent” (RCA) is defined as “any chemical not listed in a Schedule, which can produce rapidly in humans sensory irritation or disabling physical effects which disappear within a short time following termination of exposure.”⁹³ The treaty, however, does not define what constitutes a “method of warfare.”

85. Additional Protocol I, *supra* note 78, art. 40.

86. RICHEMOND-BARAK, *supra* note 13, at 236.

87. Hague Convention (II) with Respect to the Law and Customs of War on Land and its Annex, art. 23(d), July 29, 1899, 32 Stat. 1803, 1811.

88. Arthur Herman, *Notes From the Underground: The Long History of Tunnel Warfare*, HUDSON INST. (Aug. 26, 2014), <https://perma.cc/BWB2-LJJU>.

89. Smithwick, *supra* note 1.

90. RICHEMOND-BARAK, *supra* note 13, at 236.

91. Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction, Jan. 13, 1993, S. Treaty Doc. No. 103–21, 1974 UNTS 317.

92. *Id.* art. 1(5).

93. *Id.* art. 2(7).

The United States interprets this prohibition on using RCAs as a method of warfare to not apply to the use of riot control agents in war in defensive military modes to save lives, such as use of riot control agents in riot control situations in areas under direct and distinct U.S. military control, including controlling rioting prisoners of war; situations in which civilians are used to mask or screen attacks and civilian casualties can be reduced or avoided; rescue missions in remotely isolated areas, of downed aircrews and passengers, and escaping prisoners; and in rear echelon areas outside the zone of immediate combat to protect convoys from civil disturbances, terrorists, and paramilitary organizations.⁹⁴

If the United States were to engage in armed conflict with an adversary, such as North Korea, it is likely someone would inquire whether RCAs like tear gas could be used to clear subterranean systems. Unless the situation met the exceptions noted above, any such RCA use would be considered a “method of warfare” and prohibited.

D. Cement

The use of cement to block a tunnel has some similarities to flooding but also some significant differences. It is one way to quickly neutralize an underground threat by blocking the opening. However, the use of cement to block one opening of the tunnel may not neutralize the threat unless other openings are similarly blocked, as the adversary may still be able to conduct an attack on one’s forces. The use of cement differs from flooding in that there is no risk of collapsing the structure and causing damage to the surface structures.

There are feasibility issues with using cement to neutralize a subterranean system. First, depending on the size of the underground system, it may be impossible. Large underground subterranean systems covering several miles would make it infeasible to cement the entire system. Second, if faced with a large underground complex, there are likely more than one or two exits. If forces are unable to block all the entrances, it may consider alternatives such as blocking key sections or emplacing obstacles short of complete closure to impede or disrupt or divert the enemy. Depending on the method of construction, destroying or denying reinforced tunnel sections may require additional technical solutions. Ultimately, if the number and location of all access points is unknown, blocking or sealing only known access points leaves the tunnel vulnerable to further use via unknown points.

There are legal considerations when contemplating sealing all the entrances and exits while individuals are inside. The first question is whether the individuals were combatants, civilians directly participating in hostilities, or civilians. If

94. DoD LAW OF WAR MANUAL, *supra* note 57, § 6.16. As noted in the Manual, these uses are articulated in Executive Order 11850. Even though Executive Order 11850 predated the Chemical Weapons Convention (which could have created legal obligations that were inconsistent with Executive Order 11850), interpreting the Chemical Weapons Convention consistent with Executive Order 11850 was a condition of the Senate giving its advice and consent to ratification of the Chemical Weapons Convention. *Id.*

there are civilians present, then a proportionality analysis is required. Another question is whether trapping combatants and/or civilians in a tunnel, which would result in suffocation, would constitute unnecessary suffering.

