

*Jury-Rigged Jihād:*

The Impact of Improvised Weapons Use by Sub-State Armed Groups in Iraq & Syria

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## Introduction

On April 21, 2013, a video was uploaded to a Syrian opposition YouTube channel that showed fighters from the Free Syrian Army (FSA) affiliated Sarayā al-Ḥassan wal-Ḥussayn using a catapult to launch flaming projectiles at pro-Regime forces in the Southern Damascus suburb of Sīdī Miqdād.<sup>1</sup> It garnered significant attention online, and it was becoming clear that catapults, and a menagerie of other improvised weapons, were playing a role in the fighting that deserved more attention.<sup>2</sup>

As the war progressed, improvised weapons became increasingly capable, as did the groups that produced and employed them. What was once a nationwide insurgency comprised of highly asymmetric localized armed groups transitioned into a full-scale civil war comprised of more organized Sub-State Armed Groups (SSAGs) that held territory and operated like conventional military forces using Maneuver Warfare tactics. While a plethora of research has been conducted on these two phenomena independently, considerably less work has been done on the relationship between the two. Whether that relationship is correlative or causal, and how, has not been sufficiently determined, and is a question worth answering in order to understand the changing nature of SSAGs going forward. Therefore, the goal of this research is to determine whether or not increasingly advanced and accessible improvised weapons systems are a key causal factor behind modern SSAGs operating in an increasingly conventional way.

## Literature Review

### *Maneuver & Attrition Warfare*

The most applicable paradigm for the purposes of this research is “Maneuver Warfare” versus “Attrition Warfare.” The modern concept of Maneuver Warfare is generally credited to British military theorist B. H. Liddell Hart, who called it the “Indirect Approach.” The core principles are “maneuvering” to create favorable positioning relative to the enemy and attacking their “center of gravity” instead of assaulting fortified positions directly.<sup>3</sup> These principles also appear in the United States (US) Department of Defense (DOD) dictionary definition for “maneuver” in essentially the same terms.<sup>4</sup> The US Marine Corps (USMC) defined Maneuver Warfare in the 1997 MDCP-1 as a strategy where “the goal is to attack the enemy ‘system’—to

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<sup>1</sup>Saraya Al-Hassan and Al-Hussayn Destroy the Strongholds of the Shabihah, YouTube, 2013, <https://www.youtube.com/watch?v=VuSI3w03UdM>.

<sup>2</sup>Alan Taylor, “DIY Weapons of the Syrian Rebels,” The Atlantic (Atlantic Media Company, February 20, 2013), <https://www.theatlantic.com/photo/2013/02/diy-weapons-of-the-syrian-rebels/100461/>.

<sup>3</sup>Robert R. Leonhard, *The Art of Maneuver: Maneuver-Warfare Theory and Airland Battle* (Novato, CA: Presidio Press, 1994), 93.

<sup>4</sup>Office of the Chairman of the Joint Chiefs of Staff, DOD Dictionary of Military and Associated Terms, (Washington DC: The Joint Staff, 2021) p. 135

incapacitate the enemy systemically. Enemy components may remain untouched but cannot function as part of a cohesive whole.”<sup>5</sup>

Attrition Warfare is an even less clearly defined concept because it only really exists under the Maneuver Warfare framework. Attrition Warfare is a strategy where victory is achieved, “through the cumulative destruction of the enemy's material assets by [employing] superior firepower,”<sup>6</sup> in the most direct way possible. The key difference lies in the cost-benefit analysis of attack. In pure Maneuver Warfare theory, Attrition Warfare operations seek purely to maximize damage inflicted on the enemy and Maneuver Warfare operations seek to maximize the ratio of damage inflicted to damage sustained.

Since its emergence as a central concept in US military doctrine, this binary has been subject to substantial criticism. In 2009, William F. Owen made a compelling case that Liddell Hart's characterization of Attrition Warfare practitioners as completely insensitive to cost is reflective more of his experience in WWI at the Battle of the Somme than it is of reality. Overall, Owen argues that the entire paradigm is a false dichotomy and the kind of Attrition Warfare that enables differentiation from Maneuver Warfare is purely theoretical.

However, Owen's arguments are based on an incomplete view of Attrition Warfare. In 2010, Dr. J. Boone Bartholomees, argued the core of the problem is limiting the definition of attrition to cumulative materiel losses, and that there are two kinds of attrition – Physical and Moral.<sup>7</sup> Physical Attrition refers to cumulative material losses, while Moral Attrition refers to cumulative damage to the will to fight. Like Owen, Bartholomees argues that a strategy of Physical Attrition is likely to fail, because most combatants will not engage when they stand to lose much and gain nothing. However, Moral Attrition and its record of historical success, indicate that Clausewitz overestimates human rationality, since political opinion can turn against a war effort without, “the expenditure of effort [exceeding] the value of the political object,” if enough emotional damage is inflicted.<sup>8</sup>

### *The Nature of Sub-State Armed Groups*

The security failures leading up to the 9/11 Attacks demonstrated that the US national security and academic establishment's understanding of insurgency and terrorism was no longer accurate. However, within a decade, there was a well-researched body of work that drew on experience gained fighting Jihādī insurgencies in Iraq and Afghanistan, as well as the words of Jihādī leaders themselves. In *The Call to Global Islamic Resistance*, ‘Abū Muṣ‘ab al-Sūrī

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<sup>5</sup> “Marine Corps Doctrine Publication 1 - Warfighting,” Marine Corps Doctrine Publication 1 - Warfighting § (1997), <https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/dictionary.pdf>, 37.

<sup>6</sup> “Marine Corps Doctrine Publication 1 - Warfighting,” Marine Corps Doctrine Publication 1 - Warfighting § (1997), <https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/dictionary.pdf>, 36.

<sup>7</sup> Bartholomees, J. B.. "The Issue of Attrition." *The US Army War College Quarterly: Parameters* 40, 1 (2010). <https://press.armywarcollege.edu/parameters/vol40/iss1/1> p. 6

<sup>8</sup> Bartholomees, J. B.. "The Issue of Attrition." *The US Army War College Quarterly: Parameters* 40, 1 (2010). <https://press.armywarcollege.edu/parameters/vol40/iss1/1> p. 13

advocates for a strategy of “individual Jihād”<sup>9</sup> where military operations are purely asymmetric and pursue a strategy of Moral Attrition. Scholars at the time who recognized al-Sūrī’s strategy in Iraq, concluded that not only were these insurgencies largely non-hierarchical, “constantly shifting networks”<sup>10</sup> of individual cells that “do not aspire to win a conventional military victory,”<sup>11</sup> but that they were the model for all insurgencies going forward.

This was an evolution from the Maoist model of insurgency that dominated the 20<sup>th</sup> Century. Mao Tse-tung’s “People’s War” was a phased approach that began with non-violent laying of a political groundwork, transitioned into guerilla warfare to seize increasing amounts of territory and materiel, and concluded when the insurgency’s power began to rival that of the state leading to conventional warfare.<sup>12</sup> The best explanation for the departure from the Maoist model is given by al-Sūrī, who asserts that, “open confrontation with America or many of her military allies is impossible as long as America can maintain complete hegemony with its overwhelming technological capabilities.”<sup>13</sup> The capability gap that al-Sūrī is referencing developed over the last three decades, and the most important contributing factor was the changing role of airpower. Since the power of precision guided munitions (PGMs) and stealth aircraft were demonstrated during Operation Desert Storm, the nature of land warfare “fundamentally changed.” The implication of precision-strike airpower is that any enemy force without a similar capability will be forced to engage in “tactics of the weak,” like adopting an asymmetric force structure and strategy of Moral Attrition.<sup>14</sup>

However, the applicability of this new understanding has come under increased scrutiny in recent years following the emergence of groups like the Islamic State. Scholars like Edward Stoddard argue that these examples represent a return to the Maoist model,<sup>15</sup> but explanations for the cause behind the shift vary. According to Stoddard, it is “a strategic choice, not an automatic process,”<sup>16</sup> while Andrea Beccaro argues the capability gap, technological innovation, and urban

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<sup>9</sup> Zabel, Sarah E. “The Military Strategy of Global Jihad.” Strategic Studies Institute, US Army War College, 2007. Accessed May 4, 2021. <http://www.jstor.org/stable/resrep11517>. p. 8

<sup>10</sup> Martin J. Muckian, “Structural Vulnerabilities of Networked Insurgencies: Adapting to the New Adversary,” *Parameters* 36, no. 4 (2006), <https://press.armywarcollege.edu/parameters/vol36/iss4/8>, 16

<sup>11</sup> Martin J. Muckian, “Structural Vulnerabilities of Networked Insurgencies: Adapting to the New Adversary,” *Parameters* 36, no. 4 (2006), <https://press.armywarcollege.edu/parameters/vol36/iss4/8>, 18

<sup>12</sup> Thomas Marks, “Mao Tse-Tung and the Search for 21st Century Counterinsurgency,” *CTC Sentinel* 2, no. 10 (October 2009): pp. 17-20, <https://ctc.usma.edu/mao-tse-tung-and-the-search-for-21st-century-counterinsurgency/>, 18.

