SKY-WATCH

MINI UNMANNED AERIAL SYSTEMS IN PRESENT DAY MULTI-DOMAIN MILITARY CONFLICTS

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INTRODUCTION

With a view from the contemporary situation and beyond in world affairs, this study investigates the importance of multi-domain capabilities like unmanned aerial systems (UAS) to obtain and maintain the upper hand regardless of the scenario mainly with a view from the land domain.

Recent conflicts have shown the importance of embracing evolving technologies like UAS of all sorts and forms since they have proven decisive in the battle space. Hesitation can lead to an asymmetric advantage for the adversary. Hesitation can come from risk adverse behaviour in force development and procurement faced with fast-evolving technology but too much hesitation deprives the force of years of lessons learned, gained experience, and doctrinal development incorporating force multipliers like UAS.

The study focus is on military and security forces but does not exclude force multiplier effects for other types of international organizations (IO), or non-governmental organizations (NGO).

SKY-WATCH

THE COMPANY

Sky-Watch is an innovative company in the drone industry. We offer our accumulated know-how within sensor fusion to our partners, in the pursuit of finding new ways to solve tomorrow's challenges. We specialize in developing and manufacturing advanced autonomous sensor technologies for defence, law enforcement, and emergency management.

Through deep and direct interaction with customers and market-leading solution partners, we ensure that our UAS solutions and related services offer substantial and lasting value and benefit to our clients. As much as we are providing our clients with customized technology solutions, we are firmly involved in building the necessary UAS capabilities in the client organization, interoperable with legacy systems.

Sky-Watch UAS solutions fall into NATO Class I Mini category, thus referred to as mini-UAS. Sky-Watch mini-UAS like the Heidrun system can be digitally integrated with command-and-control systems and other system components in the existing force organization through tailored solutions developed together with the customer.

NATO UAS CLASSIFICATION

Class	Category	Normal Employment	Normal Operating Altitude	Normal Mission Radius	Primary Supported Commander	Primary Supported Commander
Class III > 600 kg	Strike/Combat	Strategic/National	Up to 65,000 ft	Unlimited (BLOS)	Theatre	Reaper
	HALE	Strategic/National	Up to 65,000 ft	Unlimited (BLOS)	Theatre	Global Hawk
	MALE	Operational/ National	Up to 45,000 ft MSL	Unlimited (BLOS)	JTF	Heron
Class II 150 - 600 kg	Tactical	Tactical Formation	Up to 18,000 ft AGL	200 km (LOS)	Brigade	Hermes 450
Class I < 150 kg	Small (>15 kg)	Tactical Unit	Up to 5,000 ft AGL	50 km (LOS)	Battalion, Regiment	Scan Eagle
	Small (<15 kg)	Tactical Subunit (Manual or hand laucnch)	Up to 3,000 ft AGL	Up to 25 km (LOS)	Company, Platoon, Squad	Skylark
	Micro (<66 J)	Tactical Subunit (Manual or hand laucnch)	Up to 200 ft AGL	Up to 5 km (LOS)	Platoon, Squad	Black Widow

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SECURITY PRIORITIES IN A TIME OF UNPRECEDENTED CHALLENGES

Today, more than ever, nations' fates are linked to events beyond their borders. Nations are facing a global pandemic, a deepening climate emergency, a world of rising nationalism, receding democracy, growing great-power rivalry, regional challenges from authoritarian states, and a technological revolution that promises to reshape many aspects of human lives.

Looking into continental Europe for an example, the Russian attack on Ukraine is widening a gulf between Moscow and the West. Apparently, the lesson of recent years is that while Cold War is long over, Cold War-like behavior lives on.

Many nations must renew or even modernize their enduring security and defence capabilities to meet today's challenges from a position of strength. It is the responsibility of governments to ensure that the people can live in peace, security, and prosperity. Thus, nations must strengthen alliances, amplifying their individual power to disrupt threats to national security interests before they reach their borders.

Many of the biggest threats facing nations and their governments respect no borders and are best tackled with collective action, being it inter-agency or international. Pandemics, the climate crisis, cyber and digital threats, international economic disruption, humanitarian crises, violent extremism and terrorism all pose acute and, in some cases, even existential dangers. The reality is that the distribution of power across the world is changing, creating new conflicts and threats.

Beneath these broad trends is nothing less of a revolution in technology that poses both peril and promise. The world's leading powers are racing to develop and deploy technologies, such as artificial intelligence and quantum computing, that can shape everything from the economic and military balance among states and involve non-state actors. Next generation telecom-munications (5G) infrastructure will set the stage for huge advances in access to information. Though, the direction and consequences of the technological revolution remain unsettled. Emerging technologies remain largely ungoverned against misuse or malign action. Without guardrails, uncertainty increases and so does the likelihood of competition leading to conflict. A cornerstone of a national defence is a powerful military matched to the security environment. The armed forces need to be equipped to deter adversaries, defend the people, national interests, and allies, and defeat emerging threats. In the militaries around the world, regardless of the technological evolution, people who serve remain a centerpiece capability.

Regardless, in the Western Hemisphere nations struggle to man their armed forces to meet force goals in demand.

Due to the return of great-power competition and state rivalry, readiness has become increasingly important. This entails beefing up logistics, stocks, training level, and equipping the force to the best of the state's ability. Also, it involves securing supply chains and building strategic autonomy that ensures national freedom of action. Protection of critical infrastructure and retention on technological know-how has become a national security interest.

In a world of unprecedented security challenges, it is necessary to assess the appropriate structure, capabilities, and sizing of the force. It is necessary to identify unneeded legacy platforms and weapons systems to free up resources for investments in new technologies and capabilities that will determine the actual strength of the force and offer a national security advantage. It is necessary to harvest technology advancements to reduce manning requirements and increase operational safety.

