REPORT

DAESH'S DRONE STRATEGY

TECHNOLOGY AND THE RISE OF INNOVATIVE TERRORISM

SERKAN BALKAN

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TABLE OF CONTENTS

ABSTRACT | 7

INTRODUCTION | 9

MATERIALS USED IN A DRONE PROGRAM | 13

- Types of Drones Used by DAESH | 15
  - Fixed-Wing Drone | 16
  - Multi-Propeller Drone | 17
- Software | 19

DEASH'S INTENDED USES OF DRONES | 23

- Reconnaissance/Surveillance | 24
- Suicide Attack Management Tool | 26
  - Vehicle Selection | 27
  - Reaching the Target | 30
- Attacks by Drones | 34
- The Use of Drones for Propaganda | 38

FIGHT METHODS AGAINST DRONES | 41

- Drone Defense Weapon | 42
- Drone Capturing System | 43
- Anti-UAV Defence System | 44
- Hunting Down Drones with Eagles | 45
- Hunting Down Drones with Nets | 46

CONCLUSION | 49

INDEX OF FIGURES

IMAGE 1. DRONES AND DOCUMENTS CAPTURED IN A DAESH DRONE FACILITY IN MOSUL, IRAQ 14
IMAGE 2. DRONES CAPTURED BY THE ISF 15
IMAGE 3. FIXED-WING DRONES CAPTURED FROM DAESH 16
IMAGE 4. FIXED-WING MUNITION-LOADED DRONE 17
IMAGE 5. FOUR-PROPELLER DRONE CAPTURED BY THE ISF 17
IMAGE 6. MUNITION-LOADED FOUR-PROPELLER DRONE 18
IMAGE 7. FLIGHT SCHEDULE USED BY A DAESH MILITANT 19
IMAGE 8. SCREENSHOT OF A DAESH VIDEO 20
FIGURE 1. DAESH'S DRONE STRATEGY 24
IMAGE 9. SCREENSHOT OF A DAESH VIDEO 25
IMAGE 10. SCREENSHOT OF A DAESH VIDEO 25
IMAGE 11. WIDE-BED VEHICLES USED BY DAESH FOR ATTACKS 27
IMAGE 12. VEHICLES USED BY DAESH FOR SUICIDE ATTACKS 28
IMAGE 13. SCREENSHOT OF A DAESH VIDEO 29
IMAGE 14. SCREENSHOT OF A DAESH VIDEO 30
IMAGE 15. SCREENSHOT OF A DAESH VIDEO 31
IMAGE 16. SCREENSHOT OF A DAESH VIDEO 32
IMAGE 17. SCREENSHOT OF A DAESH VIDEO 33
IMAGE 18. BRIDGES IN IRAQ HIT BY AN AIRBORNE ATTACK BY THE COALITION 34
IMAGE 19. MUNITIONS DROPPED ON ISF TROOPS 35
IMAGE 20. A DRONE ATTACK AGAINST A SPECIAL FORCES TANK 36
IMAGE 21. SCREENSHOT OF A DAESH VIDEO 37
IMAGE 22. A ROCKET WARHEAD MOUNTED ON A DRONE CAPTURED IN SYRIA 37
IMAGE 23. KAMIKAZE DRONES OWNED BY IRAN AND HOUTHIS 38
IMAGE 24. THE BATTELLE DRONEDEFENDER 43
IMAGE 25. THE MESMER SYSTEM 44
IMAGE 26. THE BLIGHTER A400 SERIES AIRBORNE RADAR 45
IMAGE 27. A DRONE HUNTED DOWN BY AN EAGLE 46
IMAGE 28. METHODS OF CAPTURING DRONES WITH NETS 47

ABSTRACT

"Innovative terrorism" can be described as the introduction of a new method or the development of an existing technology by terror organizations. Considering the changing traits of terrorism and the resources owned by terror organizations today, its character and patterns of using innovative terrorism make DAESH the most dangerous organization threatening regional and international stability.

Meanwhile, DAESH's principles of war, terror methods and radical ideology based on Messianic discourse, which is assertive enough to influence masses, transform the organization into the most dangerous actor threatening global peace. Terror organizations take advantage of the opportunities presented by new technologies, globalization and the benefits offered to society by the liberal global markets. This increases the impact of terrorism's message and the effectiveness of terrorists' capabilities.

In the process of innovative terrorism, DAESH and similar terror organizations are armed by using current technological platforms and gradually cause the diversification of new types of threats. One of the most striking new threats is drone (unmanned aerial vehicle, or UAV) technology.

DAESH has improved its fighting skills especially in Syria and Iraq on account of drones and this has not only caused a serious threat to the countries' security forces but also to civilians. This report analyzes the extent of the use of drone technology by terror organizations, and makes recommendations regarding how to remove this new threat.

INTRODUCTION

On a state level, innovation refers to the development of new military technologies, tactics and strategies that lead to breakthrough changes. The adjustment of these novelties to existing military methods is called "adaptation," and importing different methods and new materials to these novelties through imitation is called "emulation" –the latter is distinct from innovation. Technologies used by terror organizations are never new generation technologies. Thus, while describing the concept of "innovative terrorism" the aforementioned terms, namely "adaptation" and "emulation," are used in regards to terror organizations, not states.[1] In this context, innovative terrorism requires the spread of new technologies or techniques among terror organizations, and involves learning from previous acts of terrors, more intense implementation, and adaptation.[2] From this point of view, innovative terrorism for terror organizations can be described as the introduction of a new method of terror or the development of an already existing technology. From the organizational point of view, big terror organizations, with field control and high incomes, can introduce a new method or develop an existing technology more easily. Considering the changing traits of terrorism and the resources owned by terror organizations today, its character and patterns of using "innovative ter-

1. Adam Dolnik, *Understanding Terrorist Innovation: Technology, Tactics and Global Trends*, (Routledge, New York: 2007), pp. 4-21.

2. Maria J. Rasmussen and Mohammed M. Hafez, *Terrorist Innovations in Weapons of Mass Effect: Preconditions, Causes and Predictive Indicators*, (Defense Threat Reduction Agency Advanced Systems and Concepts Office Report, October 2010), Report No: ASCO 2010-019, pp. 2-10.

rorism" make DAESH the most dangerous organization threatening regional and international stability.

DAESH's principles of war, terror methods and radical ideology based on Messianic discourse, which is assertive enough to influence masses, transform the organization into the most dangerous actor threatening global peace. Hence, DAESH is a global threat that is of direct interest to all actors today. The organization significantly changes both the character of counterterrorism and the war itself as it uses all war tactics, and does not abide by any norms or international rules of law. In the age of innovative terrorism, terror organizations increase the effectiveness of terrorism by exploiting technological opportunities, globalization and the benefits offered to society by the liberal global markets. In this regard, weapons modernized or developed by terror organizations, such as DAESH, significantly change the nature of threat as well. One of these new kinds of threats is the development of drone technology, which sets a striking example as it exposes the dangerous face of terror. One of the most critical developments in this field in recent years is that DAESH has developed its own special drone program by using small commercial drone technology.

DAESH has increased its attack and defense capabilities owing to drones, and poses a serious threat not only to security forces but also to civilians. Bomb attacks recently committed by using drones in particular caused serious damages, demonstrating that DAESH uses drones as an effective tool. The Iraq Security Forces (ISF) ascertained that DAESH used drones for reconnaissance in Ramadi in 2015. Similarly, a Turkish military unit deployed in the Bashika Camp in Northern Iraq was exposed to intensive harassment fire 15 minutes after identifying a drone.

In this respect, it may be said that DAESH uses drones to spy on the enemy and to collect intelligence. These are the first signs of the fact that DAESH uses drone technology as a new tactic. Drone models that had apparently been worked on to modernize them, model wings and explosives were confiscated in a DAESH workshop during the ISF's Ramadi operation in February 2016. The aforementioned materials demonstrated that DAESH intended to use drones beyond collecting information and had tried to arm them for attacks.[3] In the meantime, the group continued to use drones mostly for surveillance, collecting intelligence and guiding mortar, cannonball and rocket fires against static targets.

DAESH used drones, for the first time, for attacks against Turkish military units who carried out Operation Euphrates Shield in Syria. On 27 September,

3. "Islamic State's Weaponized Drones," Conflict Armament Research, (November 2016).