<sup>13</sup> Zabel, Sarah E. “The Military Strategy of Global Jihad.” Strategic Studies Institute, US Army War College, 2007. Accessed May 4, 2021. <http://www.jstor.org/stable/resrep11517>. p.8

<sup>14</sup> Wills, Craig D. *Airpower, Afghanistan, and the Future of Warfare: An Alternative View*. Report. Air University Press, 2006. 1-8. <http://www.jstor.org/stable/resrep13769.8>, 6

<sup>15</sup> Edward Stoddard, “Maoist Hybridity? A Comparative Analysis of the Links between Insurgent Strategic Practice and Tactical Hybridity in Contemporary Non-State Armed Groups,” *Studies in Conflict & Terrorism*, July 25, 2020, pp. 1-25, <https://doi.org/10.1080/1057610x.2020.1792724>, 3.

<sup>16</sup> Edward Stoddard, “Maoist Hybridity? A Comparative Analysis of the Links between Insurgent Strategic Practice and Tactical Hybridity in Contemporary Non-State Armed Groups,” *Studies in Conflict & Terrorism*, July 25, 2020, pp. 1-25, <https://doi.org/10.1080/1057610x.2020.1792724>, 18.

environments are all causal factors.<sup>17</sup> Both point out that more case studies are necessary for the shift to be adequately explained.

A critical flaw in Stoddard's argument is that he frames Moral Attrition warfare as an alternative to operating as a conventional force, when in reality it is a measure of last resort. Most rational SSAGs would never choose to operate asymmetrically if they perceive conventional warfare to be a viable option. Dissent from regional al-Qā'idah leaders like 'Abd al-'Azīz al-Muqrin and 'Abū Muṣ'ab al-Zarqāwī over the decision of leadership to forgo regional state building until the "far enemy" was defeated through Moral Attrition is well documented. However, central figures like 'Usāmah bin-Lādin and al-Sūrī only object to conventional operations on the grounds that the capability gap dooms all such operations to failure. Therefore, in addition to territorial capture, the other important causal factor in the transition is the narrowing of the capability gap.

### **Improvised Weapons Background**

This research focuses on three categories of improvised weapons: Up-Armored Suicide Vehicle-Borne Improvised Explosive Devices (SVBIEDs), Improvised Unmanned Aerial Systems (UAS), and Improvised Rocket Assisted Munitions (IRAMs). Car bombs (VBIEDs) were a defining characteristic of insurgency in the 20<sup>th</sup> Century, and their widespread adoption was a direct result of their ability to reliably deliver potentially massive explosive payloads to targets. SVBIEDs were especially useful since the presence of a driver allowed them to be used against targets that were too unpredictable or well defended for a prepositioned VBIED.

Today's Up-Armored SVBIEDs are a newer innovation though, having emerged in the early years of the Syrian Civil War. Up-Armored SVBIEDs are a conversion from covert insurgency weapons to frontline weapons, through the application of improvised armor to the outside of the vehicle so it can reach its target under small arms fire. The majority of work focusing on Up-Armored SVBIEDs is by Swedish researcher Hugo Kaaman, who explained in a 2019 MEI report that the transition from insurgency to conventional warfare, "negated the advantage of stealth offered by the use of covert SVBIEDs," and necessitated hardening through armor to ensure delivery.<sup>18</sup> Up-Armored SVBIEDs are a focus of this research because they are often employed in a way similar to conventional PGMs delivered by airstrikes,<sup>19</sup> and could potentially be seen as narrowing the capability gap between SSAGs and conventional militaries.

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<sup>17</sup> Andrea Beccaro, "Modern Irregular Warfare: The ISIS Case Study," *Small Wars & Insurgencies* 29, no. 2 (March 20, 2018): pp. 207-228, <https://doi.org/10.1080/09592318.2018.1433469>, 221.

<sup>18</sup> Hugo Kaaman, "Car Bombs as Weapons of War" (<https://www.mei.edu/publications/car-bombs-weapons-war-iss-development-svbieds-2014-19>, April 10, 2019), 3.

<sup>19</sup>Kenton Fulmer, "Islamic State Development & Employment of SVBIEDs," ARES (Armament Research Services, January 20, 2016), <https://armamentresearch.com/islamic-state-development-employment-of-svbieds/>.

Improvised UAS first saw widespread use in Syria as well. The proliferation of UAS technology and emergence of cheaper commercial drones have lowered the barrier of entry to militarized UAS considerably. It is important to note for the purposes of this research “improvised” refers to systems either produced entirely by SSAGs themselves (“craft-produced”), physically modified versions of existing weapons or commercial products, or physically unmodified commercial products used in a combat role not intended by the manufacturer.

Improvised UAS design varies significantly, but all Improvised UAS serve in one of two primary roles. The most common role is Intelligence, Surveillance, & Reconnaissance (ISR), wherein they are used to enhance situational awareness, as well as find, fix, and track targets for other weapons. Improvised UAS in an ISR role often require little to no physical modification and are frequently off-the-shelf hobbyist models. Improvised UAS in a strike role are less common, but the subject of much attention from researchers. Improvised Strike UAS began appearing a few years later, but significantly affected the dynamics of the conflicts in Iraq and Syria despite relatively little use. Since SSAGs cannot legally purchase militarized UAS, all Improvised Strike UAS are commercial systems modified to drop bomblets, or in rare cases are completely self-produced systems of much lower quality. Improvised UAS in both roles are a subject of this research as they give SSAGs access to low-level airpower capabilities.

An IRAM is any munition delivered via a craft-produced rocket or any existing artillery rocket that has been physically modified. Craft-produced rockets have been used by SSAGs for years with significant variation in design and quality. Their propellant is almost always craft-produced,<sup>20</sup> but their payloads can be existing munitions mounted to the rocket with the existing fuse system.<sup>21</sup> Self-produced explosives with fuses adapted from other munitions or made from scratch are also common.<sup>22</sup>

The Syrian Civil War has seen a particularly unique set of IRAMs over the years. This includes everything from low-quality propane tank mortar bombs (“Hell Cannons”)<sup>23</sup> to multi-booster systems with significantly larger payloads. These more advanced IRAMs tend to be used less like traditional artillery rockets and more like the low-intensity conflict analog of a standoff weapon. The wide range of unique applications as substitutes for more advanced conventional weapons are why IRAMs are a focus of this research.

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<sup>20</sup> *Experience with the 'Umar I' Missile* (Teḥrīk-ī-Ṭālibān Pakistan, 2015), Umar Media. Source: Jihadology. Imagery shown: Appendix I-1

<sup>21</sup> *ibid.*

<sup>22</sup> *Silāḥ Lā Yanḍib [Inexhaustible Weapons]* (Anṣār al-Islām, 2011), al-Anṣār Media Foundation. Source: Telegram. Imagery shown: Appendix I-2

<sup>23</sup> “Hell Cannons: From Minor Nuisance to Major Threat,” Bellingcat, August 21, 2015, <https://www.bellingcat.com/news/mena/2015/08/21/hell-cannons-from-minor-nuisance-to-major-threat-the-evolution-of-syrian-opposition-siege-artillery/>.

## Research Design

To determine whether improvised weapons are an important causal factor behind the transition of SSAGs from asymmetric forces to more conventional forces, this research uses a comparative case-study with a most-similar systems design. The cases are four SSAGs operating in Syria and Iraq including Hay'at Tahrir al-Shām (HTS),<sup>24</sup> the Islamic State (IS), Anṣār al-Tawhīd, and Anṣār al-Islām. All four SSAGs are Jihādī groups present in the same conflict, are not sponsored by any states, have held, or still hold some amount of territory, and have used at least two of the three selected improvised weapons in the past. The independent variable being observed is each SSAG's improvised weapon capabilities over time, and are evaluated by observing usage, production capacity, and quality. The dependent variable being measured is whether each SSAG is operating as an asymmetric force relying on Moral Attrition or a conventional force engaging in Maneuver Warfare. This is evaluated by observing the change in the operational profile of attacks before and after improvised weapons are introduced, how improvised weapons are being employed, and the approach to territory capture.

The main data source for this research is a dataset of attacks and improvised weapons imagery that was built over the last two years from primary source material released by the four SSAGs. This material was collected directly from SSAG social media channels (particularly on Telegram) and websites. Older releases were retrieved from "Internet Archive" and "Jihadology." When applicable, primary source material was analyzed with open-source techniques such as geolocation to confirm authenticity and evaluate the variables. The observation period for each SSAG is from the date they entered the Syrian Civil War to April 1, 2021.

