

Taking Fourth-Generation Warfare to the Skies? An Empirical Exploration of Non-State Actors' Use of Weaponized Unmanned Aerial Vehicles (UAVs—'Drones')

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Abstract

Recent events in and outside of conflict zones have raised apprehensions about the threat that Unmanned Aerial Vehicles (UAVs) might pose to modern societies. There have been reports of organizations like the Islamic State of Iraq and Syria (ISIS) weaponizing their UAVs. However, scholarly literature exploring this topic is scarce. This article brings forth findings from empirical evidence systematically collected and compiled from open sources and databases (n = 440). Our findings demonstrate that non-state actors, especially in the Middle East, have acquired weaponized UAV capabilities. We have also found that non-state actors choose targets discriminately, preferring hard targets over soft targets, and that their UAV attacks have so far not led to mass casualties. However, the latter may change if target preferences change. These findings should further raise awareness of the threat posed by weaponized UAVs in non-state hands while acknowledging a disturbing implication for counterterrorism efforts—their bombs might become harder to stop.

Keywords: UAV, drone, non-state actors, fourth-generation warfare, Islamic State, Houthi

Introduction

Airpower has traditionally been a tool wielded by rich industrialised nations while terrorists were bombers without an air force. However, the last decade has shown that smaller entities, militias, and organizations defined as terrorist groups have evolved and expanded their operations to the air space by their use of unmanned aerial vehicles (UAVs) with the potential to deploy explosives on targets. This threat became a reality to the general public in late 2018. Though not a direct attack, a UAV sighting near Gatwick Airport in the United Kingdom effectively shut down hundreds of flights and delayed thousands of passengers.[1] A similar incident in Norway delayed flights when a UAV was spotted over Bodø Airport in 2019.[2] While these incidents, to our knowledge, had no hostile characteristics, the mere presence of a UAV close to, or on the grounds of, an airport still prompted authorities to take action. The most dramatic and internationally known incident to date was the attack on Saudi oil facilities in September 2019.[3] The attack has raised international concerns about security measures against the threat of weaponized UAVs used by non-state actors. The Houthis, who claimed responsibility for the attack, are known to be supported by Iran.[4] However, investigations into that particular incident have found that technical specifications found at the site, as well as the direction the attack came from, point toward the direct involvement of Iran.[5] This event, and others, have caused security experts to deem the threat of UAVs in hands of non-state actors, such as terrorist groups, as a likely future threat to Western and non-Western countries.[6]

In *'The Transformation of War'*, Martin van Creveld hypothesized that future warfare would have different characteristics than those presented 150 years earlier by the classical military author Carl von Clausewitz.[7] In Clausewitz's time, wars were primarily fought between empires and nations, but van Creveld hypothesized that this would change, and he appears to have been right. While opposing groups, also before Clausewitz's time, adapted irregular methods of warfare, current armed conflicts are characterized by private security companies, various militias, and religious and ideological actors that use both conventional and guerrilla tactics in their armed operations.[8]

Contemporary conflicts are also increasingly nonnational or transnational in nature, involving networked guerrilla-like tactics where psychological warfare, such as manipulation of the media and public opinion, are just as important tools as rockets and rifles.[9] Lind et al. (1989) proposed that conventional armies would not stand a chance of decisive victories if these and other strategies were used in combination, and he coined this new phenomenon fourth-generation warfare (4GW).[10] The term has since been adapted and used by other military scholars, such as Hammes (2004), who added that *causes* rather than *nations* will command loyalty. [11] Non-state actors, such as terrorist and insurgent groups, have adapted 4GW strategies.[12] This has led scholars to urge nation-led armies to similarly adapt their strategies, rather than preparing for a short high-tech war.[13]

Study Aim

Until recently, airpower has primarily been at the disposal of conventional armies. Today, non-state actors play a larger role in contemporary armed conflicts than ever before, and at the same time, various UAVs are now widely available on commercial markets. While a number of articles and reports have provided insights into non-state actors' UAV operations, to the best of our knowledge, no scholarly work has provided broad and systematically collected empirical evidence of weaponized UAVs, nor have scholars applied statistical analysis to the use of armed UAVs by non-state actors.[14] The full effects of 4GW, which now also includes aerial attacks from non-state actors, are hard to measure. While it is tempting to draw conclusions based on what we think these effects are, our research focuses on the actions themselves. This requires a brief look back in time.

First, terrorists have long preferred soft targets, as they provide an opportunity to maximize casualties, spread fear, and increase publicity.[15] There is no uniform definition of what a soft target is, but it is commonly understood as a poorly defended position where there are possibly many vulnerable targets, such as a marketplace, a bus station, or an educational institution—places where many civilians are present.[16] Also, assaults against soft targets have previously been found to be motivated by ideology, specifically religion. [17] Second, some terrorists are also identified as being discriminate in their target selection, meaning they do not choose targets randomly.[18] Third, Islamist extremists have been found to aim and plan for mass casualties in some of their attacks. [19] While our research does not focus specifically on militant Islamist actors, we build on previous findings, especially those by Hemmingby, and apply the *warning triangle* of these groups' lethality by asking the following questions: (i) do they target indiscriminately? (ii) do they have a mass casualty focus? and (iii) do they prefer soft targets?[20] Our initial assumption, as well as a first look at our data, suggested that weaponized UAVs are mainly deployed in the Middle East by militant Islamists. This article aims to fill a major research gap and hopefully will provide civilian governments, security services, and national military establishments with more insight into non-state actors' use of weaponized UAVs.

Research Question

What characterizes non-state actors' use of weaponized UAVs in their operations?

The authors utilize partially exclusive data to explore different non-state actors' target selection, the number of casualties and injuries from their attack, and explores whether soft targets are preferred over hard targets.