2016, a DAESH-controlled drone dropped an explosive material on Turkish soldiers in Syria, wounding three; the soldiers were part of the Turkish military-led Operation Euphrates Shield.[4] The first drone attack by DAESH in Iraq took place on October 2, 2016, against Peshmerga forces who were preparing for Operation Conquest/*Fatah* in the Northern Iraqi city of Mosul. Two Peshmerga died and two soldiers of the French Special Forces were heavily wounded in the explosion of an improvised explosive device (IED) planted in a drone.[5]

As of the last quarter of 2016, DAESH has intensified the use of drones for assault against security forces involved in Operation Conquest in Iraq and against the PYD-PKK terror organization within the Raqqa Offensive in Syria. For security reasons, countries are concerned about DAESH's gradually increasing use of drone technology as a means of attack. Especially the United States of America, which is playing an active role in the operations launched in both countries and which has increased security concerns, has discussed across all its institutions possible measures against this threat. In this context, any kind of materials, from waterballs to laser, were examined for use in anti-drone fights.[6] Efforts to prevent the use of drones by DAESH can be likened to the U.S. fight against IEDs used by Al-Qaeda. The commander of Operation Inherent Resolve,[7] Lieutenant General Stephen Townsend, said that the number one force protection priority in the fight against DAESH was to defuse drones. Although no American personnel have been killed by DAESH drones, there is the psychological effect that these devices afflict on soldiers because of the difficulties in identifying such vehicles and the casualties caused to the ISF by drones.[8]

DAESH introduced drones into the irregular warfare literature and drones inflict severe losses. The use of drones for attacks by other non-state actors has added a new international dimension to the problem. In fact, Hezbollah, Op-

4. Bleda Kurtdarcan and Barın Kayaoğlu, "Turkey Is on the Front Lines against ISIS's Bomber Drones," *The National Interest*, October 16, 2016.

5. Sam Webb, "Death from Above: Kurd Fighters Killed and French Special Forces Soldiers Badly Hurt by ISIS Drone Packed with Explosives", *The Sun*, October 11, 2016.

6. Christopher Diamond, "DoD Prepares for More Advanced Armed Drones Amid ISIS Threat," C4ISR, March 30, 2017, http://www.c4isrnet.com/articles/dod-prepares-for-more-advanced-armed-drones-amid-isis-threat, (Access date: May 3, 2017).

7. The titles of U.S.-led operations conducted by the coalition forces against DAESH in Syria and Iraq.

8. Mark Pomerleau, "Counter-Drone is the New Counter-IED," C4ISR, March 21, 2017, http://www.c4isrnet.com/articles/counter-drone-is-the-new-counter-ied, (Access date: May 3, 2017).

ponents in Syria, and Hashd al-Shaabi in Iraq have begun to use drone technology. Houtis attacked a Saudi frigate with a bomb-laden unmanned marine vehicle in Yemen, killing three soldiers in the attack.[9]

The use of drones by a non-state actor in a cost-effective way and for the purposes of attack, defense and reconnaissance may prompt regular armies to include drones in warfare concepts in the upcoming period. In a fashion similar to that of DAESH, the ISF uses drones in urban warfare to identify snipers, who are among the leading causes of personnel casualties. The ISF organizes bomb attacks against DAESH by using drones captured from the group during Operation Conquest.[10] Iran has developed suicide drones[11] and Russia has developed its first attack drones.[12] As seen, both states and non-state actors wish to develop attack-drones. Hence, the purpose of this analysis is to demonstrate how the use of drones has reached a dangerous level; to examine the fight against this threat before it spreads to other countries in the Middle East through foreign terror fighters; and to analyze anti-drone technology.

9. Rıfat Süleyman,"ميناء الحديدة فرقاطة سعدية تتعرض لهجوم من قبل زوارق يقودها انتحاريون غرب", RT Arabic, January 30, 2017.

10. Hikmet Durgun, "Irak Ordusu IŞİD'i Musul'da, IŞİD'in Silahlarıyla Vuruyor," Sputnik Türkiye, April 11, 2017.

11. Jennifer Newton, "Iran Develops a 'Suicide Drone' Capable of Delivering Explosives and Skimming Water to Attack Targets on Land and Sea," *Daily Mail*, October 26, 2016.

12. "Rusya'nın İlk Saldırı Amaçlı İHA'sı Bombalamaya Hazır," Sputnik Türkiye, March 29, 2017.

MATERIALS USED IN A DRONE PROGRAM

On October 17, 2016, the ISF and Peshmerga forces launched Operation Conquest from four fronts.[13] In the meantime, the ISF identified more than 10 workshops where drones are manufactured and modernized by DAESH in various locations in the city center of Mosul. Documents confiscated in these workshops revealed that DAESH is making preparations in order to use drones as weapons; has a systematic drone program –contrary to popular belief; has formed an aviation surveillance sector to coordinate the procurement and development of drones; and has an airborne operation center in order to orchestrate acts of terror committed with the aid of drones.

Documents released by West Point Combatting Terrorism Center have demonstrated that the group is fairly detail-oriented and bureaucratic when it comes to its drone operations.[14] An in-depth examination of the documents reveals that DAESH seeks ways to develop and improve vehicle capabilities. In this regard, the documents confiscated in Iraq can be broken down into four main categories:

13. "القوات المشاركة و محاور عملية الموصل العسكرية," Sky News Arabia, October 17, 2016.

14. Don Rassler, Muhammad al-Ubaydi and Vera Mironova, "The Islamic State's Drone Documents: Management, Acquisitions, and DIY Tradecraft," CTC Perspectives-West Point Combating Terrorism Center, January 31, 2017.

1. Drone purchase requests
2. Permission documents
3. Receipts of purchase forms
4. Reports of drone use[15]

IMAGE 1. DRONES AND DOCUMENTS CAPTURED IN A DAESH DRONE FACILITY IN MOSUL, IRAQ

The receipts show purchases totaling thousands of dollars a month for drone equipment. Documents and receipts are prepared for the aviation sector of the Committee of Military Manufacturing and Development. At the aviation surveillance unit, some of the documents were standardized and filled out by operators for pre- and post-operation.[16] Accordingly, operators are first asked to fill out what type of mission they have conducted: surveillance or weaponized. After the form is filled out, the checklists for the flight mission are filled out. Checklists allow operators to conduct the pre- and post-mission confirmation of the functionality of the systems and equipment. Lastly, a report is prepared by the operator to indicate whether the mission was successful or not. In addition to daily reports prepared by the operators, DAESH also asks operators to prepare monthly reports

15. "وثائق تكشف أسرار استخدام داعش للدرون في العراق," Al Arabiya, February 2, 2017.

16. Susannah George and Lori Hinnant, "ISIS Using Drones, Other Innovating Tactics with Deadly Effect," The Associated Press, February 1, 2017.

on difficulties and hardships.[17] After such systematic efforts and tests, DAESH decides on which drone to use and for what purpose.

TYPES OF DRONES USED BY DAESH

In 2016, there were 600 different drone types as opposed to 20 types known in 1999. Although the most expensive drone costs about $22,000, DAESH generally purchases quadcopters that cost between $650 and $1,000.[18] The average flight time of drones is between 10 and 30 minutes, and maximum control distance is between 0.5 and 7 kilometers. Equipped with professional cameras, drones are capable of 1080P Full HD shots.

DAESH tries to modernize all of the drones' features. A detailed examination of drones captured from DAESH during Operation Conquest has shown that the devices were modified to carry and drop explosives.

IMAGE 2. DRONES CAPTURED BY THE ISF

DAESH uses two types of drones:

1. Fixed-wing drones
2. Multi-propeller drones

Image 2 depicts fixed-wing and multi-propeller drone types both of which are frequently used by DAESH. Such drones have been modernized by the group

17. Mark Pomerleau, "The Elaborate System Behind ISIS' Drone Program," C4ISR, January 31, 2017, http://www.c4isrnet.com/articles/the-elaborate-system-behind-isis-drone-program, (Access date: May 3, 2017).

18. Pomerleau, "Counter-Drone is the New Counter-IED."

to drop explosives and have been equipped with high quality cameras. As a result, most can only fly for a maximum of approximately 20 minutes; flight time is reduced by the weight of a drone.[19] Despite this handicap, they have become more dangerous for the security forces.

Fixed-Wing Drone

DAESH mostly purchases Skywalker X8 and Skyhunter brands of fixed-wing drones and uses them for reconnaissance/surveillance, collecting intelligence and dropping explosives. Thanks to Video Downlink System, an operator can instantly examine the situation on ground from a safe location and make target acquisition. Such drones can be easily purchased online and cost about $200. Since they are flight-ready drones, buyers can directly use them. Image 3 depicts fixed-wing drones captured by ISF in Mosul. It appears that tapes were heavily used on the wings, demonstrating the numerous modifications to increase maximum altitude, speed and flight distance capabilities.

The maximum altitude for this type of drone is 200 meters. They are loaded with a servomotor, battery and HD camera. All of these parts and electronic parts are bundled together in the body which has two fixed wings. The servomotor enables the execution of commands sent to the drone by controlling the angles of the ailerons on the fixed wings.[20]

IMAGE 3. FIXED-WING DRONES CAPTURED FROM DAESH

19. Kelsey D. Atherton, "What We Know About ISIS's Scratch-Built Drones," *Popular Science*, November 8, 2016.

20. "X8 Flying Wing Kit (3rd Party)," Airelectronics, http://www.airelectronics.es/products/solutions/x8, (Access date: May 3, 2017).