Despite being a valuable resource, it is important to note the limitations of this dataset. First, it is impossible to guarantee that the first appearance of a weapon or employment of a tactic in an SSAG's media is the first time it was used. It may be in close proximity with the first usage, but that is not guaranteed. Second, the dataset is large but not comprehensive. The only SSAG in the sample with a complete dataset of all their media releases is Anṣār al-Tawhīd, since they were formed in 2018 and release videos with less than monthly frequency overall. Both HTS and IS have been releasing media for years and possess significantly more productive media organizations. Complete analysis of all their releases is beyond the capacity of this research, so the scope was limited to "feature length" video releases unless a relevant smaller release was found incidentally or referenced in secondary source research.

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<sup>24</sup> HTS Naming Clarification: the group now known as HTS was founded in late 2011 as "Jabhat al-Nuṣrah," which it operated under until mid-2016 when it changed its name to "Jabhat Fataḥ al-Shām" and partially severed its connection to al-Qā'idah. In early 2017, it merged with and absorbed various other Islamist armed groups to form HTS, while also fully severing its official connection to al-Qā'idah. The dominant element has been the same in all three iterations, and its top leadership is still the same, but using the names interchangeably is not entirely accurate. For the sake of simplicity though, HTS will be used to refer to this group in the main body of this report.

## Hay'at Tahrīr al-Shām (HTS)

### *Overview*

HTS began seizing and holding territory through joint operations with other rebels in mid-2012. During the latter half of 2012, it established a relatively high level of territorial control compared to other opposition groups, began engaging the Regime over clear front lines, and significantly narrowed the capability gap by capturing large amounts of conventional weapons. Therefore, this is the period where it transitioned into more of a conventional military force.<sup>25</sup> Despite the damage it has sustained over the last nine years, HTS never reverted back into a predominantly asymmetric force, and still controls the majority of Syria's Idlib province today.

### *Improvised Weapons*

HTS was the first SSAG in Syria to start applying armor to SVBIEDs. The earliest documented example predates this research's primary source dataset, and was a flatbed truck featuring interior armor on the windshield that was used to bomb a Regime position near Sarāqib, Syria on September 12, 2012.<sup>26</sup> From this point until Russia's intervention in September 2015, increasingly more advanced Up-Armored SVBIEDs with ever larger payloads would become the most effective weapon in HTS' arsenal. However, following the 2015 Russian intervention, HTS was permanently put on the defensive and gradually lost access to the resources required to maintain its current approach to Up-Armored SVBIEDs. The result was a transition to a more "conservative" approach where Up-Armored SVBIEDs became smaller, more agile, based on lower-cost vehicles, and used less frequently.<sup>27</sup> Since 2015, HTS has employed Up-Armored SVBIEDs in a way similar to how a conventional air force would employ a limited supply of PGMs – only when they are desperately needed and can achieve their maximum effect.

The first documented instance in the dataset of HTS using Improvised UAS was on July 14, 2014 in the Damascus suburb of al-Maliḥah. The footage in the video was taken from the perspective of an unmodified hobbyist quadcopter being used in an ISR role.<sup>28</sup> A scene later in

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<sup>25</sup> Charles R. Lister, *The Syrian Jihad: Al-Qaeda, the Islamic State and the Evolution of an Insurgency* (London: Hurst & Company, 2017), 84.

<sup>26</sup> Hugo Kaaman, Twitter post, February 2021, 5:54 a.m., <https://twitter.com/HKaaman/status/1361992478996508674?s=20>

<sup>27</sup> Hugo Kaaman, "Shifting Gears" (<https://www.mei.edu/publications/shifting-gears-htss-evolving-use-svbieds-during-idlib-offensive-2019-20>, October 28, 2020), 4.

<sup>28</sup> *Kasr al-Ḥiṣār [Breaking the Siege]* (Jabhat al-Nuṣrah, 2014), al-Manārah al-Bayḍā' Foundation for Media Production. Source: archive.org. Imagery Shown: Appendix I-3

the video appears to show fighters being briefed on their forthcoming operation using printed aerial photos taken by the UAS.<sup>29</sup> Aerial footage from Improvised UAS used for ISR became a staple of all major media releases from the group moving forward, and there is significant evidence to suggest they are used for targeting purposes. UAS are commonly used to view the impacts of IRAM and other artillery, and there is footage of HTS fighters explaining how UAS are used to guide SVBIEDs.<sup>30</sup> HTS' Improvised Strike UAS usage is less clear. Beginning in late 2017, Russia's Khmeimim Air Base started coming under periodic attack from crude Improvised Strike UAS originating from HTS-held territory. The quality of the UAS increased gradually over time along with Russian measures to protect Khmeimim, following alleged incidents of casualties and materiel damage.<sup>31</sup> However, these attacks have never been attributed to a specific group.

The first documented usage of IRAMs by HTS in the dataset was a picture set showing the first launch of an IRAM referred to as the Fayṣal-1, targeting Regime forces in Khān Shaykhūn on January 9, 2013.<sup>32</sup> Nine months later, a feature length video was released dedicated to the Fayṣal-1 that detailed the rocket's specifications and its standardized production process.<sup>33</sup> HTS has continued to use IRAMs throughout the conflict, but its capabilities have improved dramatically over time. The primary IRAM used by HTS currently is a Soviet-era 9M22U artillery rocket with a significantly increased payload, referred to as an "Elephant Rocket."<sup>34</sup> Elephant Rockets likely have relatively poor accuracy, but they could cause critical damage to the average, house-sized structure<sup>35</sup> and are quite dangerous when fired in large salvos. HTS also uses them in quantities that suggest they are effective enough to be seen as worthy of a substantial investment.

## The Islamic State (IS)

### *Overview*

IS captured the most territory of any group in the sample in the least amount of time, and much of it was via asymmetric means. Following 'Abū Muḥammad al-Jūlānī's rejection of IS authority on April 10, 2013, there were mass defections from his forces to IS, and this came with

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<sup>29</sup> *ibid.*

<sup>30</sup> Hugo Kaaman, "Shifting Gears" (<https://www.mei.edu/publications/shifting-gears-htss-evolving-use-svbieds-during-idlib-offensive-2019-20>, October 28, 2020), 14.

<sup>31</sup> Nick Waters, "The Poor Man's Air Force? Rebel Drones Attack Russia's Airbase in Syria," *Bellingcat*, January 12, 2018, [https://www.bellingcat.com/news/mena/2018/01/12/the\\_poor\\_mans\\_airforce/](https://www.bellingcat.com/news/mena/2018/01/12/the_poor_mans_airforce/).

<sup>32</sup> "Launching Missiles (Fayṣal 1) at a Group of Nuṣayrī Soldiers in Khān Shaykhūn," al-Manārah al-Bayḍā' Foundation for Media Production (Jabhat al-Nuṣrah, January 9, 2013), *Jihadology*. Imagery Shown: Appendix I-4

<sup>33</sup> *Taghṭīyat Marāḥil Taṣnī'e Ṣārūkh Fayṣal-1 [Covering the Stages of Production of the Fayṣal-1 Missile]* (Jabhat al-Nuṣrah, 2013), al-Manārah al-Bayḍā' Foundation for Media Production. Source: *Jihadology*. Imagery Shown: Appendix I-5

<sup>34</sup> *Untitled* (Hay'at Tahrīr al-Shām, 2020), 'Ibā News Network. Source: Telegram. Imagery Shown: Appendix I-6

<sup>35</sup> Appendix II

significant territory acquisition,<sup>36</sup> which was leveraged to take even more territory from other opposition groups. IS seized much of its territory in Northern Iraq from the beginning of the “Harvest of the Soldiers” campaign to its capture of Mosul through more asymmetric terror tactics.<sup>37</sup> It really only began operating predominantly as a conventional force after it captured large amounts of territory and equipment. Therefore, the transition can be placed sometime in late 2013.

Its reversion into a predominantly asymmetric force occurred in March 2019 when the last IS-held village in Syria was liberated. Since then, there have been four feature-length IS media releases from Syria showing combat footage. The videos show IS in Syria’s central desert region known as the Bādiyah carrying out brazen attacks with significant operational freedom. However, they do not show IS capturing much territory or equipment, and IS seems to still be operating as an asymmetric force limited to a Moral Attrition strategy.<sup>38 39 40 41</sup>

### *Improvised Weapons*

The first Up-Armored SVBIED usage by IS in the dataset appeared in the infamous “Flames of War” video in September 2014. The SVBIED footage in the video was from just over a year prior when IS was participating alongside other opposition groups in the capture of Minagh air base North of Aleppo.<sup>42</sup> However, according to research by Hugo Kaaman, the SVBIEDs were driven by IS fighters, but produced mainly by Liwā’ ‘Aṣifat al-Shamāl, an FSA-affiliated group that briefly cooperated with IS. This was likely a necessity due to the high materiel costs and IS’ limited presence in Northern Aleppo at the time.<sup>43</sup> Once IS fully established itself territorially though, it quickly became the global leader in Up-Armored SVBIEDs. Up-Armored SVBIEDs ranging in size and design appear in most feature-length IS media releases in the data set for this research. To keep up with the significant demand for SVBIEDs created by their tactics, IS built numerous dedicated SVBIED production facilities across its territory that could manufacture a wide range of variants with a high degree of standardization in some cases.<sup>44</sup>

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<sup>36</sup> Charles R. Lister, *The Syrian Jihad: Al-Qaeda, the Islamic State and the Evolution of an Insurgency* (London: Hurst & Company, 2017), 134.