It is prohibited to use weapons that are calculated to cause superfluous injury or unnecessary suffering.⁹⁵ As both William H. Boothby in his book, *Weapons and the Law of Armed Conflict*, and the U.S. Department of Defense (DoD) Law of War Manual note, there have been various formulations for the prohibition against superfluous injury or unnecessary suffering both in treaties to which the United States is a party and those to which it is not.⁹⁶ Weapons that may cause great injury, suffering, or even death are not prohibited if the weapons' effects are necessary to enable the operator to accomplish its military mission.⁹⁷ Boothby notes that the "most clear and accurate formulation of the superfluous injury and unnecessary suffering test available" comes from the original DoD weapons review Directive.⁹⁸ It provides:

The prohibition of unnecessary suffering constitutes acknowledgment that necessary suffering to combatants is lawful, and may include severe injury or loss of life. There is no agreed international definition of unnecessary suffering. A weapon or munition would be deemed to cause unnecessary suffering only if it inevitably or in its normal use has a particular effect and the injury caused is considered by governments as disproportionate to the military necessity for it, that is, the military advantage to be gained from its use. This balancing test cannot be conducted in isolation. A weapon's or munition's effect must be weighed in light of comparable, lawful weapons or munitions in use on the modern battlefield. A weapon is not unlawful merely because it may cause severe suffering or injury. The appropriate determination is whether a weapon's or munition's employment for its normal or expected use would be prohibited under some or all circumstances. The correct criterion is whether the employment of a weapon for its normal or expected use inevitably would cause injury or suffering manifestly disproportionate to its military effectiveness.⁹⁹

When a commander is trying to determine whether to seal an underground system, he or she will need assess the legitimate military necessity for doing so.¹⁰⁰ For example, the commander will need to look at mission requirements, time, the availability of other weapons or personnel to clear the system, the amount of

95. *Id.*

96. See DOD LAW OF WAR MANUAL, *supra* note 57 § 6.6.1 (noting the various definitions used for superfluous injury); see also WILLIAM H. BOOTHBY, WEAPONS AND THE LAW OF ARMED CONFLICT 46–50 (2d ed. 2016) (recounting the history of superfluous injury and unnecessary suffering).

97. DOD LAW OF WAR MANUAL, *supra* note 57, § 6.6.3.

98. BOOTHBY, *supra* note 96, at 347.

99. W. Hays Parks, *Means and Methods of Warfare*, 38 GEO. WASH. INT'L L. REV. 511, 517 n.25 (2006), quoted in BOOTHBY, *supra* note 96, at 347.

100. DOD LAW OF WAR MANUAL, *supra* note 57, § 6.6.3.1.

munitions and manpower required, as well as the risk to the civilian population.¹⁰¹ Although it appears cruel to suffocate a combatant, the use of cement does not necessarily constitute unnecessary suffering.

E. Bulldozer

One of the simplest ways to neutralize smaller and less developed tunnels or subterranean systems is with a bulldozer. To be effective, the operators must have effectively mapped the route of the tunnel and understand how it is constructed. Israel and Egypt have often used bulldozers to destroy tunnels on the Gaza border.¹⁰²

Bulldozers do not pose the same threat to civilians and civilian objects in the area, but manually destroying a tunnel using a bulldozer in a hostile environment does place greater risk on one's own forces. Those destroying the tunnel will need to watch for civilians and ensure they are no longer in the tunnel or it will raise many of the same issues discussed above with the use of concrete. By destroying the tunnel, it effectively neutralizes the tunnel and generally prevents the adversary from using it in the future.

F. Use of Explosives through Aerial Strikes

On February 13, 1991, during the midst of the first Iraq War, the United States, using two laser guided bombs, targeted a hardened underground bunker it believed was a military command center located in a middle-class neighborhood in Baghdad. The facility was built as a bomb shelter to protect Iraqis from attacks during the Iran-Iraq war in the 1980s. According to U.S. military officials, however, it had since been hardened (with a 10-foot-thick concrete and steel roof to withstand indirect nuclear attack) and converted into a replacement military command and control center after bombing in central Baghdad forced a dispersal of such activities. Intelligence showed that the site was surrounded by a chain-link fence with barbed wire and covered with camouflage. Military officials noted that "military personnel had been seen coming and going, and military vehicles had been parked outside 'recently', but no large numbers of civilians had been seen entering."¹⁰³ Unbeknownst to the Americans, in addition to serving as a command and control location, it also housed hundreds of civilians and was the Amiriya bomb shelter, and the strike killed some 408 civilians in the deadliest episode of civilian casualties in the quarter-century long fight in Iraq.¹⁰⁴