IMAGE 4. FIXED-WING MUNITION-LOADED DRONE

Image 4 depicts fixed-wing drones modified by DAESH to drop bombs. Two 40-milimeter munition are loaded on the drone. Related images reveal that up to four 40-milimeter munition heads can be loaded on fixed-wing drones.

The type of drone in Image 4 is the one that has killed two Peshmerga and wounded two French soldiers. The IED installed in the body explodes at a certain time after the drone is hit and captured. Such drones have enough space inside to carry an IED. DAESH prefers fixed-wing drones not only for their capability to store IEDs, but also to host up to four bombs that can be dropped from above.

Multi-propeller Drone

DAESH mostly prefers commercially available multi-propeller drones for airborne bomb attacks. They can be easily procured online and modified, and are flight-ready. Multi-propeller drones have the capability to drop bombs over a selected target owing to their ability to hover.

IMAGE 5. FOUR-PROPELLER DRONE CAPTURED BY THE ISF

DAESH mostly uses DJI Phantom series from among multi-propeller drones. DJI Phantoms chase a selected moving object and have high resolution live video streaming capability with a range of up to 5 kilometers. They have 30 minutes

flight time, and obstacle sensing and avoidance capability.[21] DJI Phantoms can be modified to drop bombs. Image 5 depicts drones modified and loaded with a bomb dropping mechanism. A plastic container placed underneath can host one 40-milimeter munition. The drone, captured by the ISF, has a bomb dropping mechanism controlled by a servomotor and can attack a selected target.

IMAGE 6. MUNITION-LOADED FOUR-PROPELLER DRONE

A different type of drone depicted in Image 6 has a camera rotating 180 degrees in vertical and 360 degrees in horizontal planes and a mechanism that enables it to drop two 40-milimeter munitions. A plastic apparatus and a tail are attached to the rear part of the munition so that from the point where it is disposed, it follows a linear path and drops on its ground-projection. A servomotor, as a release mechanism, has been attached to the drone. With the command of the operator, the munition (explosive) is dropped by opening the slide under a latch/hook that holds it in place.

21. For details, see the company's official website: Da-Jiang Innovations Science and Technology Co., Ltd, https://www.dji.com/phantom-4, (Access date: May 3, 2017).

Moving-head cameras and the ability to hover increase a multi-propeller drone's probability of hitting a target. Such drones have limited capacity when it comes to carrying IEDs or 40-millimeter munitions. However, it is predicted that the bomb-dropping feature in both fixed-wing and multi-propeller drone models will be further improved in the near future.

SOFTWARE

A video footage released by DAESH demonstrates that the group operates drones professionally. Image 7 depicts the use of "Qground Control 2.0" software by DAESH to control drones. As seen in the screenshot in the image, this software offers the operator the main flight information (speed, altitude, direction, etc.) on the upper left corner in the Head-up Display (HUD) format, and the drone's location on the map on the right side.

IMAGE 7. FLIGHT SCHEDULE USED BY A DAESH MILITANT

Image 8 depicts a drone operator, affiliated with DAESH, controlling drones at a makeshift operation center, facing three screens. The first screen is unclear due to the reflection. The Qground Control 2.0 program is running on the second screen and a Mosul map is being displayed. The third screen is for analysis and target identification, and instantly displays video images sent from the drones. The drone operator before the computer screens, with a walkie-talkie in hand is coaching a suicide bomber.

Qground Control is an open-source program. Hence, it has possibly been improved by DAESH members. The program is used for task planning and flight control. A person who has never used a drone before can easily be assigned a task and fly a drone. The key features of this program are as follows:

1. The planning and configuration of autopilot for the flight mission
2. The flight map display showing the drone's position and flight tracks
3. Video streaming with drone display overlays
4. Support for managing multiple drones[22]

The program uses the Google Maps database. Before the flight, the flight tracks are determined on the maps used in the program; therefore, the mission is easily planned and a demo flight is also possible after the planning stage has been completed. After the altitude and speed parameters are entered into the program and a route is determined, the only thing to do is simply push the botton for "Fly view."

IMAGE 8. SCREENSHOT OF A DAESH VIDEO

From there on, the program automatically runs and lands the drone at the take-off point upon completion of the mission. While the software is running, route changes are possible, if needed, and new commands may be added to the mission.

Each task must have a defined "Planned Home Point." Therefore, the flight legs formed on the map may be applied without error. Besides, different home points may be defined for each drone on task. As live video streaming is realized during the flight, the streaming is also saved on an SD card for an in-depth examination and for preparing propaganda videos at a later date. This feature also helps security forces confiscate video footages recorded on the captured drones, and identify the vehicles' routes and take-off points

22. "QGround Control User Guide," https://donlakeflyer.gitbooks.io/qgroundcontrol-user-guide/content/en, (Access date: May 3, 2017).

DAESH'S INTENDED USE OF DRONES

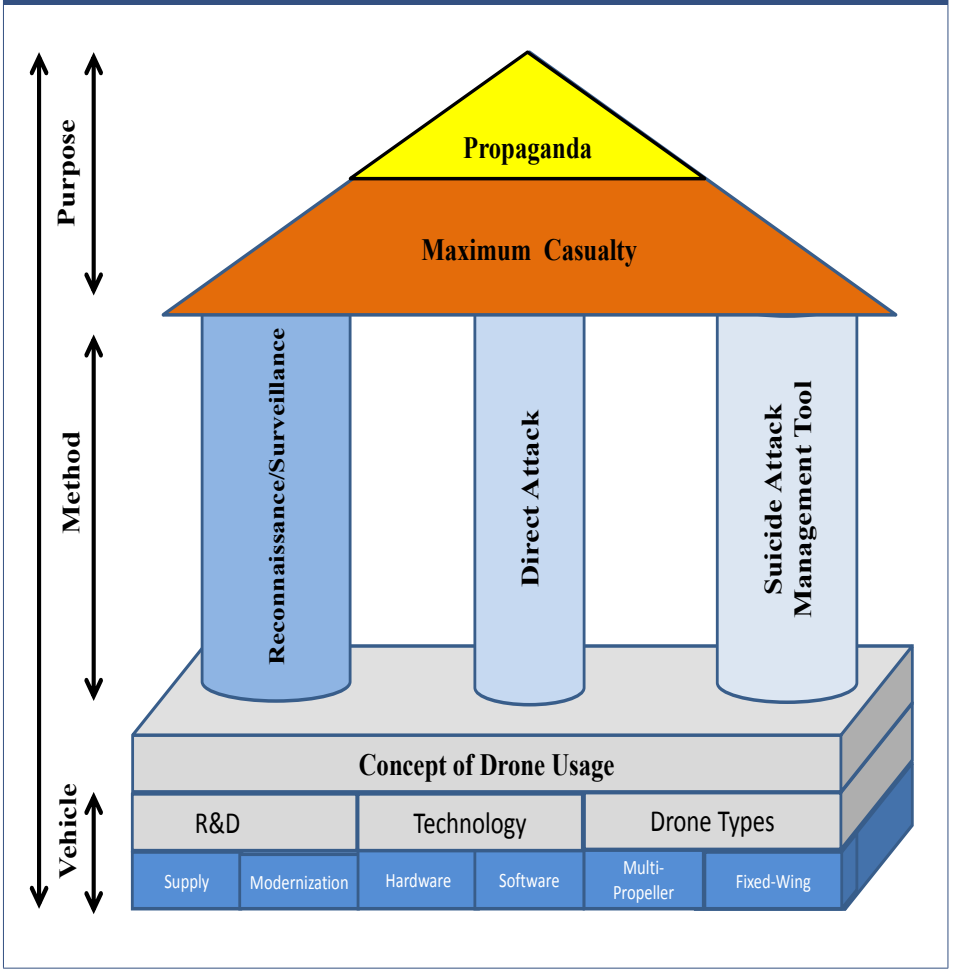
Mosul has become an ideal place for the organization to use commercially available drones. So, DAESH has frequently used drones against the Peshmerga and Iraqi Security Forces. Besides, it becomes easy for drone operators to identify and attack targets because hand-to-hand combat continues in the city and targets are not far, as opposed to the open terrain. As a result, it is easy for them to be hit by limited-range drones. Since operators command drones from mosques or houses, they cannot be differentiated from civilians.

On close examination of the way DAESH employs drones, it becomes apparent that the group uses drones for two purposes: (1) to cause maximum casualties, and (2) to publish/broadcast their capabilities for propaganda purposes. In order to meet these goals, DAESH uses drones in three different ways:

1. Reconnaissance/surveillance activities for gathering intelligence
2. The coordination of suicide attacks in order to maximize casualties
3. Direct attack by dropping IEDs/bombs

Figure 1 depicts the instruments, methods and purposes in DAESH's drone strategy.