<sup>37</sup> Jessica D Lewis, “AQI’s ‘Soldiers’ Harvest’ Campaign” (Institute for the Study of War, October 9, 2013), [http://www.understandingwar.org/sites/default/files/Backgrounder\\_SoldiersHarvest.pdf](http://www.understandingwar.org/sites/default/files/Backgrounder_SoldiersHarvest.pdf), 5.

<sup>38</sup> *Malaḥamat al-‘Istinzāf 1 [Attrition Saga 1]* (Islamic State, 2019), Wilāyat al-Shām, al-Khayr. Source: Telegram.

<sup>39</sup> *Malaḥamat al-‘Istinzāf 2 [Attrition Saga 2]* (Islamic State, 2020), Wilāyat al-Shām, Ḥimṣ. Source: Telegram.

<sup>40</sup> *Malaḥamat al-‘Istinzāf 3 [Attrition Saga 3]* (Islamic State, 2020), Wilāyat al-Shām, al-Barakah. Source: Telegram.

<sup>41</sup> *Malaḥamat al-‘Istinzāf 4 [Attrition Saga 4]* Islamic State, 2020. Wilāyat al-Shām, al-Khayr. Source: Telegram.

<sup>42</sup> *Flames of War* (Islamic State, 2014), al-Ḥayāt Media Center. Source: Telegram. Imagery Shown: Appendix I-7

<sup>43</sup> Hugo Kaaman, “The Unique SVBIEDs Used in the 2013 Capture Of Menagh Airbase,” Hugo Kaaman: Open Source Research on SVBIED, September 21, 2020, <https://hugokaaman.com/2020/09/21/the-unique-svbieds-used-in-the-2013-capture-of-menagh-airbase/>.

<sup>44</sup> Hugo Kaaman, “Factories Of Destruction - How Up-Armored SVBIEDs Are Manufactured,” Hugo Kaaman: Open Source Research on SVBIEDs, June 2, 2020, <https://hugokaaman.com/2020/03/31/factories-of-destruction-how-up-armored-svbieds-are-manufactured/>.

The first IS video in the dataset featuring UAS footage was released on August 23, 2014 and showed a quadcopter performing ISR over a Regime military position in al-Raqqa.<sup>45</sup> Improvised UAS footage appears in IS media much more frequently after this point, and there is significant visual evidence of IS using them for targeting.

Reports of IS Improvised Strike UAS began to emerge from Northern Iraq in Fall 2016,<sup>46</sup> but the first appearance of them in the media dataset was on January 24, 2017 in a video released by IS showing fighting in Mosul.<sup>47</sup> The video featured a commercially available flying wing UAS modified to drop a variety of bomblets.<sup>48</sup> However, the footage in the video from the perspective of the Strike UAS was clearly shot by a quadcopter, meaning IS had multiple functioning designs. The quadcopter strike footage also includes four instances of bomblets being dropped into, or directly next to, the open hatches of armored vehicles<sup>49</sup> and this level of accuracy is likely not possible with the flying wing variant. Improvised Strike UAS continue to appear in the data set for roughly another year, and Conflict Armament Research (CAR) discovered an entire workshop in Ramadi that was dedicated to producing Strike UAS,<sup>50</sup> suggesting that IS saw this as an area worthy of further investment.

The first IRAM in the dataset appeared in a video from Northern Iraq on February 2, 2015.<sup>51</sup> Field work conducted by CAR identified this as one of two IRAM variants produced in industrial quantities with a high degree of standardization by IS<sup>52</sup> workshops in Northern Iraq. In the dataset, both variants are featured extensively in IS media from Northern Iraq between 2015 and 2017.<sup>53</sup> CAR field researchers in Syria also documented IRAMs used by IS in Kobane the same month they began appearing in media from Northern Iraq.<sup>54</sup> However, IRAMs featured in IS media from Syria are significantly less frequent and standardized. Regardless of region, IS almost exclusively employed IRAM in the exact same way conventional rocket artillery is used.

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<sup>45</sup> *Fasharid bihum min Khalfahum [He Dispersed Them from Behind]* (Islamic State, 2014), al-I'tisām Media. Source: Jihadology. Imagery Shown: Appendix I-8

<sup>46</sup> Michael S Schmidt and Eric Schmitt, "Pentagon Confronts a New Threat From ISIS: Exploding Drones," *The New York Times* (The New York Times, October 12, 2016), <https://www.nytimes.com/2016/10/12/world/middleeast/iraq-drones-isis.html>.

<sup>47</sup> *Farsān al-Dawāwīn [Knights of the Departments]* (Islamic State, 2017), Wilāyat Ninawa. Source: Telegram. Imagery Shown: Appendix I-9

<sup>48</sup> *ibid.*

<sup>49</sup> *ibid.*

<sup>50</sup> "Islamic State's Weaponised Drones" (Conflict Armament Research, 2016), <https://www.conflictarm.com/perspectives/islamic-states-weaponised-drones/>.

<sup>51</sup> *Ghazwat al-Kurrār 1 [Raid of the Striker 1]* (Islamic State, 2015), Wilāyat Ninawa. Source: Jihadology.

<sup>52</sup> "Standardisation and Quality Control in Islamic State's Military Production" (Conflict Armament Research, 2016), <https://www.conflictarm.com/dispatches/standardisation-and-quality-control-in-islamic-states-military-production/>, 24.

<sup>53</sup> *Taşnī'e Şārūkh al-Fataḥ [Manufacture of the Fataḥ Missile]* (Islamic State, 2016), Wilāyat al-Fallūjah. Source: Telegram. Imagery Shown: Appendix I-10

<sup>54</sup> "Analysis of Weapons and Ammunition Captured from Islamic State Forces in Kobane." (Conflict Armament Research, 2015), <https://www.conflictarm.com/dispatches/islamic-state-weapons-in-kobane-2/>, 13.

## Anṣār al-Tawḥīd

Anṣār al-Tawḥīd formed in March 2018 out of remnants of Jund al-'Aqṣā. The group may nominally hold territory around the town of Sarmīn, but whatever territory they do hold exists fully within HTS' domain. Anṣār al-Tawḥīd has developed a unique operational profile, increasingly specializing in IRAMs, artillery, and sniping. There are no confirmed instances of Anṣār al-Tawḥīd using an Up-Armored SVBIED, but their first video does feature quadcopter footage of a training montage, demonstrating the capacity to use Improvised UAS for ISR, which they do frequently.<sup>55</sup>

Anṣār al-Tawḥīd's first IRAM appeared in footage of a December 2018 strike on Regime forces in Tal Musaytaf. The IRAM is referred to as the "al-Ḥamīm" and is a 9M22U artillery rocket with an enlarged payload.<sup>56</sup> Anṣār al-Tawḥīd's second IRAM is called the "al-Burkān" and first appeared in media released on July 31, 2019 depicting that day's strikes targeting Regime forces in the village of al-Ḥākūrah.<sup>57</sup> The Burkān is a much larger IRAM made of four 9M22Us. Anṣār al-Tawḥīd also uses Elephant Rockets of slightly lower quality than HTS,' but these have only appeared in their media twice.<sup>58</sup>

Depending on the IRAM, Anṣār al-Tawḥīd uses them in unique ways compared to the other SSAGs in the sample. Like HTS, Anṣār al-Tawḥīd seems to use Elephant Rockets as a relatively low-cost force multiplier to compensate for supply shortages. Given the volume they are typically launched in, Ḥamīm rockets serve the same purpose<sup>59</sup> but due to their more complicated design and higher cost, are probably not used as much during more desperate situations.

