Yorktown Institute

Reimagining Quick Reaction Force Technology and Tactics for the 21st Century: Analyzing the IDF's initial response to the October 7th attacks

Brent Cagen
Research Assistant, Yorktown Institute
May 2024

Part 1: Air Defense and an Evolving Aerial Threat Environment

When units of Hamas, Palestinian Islamic Jihad, and their allies attacked Israeli towns on October 7th, 2023, the effectiveness of the IDF's response varied significantly from area to area, and the horrors of that day demonstrate that the IDF and other modern militaries must reevaluate how armed forces respond to rapidly developing conflict situations in civilian areas. Armored units of the IDF 33rd Caracal infantry combat battalion, 512th Paran infantry brigade as well as special forces units such as Unit 217 "Duvdevan", 89th "Oz" Brigade performed admirably during 17 hours of continuous combat operations despite the IDF's initially disorganized command structure and a lack of information about conditions on the ground. Other IDF units were not so effective. Photos quickly emerged of a small number of IDF Merkava tanks disabled and heavily damaged by Hamas on October 7th, and disorganized IDF units suffered from slow reaction times as well as unnecessary casualties during initial response operations.

Hamas' employment of drones as loitering munitions caused a significant portion of IDF material and vehicle losses during the initial fighting, and IDF forces were not prepared to detect and defeat Hamas aerial threats on October 7th. Hamas consumer grade quadcopter drones disabled IDF armor, communications systems, and C3ISR systems during the opening stages of the attack. Prior to October 7th, the IDF's experience with drones deployed by regional terror

groups was limited to a growing but ultimately isolated number of incidents where the IDF was able to destroy the drones before the latter could inflict damage. Moreover, these drones were not consumer-grade quadcopter designs but rather larger, longer endurance types such as those shot down by IAF F-35 fighters in 2021. Hamas also utilized manned powered gliders to circumvent Israeli border fortifications and inflict significant casualties on Israeli civilians in the area of the attack. These glider systems are cheap, provide no protection for their users, and on paper should not have been able to penetrate Israeli territory given the advancement of the IDF; the effectiveness of drones and manned powered gliders in the October 7th attack immediately present two distinct technological problems that the IDF and other modern militaries must address for future preparedness against potential low-tech adversaries.

The first issue is the lack of battlespace awareness and aerial detection systems for SHORAD-level threats. Since the end of the Cold War, Western-style militaries shifted away from dealing with SHORAD-type threats, which, in 1992, comprised mainly of helicopters and attack aircraft. Such targets were dangerous to ground forces but were limited in the number and were large enough that standard ground-based radar systems could detect them. Combined with the emergence of insurgent threat environments and peace dividend budget cuts, Western militaries deemphasized the need for short range air defense, instead prioritizing long range missile defense and securing air superiority. For budget keepers, this change made sense: helicopters, ground attack aircraft, and military-grade UCAVs were weapons that only government-sized entities could afford to purchase and maintain in any serious capacity, and it wasn't until the 2010s that the aerial threat environment began to shift again. In 2013, PRC civilian drone manufacturer DJI released its first mass-market, consumer grade quadcopter drone, the Phantom 1. This heralded a new age of cheap aerial drones that were well within the price range of the average Western consumer; this also meant that non-state actors could now afford aerial systems as well, and within a few years drones began to see deployment mainly in the Middle East in the ISIS war. By the end of the 2010s, low cost consumer-grade drones saw significant use in the Middle East, but it was not until 2022 that such drones demonstrated their lethality on the modern battlefield. The Russian invasion of Ukraine became notable for any

number of reasons, but the ubiquitous presence of drones both consumer-grade and larger became an integral component of the character of the war as such devices saw tremendous employment by both the UAF and the RUAF. This state of affairs, as the IDF later learned in costly, unnecessary lessons, did not go unnoticed by terror groups such as Hamas.

The advantages of consumer grade drones for militant organizations aside from the systems' low cost include the drone's small size and emissions. Though the payload is low, such drones, especially FPV drones, can utilize maneuvers and pathways that larger standard military drones cannot utilize. These factors make detection and interception of such drones difficult even under ideal circumstances.

It is ironic that the IDF, one of the first Western military adopters of loitering munitions, did not consider that it would be prudent to develop and deploy systems to counteract such weapons, but the reality is that the IDF did not adequately prepare for such a threat environment. In a cruel irony, Israeli Aircraft Industries was one of the first defense companies to seize on the options that low-cost loitering munitions could provide well ahead of its competitors; IAI developed the Harpy loitering munition from the prototype of the ARD-10 anti-radiation drone IAI purchased from Kentron (now Denel) in the late 1980s and began mass production the early 1990s. There was no commensurate development in Israel of SHORAD systems that could effectively defend against such systems en masse; the Machbet, itself an upgrade of the IDF's copy of the US M163 PIVADS, the Hovet, offered limited improvements over the original design and mainly saw combat against ground targets in urban settings. Moreover, the IDF, like the US Army, derived the Machbet from the venerable but slow and poorly protected M113 APC, limiting the Machbet's effectiveness in a dynamic combat environment.