FIGURE 1. DAESH'S DRONE STRATEGY



RECONNAISSANCE/SURVEILLANCE

In the beginning, DAESH used drones for due diligence and gathering intelligence on the Iraqi Security Forces and Peshmerga. Later on, the group started to use drones for the purpose of attack in addition to reconnaissance and surveillance activities before or during attacks.

Image 9 depicts a screenshot from a wide-angle video footage by a drone. The green dots represent ISF units; all roads to these military units have been closed off by the setting up of road blocks using private cars. Under normal circumstances, it is impossible for a DAESH suicide bomber to find his way to his target as he finds himself in a kind of labyrinth, unable to reach his target and forced to seek alternative routes. Such unsuccessful efforts are enough to grab the attention in a place like Mosul. However, with the help of a drone a path for directly reaching the target can be easily determined.

IMAGE 9. SCREENSHOT OF A DAESH VIDEO

The same tactic is used in Image 10 where DAESH is seen stopping an ISF convoy by using a drone. A member of a sleeping DAESH cell in the closest proximity to the aforementioned convoy was assigned the task. Accordingly, the militant used a bomb-vehicle to commit an attack against an ISF tank with the aid of a drone.

IMAGE 10. SCREENSHOT OF A DAESH VIDEO

SUICIDE ATTACK MANAGEMENT TOOL

In addition to reconnaissance/surveillance activities for the purpose of gathering intelligence, DAESH uses drones to guide bomb-vehicles to their targets; to determine the place to be bombed; and to increase the enemy casualties to a maximum by coordinating with the drone operator. In the initial phases of Operation Conquest, DAESH was not satisfied with the damage caused by suicide attacks. The reason was that security forces either had enough time to stop a bomb-vehicle before it had reached the target on an open terrain, or they managed to prevent more casualties by taking a combat position if the vehicle could not be stopped. In fact, rather than causing casualties, DAESH committed drone attacks to motivate its members and create psychological pressure on the other party.

As the ISF approached Mosul city center, the number of suicide attacks by drones and of casualties gradually increased. As a matter of fact, since the third phase of Operation Conquest all reinforcement roads used by DAESH have been blocked; the ISF and Hashd al-Shaabi militia have encircled Mosul. This has caused DAESH to use explosive stocks more effectively. The best way to do this is to clearly identify targets by using drones and accurately choose the vehicle to be used in a suicide attack.

Videos broadcast by DAESH demonstrate that the group has attacked the ISF, tanks and buildings en masse by exercising its aforementioned abilities. The east side of Mosul was captured in 100 days. CENTCOM Commander Army General Joseph Votel explained in front of the U.S. Senate Armed Services Committee that the ISF had 490 dead and 3,000 wounded in the city's east side during the operation, and 284 dead and 1,600 wounded in the west of Mosul in the first month of the operation.[23] These figures also include the number of damaged vehicles under the possession of the ISF. Furthermore, the Iraqi Central Government has not released information on the number of casualties. However, a detailed examination of videos released by DAESH demonstrates that the group uses similar acts of terror systematically and causes both material and personnel damage to its enemies. The latest DAESH videos show more than 50 suicide attacks coordinated with drones and carried out against designated targets by vehicle bombs. For this reason, it is evaluated that the number of casualties was, in fact, greater than what Votel announced and that the use of drones played a major part in this.

23. Jim Garamone, "CENTCOM Commander Briefs Congress on Regional Threats," US Central Command, March 29, 2017, http://www.centcom.mil/MEDIA/NEWS-ARTICLES/News-Article-View/Article/1134069/centcom-commander-briefs-congress-on-regional-threats, (Access date: May 4, 2017).

Vehicle Selection

Initially DAESH preferred modified wide-bed trucks or pickups in suicide attacks carried out by vehicle bombs. This way, DAESH could load the maximum amount of IED by using only one vehicle. The front and tires of the vehicles used were covered with thick panels in order to turn them into armored vehicles. Thus, the group tried to prevent the death of the driver and to eliminate road blocks set up to hinder the passage of vehicle bombs. Image 11 shows how large, open-bed vehicles have been modified and the beds have been filled with large amounts of explosives.

IMAGE 11. WIDE-BED VEHICLES USED FOR ATTACKS BY DAESH

As trucks or pickups, such as Toyota Hilux, driven by DAESH members were easily spotted and immediately destroyed as potential threats by the Coalition Forces' drones, DAESH began to use new types of vehicles. These new types of vehicles were chosen for their capacity to carry sizeable amount of bombs and not to be detected until the moment of attack. In order to go unnoticed, the group tended to pick models preferred by civilians in daily life. However, hatchbacks or sedans have limited capacity and cannot be loaded with explosives at the desirable level. For this reason, DAESH prefers jeeps for suicide attacks because they typically have the four-wheel drive option, allowing them to travel over rough terrain, and have the capacity to carry a large amount of explosives. DAESH con-

tinued to use its fleet of Toyota pickup trucks by mounting heavy weapons in the rear, while for suicide attacks the group prefers the brands KIA and Hyundai Tuscon. Based on various videos by DAESH propagandists and the Iraqi Security Forces, vehicles from South Korean car manufacturers Kia Motors and Hyundai have been spotted with greater frequency in Mosul. Such vehicles were provided by car dealers after DAESH invaded the city in 2014.[24]

IMAGE 12. VEHICLES USED BY DAESH FOR SUICIDE ATTACKS[25]

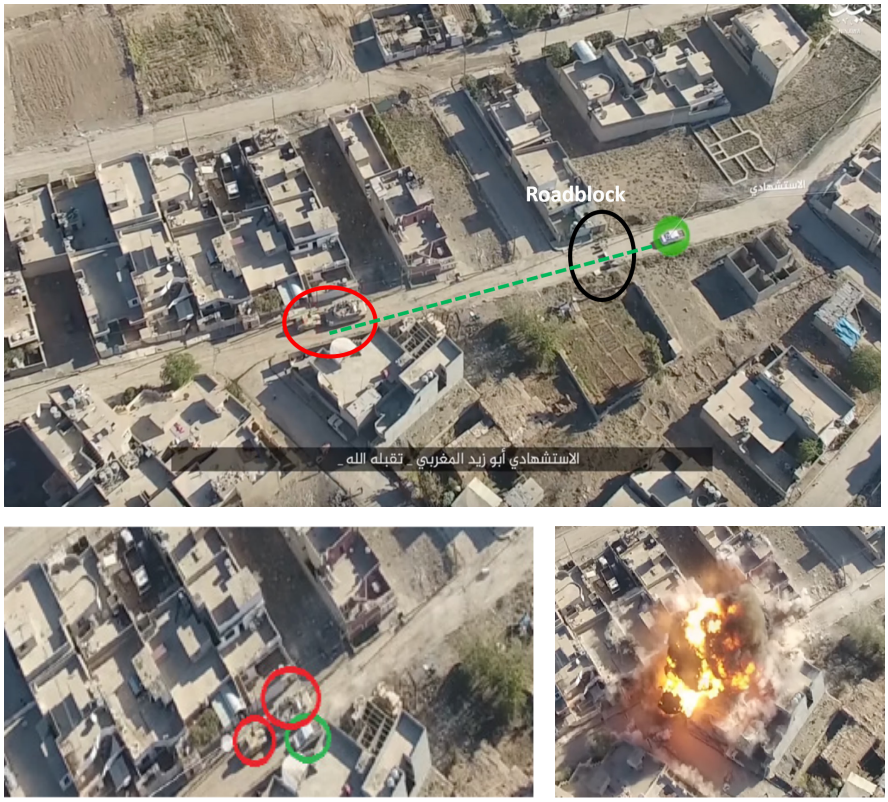
A closer look at Image 12 shows that such vehicles are modified and armored by DAESH using thick panels; the panels are painted a color as close as possible to the original vehicle's color, making it difficult to be spotted by the coalition's drones. When it is realized that the vehicles are going to be used for suicide attacks, security forces either shoot the tires or kill the drivers to prevent the attacks. The ISF built roadblocks in the city so as to prevent DAESH's suicide attacks by vehicle-bombs. However, the armor built on the front part of the vehicles

24. David Choi, "ISIS Has Been Using Kia Vehicles as Their Weapon of Choice in Mosul," Business Insider, March 18, 2017, http://www.businessinsider.com/kia-iraq-afghanistan-war-2017-3, (Access date: May 3, 2017).

25. Hugo Kaaman, "The History and Adaptability of the Islamic State Car Bomb," Zaytunarjuwani, February 14, 2017, https://zaytunarjuwani.wordpress.com/2017/02/14/the-history-and-adaptability-of-the-islamic-state-carbomb, (Access date: May 3, 2017).

enable them to easily run through the roadblocks. Images 13 and 14 depict two different suicide attacks in which DAESH coordinated with drones and used vehicle-bombs. Roadblocks were formed to prevent DAESH from approaching the lot filled with ISF's armored vehicles. However, DAESH overcame the roadblocks and caused the explosion of the vehicle-bomb in the middle of the lot with the help of drones. Thus, in a single attack DAESH caused maximum damage to the military units joining the operation.

