The Use of Weapons in Densely Populated Areas

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The term "urban warfare" has always been understood to refer to combat by an army maneuvering in a city or in a densely populated area. However, in recent years, it has assumed an entirely different meaning: fighting against terrorists and terrorist organizations. In terms of weapons, as well as in terms of combat doctrine, we are talking about two different modes of combat.

Weapons

Combat against such organizations in densely populated areas has many facets, some of which have to do with weapons, for example during riots. Ten to fifteen years ago, the issue of non-lethal weapons was very popular, because there is no better way to capture the imagination than to evoke a scene in which, instead of firing at people and killing them, and meanwhile also unintentionally injuring uninvolved civilians, some clever contraption is used to scatter and neutralize the crowd without shooting at anyone. Much was invested in that; many methods were developed, but they more or less went up in smoke when used in riots that involve the use of weapons. Non-lethal weapons can be used against a large number of people who come to a particular spot, but if they too use weapons, then the non-lethal weapons become ineffective. You cannot use something like a cap gun, which does nothing more than scare people, against someone who wields a real gun. There are many aspects to this topic, but I have decided to focus on the factors that allow us to reduce the scope of collateral damage.

Everything related to the battlefield always draws upon two sources: the latest technology; and the operational needs and characterization of

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the battlefield. Technology is very important. Like other armies around the world, the IDF is very proud of the fact that in recent years, from one operation to the next, the number of people whom it did not purposely injure has declined. A bomb can injure someone unintentionally, but the IDF has gradually reduced the risk. This was facilitated, inter alia, by technological changes and by methods that were unavailable some 10, 15, or 30 years ago. In other words, it is not exclusively a matter of values. Values are one component, but values have always played a role in these matters. We are attempting not to hurt people who do not deserve to be hurt. It also has to do with the available technological capability

The key to this capability is the well known device, the computer, which was originally enormous in size but has gotten smaller over the years. Every miniaturization and improvement in computer technology has bred another operational capability, mainly because of the effect of what today is known as Moore's Law on the miniaturization of devices. The world's first two computers, built by Von Neumann and Turing, were stored in an enormous room. Compared to human capability, they offered a fantastic calculating capability. The first computer was able to complete 1,000 calculations in a second. None of us can do that. However, computers today perform 5 billion calculations per second. Computers have gotten smaller, and today, 4 or 5 billion transistors can be placed on one microchip. This is the implication of Moore's Law, which generally states that the number of transistors on integrated circuits doubles approximately every two years. This means that the computer then has twice as many transistors, and that it correspondingly gets smaller as it acquires greater speed.

I was drafted into the IDF after the 1967 Six Day War. At that time, the IDF had three computers, each the size of a small auditorium. The only way the computers could then be used was offline – in other words, you would write a program, run it, get the results in the output, and then present them to the operational echelon. Approximately a decade later, as the transistors and computers were getting smaller, more or less in the 1980s, for the first time, we installed computers on planes. In 1973 we already had a bombing computer on the Phantom, not in the form of a computer we know now, but more like what we now call an analog computer. In fact, it was actually capacitors, resistors, and coils that performed a certain function, but it was not a computer in the modern sense because all of this equipment could not be fitted onto the aircraft. The first time that this assembly was reduced to an effective size and could be mounted on aircraft was in the 1980s. The Israel Air Force was the first air force in the world to use a computer on a fighter bomber. It was a US-made computer, and the aircraft was manufactured in the United States, but Israel was the first to integrate the two, thereby automatically improving the precision of the bombing by a factor of five or six. By the 1990s, the computer had become so small that it could be placed into a bomb. That was when the so-called "smart bomb" – or the "smart weapon" or "precision guided munitions" – appeared on the scene. Why is that a "smart" bomb? Because it has an electronic brain and is capable of actions that had previously only been a far-flung fantasy. Let me illustrate this with numbers. Thus, with the analog computers that were fitted onto aircraft in 1973, even if we tried to a strike a target as tough to hit as a tank with pinpoint precision discharging the entire huge payload of the Phantom jet, chances of hitting and destroying that tank would still be no more than 1 or 2 percent, because the bombs were dispersed over a large area. A decade later, with a digital computer on aircraft such as the F-16, and a five-fold greater chance of hitting the target, this was still not particularly impressive and the strike chances never exceeded 7 percent. It took nearly 20 aircraft to hit one single tank with regular bombs. A large part of the development effort focused not on regular bombs, but on fragmentation bombs, cluster bombs, and similar weapons. One generation later, in the 1990s and in the twenty-first century, the aircraft deployed by the United States in the war in Iraq, for example, had a chance of more than 100 percent of hitting a tank. Of course, there is no more than 100 percent, but if one F-15 drops four smart bombs, each of them has close to a chance of nearly 100 percent of hitting a different target.

Between 1973 and 2003, the accuracy level increased by more or less a factor of 100. The chance of hitting the targets increased approximately 100 times, from 1 to 100 percent. It is hard to grasp the entire gamut of the consequences of this development, and they were especially notable in the context of the subject under discussion here. Before the first half of the 1990s, the import of the classic threat that the IDF needed to address – namely, war against the invasion of armies from the border – declined. Meanwhile, the threat that emerged in various forms in clashes with Fatah and evolved into confrontations with Hizbollah increased. It became clear that this technology must be adapted to something new: to combat that is ultimately very intricate in an area that is crowded and teeming with civilians who are not combatants, where the targets are by and large human beings – not tanks, aircraft, or artillery.