In some capacity, the IDF lacked the ability to detect and catalog small aerial contacts in the vicinity of the Gaza Strip. Hamas drones were able to cross into Israel and inflict significant material damage on IDF units guarding the border, blinding and confusing the IDF long enough to insert personnel into Israel and inflict grievous military and civilian casualties.

While Western militaries were slow to consider the danger posed by large-scale usage of SUAVs, the Western arms industries began development in the mid 2010s of systems that could,

in theory, effectively defend against multi-drone attacks. One such solution was wide-area jamming; companies developed systems both static and truck-mounted that personnel could rapidly deploy. Such systems would jam the control links of SUAVs, rendering them into little more than large paperweights with an unguided ballistic trajectory. Other companies took the concept of a drone jammer and downsized it into a rifle-sized, man-portable system that a soldier could use like an oversized flashlight. These systems, however, do have drawbacks. The larger static and truck-mounted jammer systems cannot hardkill incoming drones, meaning that even if the enemy drone operators lose control of the platform it can still inflict damage if it happens to crash on top of friendly forces. Moreover, the jammers, while they are able to disrupt drones' onboard GPS guidance, are unable to affect drone guidance systems that rely on inertial navigation. The man-portable systems specifically suffer from a limited battery life, and while companies producing jamming rifles have designed a number of features that can mitigate this problem, energy storage realities will limit these systems' effectiveness. The static and truck-mounted jammers are also quite fragile and thus susceptible to enemy fire that the jammer cannot stop such as mortars or tube artillery.

Arms companies also developed a number of "hardkill" solutions that would physically destroy incoming drones with automatic cannons, SAMs, lasers, or a combination of the above. Such systems descend from previous examples of SHORAD vehicles employed by NATO during the Cold War but also derive from CIWS examples commonly found in most modern naval forces. In the late Cold War and 1990s, Western defense companies devised a number of SHORAD solutions that would regrettably fall by the wayside due to the military climate at the time. The Italian company OTO Melara, now merged into Leonardo, developed in the 1980s as a private venture and completed in 1987 a single prototype of the Otomatic SPAAG; this system mounted an Otobreda 76mm automatic naval cannon on the chassis of an OF-40 MBT. Such a system would provide low altitude area defense at ranges far exceeding conventional gun SPAAGs at the time for a lower cost per round than surface to air missiles. General Dynamics in conjunction with the USMC developed the Blazer air defense turret for the LAV amphibious vehicle in the late 1990s. GD completed delivery of 17 LAV-ADs in 1999, but the system saw

no further development or production afterwards. SHORAD development languished in the 1990s and 2000s; several militaries conducted research on laser weapons, but these were early prototypes and were not practical for common use. Beginning in the 2010s with the increasing threat of drone aircraft, however, SHORAD development began to pick up slowly. Part of this resurgence can be attributed to the rapidly rising cost of aerial interceptor aircraft and surface to air missiles; destroying drones that cost even in the tens of thousands of dollars with missiles that easily cost more than a million dollars was not an economically sustainable practice. European arms producers began to experiment with new SPAAG designs. Rheinmetall developed the Mantis area air defense system in the mid-2010s, which along with missile launchers included 35mm and 30mm autocannons. Rheinmetall would later develop the Mantis into the Skyranger 30 air defense turret, including a variant equipped with a 30mm gun, Stinger missiles, and a high-energy laser in 2023. BAE Systems revisited the rare anti-aircraft variant of the Bradley IFV, the M6 Linebacker, and in 2017 demonstrated at the AUSA conference a Bradley upgunned with an XM914 30mm gun that could fire proximity-fuzed and airburst anti-aircraft rounds as well as a quad-pack stinger launcher mounted to the side of the vehicle. While the Skyranger and the Bradley M-SHORAD are merely examples, the IDF possesses no equivalent system in its inventory.

At a fundamental level , the IDF needs to incorporate a) a large scale low altitude threat detection network with redundancy and b) air defense solutions that can efficiently and quickly intercept small maneuvering/controlled low-altitude aerial threats. For the latter, the IDF must consider armored/mobile hardkill solutions supported by jammers. In the long term (decade+) the IDF must develop an effective mobile AAA laser system, but in the short term it must consider a mobile hardkill SHORAD solution that can quickly be acquired and fielded.