IMAGE 13. SCREENSHOT OF A DAESH VIDEO



Considering that about a million people were living in the city while Operation Conquest continued in Mosul, there was not a lot of time to identify a vehicle-bomb that might be used in a potential suicide attack, and for security forces to take counter measures. Buildings form natural camouflage for both drones and vehicle-bombs. Although the number of potential vehicle-bombs intercepted by the Coalition and Iraqi Security Forces are greater than the number of attacks that occur, DAESH has still managed to cause a great deal of damage by using the aforementioned tactic.

IMAGE 14. SCREENSHOT OF A DAESH VIDEO

Reaching the Target

Besides the selection of vehicles, another key point for DAESH is to determine routes that will reach their targets. To this end, the group uses drones in suicide attacks to hit targets with high precision. For this reason, DH cameras are mounted on drones to surveil potential scenes of suicide attacks. The member of DAESH operating the drone is given instructions about the timing and location of the explosion to accurately direct suicide bombers directly to the target. DAESH aims to have perfect coordination: it does not let the driver of the vehicle-bomb use his own judgement about the moment of explosion and, thus, increases the impact of the attack. As a matter of fact, the driver has a very limited viewpoint due to the modification made for armoring the vehicle –the ultimate aim of the armor is to protect the driver. Due to the small opening left in it, the driver has no chance to determine the location of an explosion. As a result, the drone operators who watch video streams coming from the drones decide the route to the target and the moment of the attack.

Image 15 depicts an ISF unit on duty at a certain location. All roads in the region where the ISF unit was located were closed off by private vehicles. Additional vehicles were also left on the road to completely block traffic. However, it

was realized, with the help of a drone, that a small area was left clear either by mistake or to allow ISF vehicles to rapidly exit in the case of emergency operations. The driver was, thus, directed by the drone operator and the vehicle-bomb managed to pass through the limited unobstrusted areas, reaching the target and carrying out a suicide attack in the middle of a group of ISF vehicles.

IMAGE 15. SCREENSHOT OF A DAESH VIDEO

DAESH also has used garages of privately owned houses in residential areas to park vehicle-bombs waiting their turn for suicide attacks. Drivers of such vehicle bombs cannot see what is going on outside the garage. However, a drone operator who identifies a target can help the driver exit the garage at a particular time and commit a suicide attack.

Image 16 depicts an example of the aforementioned situation. In the image, an ISF convoy passes a garage inside of which is a vehicle-bomb. Various armored vehicles are seen in front and behind the convoy. DAESH chose a tank with the highest capacity as a target and followed the deployment of the convoy via live streaming from a drone. As the targeted tank in the convoy approached the garage, the driver of the vehicle-bomb inside the garage was informed by the drone operator. The driver took action and carried out the attack. By using this tactic, DAESH minimizes the approach distance to the target.

Iraqi Security Forces planning to rapidly proceed in the city to show the international and national community, in particular, that they have succeeded against DAESH do not have the opportunity to check the garages of every single house. This is an advantage for DAESH that uses drones for coordinating attacks; the time to awaken sleeping cells is decided in coordination with drones.

Vehicle-bomb attacks are usually committed in daytime. Although night vision cameras are commercially available, DAESH does not prefer this method. Possible reasons may be:

1. DAESH is dissatisfied by the quality of the night vision of cameras on the market.
2. To identify a target in the dark is difficult.
3. The coordination of attacks is difficult.

Still, as shown in Image 17, DAESH demonstrates that they can carry out a vehicle-bomb attack by ensuring coordination with drones even at night.

IMAGE 16. SCREENSHOT OF A DAESH VIDEO

As opposed to suicide attacks committed in open terrain, suicide attacks in residential areas are more effective when it comes to casualties among security forces. The reason is that the vehicles of security forces in residential areas are more vulnerable to security weaknesses than those in open terrain. In some cases, DAESH organizes multiple suicide attacks at the same time in order to maximize casualties.[26] During the moments of shock and chaos following the first attack carried out in coordination with a drone, the scenes of the following explosions are determined through instant images sent by the drone.

26. "داعش يتبنّى التفجيرات الانتحارية شرق الموصل ٣٠ قتيلًا ب ٣ سيارات مفخخة يقودها انتحاريون انفجرت في كوكجلي" Al Arabiya, December 22, 2016.

A general assessment of the suicide attacks DAESH commits by using vehicle-bombs indicates that the vulnerability created by the use of armored vehicles in urban warfare increases the likelihood of hitting the target, and that if the safety distance between the targeted vehicles is not adjusted suitably, the number of casualties caused by a vehicle-bomb increases. Roadblocks set to prevent suicide attacks are of no use as they cannot stop the passage of a vehicle-bomb. It also becomes evident that if a drone operator decides the timing of an attack rather than a suicide bomber who has limited view and is nervous, the number of casualties increases.

IMAGE 17. SCREENSHOT OF A DAESH VIDEO

The extent of these casualties has reached a point that the Eastern Mosul Operation (the third phase of Operation Conquest) had to be halted for two weeks. Only in Eastern Mosul, more than 900 suicide attacks were carried out by vehicle-bombs; the percentage of casualties reached 40 percent among Iraqi Special Forces (Golden Division) who were responsible for waging urban warfare.[27] To prevent casualties and stop DAESH's mobility between Eastern and Western Mosul, Coalition Forces bombed the entry and exit roads of five of the four bridges connecting the two sides of the city over the Tigris River. However, DAESH has

27. Hevidar Ahmed and Rebwar Qasim, "Iraq's Golden Division May Liberate Mosul, but at What Cost?," Rudaw, December 24, 2016.

comfortably continued the transfer of vehicle-bombs from Western Mosul to the east via the bridge in the middle (known as the old bridge), inflicting ongoing casualties to ISF. The Eastern Mosul Operation that was halted for replanning was resumed after the strike of the last bridge and the completion of the planning phase.[28]

IMAGE 18. BRIDGES IN IRAQ HIT BY AN AIRBORNE ATTACK BY THE COALITION

Image 18 depicts bridges over the Tigris River bombed by the Coalition Forces. However, they were not completely destroyed –only the roads to the bridge were struck to distrupt the transfer of DAESH vehicles. This could not stop DAESH's vehicle transfer from the west to the east of the city; the group, this time, used marine vessels for transfers to the eastern part of Mosul. To put an end to this, Coalition Forces launched an airborne operation, destroying over 100 marine vessels that belonged to the group.[29]

ATTACKS BY DRONES

In addition to coordinated activities of reconnaissance/surveillance and attack, DAESH began to use drones for assaults. To this end, DAESH modifies muni-

28. "Iraq Resumes Mosul Operation after a Two-Week Lull," Aljazeera, December 30, 2016.

29. Christopher Woody, "Watch a US-Led Airstrike Wipe out an ISIS Escape Route amid the Fighting in Mosul," Business Insider, January 23, 2017, http://www.businessinsider.com/us-led-airstrike-isis-escape-boatstigris-mosul-2017-1, (Access date: May 3, 2017).

tions, carries them with drones to designated targets and hits the targets. Hand granades, rocket warheads and light munitions are used in assaults carried out by the group. In Syria and Iraq, it is not difficult to find the munitions carried by the drones, which is very convenient for the drone operators. Although DAESH assaults are not as effective as mortar fires, they are carried out with greater precision.

DAESH aims to create disorder by the attacks committed by drones dropping explosives. Britain's top commander in the region Major General Rupert Jones said the militant group were using off-the-shelf drones to drop grenades on civilians and security forces in Mosul in inhuman and indiscriminate attacks. The general said that as the operations approach an end, commercial drones are all they have left, and that the use of drones by terrorists was becoming an increasingly insidious threat in Iraq.[30]

Image 19 depicts attacks carried out via bombs dropped by a drone on groups of ISF soldiers. A closer look at video footages by DAESH reveals that the bombs dropped by drones are not as effective as vehicle-bombs since 40 mm munitions have limited effect. However, a drone with the help of a simple mechanism can still inflict casualties on ISF personnel or cause the injury of personnel and render them ineffective in the fight. After an attack, disorder is experienced in all military units around the scene of the explosion, and armored vehicles and all personnel leave the area. In some of the attacks, DAESH has used this environment of disorder for further attacks. The number of casualties has increased when DAESH has committed another vehicle-bomb attack, again coordinated by a drone, against military units trying to escape the scene.