The IDF began to make its technological adjustments to this new environment in the mid-1990s. The ratio of smart bomb usage rose steadily between 1991 and 2003. In the 1991 Gulf War, for example, the Americans used smart munitions at a rate of 8 percent, while in Kosovo in 1999, that rate rose to 35 percent. In Afghanistan in 2001, this ratio stood at 56 percent, while in the 2003 Gulf War and during the occupation of Iraq, it already reached 68 percent. In Operation Pillar of Defense in 2012, and even before that, in Operation Cast Lead in 2008, Israel's use of such weapons reached close to 100 percent. All of this prompted the United States and Israel to make changes.

In 1991, the Americans decided to introduce a certain change into their combat doctrine, which was more oriented to the new world, in which the enemy was no longer the Soviet Union, which was an enemy more or less on a par with their own capability level, but either a Third World country that might have had an army but was technologically inferior, or an organization of the type discussed above that has become the major threat – the main threat benchmark scenario encountered today. In the face of these threats, the Americans tried to develop a combat doctrine that they called asymmetric. The term "asymmetric" is used extensively. Although understood differently by many people, initially it meant that whereas the United States was a technologically organized superpower, the enemy was an organization like Hizbollah and Hamas. Since from the technological aspect neither they nor any Third World army could compete with the United States, they knew they had to exploit this advantage. The combat and technology doctrine was therefore formulated with the inherent edge that the Americans enjoyed.

With respect to urban warfare, this doctrine was based on four principles: precision attack, control of the combat arena, dominant maneuvering, and intelligence and information warfare. Precision attack is presented as a triangle with three legs. Thus far, we have only discussed the top vertex, namely precision guided weapons, but they must also have an intelligence sensor that indicates the target's location. Technically, it is possible to fly over the Sea of Galilee and direct a precision-guided missile to penetrate the window of a house in Damascus with an accuracy level of 1 meter. However, the problem is that the pilot cannot see Damascus;

he cannot see the target with his own eyes. At best, he can spot a small dot on the edge of the horizon. It is therefore impossible to activate the precision guided weapon without a sensor that supplies intelligence in real time. The real time intelligence sensors therefore constitute the second leg of the triangle. When we have precision guided weapons and the sensor intelligence, and we know precisely where to direct the bomb, we still need the third component to launch the weapons exactly at the right time. This third leg is the command-and-control systems. All of this was accomplished over the past 10 or 15 years thanks to computers. In the past, we would use telephones and the like, but what we called "on-time" information was in fact 24 hours behind, and this is ineffective. In this context, we also have unmanned aerial vehicles, but these are beyond the scope of this essay.

The Significance for Urban Warfare

What are the requirements for engaging in urban warfare? First, the threat in a crowded environment must be identified. Then a precision strike against the target must be launched with maximum efforts to minimize collateral damage. These are the requirements from the weapons, and they can be achieved to comply with the demands of the concept of precision attacks – which was developed at the same time but as separate and unrelated process – yet with the added features that could theoretically justify engagement in urban warfare.

First, weapons and accuracy, meaning a small warhead: in the past, bombs were intended to be as large as possible, aircraft were constructed that would be able to carry a somewhat heavier payload, with reinforced wing hard points. These measures were taken to achieve more of the original capabilities, thinking that even if we did not strike precisely, a large bomb would in any case cause the desired damage. If the target is localized to the pinpoint level, there is no longer need for large warheads, so that even when they are smaller, the collateral damage to the surroundings can be minimized. Yet this is still not effective when people are hiding inside bunkers or behind concrete walls that need to be cracked. In combat in an urban environment, by very nature of this type of warfare, the tough problems are the people who stand on the roof of a building and fire, or their commanders who gather in an apartment for a meeting. Once we know how to "penetrate" through that apartment's window, we no longer need a large warhead.

The second characteristic is the sensors: We need real time high resolution identification during all hours of the day and in all weather conditions. The main requirement is higher resolution. An attack on a large target such as a tank or a military airfield differs considerably from an attack on a human target, especially when the strike is carried out by a drone flying at an altitude of 15,000 feet, which cannot distinguish between individuals. Therefore, the intelligence data must be augmented in order to ensure that the target that is being attacked is the right one. In other words, more sensors are needed. Nevertheless, the heart of the matter is to have a command and control system that can coordinate all these components and consolidate the intelligence information from the different sensors and from the intelligence agencies into such a level of target identification that it can ultimately direct the weapon to the target that the sensors had detected and can guarantee that only the correct individual is hit, but not uninvolved parties. This is something that the IDF started to work on only a short time before Operation Cast Lead.

At the same time, this entire aspect of weapons is worthless if it is not integrated within the combat doctrine because the two reinforce each other. The combat doctrine must nurture weapons development, which in turn allows for fulfillment of that doctrine.