Literature and Reporting on Non-State Actors' UAV Operations and Capabilities

UAVs have been of interest to non-state actors for many years, and the earliest recordings of their offensive use go back to the year 2006 and the Palestinian Hamas organization.[21] Later have other groups, including Hezbollah, Jabhat al-Sham, al-Qaeda and ISIS, added UAVs to their operational toolbox.[22] Since 2016, news reports have revealed that ISIS has used UAVs in offensive operations, while US-supported forces have located and attacked the Islamic State's UAV factories.[23] Reports indicate that these UAVs are commercial products,

costing under US \$1,000 to acquire before being redesigned to have offensive capabilities.[24] The advantages of an aerial combat platform are many, including surveillance as well as defensive and offensive operations.[25] UAVs have been used for years by North Atlantic Treaty Organization (NATO) countries for these and other reasons, including that they offer users the safety due to the distance from the area of actual deployment. The obvious benefit of this for the remote operator is that it reduces human losses on one side of the conflict dyad while, at the same time, offering the capability to deploy a variety of explosives to the other side.[26]

According to Bunker (2015), non-state actors have mainly used UAVs for surveillance and reconnaissance, but they are generally far less technically advanced than the UAVs operated by the United States or other NATO countries.[27] This is, however, changing, as some non-state actors have, in recent years, procured UAVs with long-range capabilities that move at high speeds and have multiple deployment capabilities.[28] This includes dropping or placing explosives or merely being flown into the target.[29] In addition, some images and news reports have presented ISIS as having UAVs with missile-firing capabilities.[30] It has been hypothesized that some of these advancements may be the result of reverse engineering from NATO coalition UAVs.[31] In the case of the Houthis in Yemen, the technology appears to have been provided directly by Iran.[32]

Whether simple or advanced in their design, UAVs offer some of the same advantages: distance from the area of operation and their targets, tactical and operational overview, and safety for the operators. The threat of ISIS's weaponized UAVs was deemed by US Gen. Raymond Thomas to be the most daunting problem of 2016.[33] In addition to tactical and operational advantages, the mere presence of UAVs on the battlefield has also caused distress. In an exploration of the widely held belief that UAVs strike with "surgical precision", researchers found that a Pakistani population living under UAVs was constantly worrying about the possibility of being harmed by a deadly strike.[34] Others have claimed that the use of UAVs flying over civilian areas and communities violates the inhabitants' right to peace.[35] As the weapon of choice in the "war on terror" through much of the last decade, UAVs have been found to cause serious harm to civilians in those areas where they were deployed.[36] For instance, a recent *Lancet* publication found that Gaza inhabitants who had been struck by UAV attacks suffered more severe injuries and needed significantly more surgical operations to treat their amputation injuries than those injured by other weapons.[37] Thus, UAVs provide both tactical and operational advantages for attackers, but psychologically, they create a sense of fear in those living in their shadow, affecting military forces and civilians alike.

Theoretical Framework

This article builds on Hemmingby's work on operations of militant Islamists and utilizes three features of lethality by asking whether or not non-state actors choose targets discriminately, have a mass casualty focus, and prefer soft targets when using weaponized UAVs.[38] This analytical framework incorporates key features of intent in terrorist attacks, namely their impact and targets. Hence, it enables this article to break down the data in a pragmatic manner. It also can serve as a useful tool for comparison in future studies of strategies by non-state actors.

Target discrimination is defined by the US Department of Defense as "the ability of a surveillance or guidance system to identify or engage any one target when multiple targets are present".[39] In this context, and in accordance with Hemmingby's work, target discrimination refers to whether attacks are carried out on random or specifically chosen targets. Mass casualties are not defined through a fixed number of casualties or injuries; the term instead refers to several casualties that demand extraordinary efforts from local emergency services. [40] Lastly, soft targets are vulnerable and difficult to protect and are characterized by the high likelihood of mass casualties in the event of a successful attack.[41] Still, the line between hard and soft targets is difficult to draw. For example, a military base is a defended target and one that is hard to reach, but a small infantry patrol in the streets may be considered a soft target. Similarly, airports are sometimes defined as soft targets. [42] Others classify airports as more secure, and potentially hardened against terrorist attacks.[43] As such, we perform a case-by-case assessment of whether each specific target should be considered soft or hard.

We utilize these three features as hypotheses in combination with the notion of strategic bombing.[44] The Italian military officer and strategist Giulio Douhet wrote in 1929 the seminal study *'The Command of Air'* in which he claimed that superiority in the sky is decisive and will bring victory by destroying the enemy's morale, infrastructure, economy, or all of these. This theory, called the theory of strategic bombing, hypothesizes that a population exposed to the terror of bombing will demand that their own government change its policy to make the threat of bombing go away. Hence, it is a theory that assumes that the people will put pressure on their government, thereby indirectly influencing political decision-making. This theory has been found to be wrong many times in recent history, and it has been criticized by others, including Seldon, Buruma, and Gentile.[45]

Strategic bombing did not work in Hitler's *Blitzkrieg* against Great Britain, and it did not work in the way Douhet predicted when the United States and Great Britain bombed Germany.[46] Britain spent more on its strategic bombing campaign against Germany than Germany lost in damages and disruption.[47] Israel has bombed Palestinian targets many times without decisive results, and Palestinian suicide bombers in Israel have not strengthened the peace movement in Israel but rather have weakened it. While there is little historical evidence that strategic bombing by conventional military powers itself leads to victory, the theory has not been applied in research on non-state actors. As acts of terrorism have a potentially significant influence on public opinion, we argue that this new dimension of airpower might influence the outcome of contemporary conflicts.[48] We aim to explore the notion of strategic bombing by non-state actors by specifically focusing on target discrimination, mass casualties, and soft targets.

Methodology

To obtain information about incidents in which non-state actors have used UAVs in offensive operations, a four-stage process was followed. First, the Global Terrorism Database (GTD) from the National Consortium for the Study of Terrorism and Responses to Terrorism [START] at the University of Maryland was searched for incidents.[49] This resulted in 48 incidents extracted from the latest GTD update. Second, several automatic Google alert search strings were set up to search news providers daily for relevant incidents. Third, a daily review was conducted of incidents reported on the LiveUAMap. Fourth, a broad online search for articles, news reports, and research about non-state actors' use of UAVs was carried out on a weekly basis. This resulted in 189 unique incidents. Additionally, we recently also were given access to Bellingcat analyst Nick Waters' collection of ISIS UAV attacks, accompanied by some photographic evidence from the UAVs themselves.[50] This provided 203 additional incidents.