IMAGE 19. MUNITIONS DROPPED ON SPECIAL FORCES TROOPS

Another attack carried out by DAESH is seen in Image 20. The group targeted an ISF tank rather than ISF soldiers in groups. The low impact of the explosion is notable in the image. The munition dropped by a drone is not strong enough

30. Larissa Brown, "British General Issues Warning over Jihadis' Death Threat from Drones after ISIS Use Them to Drop Grenades on Civilians," *Daily Mail*, February 17, 2017.

to puncture the tanks or the armor of the armored vehicles, but is strong enough to disable the vehicles and put them out of fight mode until repaired. Image 21 depicts how an explosive counteracted a high mobility vehicle.[31]

Beyond Iraq, DAESH uses the same type of attack against the regime in Deir ez-Zor in Syria and against the PYD-PKK in Raqqa. Reportedly, however, an RPG-7 rocket warhead was seized among some of the munitions mounted on drones in Syria,[32] demonstrating that the group began to use heavier and more effective munitions with drones in the country. Nonetheless, no sign of using similar material in Iraq has been seen so far.

IMAGE 20. A DRONE ATTACK AGAINST A SPECIAL FORCES TANK

At present, DAESH effectively uses drones for air strikes both in Syria and Iraq. In some cases, bundle-attacks are committed, consisting of five drones each.[33] Against the drone threat, the U.S. units observe how DAESH uses drones and incorporate their findings into their asymmetric warfare doctrine. Against DAESH's drone technology, the U.S. has begun to mount anti-drone systems on some tactical vehicles on the ground.[34] Attacks carried out by dropping bombs from drones have increased during the Western Mosul Operation in particular. DAESH has organized a total of 72 drone attacks only on the first day of the battle

31. "المرصد", داعش بستخدم طائرة بدون طيار و يقصف دبابة عراقية, Almarsd Online Newspaper, https://al-marsd.com/108792.html, (Access date: May 3, 2017).

32. Ivan Yakovlev, "Syrian Army Shoots Down 3 ISIS Drones Loaded with Bombs in Deir Ezzor," Almasdar News, December 12, 2016, https://www.almasdarnews.com/article/pictures-syrian-army-shoots-3-isis-dronesloaded-bombs-deir-ezzor, (Access date: May 3, 2017).

33. David Martin, "ISIS Drones Disrupt US-Backed Iraqis' Fight for Mosul," CBS News, February 25, 2017.

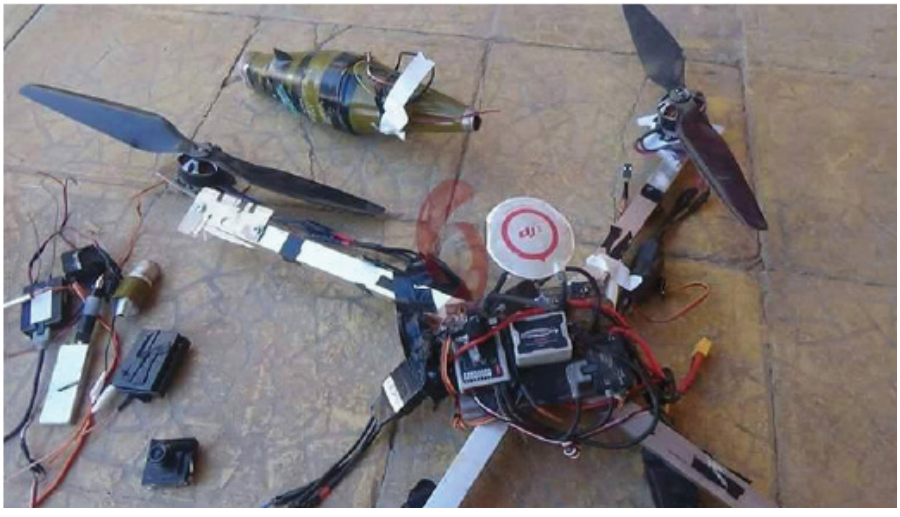
34. Jen Judson, "Drone Warfare in Mosul Shapes US Army Training to Defeat Airborne Threats," Defense News, March 14, 2017.

IMAGE 21. SCREENSHOT OF A DAESH VIDEO

of the Western Mosul Operation, and 53 sorties on the second day.[35] In Eastern Mosul, the operation had to be halted after DAESH's intensive attacks. In Western Mosul, the operation had to be slowed down in the face of DAESH's resistance.[36]

Owing to this new opportunity, despite not having war planes DAESH has gained airstrike capability. DAESH moved from camouflaged IED attacks to IED-laden vehicle-bomb attacks steered by drones. Following this, the group add-

IMAGE 22. A ROCKET WARHEAD MOUNTED ON A DRONE CAPTURED IN SYRIA



35. Richard Sisk, "US 'Jammer' Curbs ISIS Drone Threat in Mosul Battle," Defensetech, March 8, 2017, https://www.defensetech.org/2017/03/08/jammer-curbs-isis-drone-threat-mosul, (Access date: May 3, 2017).

36. "القوات العراقية تستأنف عملياتها ضد داعش في غرب الموصل," DW أكاديمية, March 27, 2017.

ed a new dimension to its acts of terror by dropping bombs from drones. Other than this, kamikaze attacks are another method of attacks –the group, however, has not committed such attacks as of yet.

On the other hand, Iran has worked on kamikaze drones. Again, CENTCOM Commander Votel, during his U.S. Senate Armed Services Committee hearing, stated that kamikaze drone attacks may be carried out against U.S. warships in the Persian Gulf by Iranian drones. The commander also said the Revolutionary Guards have tested kamikaze drones and Iran may pose a threat to U.S. ships in the region.[37]

Image 23 depicts an Iranian kamikaze drone that has a range of about 250 km, and can fly at night, even in bad weather conditions, and as high as 3,000 feet.[38] The second part of the image depicts a drone that belongs to Houthis. It has been considered that Iran provided drones to Houthis to carry out kamikaze attacks targeting Saudis' Patriot missile launchers.[39] As is seen, both the way of using drones for attack purposes and the number of state and non-state actors who use drones have been gradually increasing.

IMAGE 23. KAMIKAZE DRONES OWNED BY IRAN AND HOUTHIS

THE USE OF DRONES FOR PROPAGANDA

DAESH also uses drones to shoot videos that are broadcast for media propaganda. Aerial shots of successful suicide attacks are channeled to media and social media for propaganda purposes; the shots of unsuccessful attacks are not broadcast. Before videos are uploaded to the Internet, they are all edited to resemble computer

37. Rowan Scarborough, "Iran Deploys Jamming Device to Counter Drones," *The Washington Times*, March 12, 2017.

38. Kim Hjelmgaard, "Iran's Navy Touts 'Suicide Drone'," *USA Today*, October 26, 2016.

39. Tyler Rogoway, "Suicide Drones Have Migrated to the Conflict in Yemen," The Drive, March 24, 2017, http://www.thedrive.com/the-war-zone/8586/suicide-drones-have-migrated-to-the-conflict-in-yemen, (Access date: May 3, 2017).

games in order to influence the youth in particular. In this process, drones are used in three different ways:

1. Taking footage before and up to the attack.

2. Taking footage of casualties after the attack and the commotion experienced among troops.

3. Enrichment –for different purposes– via HD cameras of footage taken by drones including footage on execution of hostages by DAESH.

The following are examples of videos resembling computer games:

1. The 26-minute-long video released on November 14, 2016, "The Promise of Allah" is about a suicide attack carried out by 11 vehicle bombs.

2. The 41-minute-long video "The Procession of Light" is about more than 20 vehicle bomb attacks in Mosul.

3. Released on January 24, 2017, the video "Knights of Diwan" contains interviews with suicide bombers and attacks via drones. DAESH advertised this video by releasing a teaser before it was broadcast.

4. Released on January 31, 2017, the video "The Lions' Roar" is about bomb attacks carried out by dropping bombs from drones.

5. The video entitled "Quiet Shadow" includes 20 drone bomb attacks targeting ISF personnel and vehicles.

Information and images in some of these videos were also published in DAESH's *Al-Naba*[40] and *Rumiyah*[41] magazines. All of these videos consist of selected footages of successful attacks.

Considering that the number of unsuccessful attacks is more than that of successful assaults, DAESH must have tried many attacks to shoot these videos. This is clear proof that DAESH uses drones in an organized and planned way for the purpose of propaganda. DAESH is clearly trying to demonstrate the extent of their capabilities. It is likely that such propaganda inspires other terror groups or terrorists to commit similar attacks.

40. *Al-Naba*, Issue: 67, February 9, 2017.

41. An advertisement for "Knights of Diwan" was published in *Rumiyah* magazine (Issue: 6).

FIGHT METHODS AGAINST DRONES

The Coalition Forces have worked to prevent DAESH from using drones as a result of the intensified use of drones by the latter and the casualties during Operation Conquest. In this scope, the coalition has identified and hit several drones; however, intensified attacks have continued to inflict more casualties on the ISF. Since the operating frequency ranges of ISF and DAESH drones is so close, the use of jammers has been restricted to ISF's operational area. DAESH drones' tracks and their take-off points were identified after a thorough examination of technical information of the drones seized by security forces. The Coalition Air Forces have hit DAESH's drone facilities in 11 different locations.[42] Due to the lack of advanced technology to effectively fight against drones, however, these were not sufficient to prevent further drone strikes carried out by DAESH.