The most interesting of the three rockets is the Burkān though. Artillery rockets like the 9M22U tend to be fairly inaccurate so they are most effective when launched in high volume with lower payloads. The Burkān is designed using the exact opposite logic. While technically an improvised artillery rocket, the Burkān requires individual accuracy to be effective because it is a relatively expensive asset with a smaller, but more intense area of effect than the four 9M22Us used to make it would have if they were launched normally as a volley. Therefore, using a Burkān for Moral Attrition warfare is a waste because the target is not as important as total damage inflicted across an area. Analysis of Burkān attacks reinforces this theory.<sup>60</sup>

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<sup>55</sup> *Ṣannā' al-Qarār [Decision Makers]* (Anṣār al-Tawḥīd, 2018). Telegram. Imagery Shown: Appendix I-11

<sup>56</sup> *Wa-Mā Ramayt 'Idh Ramayt Walākin Allāh Rama [He Heals the Issuance of the Believers]* (Anṣār al-Tawḥīd, 2019). Source: Telegram. Imagery Shown: Appendix I-12

<sup>57</sup> *Untitled* (Anṣār al-Tawḥīd, 2019). Source: Telegram. Imagery Shown: Appendix I-13

<sup>58</sup> *Untitled* (Anṣār al-Tawḥīd, 2020). Source: Telegram. Imagery Shown: Appendix I-14

<sup>59</sup> *Shad Al-Zanād [Pulling the Trigger]* (Anṣār al-Tawḥīd, 2019). Source: Telegram. Imagery Shown: Appendix I-15

<sup>60</sup> Appendix III

## Anṣār al-Islām

Anṣār al-Islām is an independent Jihādī group from Iraqi Kurdistan that entered Syria in 2012. It was chosen for this research because of the unusual amount of attention devoted to improvised weapons in their pre-Syria propaganda. However, this dataset was far smaller than the previous three since Anṣār al-Islām does not release as much media. Therefore, this case will be a shorter analysis focusing only on how they use improvised systems.

In Iraq, they devoted significant resources to IRAM development and production,<sup>61</sup> although they do not appear to retain this capability today. Instead, recent media shows a shift to craft-produced mortars instead of IRAMs.<sup>62</sup> However, these resources appear to be limited too, making it even more important to maximize the value of each mortar they use. The best way to accomplish this is with an ISR asset that can spot for a mortar team. These can be infantry units in forward positions within sight of the target, or a UAS and Anṣār al-Islām appears to have opted for the latter.<sup>63</sup> Imagery analysis of Anṣār al-Islām media has shown that using Improved UAS in an ISR role, they have been able to establish a strike capability precise enough to inflict measurable damage to the Regime’s ability to operate, even while Anṣār al-Islām is subject to severe resource constraints.

## Analysis

Immediate analysis makes it clear that “territorial control” is critical to engaging in any Maneuver Warfare operations. However, to understand other variables it is necessary to break down territorial control. The first level is “Basic Territorial Control,” which is when an SSAG has access to an area where the dominant force is not averse to the SSAG’s operation. Basic Territorial Control grants SSAGs a place to operate in the open, stage offensive operations, and retreat to. Establishing clear front lines is critical for regular warfare. The second level, “Advanced Territorial Control,” is only achieved when an SSAG becomes dominant over an area’s security. Advanced Territorial Control includes all the benefits of Basic Territorial Control in addition to control over the area’s resources and infrastructure. A strong potential indicator that this state has been achieved is engagement in governance. In the sample for this research, HTS first established Advanced Territorial Control over areas in late 2012, while IS first established it in late 2013 and lost it in 2019. In contrast, Anṣār al-Tawḥīd and Anṣār al-Islām have never established Advanced Territorial Control because they have never been the dominant actor in the areas where they operate.

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<sup>61</sup> *Silāḥ Lā Yanḍib [Inexhaustible Weapons]* (Anṣār al-Islām, 2011), al-Anṣār Media Foundation. Source: Telegram. Imagery Shown: Appendix I-16

<sup>62</sup> *Junūd Al-Khafā’ [Invisible Soldiers]* (Anṣār al-Islām, 2019), al-Anṣār Media Foundation. Source: Telegram. Imagery Shown: Appendix I-17

<sup>63</sup> *Earthquake of the Aggressors* (Anṣār al-Islām, 2020), al-Anṣār Media Foundation. Source: Telegram. Imagery Shown: Appendix I- 18

Territorial control also clearly has an effect on the improvised weapons capabilities open to an SSAG based on two categories of requirements: materiel and technical. It is clear that while Up-Armored SVBIEDs do require skill to produce, that barrier to entry is not particularly high. The barrier to entry for Up-Armored SVBIEDs is materiel. SVBIED production, especially at scale, requires a steady supply of vehicles, metal for armor, and very large quantities of explosives – in addition to all the industrial tools like welders. As a result, Advanced Territorial Control is required for Up-Armored SVBIED production.

The requirements for Improvised ISR UAS are the lowest of all systems as that mission can be carried out by any commercially available hobbyist UAS with the ability to stream live video. Little to no modification is required, and operating these UAS is fairly simple. Improvised Strike UAS have slightly higher materiel requirements but not enough to be considered moderate. They are more difficult to design though and always require fairly significant modification. In conjunction with a less established knowledge base given their relative newness this means that “moderate technical requirements,” is accurate for now. IRAMs have moderate material requirements since, like SVBIEDs they require machine shops, large amounts of explosives and metal, and potentially conventional artillery rockets, but not as much as SVBIEDs. They also have moderate technical requirements because rocket design can be difficult to develop and produce consistently, but the knowledge base around IRAM production online is fairly large. Based on the data from the cases, the only improvised weapons produced exclusively by SSAGs with Advanced Territorial Control were Up-Armored SVBIEDs, implying that Improvised Systems with high materiel requirements are the only ones that require Advanced Territorial Control in order to produce.

The data also shows that necessity is the mother of improvised weapons invention. HTS and IS were the only two groups that transitioned to conventional forces prior to improvised weapons development because they captured large amounts of conventional weapons. HTS and IS tended to produce improvised weapons in order to capitalize on their powerful enhancing effects or to supplement shortages in supply of conventional weapons such as artillery rockets. Innovation occurred mostly as a result of weakness. On their own, Anṣār al-Tawḥīd and Anṣār al-Islām lacked the conventional capabilities to engage in Maneuver Warfare, so they relied more heavily on improvised weapons and more creative designs like the Burkān. HTS and IS innovated more as the tide of the wars continued to turn against them and they had to try and narrow widening capability gaps in conjunction with diminishing resources. As it began losing, HTS revamped its entire approach to SVBIED design and employment, in addition to shifting IRAM production away from copies of existing rockets like the Type-86, to new, larger IRAMs. Similarly, IS began shifting its Up-Armored SVBIED design to reincorporate camouflage, while simultaneously investing substantial resources in Improvised Strike UAS.

## Conclusion

This research sought to determine whether improvised weapons were as important of a causal factor as territorial control in the transition of asymmetric SSAGs pursuing Moral Attrition into conventional forces engaging in Maneuver Warfare. Following a comparative analysis of four SSAGs in Syria and Iraq, it can be concluded that improvised weapons are not as important of a causal factor as territorial control, since at least Basic Territorial Control was required in all cases.

However, narrowing the capability gap in relation to the opposing state military force *is* as important as territorial control. There are just other means of accomplishing that beyond improvised weapons. In this sample, when Advanced Territorial Control was achieved it was always done so in conjunction with enough captures of conventional weapons to sufficiently narrow the capability gap. When only Basic Territorial Control was achieved, the capability gap was still present and had to be narrowed through improvised weapon innovation in order to operate like a conventional force. Similarly, when the capability gap began to widen for SSAGs with Advanced Territorial Control, improvised weapons innovation was pursued as a means of narrowing it again.

This research also revealed significant differences between the impacts of various improvised weapons. Materiel and technical requirements determine the conditions and cost-benefit calculations behind the production and use of each system. While it is unlikely for improvised weapons to have high technical requirements, they can have high materiel requirements. Up-Armored SVBIEDs are so resource intensive that in this study, they were only ever accessible after Advanced Territorial Control was achieved and the SSAG was already operating like a conventional force. They were still used because they provided an immensely powerful capability but that was fundamentally enhancing, not enabling. All improvised weapons can enhance SSAG operations to varying degrees, but only some have an enabling effect. The most powerful enhancing systems were those that could most closely imitate an advanced capability possessed by state militaries, and the most powerful enabling systems were those that were able narrow the capability gap the most, while having the lowest barrier to entry possible. Using this framework, Up-Armored SVBIEDs were determined to be the most powerful enhancing improvised weapon, while Improvised UAS serving as ISR assets were determined to be the most powerful enabling improvised weapon. The complete results of the system assessments are included in the table below.

	<b>Up-Armored SVBIED</b>	<b>Improvised UAS – ISR</b>	<b>Improvised UAS – Strike</b>	<b>IRAM</b>
<b>Material Requirements</b>	High	Low	Low	Moderate
<b>Technical Requirements</b>	Moderate	Low	Moderate	Moderate
<b>Enhancing or Enabling</b>	Enhancing	Enabling	Enhancing	Potentially Both

Future research on this topic should increase the sample size while focusing more on smaller SSAGs that do not capture as many conventional weapons. Expansion of the sample beyond groups operating in Syria and Iraq would also strengthen the applicability of the findings to other contexts. Limiting the observation to a single type of improvised weapon may strengthen results and make collecting and processing more comprehensive primary source imagery possible.