A key challenge in the use of open sources like news reports is the possibility of inaccurate information being either mistakenly posted or posted in a deliberate attempt to mislead the reader and thus influence public opinion. This can also possibly be a part of the 4GW strategy.[51] We tried to reduce the risk of this by seeking several sources for the same incidents and checking the sources for bias through online services that provide bias checks and reviews of media sources. The data were managed using IBM SPSS version 25 and utilized to perform descriptive statistics, chi-square test of association, and binomial one-sample testing.

Results

The result of our data collection is a set of 440 unique cases where weaponized UAVs were used in attacks by non-state actors. The largest number of incidents (98.9% of all) occurred between August 2016 and March 2020. We start by presenting two of these events:

- On 10 January 2019, the Houthis launched a UAV attack directed at a Yemeni government military parade in southern Yemen, inside a military base. The attack resulted in six fatalities and 25 wounded military and intelligence personnel. It took place at a time when the United Nations tried to facilitate peace talks between the Houthis and the internationally recognized Yemeni government led by Hadi. [52]

- In another attack, in January 2017, an ISIS UAV dropped an explosive device on a civilian residential area in Diyala, Iraq, causing three injuries.[53]

These incidents are very different, both in terms of targets of the attacks, and their impact on human victims. In the following, descriptive statistics will present the full data set from our collection of incidents.

Geographic Location of Non-State Actors' UAV Attacks

Most strikingly, 433 of the 440 incidents occurred in the Middle East, four in Eastern Europe, two in South America, and one in Southeast Asia. Also, Iraq, Syria, and Saudi Arabia suffered the most attacks by non-state actors' UAVs—398 in total (90.4% of all attacks). See Figures 1 and 2.

Figure 1: Number of Attacks by Region

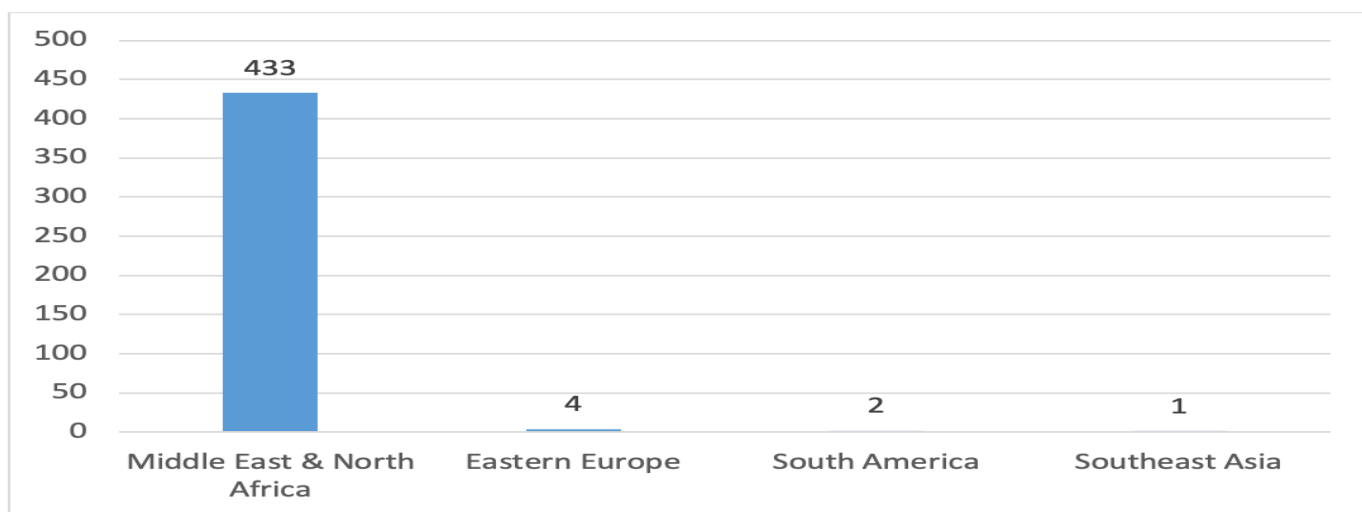
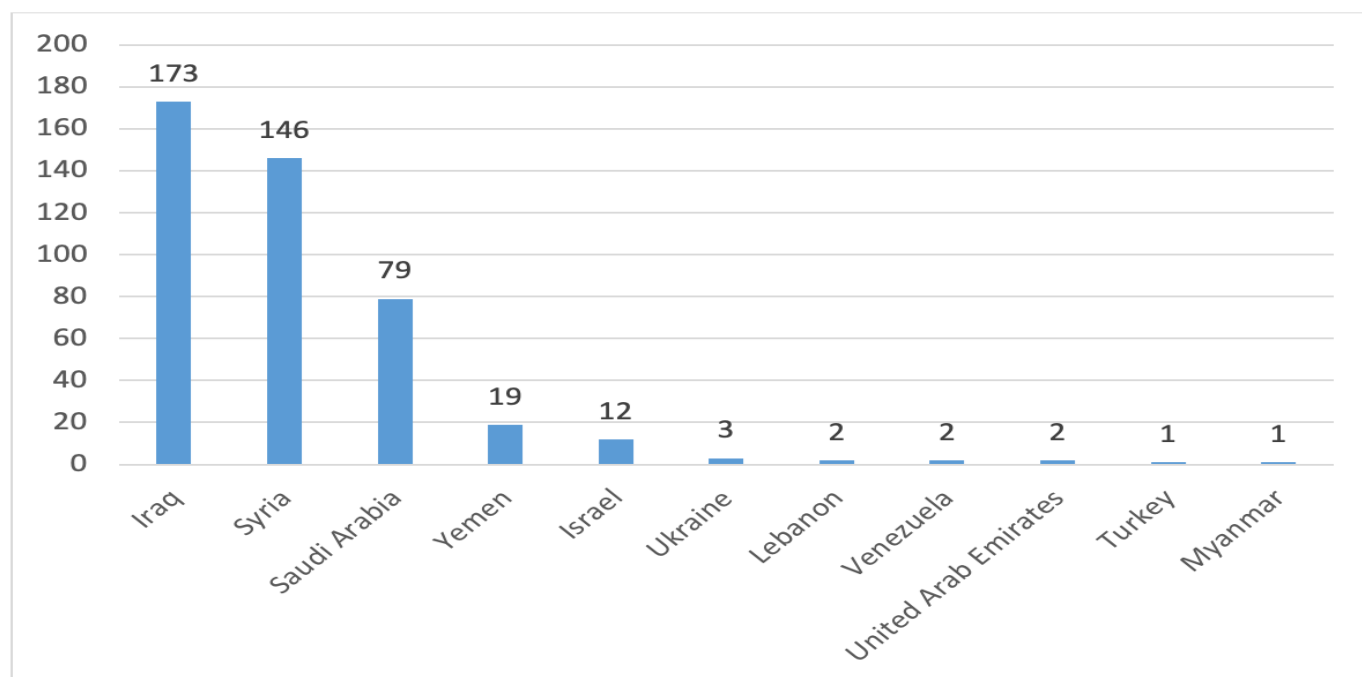