42. Oriana Pawlyk, "Air Force Works to Track ISIS Drones to the Source," Military, 27 February 2017, http://www.military.com/daily-news/2017/03/06/air-force-works-to-track-isis-drones-to-the-source.html, (Access date: May 3, 2017).

Since drones have very small radar cross-sections, it is very difficult to detect them on a radar. Although it is possible to open fire against drones with weapons sich as firearms, the likelihood of bullets hitting a target is slim as drones are small in size and at a long distance. Furthermore, this method can cause unwanted injuries in urban areas.

The U.S. Marine Corps Warfighting Laboratory has worked on disabling drones by laser energy from the ground, but assessed that the method is unsafe for people in urban areas. This has compelled security forces to seek alternative methods in the fight against drones, among which are mesh arms, electronic jamming systems, and protection by eagles. The methods that have been developed to fight drones so far will be examined in the following sections.

DRONE DEFENSE WEAPON

A drone defense weapon, which is effective against a drone approaching from about a 400-meter distance, works on a battery for up to five consecutive hours, and weighs 7 kg. Owing to the jamming signal sent by a drone defense weapon, the use of the drone by the operator is curbed. This occurs when the drone defense weapon sends the target an electromagnetic wave for jamming. Two types of jamming are possible: by severing the connection between a drone and the drone operator, or disabling the drone's GPS. As a result, the remote control of a drone is blocked and the potential damage is minimized. When a drone has no connection with its operator, its switches to protection mode. In this case, the following may take place:

1. The drone hovers.
2. The drone returns to its point of departure.
3. The drone falls to the ground.[43]

A U.S. Land Forces officer has stated that, with a new technology, the U.S. has started to strike more drones in the recent period and that U.S. Marines have used the "Battelle DroneDefender" in such operations. The Battelle DroneDefender, depicted in Image 24, uses electromagnetic waves to jam drones within 400 meters.[44] The U.S. posts have procured about a hundred of these devices, but have not shared this new technology with Iraqi posts. Hence, the ISF continues to fight against drones by using light weapons and direct firing.

43. For more information about the company, see the website of Batelle DroneDefender: https://www.battelle.org/government-offerings/national-security/aerospace-systems/counter-UAS-technologies/dronedefender, (Access date: May 3, 2017).

44. Jeff Schogol, "Marines Seek to Destroy Enemies," *Marine Corps Times*, January 31, 2017.

An Iraqi general on the ground stated on CBC channel that anti-drone technology is their top necessity; however, U.S. posts do not share this technology with the Iraqis. U.S. officials justify this by the fact that the ISF has failed to control many high capability vehicles, technology and munitions, and that some were even seized by terror organizations.[45] It is assessed that the aforementioned technology will not be shared with any other groups in the near future, except the U.S. military, in order to prevent DAESH or Iran from capturing such devices or developing counter methods, as the end of the operation in Iraq approaches.

The Battelle's DroneDefender, a shoulder-fired weapon, is heavier than an ordinary weapon, and its battery life is limited to five hours. These may be counted among the technology's disadvantages. Considering that operations continue for long hours, a time limit may become a handicap. In addition, once jammed, if a drone adopts one of the three safe modes and drops to the ground, and if it is loaded with an explosive material, that may cause an explosion and undesirable damages.

IMAGE 24. THE BATTELLE DRONEDEFENDER

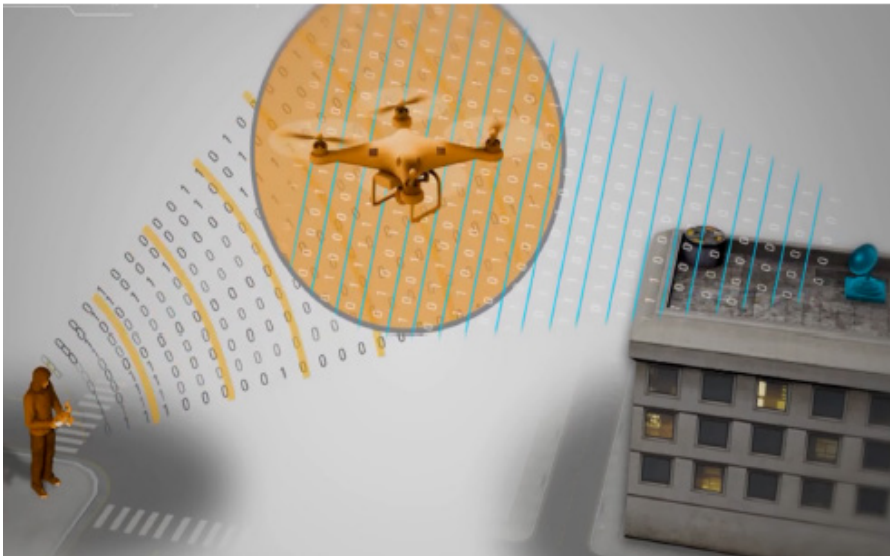
DRONE CAPTURING SYSTEM

Unlike the technology that jams the radio frequency or the GPS, the technology company Department 13 has developed a drone interception system called "Mesmer." Mesmer listens to the communication between a drone and its operator, and analyzes it to take control of the drone. The drone is controlled by means of a computer connected to an antenna and software. Once the drone is identified by the system, it is possible to send command signals, similar to those sent by the op-

45. Brendan McGarry, "Iraq Wants, but Can't Get, US Drone Zapper," Defensetech, February 21, 2017, https://www.defensetech.org/2017/02/21/iraq-wants-us-drone-zapper, (Access date: May 4, 2017).

erator, to the drone. Owing to this method, after the drone is captured, it may be safely landed at a desired location. Unlike using the Battelle DroneDefender, with Mesmer technology, drones may be truly taken under control.[46] Using jammers to scramble a GPS or an operator signal may lead to the sudden drop of a drone and result in undesired injuries. With Mesmer, a drone is directly taken under control before it adopts a safe mode. However, it should be noted that using Mesmer may be more suitable for defending critical buildings against terror attacks in cities rather than using it as a defense technique in a residential area.

IMAGE 25. THE MESMER SYSTEM[47]



ANTI-UAV DEFENCE SYSTEM

Blighter AUDS (Anti-UAV Defence System) is designed to counter drones. The AUDS has been developed in a collaborative effort by Chess Dynamics, Enterprise Control Systems (ECS), and Blighter Surveillance Systems. It features Blighter Systems' A400 Series Ku-Band electronic scanning air security radar around the clock under any weather condition. The system is able to detect a target at a distance of 10 km. The target is identified and pursued by means of an electro-optic

46. Kelsey D. Atherton, "No One Knows the Best Way to Stop a Drone," *Popular Science*, February 9, 2017.
47. For more information about Mesmer, see the videos on the company's website, www.department13.com.

director, infrared and daylight cameras, and target-tracking software generated by Chess Dynamics. A directional RF inhibitor from ECS provides the disruption of drones by selectively interfering with the command-and-control channels on the air vehicle. U.S. military units deployed in Iraq already use Anti-UAV Defence Systems in Mosul.[48]

The complex nature of urban areas negatively affects the performance of Ku-Band antennas in cities. Furthermore, the possible harms of Ku-Band antennas on human health and the environment are not yet known due to lack of research. Hence, before such antennas are used in cities, more research should be conducted on such devices, and Ku-Band technology should be further developed.

IMAGE 26. THE BLIGHTER A400 SERIES AIRBORNE RADAR

HUNTING DOWN DRONES WITH EAGLES

Hunting down drones by eagles is a method that has already been used in European countries by the police for law and order purposes. Specially trained eagles hunt and attack drones, and render them unusable. The advantage of this method is that eagles' sharp eyesight can identify drones from a distance.[49] However,

48. Huw Williams, "AUDS Achieves TRL 9, Deploys with US Forces," Jane's 360, January 23, 2017, http://www.janes.com/article/67118/auds-achieves-trl-9-deploys-with-us-forces, (Access date: May 4, 2017).

49. "Where Eagles Dare: French Military Using Winged Warriors to Hunt down Rogue Drones," Fox News, February 22, 2017.

eagles can only be used against multi-propeller drones, not against fixed-wing drones. It has been put forth that using eagles against non-state armed actors will not be effective. Additionally, there is always the possibility that the eagles will be wounded or killed when drones loaded with IEDs explode. Although drones and IEDs are amply found, finding trained eagles will eventually be more difficult; it should be noted that it takes about eight months to train an eagle. Hunting down drones by eagles is also an ineffective method against multiple drone attacks.