Contrast that incident with the April 2017 bombing of a cave complex in Afghanistan. In this instance, the United States dropped a GBU-43 or Massive Ordnance Air Blast (MOAB), nicknamed the "mother of all bombs," which has an explosive force equal to 11 tons of trinitrotoluene (TNT). It was the largest

101. *Id.*

102. RICHEMOND-BARAK, *supra* note 13, at 238.

103. Nora Boustany, *Bombs Killed Victims as They Slept*, WASH. POST (Feb. 14, 1991), <https://perma.cc/3UGA-AKK2>.

104. *Id.*

non-nuclear bomb ever used in combat.¹⁰⁵ General John Nicholson, the U.S. Commander in Afghanistan at the time, said he used the bomb so Afghan troops and their American advisers would not have to go in on the ground to clear out the caves. In a statement, the U.S. command in Afghanistan said the strike was “designed to minimize the risk to Afghan and U.S. forces conducting clearing operations in the area while maximizing the destruction of [ISIS] fighters and facilities” and officials “took every precaution to avoid civilian casualties with this strike.”¹⁰⁶ One commentator noted that the MOAB was used to “penetrate through rock and concrete and then once they get through, they explode, creating devastation to whatever is below.”¹⁰⁷ The commentator further said that “[i]t was the type of weapon that was most suited for this type of mission . . . the target [was] below the ground and there are a lot of people there and this is the type of weapon that would neutralize that number of people.”¹⁰⁸

These two examples demonstrate the advantages, as well as the hazards and deadly consequences, of conducting aerial strikes on subterranean systems. The advantage of conducting an air strike is that it limits the danger to one’s own forces in having to breach and clear the subterranean systems. The hazard is that the subterranean systems are rarely found in uninhabited areas. Another advantage is that these subterranean systems are built deep enough underground or constructed in such a manner that makes them less vulnerable to air strikes. If a military force decides to launch an air strike at a command center located in an urban area, such as the Amiriya bomb shelter or in a cave complex in the middle of the mountains, there are a myriad of legal issues associated with the targeting decision. Commanders will need to ensure that care is taken to protect civilians and civilian objects from the effects of such strikes. This is especially true in urban areas where the risk of collateral damage will be greater.

The protection of civilians is a responsibility shared among all belligerents. Parties conducting attacks have two duties in particular: first, they must take feasible precautions to reduce the risk of harm to protected persons and objects; second, they must refrain from attacks in which the expected harm to civilians and civilian objects would be excessive in relation to the concrete and direct military advantage expected to be gained.¹⁰⁹ What precautions are feasible depends greatly on the context, including operational considerations. Examples of precautions in conducting attacks that may be feasible include warnings before attack, adjusting the timing of the attacks, selecting certain weapons to use in the attacks, assessing the risk to civilians, identifying zones in which military objectives are more likely to be present or civilians are more likely to be absent, and canceling

105. *U.S. Drops “Mother of All Bombs” In Afghanistan, Marking Weapon’s First Use*, CBS NEWS (Apr. 13, 2017, 10:16 PM), <https://perma.cc/VS95-W7CF>.

106. *Id.*

107. *Id.*

108. *Id.*

109. DOD LAW OF WAR MANUAL, *supra* note 57, §§ 5.11, 5.12, and 5.14; *see* Additional Protocol I, *supra* note 78, art. 57(2).

or suspending attacks based on new information that raises concerns of expected civilian casualties.¹¹⁰

Defenders also have duties. Military commanders and other officials responsible for the safety of the civilian population must, to the extent feasible, separate the civilian population from military objectives to protect the civilian population from the effects of combat. Examples of how to do this may include evacuating civilians from known danger areas and constructing and using air raid shelters.¹¹¹ The party controlling civilians and civilian objects has the primary responsibility for the latter's protection, as it has the greater opportunity to minimize risk of harm to civilians.