Figure 2: Targets of UAV Attacks



The targets of non-state actors' UAV attacks were mainly military (57.0%), private citizens or private property (10.5%), and civilian airports (8.2%). More details are given in Figure 3. Also, targets were assessed for their status as either being soft or hard by reviewing the incident descriptions from media sources, or picture or video when available. In 34 cases, this information was insufficient to properly assess the nature of the targets. Our assessment of the cases produced 314 cases of hard targets and 92 soft targets being targeted by weaponized UAVs. In Figure 4, the number of hard and soft targets of UAV attacks are presented.

Figure 3: Number of Attacks in Each Target Category

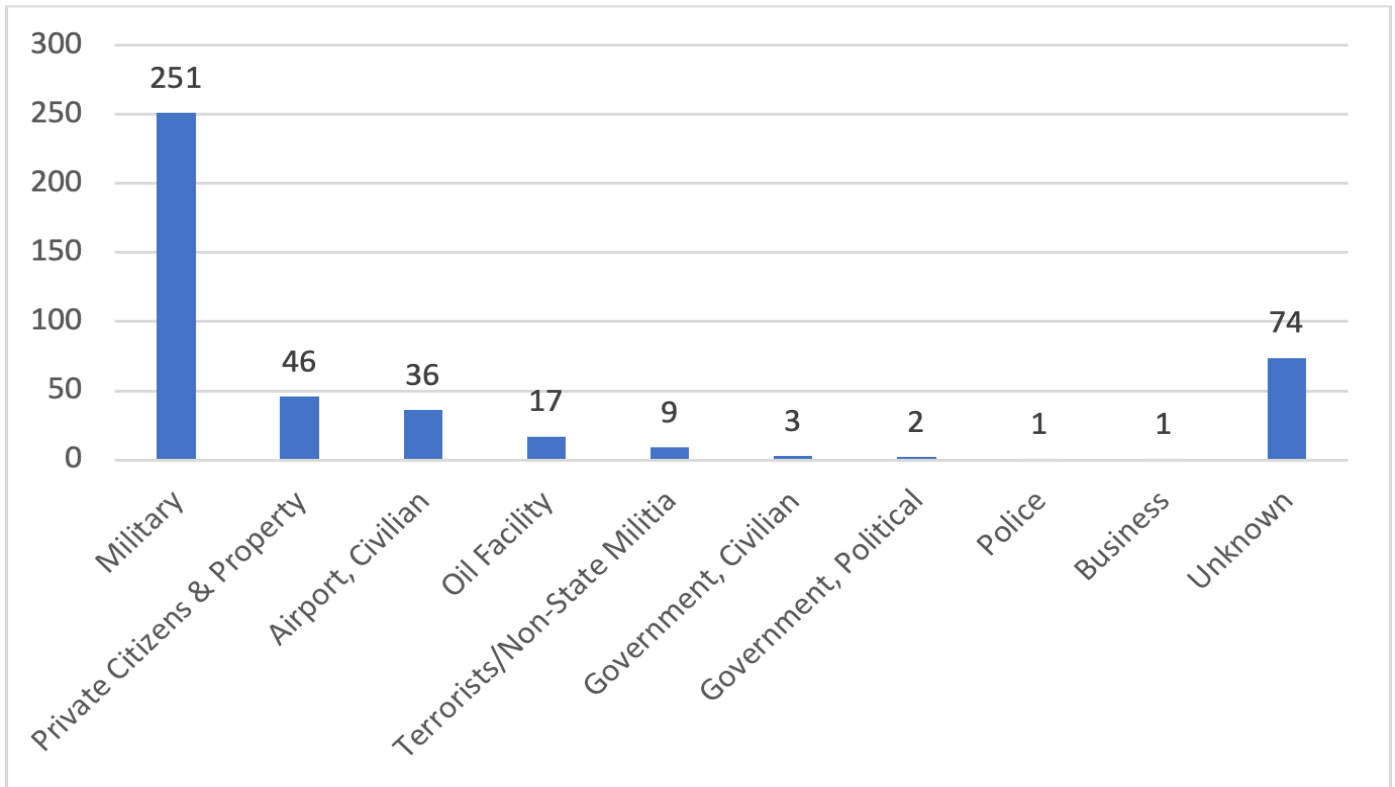
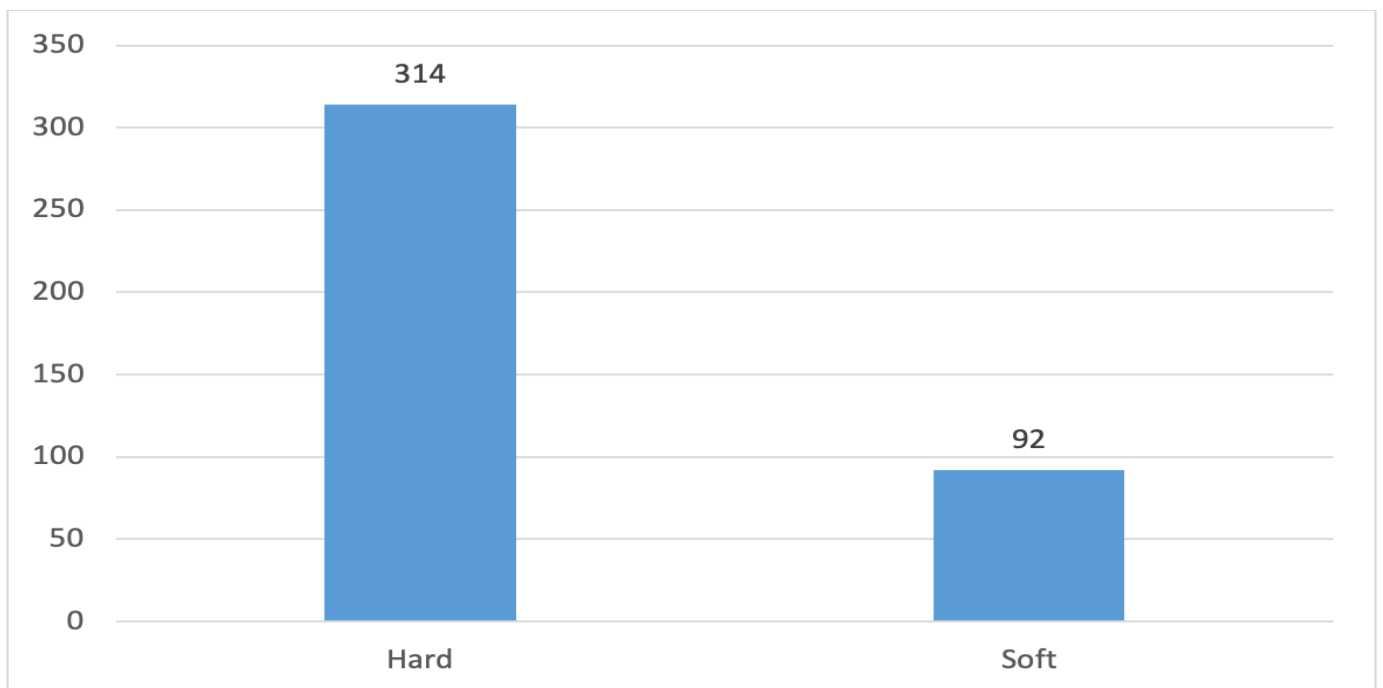


