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PREMIUM EDITORS' PICK



In Gaza's Tunnels, 'You Can Lose Sense Of Direction. You Can Really Freak Out.'

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A file image from 2014 shows an armed member of the military wing of Hamas deployed at a tunnel under Gaza City. MUSTAFA HASSONA/ANADOLU AGENCY/GETTY IMAGES

Military experts map out Israel's unique challenges in fighting Hamas underground.

When Israeli troops descend into the warren of tunnels built by Hamas under the Gaza Strip, they'll be entering an alternate reality.

Darkness. Claustrophobically tight spaces. Invisible dangers like running out of air or breathing poisonous gas like carbon monoxide.

Sensory deprivation is heightened by the gear Israel's specially trained underground combat troops wear: breathing masks and infrared goggles.

“Fighting underground is like fighting in outer space,” Jose Gordon, a retired U.S. Army Ranger

master sergeant and expert in subterranean warfare, tells *Forbes*.

In the tight confines, blast pressures are magnified. Even firing standard-issue bullets can burst eardrums and cause nosebleeds. So the soldiers wear protective radio headsets and carry rifles equipped with suppressors and heavier, slower bullets that also reduce the chances of catching one after it ricochets off a wall.

Disorientation can disable even the coolest veterans of aboveground warfare. “You can lose sense of time. You can lose sense of direction. You can really freak out,” John Spencer, an expert in urban warfare at West Point’s Modern War Institute, tells *Forbes*.

The Israeli government has vowed to destroy Hamas’ military capabilities and end its control of the Gaza Strip in the wake of the Islamic group’s October 7 surprise raid into Israel that killed 1,400 Israelis. Hamas took over 200 people hostage.

Roughly 8,800 Palestinians have been killed since, according to Gaza health officials, mostly by a fierce Israeli aerial bombardment. Since Friday, the Israel Defense Forces have been slowly moving ground troops into northern Gaza.

To accomplish its goals, the IDF will take on Hamas in a battleground as much as 230 feet under Gaza, beyond where its bunker-buster

bombs can reach. The militant group has spent decades building its underground complex to neutralize the IDF's overwhelming advantages in conventional battle.

It's a task the IDF has been preparing for in earnest since its 2014 war on Gaza, when Hamas used cross-border tunnels to ambush Israeli troops and passageways inside Gaza for concealment and maneuvers against attacking IDF ground units. After that the IDF **reportedly tripled the size** of a commando unit called Samur (the Weasels), devoted to tunnel combat and demolition, which uses an array of specialized equipment and technology.



In March, members of Al-Quds Brigades, an armed wing of Islamic Jihad Movement, stand in tunnels beneath Gaza City. ASHRAF AMRA/ANADOLU AGENCY/GETTY IMAGES

Since 2016, the U.S. Congress has provided \$320 million for U.S.-Israeli defense collaboration on detecting, mapping and neutralizing underground tunnels, according to a Congressional Research Service report.

But experts say it will be a difficult and bloody undertaking, made more complicated because Hamas is holding hostages underground. “It’s a wicked problem on top of a wicked problem,” Christopher De Ruyter, a retired Army Ranger lieutenant colonel who’s director of the National Center for Urban Operations, an advisory group on waging war in cities, tells *Forbes*.

Sand Labyrinths

Gaza’s sandy soil makes it “an ideal location for tunneling,” says Joel Roskin, a former IDF terrain analyst who has studied Hamas’ tunnel network and is currently a professor in the geography department at Israel’s Bar-Ilan University.

Since Israel pulled out of the Gaza Strip in 2005, Hamas has built a 3-dimensional underground web believed to contain hundreds of miles of passages. It connects subterranean command centers, storerooms, barracks and exits to positions above ground where militants can pop up to fire rockets at Israel and ambush ground troops, then disappear below.

Tunnels are dug by hand, with labor relatively cheap at \$10 to \$20 a day, says Roskin. A team might consist of two to three workers digging while a few more get rid of the dirt, advancing about three feet a day.

While some passageways are damp, bare earth, over the last decade, Hamas has been reinforcing

tunnels with pre-formed half circles of concrete containing rebar, making them more resistant to bombing.

Many sections are kitted out with ventilation shafts, lighting and power, drawn from the grid aboveground as well as generators below. Hamas has stockpiled enough food, water and fuel to last three to four months, a Lebanese official **told** the *New York Times* this week.

Junctions and entries to rooms are often blocked off by one- to two-inch-thick metal doors set in concrete that require skill to breach, says Gordon, who has visited tunnel sections the IDF has seized.

Sending IDF troops into the tunnels will be a last resort, experts say. Hamas is believed to have seeded them with bombs and booby traps. The tunnels' small size takes away the advantages in numbers and fire support that the IDF has aboveground, reducing it to one soldier versus one soldier at the point of contact. The IDF has uncovered sections near the border with Israel that were roughly 4-feet to 4-foot-five inches wide and 5-foot-5 to 5-foot-9 inches tall, says Gordon, who's also affiliated with the National Center for Urban Operations.

Death From Above

First the IDF attacked the system from the air.

The extensive bombing campaign since October 7

is believed to have targeted entrances to tunnels — many of which are concealed within buildings — and shallower portions.

In its ground campaign, the IDF is likely aiming to methodically clear and hold areas in Gaza, says Roskin. As tunnel openings are discovered, they'll try to map out the network below. They can pump in smoke to identify other nearby openings. They can send in robots and small drones. Among its arsenal is **IRIS**, a 3.5-pound, remote-controlled, four-wheeled surveillance robot made by the Israeli company Roboteam that can be dropped or thrown into a tunnel entrance. Elbit Systems last year unveiled a small autonomous drone called **Lanius** that the Israeli company says is capable of mapping indoor spaces — and blowing itself up if it needs to. The IDF also uses bomb-sniffing dogs that are specially trained to work underground.

The IDF will also look to interrogate civilians, says Roskin, hoping to find people who have worked on building the tunnels or know where openings are.

It's impossible to destroy the tunnel network, both because of its size and because some of it is built below civilian institutions like schools and hospitals.

Flooding Tunnels

But the IDF can take down or block sections and entrances. Once it has gained control over an

area, it can bring in tankers and firetrucks to flood sections — sewage is better than water because it's thickened by solids, making it less prone to be absorbed, says Roskin. It can also pump in concrete or a slurry containing bentonite.

One unique technology the IDF has developed to quickly seal openings during combat, says Spencer, is a bag carried by infantry that contains two chemicals that when mixed produces a thick, fast-hardening yellow foam. “They can neutralize that opening so they can move past it and not worry about anyone coming up and shooting them in the back,” he says.

When troops trained in subterranean warfare do go in (chiefly Samur or the elite special operations force Sayeret Matkal) they'll be preceded by robots or drones, as well as a dog — “a hair missile,” says Spencer — trained to attack. The soldier in front will carry a ballistic shield.

Once under the surface, Samur can use ground-penetrating radar and other sensors to attempt to map out deeper parts of the tunnel network that can't be sensed from aboveground, says Roskin.

The IDF would ideally seek to take out the power, light and ventilation and wait for militants to come up from deeper levels. “Just do tunnel sitting,” says Roskin. That's complicated by the expected presence of hostages. Israel may face a ticking clock amid mounting pressure to halt its campaign as the civilian death toll climbs.

“What’s the most important thing that the army needs?” Roskin says. “It needs time.”

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