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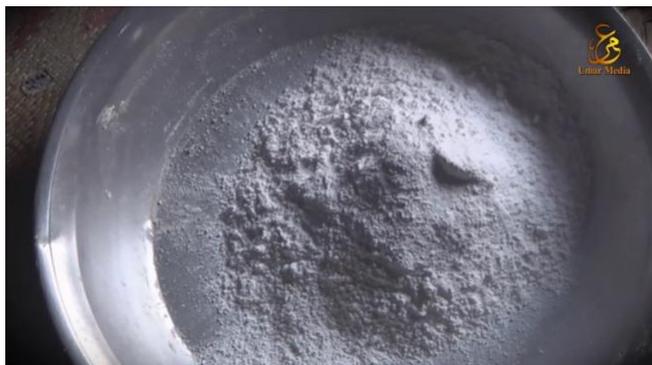
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## Appendix I – Reference Imagery

### 1. Craft-Produced IRAM Propellant (*Experience with the Umar-1 Missile*)



The most common craft-produced rocket propellant made by SSAGs uses a potassium nitrate ( $KNO_3$ ) oxidizer, a sucrose ( $C_{12}H_{22}O_{11}$ ) fuel, and an optional iron (III) oxide ( $Fe_2O_3$ ) catalyst. This propellant can be “cooked” on a skillet and hotplate and requires easily attainable ingredients. The process is shown in this video released by the Ṭālibān in Pakistan.

### 2. IRAM Warhead Variation (*Experience with the Umar 1 Missile & Inexhaustible Weapons*)



Craft-produced rocket payloads are typically existing munitions like mortars that are mounted to the rocket and utilize the munition’s existing fuse system, or craft-produced explosives & fuses. The latter are more complicated & dangerous to produce, but they are typically higher yield. The explosive ingredients required though, like explosive remnants of war (ERW) or an ammonium nitrate/fuel oil mixture (ANFO), are also more difficult to obtain in large quantities. In the “Umar-1” (Left) the payload is a modified “Type-63” 107 mm, short-range, spin-stabilized artillery rocket from China. This one has had its propellant and nozzle removed before being mounted to the Umar-1. Anṣār al-Islām (Right) is packing their own explosives into the nose cone of their IRAM.

### 3. Jabhat al-Nuṣrah First Improvised UAS Usage in al-Maliḥah (*Breaking the Siege*, 07/16/2014)



Top Left: Nuṣrah fighters going over aerial imagery prior to the attack. Top Right: a quadcopter hovers over the future target of an Up-Armored SVBIED. Bottom Left: the SVBIED detonates at its target and is filmed from a nearby building. This was a fairly large SVBIED used to “soften” a Regime position prior to an infantry assault.

### 4. Jabhat al-Nuṣrah First IRAM Usage (“Supporters of the Mujahideen” Forum, 01/09/2013)



Top Left: Nuṣrah fighter setting up the launch stand and likely consulting firing tables. Top Right: the Fayṣal-1 is a small, spin-stabilized rocket. This class of IRAM and artillery rocket are preferred by insurgents for their concealability & versatility – being able to be launched off of almost any stand, due to not having fins.

### 5. Jabhat al-Nuṣrah IRAM Workshop (Stages of Production of the Fayṣal-1 Missile)



Top Left: Fayṣal-1 nozzle assembly being drilled out. Rockets like the Fayṣal-1 are stabilized with spin instead of fins, & that spin is imparted by multiple, angled nozzles as shown. Top Right: Lathe being used to form rocket body. Bottom Left: Fayṣal-1 production was standardized & efficient. This was only a fraction of the completed IRAMs shown.

### 6. HTS Elephant Rocket Launch Near 'Abū Jurayf (Untitled, 01/16/2020)



Top Left: HTS fighters installing the IRAMs' fuses, which are typically removed for safety during transport. Top Right: clear view of Elephant rocket structure, with enlarged payloads & static fins attached to the outside of a 9M22U, the nozzles of which are visible. Bottom Left: using an improvised multiple launch system on the bed of a pickup truck.

## 7. First Islamic State SVBIED Usage at Minagh Air Base (*Flames of War*, 09/19/2014)



Top Left: up-Armored SVBIED destroying the command center at Minagh Air Base. Top Right: Soviet BMP-1 APC being converted into an SVBIED with added armor. Bottom Left: SVBIEDs were not why *Flames of War* was infamous. It was one of the earliest IS videos to feature an English speaker (Canadian Mohammed Khalifa) leading a mass execution. The men in the back are alleged Regime soldiers who are digging their own graves.

## 8. First IS Improvised UAS Usage in al-Raqqah (*He Dispersed Them from Behind*, 08/23/2014)

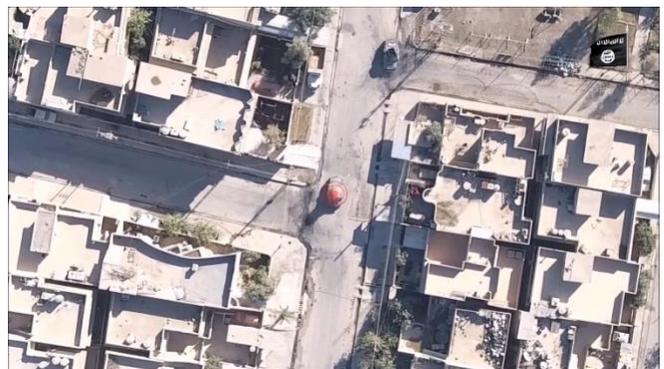


Top Left: quadcopter conducting ISR over the Regime's 39<sup>th</sup> Brigade base in al-Raqqah. Top Right: planning the route for an SVBIED attack on the base at night using printed satellite imagery. Bottom Left: SVBIED detonating after reaching its target. This was followed by an infantry battle.

9. First IS Improvised Strike UAS Usage in Mosul (*Knights of the Departments*, 01/24/2017)



Top Left: X8 Skywalker commercial UAS armed with two bomblets. 2<sup>nd</sup> Row Left: 40 mm grenade bomblet variant using a streamer for stabilization. 2<sup>nd</sup> Row Right: 40 mm grenade bomblet variant using a 3D-printed fin assembly for stabilization. 3<sup>rd</sup> Row Left: quadcopter-dropped bomblet hitting the rim of an open Abrams tank. 3<sup>rd</sup> Row Right, 4<sup>th</sup> Row Left & Right: quadcopter-dropped bomblets being dropped into the open hatches of Humvees.



10. IS IRAM Workshop Fallūjah (*Production of the al-Fataḥ Missile, 2015*)



Top Left: IS presenter explaining the how the Fataḥ components are attached using threaded joints. Top Right: IS presenter explaining the custom-made fuse assembly for the Fataḥ. Bottom Left: completed batch of Fataḥ IRAMs. These were produced in significant numbers with consistent quality control in workshops across IS territory in Iraq.

11. Anṣār al-Tawḥīd UAS Video of SVBIED & Training in Idlib (*Decision Makers, 12/07/2018*)



Top Left: UAS footage of an SVBIED targeting Regime forces, but no such attack by Anṣār al-Tawḥīd could be confirmed so it is likely not their footage. Top Right: UAS footage of a dismount drill during training. Bottom Left: an unusual anti-armor team. The fighter fires the RPG-7 from the back of the bike a few seconds later.

12. First al-Ḥamīm Launch, Tal Muṣaytaf 12/22/2018 (*He Heals the Issuance of the Believers*)



First appearance of the Ḥamīm IRAM, a 9M22U inserted into a fabricated rocket body to act as a single booster carrying a larger payload than a normal 9M22U. The tail of the 9M22U is still visible. These IRAMs targeted Regime forces in Tal Muṣaytaf on 12/22/2018, but the footage was not released until the following April. Five Ḥamīm were launched.

13. First al-Burkān Launch; launched at al-Ḥākūrah from al-Manṣūrah (*Untitled*, 07/31/2019)



First appearance of the Burkān IRAM, the first iteration of which was made of four externally mounted 9M22Us carrying a large central payload. This launch targeted Regime forces in al-Ḥākūrah in retaliation for increased Regime and Russian air strikes that Summer. The Burkān likely missed on this occasion. Breakdown of launch in Appendix III.

14. Anṣār al-Tawḥīd Elephant Rockets (*Preach to the Believers* & *And if You Come Back*, 2020)



Left: Elephant Rockets being fired by Anṣār al-Tawḥīd at Regime forces in Tal Khatra on 01/16/2020.

This is the first appearance of Elephant Rockets in Anṣār al-Tawḥīd's media. While similar, there are clear differences between these and the Elephant Rockets used by HTS, such as the back of the extended payload not being closed. This footage appears in the video *And Preach to the Believers*, which was posted to Telegram on 01/22/2020.