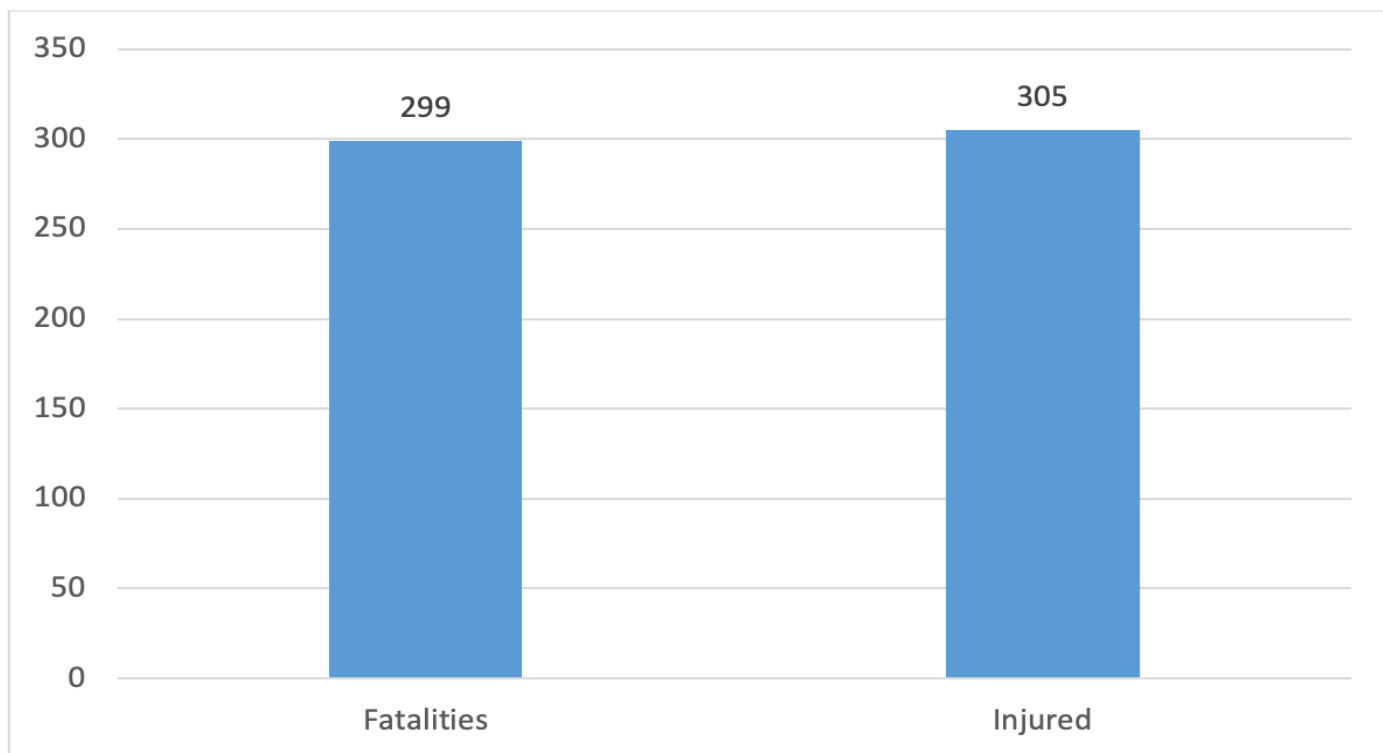
Figure 4: Number of Attacks on Hard and Soft Targets



Injuries and Fatalities from UAV Attacks

Fatalities and/or injuries from non-state actors’ UAV attacks were frequently un- or under-reported. Many reports of incidents either did not mention them specifically, or were phrased in a way that did not give a clear picture of how the attack impacted human beings (59% of all cases). The data on fatalities and injuries were not cleaned for outliers, as they were not used in statistical analysis beyond mere description. Analysis of incidents where impact on human beings was available found a total number of 299 fatalities (mean 1.67 fatalities per attack) and 305 injured (mean 1.70 injured per attack).