Part 2: Organizational Failure and Reorganization of IDF border forces around QRF and data collection/processing

The IDF possesses some of the most advanced surveillance technology resources in the world, from air-based drone surveillance to satellites to ground based networks. For a number of reasons, however, it has failed to implement a proper surveillance and intelligence collection network that spans the borders of Israel. Moreover, the IDF has not actively pursued an effective quick reaction force structure that would enable it to react to attacks such as the one perpetrated by Hamas on October 7th, 2023. The pairing of a highly mobile, heavily armed quick reaction force and a robust intelligence distribution system would enable the IDF to rapidly deploy forces in a coordinated fashion to oppose developing threats before they can inflict significant military and civilian casualties.

A hypothetical intelligence network would rely heavily on unmanned system for wide area coverage. Such systems would include UAVs as large as dirigibles and as small as civilian quadcopter drones. Dirigibles armed with sensor suites can patrol large geographical areas for significant durations far in excess of conventional manned aircraft or fixed-wing high altitude UAVs. Dirigibles are, unsurprisingly, slow and do not possess maneuverability; consequently, such a design would need to operate at a fairly high altitude and possess a limited self defense capability. It is within the technological and industrial means for Israel's regional adversaries to create a munition capable of reaching significant altitude and striking an object as slow as a dirigible with limited guidance. To counter such a threat, the dirigible would potentially need a hardkill interceptor system. Conversely, designing the dirigible to operate at high altitudes would force any would-be adversary to construct a munition so large that it could not be deployed in a firing position without being detected and destroyed before it could launch.

To complement the dirigibles, the IDF already has a number of smaller reconnaissance UAV models capable of both passive data collection and strike operations. Employing these in a unified network would allow for a rapid decision making loop that receives data, analyzes it, and decides on a particular option for dealing with a potential threat. The final aerial pillar of this

operation would be small, quadcopter drones that could patrol an area and transmit visual data back to a data center. These drones, while lacking in endurance, would make up for this weakness by operating in significant numbers and relying on plug and play battery packs in a docking system that could potentially run on an automated scheme.

The ground component of this data gathering and analysis system would include both UGVs equipped with a multi-domain sensor mast that can reach over obstacles and armed sentries built on both wheeled and tracked chassis. The sensor mast variants would patrol areas and collect data in a similar vein to the quadcopters and other UAVs; it would be escorted by armed drones that could operate to defend the sensor drones and to attack targets. These drones, unlike the sensor mast, would only be automated when not in combat; in the event of an attack detection, operation of the drones would transfer to remote control human operators.

The core of this surveillance data collection system would be artificial intelligence. The US military, for example, is already working on a strategic-level AI, SCEPTER, that could plan military operations. This concept could be expanded to support a dedicated center of human operators; the AI would take in and process large volumes of visual data to make it useful for intelligence purposes. The AI would then project possible scenarios for how a threat might act in given the data the surveillance network connected. The AI could potentially make recommendations on what IDF units are best to deal with a developing threat based on unit readiness, composition, and proximity to the area of operations.

The second part of this strategy is the presence of IDF quick reaction forces that can very rapidly deploy to contain and eliminate developing threats on Israel's borders. These forces would need to adopt a "lightning bruiser" force concept; they would be heavily armed and be highly mobile to quickly defeat threats. The goal of such a force would not be long-term, sustained combat; such a force would lack the heavy vehicles necessary to conduct a sustained engagement against an armored task force. Such a force would be more than capable of combating light motorized elements utilizing refitted Toyota Hilux equipped forces up to forces equipped with BTRs or older model BMPs. The QRF would ideally consist of a brigade sized force. This force would coordinate with the IDF Home Front Command; the HFC would, in the

event of an attack, immediately begin evacuation procedures while coordinating with QRF forces with regards to intelligence sharing to protect evacuees and evacuation teams retrieving the former. In an ideal scenario, HFC would operate immediately behind or alongside QRF teams during the initial stages of a containment operation.

The offensive core of this force would likely be the new fire support vehicle the IDF intends to procure; the goal of this design is to create a heavily armed fighting vehicle that is small enough to achieve high mobility even in tight urban areas. This vehicle is armed with a 50mm autocannon that can, like similar weapons in its class, fire standard APFSDS-T anti-armor shells as well as proximity or sensor-fuzed programmable shells that can counter enemy personnel in defilade. The design will prominently feature a hardkill active protection system that can intercept incoming enemy anti-tank missiles and rockets, allowing the overall design to shed the heavy armor that is present on the IDF's Merkava series of tanks. Groups of these units in concert with currently available high mobility motorized special forces such as the Duvdevan unit would operate as a highly effective spearhead.

The combination of a semi-decentralized multi-domain sensor network, an AI that can efficiently process data collected by the network, and the formation of dedicated rapid-response IDF battlegroups will allow the IDF to quickly suppress October 7th-style attacks on Israeli territory.