Right: Elephant Rockets being fired by Anṣār al-Tawḥīd at Regime forces in al-Barsah. This footage appears in the video *And if You Come Back*, which was posted to emaad.net on 02/02/2020. Elephant Rockets only being used at this time (height of the Idlib Offensive) suggests that their use is a reflection of supply shortages in desperate circumstances.

15. al-Ḥamīm Salvo Launched at al-Ḥākūrah from al-Manṣūrah (*Pulling the Trigger* 08/16/2019)



One of two salvos of ten al-Ḥamīm IRAMs fired at the village of al-Ḥākūrah in late July 2019. Here the Ḥamīm is being employed in a similar manner to normal artillery rockets – compensating for inaccuracy with volume of fire. One of the impacts of these was observable on Google Earth, giving an indication of the damage. See Appendix II.

16. Anṣār al-Islām IRAM Design Before Production (*Inexhaustible Weapons*, 10/04/2011)



Members of the Anṣār al-Islām “Engineering Unit” being briefed on an IRAM design prior to production, which is shown next in the video. This video was one of two in a series dedicated to weapons production, and has been referenced throughout Anṣār al-Islām media in the years since. Anṣār al-Islām dedicates a disproportionate amount of media to this topic.

17. Anṣār al-Islām Mortar Production Workshop, Idlib (*Invisible Soldiers*, 02/23/2019)



Left: an Anṣār al-Islām fighter using a lathe to form the body of a large mortar.

Right: an Anṣār al-Islām fighter fitting a tail assembly to a large mortar body fabricated in the same workshop. Despite limited resources, this workshop is shown throughout the video to be quite productive. One piece of evidence for this are the mortar tail assemblies on the ground behind the fighter on the right.

This is one of the weapons production videos that references the *Inexhaustible Weapons* series from eight years prior, and this video is very much framed as continuing that tradition, despite a significantly diminished capacity.

### 18. Anṣār al-Islām Mortar Team with UAS (*Earthquake of the Aggressors*, 07/29/2020)



Top Left: an Anṣār al-Islām mortar team member starting up a commercial UAS, that uses his smart phone as a controller display for the live camera feed. Top Right: the UAS this fighter is flying is a DJI Mavic Mini, which retails for roughly \$400 - \$500 online. Bottom Left: the Mavic Mini camera feed spotting for the mortar team targeting Regime forces near the white building in the center of the photo.

### Appendix II – Single 9M22U IRAM Damage Analysis

This frame from *Pulling the Trigger* shows an al-Ḥamīm salvo hitting the village of al-Ḥākūrah. These impacts are geolocatable, and relevant features for that are annotated.



### Impact 1 geolocation in Southern al-Hākūrah.



The salvo shown in Pulling the Trigger was fired on 07/31/2019. Fortunately, Google Earth took a picture of the area 5 days later, allowing the damage to be observed. While the building is still standing, it is clear that an increased payload 9M22U can inflict significant damage.



### Appendix III – al-Burkān Strike Analyses

This frame from *Pulling the Trigger* claims the 1<sup>st</sup> Burkān target was al-Ḥākūrah.



Confirmation that al-Ḥākūrah was the target provided by this geolocation.



The 1<sup>st</sup> frame necessary for launch site geolocation is from the untitled video uploaded on 07/31/2019 and it shows a water tower behind the launch site.



The 2<sup>nd</sup> necessary frame is from *Pulling the Trigger*, and shows nearby buildings despite an attempt at censoring the surroundings for operational security.



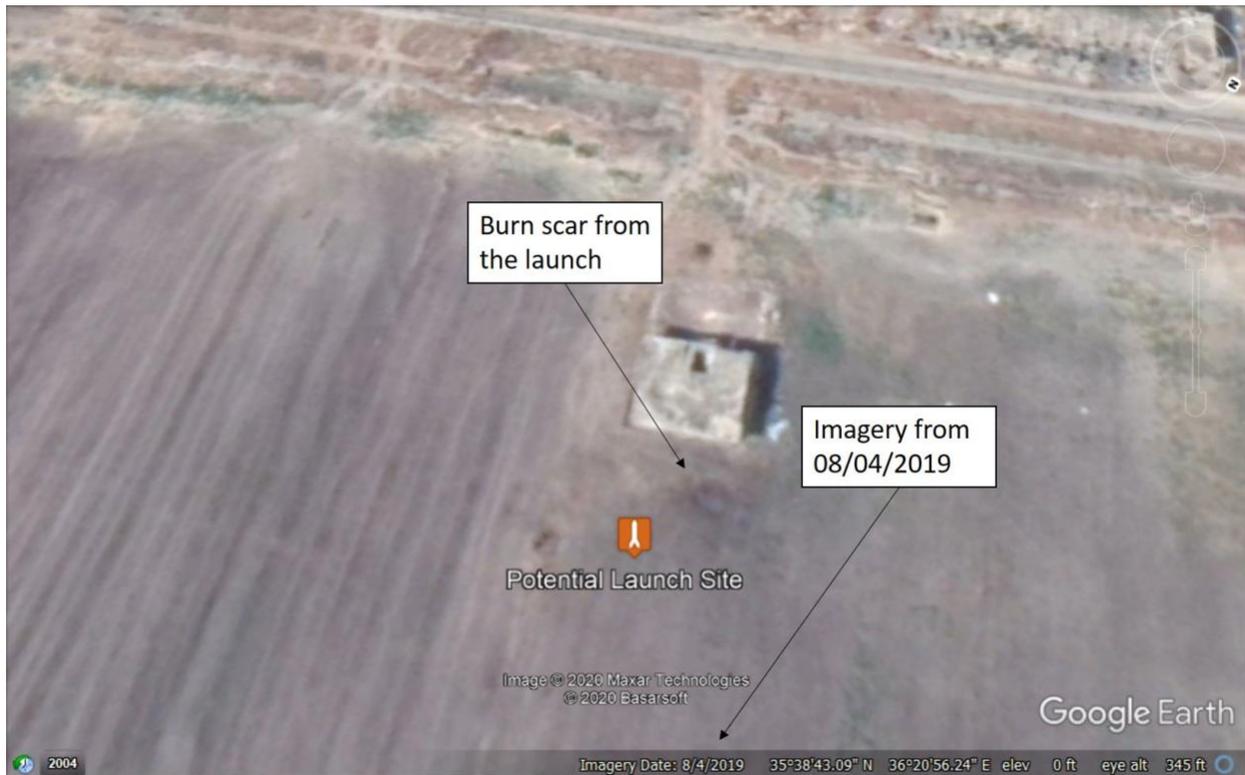
The 3<sup>rd</sup> necessary frame is also from *Pulling the Trigger* and shows a building back and to the left of the launch site across a small field.



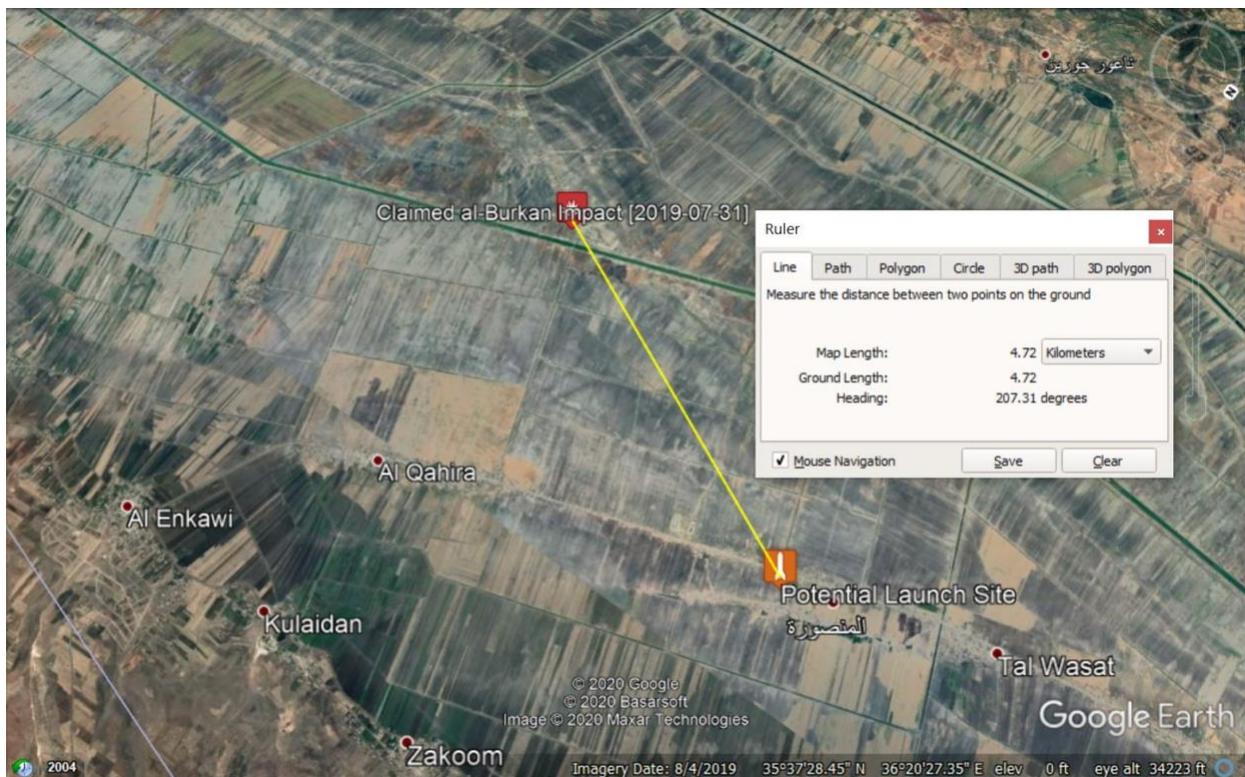
These frames allow the launch site to be geolocated at the edge of the village of al-Manṣūrah.