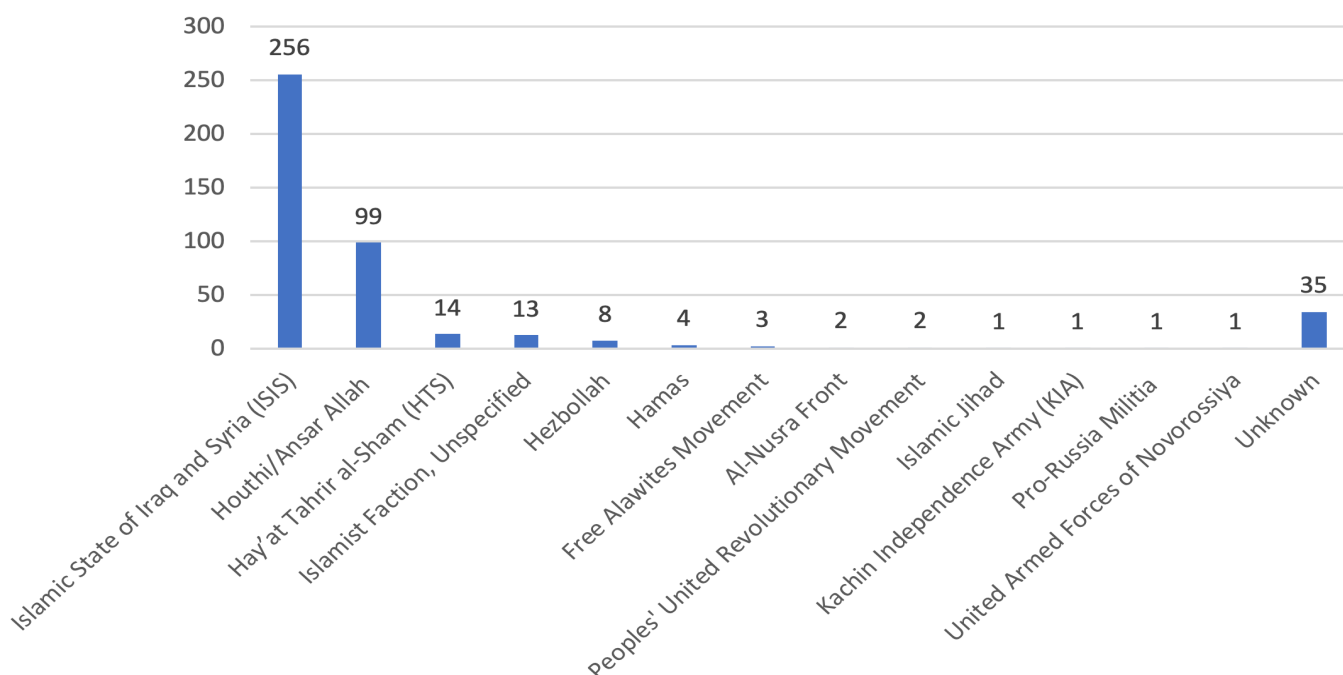
Figure 5: Number of Fatalities and Injuries from UAV Attacks.



Non-State Actors Responsible for Carrying Out UAV Attacks

The two main non-state actors that have used UAVs in offensive operations are ISIS and the Houthi/Ansar Allah movement in Yemen. In total, these two actors were responsible for 80.7% of all non-state actors’ offensive uses of UAVs.

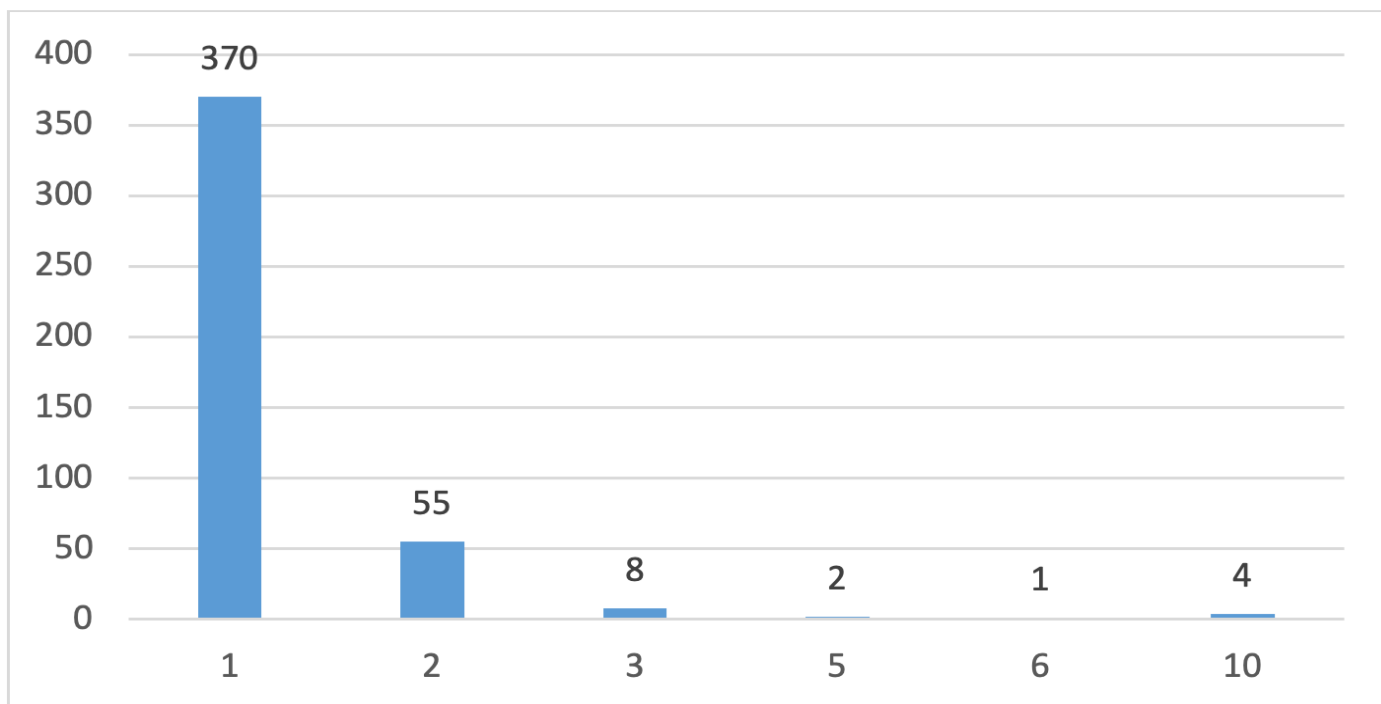
Figure 6: Number of UAV Attacks by Various Non-State Actors