IMAGE 27. A DRONE HUNTED DOWN BY AN EAGLE

HUNTING DOWN DRONES WITH NETS

Hunting down drones with nets is another anti-drone method. The method is applied in two ways: one is to disable an intruding prey drone by dropping a net[50] carried by a friendly drone, and the other is to catch the prey drone by firing a net, with the help of a weapon, from the ground.[51] Image 28 depicts hunting down a drone with a net. The method, however, is suitable for hunting multi-propeller drones, not for fixed-wing drones. Furthermore, an experienced operator is needed for a friendly drone to hunt its prey. The shoulder-mounted SkyWall 100 is an anti-drone net-launching bazooka. The device can reach drones within a range of

50. Damien Gayle, "The Drone Catcher: Flying Net is Designed to Stop Terrorists from Flying Bomb-Laden Gadgetsi Nuclear Power Stations," *Daily Mail*, February 10, 2015.

51. Kelsey D. Atherton, "SkyWall is a New Anti-Drone Net Bazooka for Police," *Popular Science*, March 7, 2016.

up to 100 meters; however, it is not suitable for bomb-laden drones flying at 200 meters. Neither of the two methods is appropriate for multi-drone attacks. Such anti-drone methods are effective only against a single drone that can be seen from a certain distance by the naked eye.

IMAGE 28. METHODS OF CAPTURING DRONES WITH NETS

CONCLUSION

During World War I, airplanes were used to gather intelligence by way of taking pictures of the enemy's frontline and behind the frontlines. The first airplanes had very limited capacity for munitions, so they were not preferred for attack purposes. However, following the rapid development of aircraft technology, airplanes came to be seen from quite a different perspective by the time of World War II. Today, DAESH has begun to develop its drone program, which was originally launched for reconnaissance and surveillance purposes, for attacks. Simply procured from toy shops, drones are diligently tested and modified to serve on a tactical level in combat zones. Even under heavy pressure, DAESH continues to develop such technological innovations. Thus, a drone under normal conditions bought for the purposes of a hobby is transformed after modifications into a deadly weapon. Costing a mere couple of hundred dollars, a drone causes material damages to million-dollar vehicles, while when used in coordination with a powerful explosive, the loss of lives of personnel, together with the psychological pressure, creates a negative impact on the morale and motivation of the personnel on the ground.

As the operations progress in the upcoming period especially in Iraq and Syria, and the sieges in Talafar, Havija and Deir ez-Zor continue, it is expected that the drones that have been disabled by either the coalition or security forces will not be able to be replaced by new ones and that drone attacks will decrease. Nonetheless, DAESH is using drones as a new weapon and is becoming successful in this field, which signals a new kind of threat. The use of such a threat is gradually spreading. Drones are already being used for attacks in the Middle East and Ukraine. The use of drones has become one of the factors that has affected the

progress of both the Eastern and Western Mosul operations. The effective testing of drones on the ground has caused the use of these vehicles by other actors as well. Non-state actors, such as Hashd al Shabi, Hezbollah, Syrian Opponents, Houthis and the Russian-backed rebels in Ukraine,[52] have begun to take advantage of drone technology. In the very new future, drones equipped with weapons and explosives will emerge as a worldwide problem faced by security forces. It should not be forgotten that there were two drones among the materials seized in the house of the militant who carried out the attack at the night club Reina in Istanbul,[53] signaling that drones are preferred as a method of attack by foreign fighters who are in Europe or have returned to Europe. The effects of drone attacks and the widespread use of drones in Western countries should be followed with close attention.

The use and development of drone technologies by terror organizations will jeopardize the future plans and operations of security forces. Using explosive-loaded drones in crowded areas is one of the biggest threats of the future. Explosive-laden drones will easily overcome conventional security measures taken during outdoor sports organizations, and political or cultural activities. The panic in the crowd that will follow will have a much greater impact than that of the explosive dropped by the drone.

The threat posed by drones can be decreased only by technological developments. However, an anti-drone system that can thoroughly and successfully defeat drones has not been developed yet. Still, drone technology rapidly continues to advance. In particular, the number of drones commanded by a single operator increases every passing day. The progress in night vision will increase the magnitude of the danger in the future.

The altitude reachable by a drone, the full-charge flight distance, speed, and the weight of the munitions loaded on a drone will increase. If the intention is not to strike down a 200-dollar drone with a million dollar missile, a more effective anti-drone technology –rather than a defense mechanism visible to the naked eye– should be developed. A drone is visible at about 100 meters and the sound of a drone is heard from 40 meters. These are not sufficient distances to eliminate the threat posed by a drone. Thus, even if a drone's radar cross-section is small, radar systems to identify a drone within the range of at least 1,000 meters should be developed.

These systems will serve in two modes: fixed and mobile. The fixed system will be assembled to protect critical venues and locations in cities, and the mobile system will be developed to protect VIPs against possible assassination attempts.

52. Will Skowronski, "The Drone Wars," *Air Force Magazine*, (February 2017), pp. 31-33.

53. "Reina Saldırganı Teröristin Yakalandığı Evden 2 Drone Çıktı," *Hürriyet*, January 17, 2017.

In addition, mobile systems will be deployed to venues/locations of important events/gatherings upon request or in case of potential terror threats. Within this scope, the following preventive measures should be taken:

1. The undertaking of work on fixed-systems to be mounted on critical venues, such as the Presidential Complex, the Grand National Assembly of Turkey (TBMM) Building and Anıtkabir (Mausoleum of the founder of Turkey, Mustafa Kemal Atatürk), and other critical locations.

2. The procurement of easy-to-transport/assemble mobile systems for the transportation routes of VIPs.

3. The close monitoring of the commercial drones market to prevent bulk purchases of such devices considering that DAESH acquires drones in advance.

4. The prevention of unauthorized flights over institutions and organizations critical for the national security of Turkey and military security zones; the prevention of the procurement/supply of such aerial vehicles by terrorists for potential use in bomb attacks and reconnaissance activities against Turkish security forces and institutions and organizations with high vulnerability; and the prevention of shooting films and taking photos of the aforementioned venues.[54]

5. Those who purchase drones of 0.5-4 kg (DRONE0 category[55]) should be subject to registration procedures as is the case for the other drone categories.

This analysis has focused exclusively on drone technology. It is beyond doubt that the nature of future wars will be shaped by unmanned robotic vehicles. Therefore, the countries that fail to develop relevant technologies –both for defensive and offensive purposes– will be the ones most harmed during times of conflict and combat.

54. In accordance with the statement entitled "DRONE or the Use of Light Motor Vehicles in Coordination with DRONES", issued by the Republic of Turkey Office of Governor in Hakkari, No.24222997-705.02 and dated February 22, 2016, the use of any type of drones is subject to permission in order to prevent terror organizations from using such devices in bomb attacks and reconnaissance activities against high vulnerability public premises, institutions and organizations, and against Turkish security forces. Furthermore, the use/flight of drones over governorate and district governorate buildings; military zones/buildings/facilities/personnel housing, courthouses and personnel housing of the Administration of Justice; security buildings/personnel housing, facilities, airports and airport vicinities, and buildings/facilities/personnel housing of public institutions is forbidden.

55. In the Directive of the Republic of Turkey Unmanned Aerial Vehicle Systems, drones are categorized under four headings: (a) DRONE0: Maximum take-off weight 0.5 kg (included)-4 kgs drones; (b) DRONE1: Maximum take-off weight 4kgs (included)-25 kgs drones; (c) DRONE2: Maximum take-off weight 25 (included)-150 kgs drones; (ç) DRONE3: Maximum take-off weight 150 kgs (included) and over drones. The weight of multi-propeller drones heavily used by DAESH is between 1 and 3 kg.

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REPORT

DAESH'S DRONE STRATEGY

TECHNOLOGY AND THE RISE OF INNOVATIVE TERRORISM

SERKAN BALKAN

"Innovative terrorism" can be described as the introduction of a new method or the development of an existing technology by terror organizations. Considering the changing traits of terrorism and the resources owned by terror organizations today, its character and patterns of using innovative terrorism make DAESH the most dangerous organization threatening regional and international stability.

Meanwhile, DAESH's principles of war, terror methods and radical ideology based on Messianic discourse, which is assertive enough to influence masses, transform the organization into the most dangerous actor threatening global peace. Terror organizations take advantage of the opportunities presented by new technologies, globalization and the benefits offered to society by the liberal global markets. This increases the impact of terrorism's message and the effectiveness of terrorists' capabilities.

In the process of innovative terrorism, DAESH and similar terror organizations are armed by using current technological platforms and gradually cause the diversification of new types of threats. One of the most striking new threats is drone (unmanned aerial vehicle, or UAV) technology.

DAESH has improved its fighting skills especially in Syria and Iraq on account of drones and this has not only caused a serious threat to the countries' security forces but also to civilians. This report analyzes the extent of the use of drone technology by terror organizations, and makes recommendations regarding how to remove this new threat.

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