Additional confirmation is possible due to the satellite imagery being from 5 days after the launch and the burn scar from the launch still being visible as a result.



Therefore, the range of the 1<sup>st</sup> iteration of the Burkān's 1<sup>st</sup> flight can be approximated to be ~4.7 km – under 25% of the range of an unmodified 9M22U. Accuracy & Effect still unknown.



An impact of the Burkān's 2<sup>nd</sup> iteration (internally mounted 9M22Us) is geolocatable though. Footage from an untitled video released 03/09/2021 shows 2 of these Burkān being launched from a site that is not geolocatable, but this frame confirms that these are Burkāns.



Anṣār al-Tawhīd also confirms later in the video that the impacts shown are the Burkāns.



The 1<sup>st</sup> frame necessary for geolocation shows the Great Mosque in Tal Mardikh



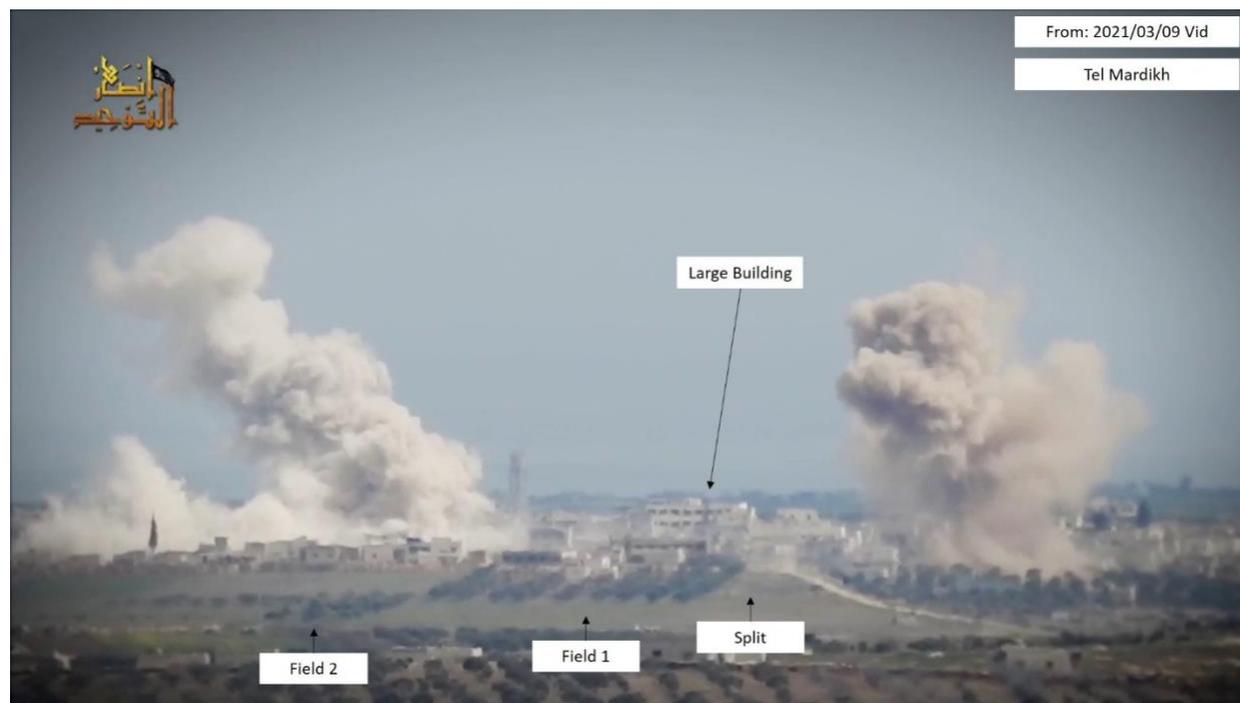
The 2<sup>nd</sup> frame shows the 1<sup>st</sup> impact cloud blocking the Great Mosque & more of the surroundings, most importantly, the Bilal bin Rabah Mosque.



The 2<sup>nd</sup> impact is shown on the other side of the city in this frame.



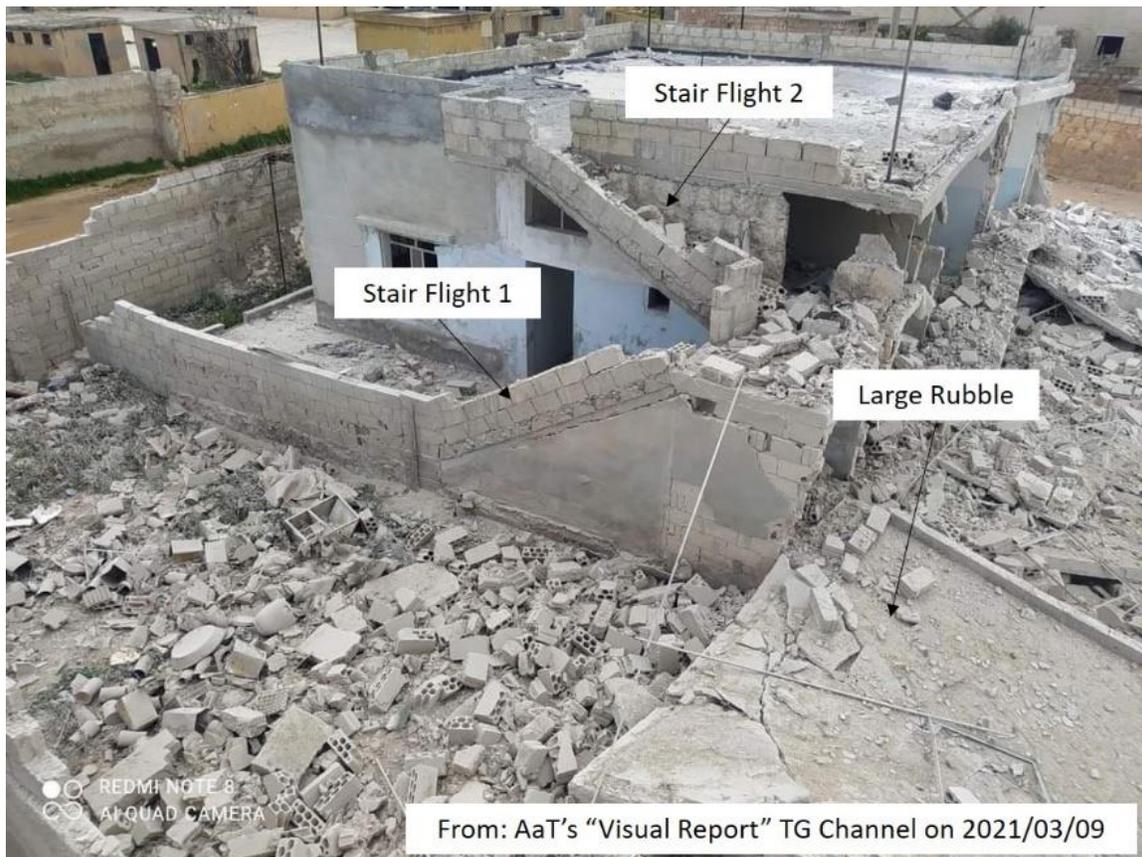
The 4<sup>th</sup> frame necessary for geolocation shows both impacts together.



Precise geolocation of the 1<sup>st</sup> impact is possible due to a photo set of 6 images taken by bystanders and released on Anṣār al-Tawḥīd’s secondary Telegram Channel.



The last two images from the photo set necessary for geolocation below.



This allows precise geolocation of the 1<sup>st</sup> impact and an assessment of the damage capacity of a Burkān – which is substantial, given that it can destroy stone walls at the maximum lethal radius of an unmodified 9M22U.