Number of UAVs in Use

In 84.1% of incidents where UAVs were used in offensive operations, only a single UAV was operated. When we recorded incidents in our data set, we registered that two UAVs were used in operations when the reports of the incident described UAVs in plural without giving a specific number. Thus, reports of “several” and “many” UAVs were recorded as two, but the real number may have been higher. Figure 7 clearly shows that, in the majority of incidents, only a single UAV was used.

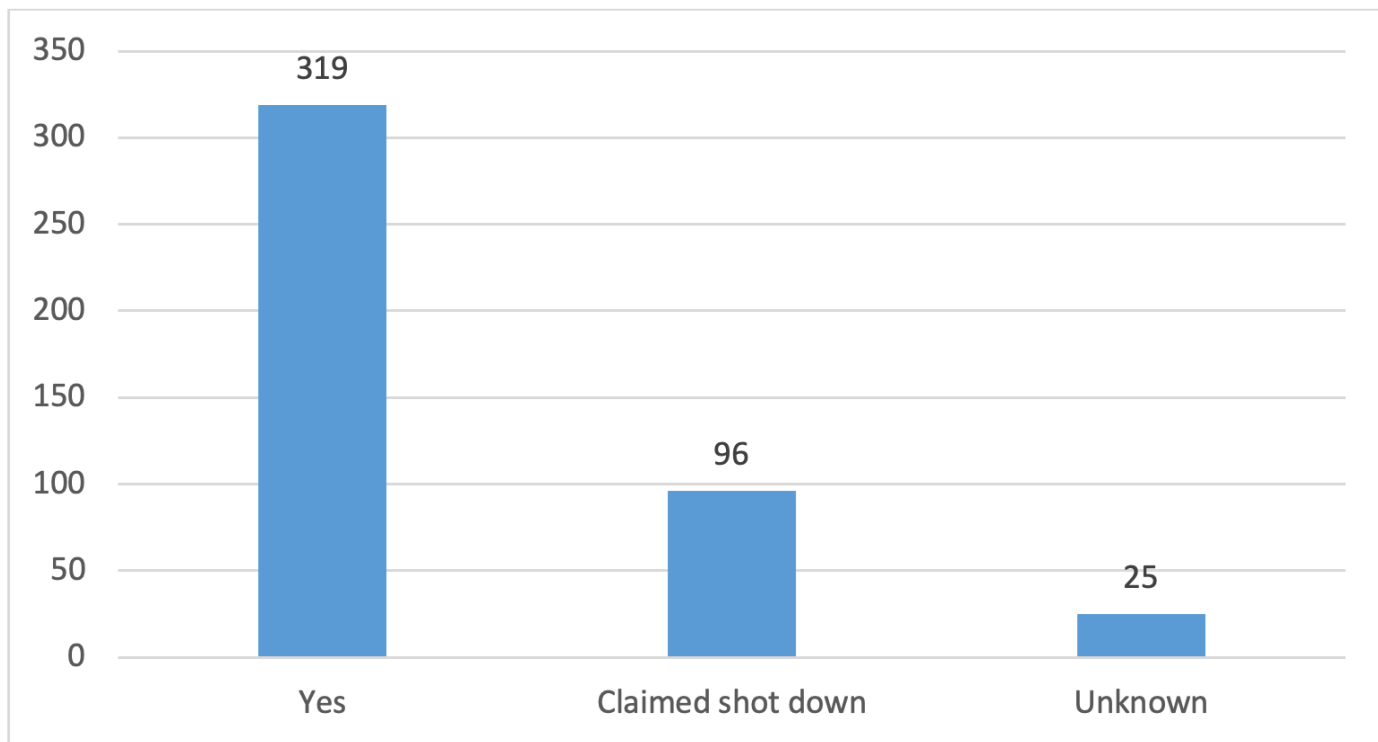
Figure 7: Number of UAVs Used in an Attack



Successful Attacks

For this variable, ‘success’ was used to indicate whether a UAV reached its target and deployed munitions (e.g., placing explosives, dropping grenades, or firing missiles). Our findings indicate that 72.5% of the attacks were successful. 21.8% of the other armed UAVs were claimed to have been shot down by air defenses. In 5.7% of the cases we were unable to determine the result of the attack from the data at hand.

Figure 8: Number of Successful, Claimed Shot Down, and Unknown-Result Attacks



Target Discrimination, Mass Casualties, and Soft or Hard Targets?

The descriptive statistics provide some insight into which targets non-state actors choose for their weaponized UAVs. However, to determine if there is an association between groups and target types, a chi-square test of association was calculated. A significant association was found ($\chi^2(117, N = 440) = 360,878; p = 0.000$) with an effect size of 0.302, which can be interpreted as strong.[54] This finding indicates that target selection is dependent on the non-state actor, meaning that targets are chosen discriminately. Also, a binomial test indicated that the 0.77 proportion of hard targets was higher than the expected 0.50, $p = 0.000$ (1-sided). This finding indicates that non-state actors prefer hard targets over soft targets when using weaponized UAVs.

With the help of the above statistical analysis, we have determined that non-state actors choose targets discriminately, and that hard targets are chosen over soft targets. However, as no fixed number exists to indicate mass casualties, our analysis relies on our own interpretation. The mean numbers for fatalities and injuries were 1.67 and 1.70, respectively, indicating low numbers. Additionally, as mentioned in the descriptive results, this mean value was not cleaned for outliers, and only cases with information about fatalities and injuries were included. Taking into account that one incident had 111 casualties and that this particular attack in Yemen was carried out by both UAVs and missiles, the mean number is in fact much lower. Hence, we found that non-state actors’ weaponized UAVs do not cause mass casualties or injuries.