The effectiveness of aerial strikes will be greatly impacted by the presence of civilians in subterranean operations. Parties to a conflict must carefully apply the LOAC principles of distinction and proportionality. A subterranean system must be a military objective and the damage to civilians and civilian objects must not be excessive in relation to the military advantage expected to be gained from the attack. Importantly, parties to a conflict must take feasible precautions to protect the civilian population and civilian objects under their control against the effects of attacks.

G. Breaching

During the Vietnam War, the United States tried to destroy the Cu Chi tunnels using explosives, but the tunnels were often too deep to be destroyed by a blast at the mouth, with the Viet Cong designing their tunnels so that blasts could only destroy small segments. The tunnels were very well made, with sharp right angles every few meters to baffle the blast of an explosive charge, and breathing holes dug by taking rabbits and gophers to the bottom of a tunnel and letting them dig themselves back to the surface. After several attempts of using tear gas, acetylene gas, and explosives failed, it was determined that someone would physically have to enter the tunnels.¹¹²

Physically clearing a subterranean environment is a complicated and dangerous task. The first task a unit will need to accomplish is entering the subterranean system, which will generally require breaching through mechanical, ballistic, thermal, or explosive methods.

Mechanical breaching uses items such as a sledgehammer, bolt cutter, crowbar, or even an armored vehicle to create a point of entry. The effectiveness of this method depends on the construction of the entrance. If the entrance is heavily fortified, mechanical breaching is likely to be very slow. This would give the adversary an opportunity to react to the breach activity. Mechanical breaching, however, can minimize collateral damage and maintain the element of surprise.¹¹³

110. DOD LAW OF WAR MANUAL, *supra* note 57, § 5.11.

111. *Id.* § 5.14; *see* Additional Protocol I, *supra* note 78, art. 58.

112. Smithwick, *supra* note 1.

113. ATP 3-21.51, *supra* note 2, ¶ 6-71.

Ballistic breaching uses a projectile weapon, such as a shoulder-launched munition and close combat projectile, to create a breach. A ballistic breach is normally directed against a wall, a door, or a window and done from close range. It is preferable to use precision fires to destroy either the latch and lock or hinges of the door as it minimizes collateral damage and allows for rapid entry into the subterranean system. For example, shooting the latch and lock of a door would require fewer shots and is easy to target, whereas shooting the hinges requires more shots.¹¹⁴

Thermal breaching, where appropriate, uses cutting torches to create the breach by producing extremely high heat to melt or burn the barrier. This form of breaching is very slow and deliberate. On the other hand, explosive breaching uses explosives to create a breach. Explosive breaching is often the fastest and most combat-effective method, but it is also the least preferred method in a subterranean facility due to overpressure, shockwave propagation, air contamination, loss of visibility, and potential to collapse the tunnel. Once a party to the conflict has breached the entrance to the subterranean system, the difficult job of clearing it begins.¹¹⁵

U.S. military personnel will use what is known as tactical call-out to help clear the subterranean system. This technique is used to remove personnel from a tunnel prior to committing soldiers to a subterranean environment. This approach gives the assault force the opportunity to cordon the intended target area and gives the enemy an opportunity to walk out or surrender without duress or injury. It provides maximum force protection and limits collateral damage, augments the information operations plan, and helps provide leads to future targets.

Robots, which can be mounted with a speaker to relay commands to personnel in the tunnel, can also be used to assist in tactical call-out.¹¹⁶ Robots provide critical intelligence and data collection (video and audio) before, during, and after clearing operations. Once deployed, robots can safely detect hazards such as enemy personnel, booby traps, animals (snakes/insects), and—if equipped with a gas meter—oxygen and hazardous gas levels. They can also be used for chemical detection by attaching a joint chemical agent detector. Ideally, robots should have the capability to operate in a water environment without a reduction of performance, communicate clearly, have powerful infrared and white light sources, sensors, and use color video/camera systems.¹¹⁷

There are limitations to using robots as they may not be able to relay their location or heading when robots get around corners, affecting its video signal and radio communications. Obstacles such as water, stairs, and walls may present challenges as well. While a tethered robot will not suffer a degradation of signal, the tether cannot recover it. Finally, battery life can also be a limitation.¹¹⁸

114. *Id.* ¶ 6-74.