Summary of Findings

First, we have demonstrated that one of three hypotheses still stands: various non-state actors choose targets discriminately when using weaponized UAVs. They do, however, not cause mass casualties or injuries, and they choose hard over soft targets. Non-state actors, such as ISIS and the Houthis, may aim to cause mass casualties, but our findings have demonstrated that they fail to do so by using weaponized UAVs.

Secondly, and outside the main scope of this article, the larger body of incidents (98.9% of all) occurred between August 2016 and March 2020, making non-state actors' offensive use of UAVs a highly recent phenomenon in international conflict and warfare. Non-state actors' use of weaponized UAVs has been found almost exclusively in the Middle East (98.4% of cases)—mainly in Iraq, Syria, and Saudi Arabia (90.5% of cases). As such, we demonstrated that non-state actors operating in the Middle East have adapted weaponized UAVs for their operations. It's worth stressing that ISIS and the Houthis are responsible for the majority of cases and that our findings are not necessarily transferable to other non-state actors in the region.

Evolution of 4GW Aerial Attacks

Non-state actors have previously been found to be innovative and adaptive regarding available technology and incorporating some tactics of fourth-generation warfare (4GW).[55] Now, they have also widened their repertoire to include the use of air power. Although the adoption of weaponized UAVs can be seen as a natural evolution of 4GW being carried out by smaller and more flexible entities, uncertainty exists regarding the effects that may have on the conflicts in which they appear. We demonstrated that non-state actors preferred hard rather than soft targets, such as military bases and airports. However, the impact on these targets has yet to include mass casualties, particularly among the civilian population. Our statistical findings indicate that these weaponized UAV operations do not appear widespread or destructive enough to impel the targeted population to demand political change from their rulers to ensure survival. Hence, based on our limited empirical data, the theory of strategic bombing has been disproven once more—this time for non-state actors.

Limitations

Conflicting information was obviously a great challenge in this research. Where there was conflicting information about whether a UAV was shot down or managed to reach and strike its target, the label "claimed shot down" was given. Where information with pictures, video, or overwhelming news coverage about the results of an attack was available, the label "yes" was given even if there were some conflicting statements. Additionally, in the case of some incidents where the information was conflicting and inconsistent, the label "unknown" was used. The same uncertainty about target, or perpetrator, resulted in "unknown". Also, we cannot say with 100% certainty that what ended up as targets of weaponized UAVs were in fact the intended targets. The findings in this article rely on the accuracy and trustworthiness of the reports on non-state actors' offensive use of UAVs. This is widely known as a problem with using open sources in terrorism research, specifically regarding the validity and reliability of data. Also, incidents that cause substantial damage or many casualties receive more media attention than other attacks.[56] This might cause a skewed reporting in media, and thereby influence research such as ours. As the majority of the incidents included in our analysis are from the Middle East, our findings may not necessarily be transferable to other conflict zones. However, as 43% of cases were collected and reviewed by the first author, and 46% were from the Bellingcat data set, we are confident that we have done what we can to ensure the trustworthiness of both data set and analysis. Regardless, the risk of skewed reporting from some countries, while incidents in other countries go 'under the radar' must be taken into consideration when assessing this article's findings.

Implications and Concluding Remarks

What is, or at least has been, the weapon of choice in the war *on* terror is now available on the commercial market to non-state actors, turning drones into yet another weapon *of* terror.[57] While there are still vast differences between the UAVs operated by the United States, Russia, and other major powers and those used by non-state actors, the practical difference might be shrinking, making UAVs a hard nut to crack for ground forces and those charged with protecting military installations and civilian infrastructures in conflict and non-conflict zones. Non-state actors, such as terrorist organizations, have in the past used explosive devices that were thrown at their targets, or improvised explosive devices that were rigged to go off by various means.[58] Fourth-generation warfare has now evolved providing “David” fighting “Goliath” with air power to influence the target country’s government, economy, and citizens’ resilience, resulting in new uncertainties and fear. While our findings indicate that non-state actors are still some steps away from significantly influencing public opinion with their weaponized UAVs, this may change if their target selection changes toward softer targets with large groups of civilians becoming victims.

The evolution of combat, whether conventional or not, is most certainly not in its final stages, and the ability to both conquer and remain dominant in the air, will, by all expectations, still serve as a vital element in future armed conflicts. Military establishments and counterterrorism agencies, face, however, a new challenge: how to stop UAVs armed with explosives? As the low price and wide availability of UAVs gives the general population easy access to this new technology, it will increasingly also be adapted for malicious purposes. In retrospect, the “innocent” incidents at Gatwick Airport in 2018 and Bodø Airport in 2019 give us an idea just how powerful and generally available a tool this can be. Their destructive and psychological impacts have been emerging in recent years, first in the form of UAVs used by the United States in Afghanistan and Pakistan and, more recently, by their deployment by non-state actors, such as ISIS and the Houthis. While weaponized UAVs are a new tool for terrorist groups in conflict theatres, they may still be shunned for some time in non-conflict zones where less sophisticated everyday instruments like trucks can be used. [59]

We have found that weaponized UAVs have been acquired and used by non-state actors and that they choose targets discriminately, prefer hard over soft targets, but cause few casualties and injuries. What we cannot say with equal certainty is how the adoption of weaponized UAVs by these non-state actors have had an impact on the conflicts they have appeared in. The task of isolating one specific factor in a complex situation like armed conflict and irregular warfare has not been the aim of this article. Our findings also raise more questions, such as: how will UAVs contribute to shaping the future 4GW?; and, how will state actors be able to defend hard and soft targets against UAVs, both in and out of active conflict zones?; and, at what cost? Continued efforts to explore and analyze this phenomenon should provide knowledge that can strengthen our societies’ preparedness for, and resilience to, this new threat from the air.

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Note on Ethical Considerations

All information was procured through open sources, with none originating from social media postings. As such, no information about individuals other than those who wrote the newspaper articles cited can be traced back to our data set. Therefore, this research has not been submitted for ethical evaluation to the Norwegian Centre for Research Data (NSD).

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