115. *Id.* ¶¶ 6-75, 6-76, and 6-77.

116. *Id.* ¶ 4-103.

117. *Id.* ¶¶ 4-128, 6-96, 6-97.

118. *Id.* ¶ 6-97.

Even if a tactical call-out is successful, it is possible that not everyone will come out and those remaining inside the subterranean system will resist efforts to clear and neutralize it. Therefore, forces will then have to physically clear the subterranean system.¹¹⁹ When approaching and moving through subterranean systems, care must be taken to avoid booby traps, as enemy forces will likely deploy it near openings and junctions. The types of booby traps vary significantly based on geography, availability of materials, and the technical sophistication of the enemy force. Early warning devices may also be used to warn the enemy of the presence of intruders. Examples of booby traps include trip wire improvised explosive devices, buried pressure plate improvised explosive devices, and anti-personnel mines.¹²⁰

If available, military forces can use military working dogs to assist in the clearance of subterranean systems. The advantages of military working dogs are their ability to detect explosives and drugs, and instill fear in the opposition. However, in subterranean environments, some dogs' senses may be overwhelmed by the lack of air flow and confined spaces. When planning operations, these advantages should be weighed against the military working dogs' potential vulnerability to drowning or lack of air, disorientation from an enclosed environment, and unusual sounds and susceptibility to booby traps.¹²¹

The legal considerations with respect to physically clearing a subterranean system are like those discussed above. As noted in Part II of this paper, the first question is whether the subterranean system constitutes a military objective. This is complicated by the fact the subterranean system is a "dual-use" object. "Dual-use" is a term used to describe objects that are used by both the armed forces and the civilian population. For example, a subway system or other underground facility would normally be a civilian object but during an armed conflict it may be used a storage facility for weapons or a headquarters for command and control.¹²² From a legal perspective, however, the object is either a military objective or it is not; there is no intermediate legal category of "dual-use." If an object is a military objective, it is not a civilian object and may be made the object of attack. When the attack on a military objective will impact the civilian population or civilian objects, commanders must conduct a proportionality analysis.¹²³

The next aspect in planning and conducting an attack is again the requirement to take feasible precautions to reduce the risk of incidental harm.¹²⁴ For example, if an attack is going to be conducted in a subway system, feasible precautions may include warning civilians before an attack, adjusting the timing of the attack to ensure that the number of civilians is limited, selecting certain direct fire weapons to use in the attack versus indirect fire weapons, and canceling or suspending

119. *Id.* ¶ 3-180.

120. *Id.* ¶¶ 5-14, 5-15.

121. *Id.* ¶ 6-29.

122. See DoD LAW OF WAR MANUAL, *supra* note 57, § 5.6.1.2.

123. *Id.*

124. *Id.* § 5.11; see Additional Protocol I, *supra* note 78, art. 57.

an attack based on new information that raises concerns of expected civilian casualties.¹²⁵

CONCLUSION

Daphné Richemond-Barak correctly noted that underground warfare and fighting in subterranean systems is an understudied area of the law and this method of warfare is not going away anytime soon. It is important that states develop a strategy to contend with underground threats. The U.S. Army has classified the various types of subterranean spaces and structures where it will fight in the future. Once discovered, a subterranean system will need to be neutralized or destroyed. There are a variety of lawful methods to neutralize and destroy tunnels and other subterranean systems, but the corresponding legal issues are as complex as the types of subterranean systems and require careful consideration by commanders and legal advisors.

125. DoD LAW OF WAR MANUAL, *supra* note 57, § 5.11.