Therefore, many nations are faced with streamlining the processes for developing, testing, acquiring, deploying, and securing these technologies. Further, they need to consider how to ensure and retain the talent to acquire, integrate, and operate them. It must be an international priority to shape an ethical and normative framework to ensure leapfrogging technologies are used responsibly.

Apart from the state militaries, a nation's security forces, law enforcement, and disaster relief capacities need once again to become integrated components in a total defence force, together constituting a strong grouping within and across borders. Resource considerations entail inter-agency co-operation and ensure inter-operability of technologies and capabilities between various components of the total force.

At this inflection point nations struggle to navigate the future of unprecedented challenges. Each nation, alliance, and entity must strive to approach the situation from a position of as much strength as they are able to muster.

THE MULTI-DOMAIN APPROACH

The term multi-domain operation (MDO) was first used in the United States Army in 2018 as a national doctrinal concept. The term was mainly used to optimize ground combat power at the operational and tactical levels. The concept of multi-domain operations builds on the 1980s U.S. Army doctrine "Air-Land Battle", which was defined as an answer to the threat posed by the Soviet Red Army in the European theatre. In either case, the challenge for the U.S. Army remained that of command and control (C2) of forces to defeat an enemy of the scale of the Soviet Red Army by integrating itself into the joint fight across the traditional physical manoeuvring domains of air and land.

Outside the U.S. military, specifically in NATO, the term MDO is more generic. Obviously, it means different things to different nations. NATO Partners and other nations outside the Alliance still consider and are influenced by conceptual and doctrinal thinking in the U.S. and NATO.

There are also related concepts, such as the multi-domain combat cloud, which attempts to create a connection between manned and unmanned platforms and artificial intelligence (AI) support.

Regardless of how the term MDO is perceived there is a common theme, the desire by Allies and partner nations to keep up with, and stay ahead of, the challenge imposed by complex future warfare through harnessing technology. The different interpretations and applications of the term MDO are a continuation of an idea as old as Sun Tzu that implies to win the fight before it begins. Therefore, monitoring and countering commercial technology used by competitors and adversaries is a must.

That being said, mastery and improvement of newer science, particularly information technology, must not happen at the expense of the art of command and control. Whatever technology does for own forces, and whatever own forces know about adversary threats and technology, a joint force commander will have to bring it all together. The same applies to various scenarios short of war and conflict, like conflict prevention, peace keeping, disaster relief, incident handling, etc.

Recent real world armed conflict as in the attached case studies demonstrate the key role intelligence, surveillance, and reconnaissance (ISR) and strike UAS may play in establishing air superiority in future armed conflict. The commercialization of UAS components has increased the rate of innovation. Thus, the consequential minimization and standardization have opened

the market to affordable solutions designed to increase speed and precision in operational decision-making through UAS-enabled situational awareness (SA).

Sky-Watch envisions a massive proliferation in the utilization and deployment of UAS and sensor technology in the lower and sub-tactical levels of the defence and security force segment. Sky-Watch aims to be a driving force in shaping and facilitating these multi-domain frontline capabilities in defence, security, and battlespace management, to include other law enforcement and emergency response organizations that can benefit of improved and continued SA. While the bigger platforms in NATO class II and III remain important, the above trends will impact the NATO Class I and mini-UAS the most.

The ability to adopt third party Commercial-Off-The-Shelf / Military-Off-The-Shelf system components from a fast-moving unmanned industry based on open architecture and opensource software platforms as well as in aligning with the mini-UAS defence requirements regarding interoperability, data analysis, and data dissemination is the differentiating opportunity. This technology reality is an unavoidable shift from proprietary defence solutions towards open standards and broad third-party system integration. Therefore, mini-UAS at scale will become part of the best prepared nation's capabilities.

SKY-WATCH SOLUTIONS

Sky-Watch primarily produces a NATO Class I Mini category, a mini-UAS called the Heidrun system with different payloads. A drone system is the materialization of a multi-domain capability. It's launched from the ground, utilizes air to manoeuvre, and exploits cyber for connectivity and harvesting information. The data collected necessitates processing into intelligence that allows SA. SA in the shortcut to staying ahead of adversaries or events unfolding. Thus, UAS are true force multipliers to gain SA.

Drone systems have emerged in a multitude of shapes and sizes within the last two decades. Drone systems are mostly piloted by operators or specialists pending on the complexity of the system. These operators are humans in the decision loop able to decide what to do with a particular piece of information. UAS are taking advantage of technology advancements and commercialization of components to reduce manning requirements and increase operational safety for the individual operator because the drone can collect data a higher pace and with much lesser risk to involved personnel compared to human mounted of dismounted information gathering like ground reconnaissance.

Evolving technology is often characterized by huge investments with increased cost which is especially true for military technology. Therefore, affordability and life-cycle-cost has become a real concern. Strengthening the force must not overwhelm national budget allocations for security purposes.

Since the drone stone age two decades ago, commercial technologies have in some areas evolved at a higher pace compared to the dedicated defence industry. This has allowed space for Sky-Watch to offer mini-UAS based on commercially available, sourced components that are integrated into the Heidrun system, resulting in a competitive solution both from a procurement and logistic point of view.

More so, a contemporary UAS must be easy to use with a user-interface that allows digital natives in the younger generations to operate the system with a minimum of training assisted by E-learning which limits the strain on the organization and minimizes the need for service and support when on operation.

This isn't possible without minimizing the number of components and the components themselves in the UAS. These developments add to the man-packability of the Heidrun platform that can be operated both mounted and dismounted, leaving the operators with maximum flexibility at the very frontline of events.

Affordability, flexibility, and dispersibility even in larger organization has thus become achievable because procurement at scale is realistic, regardless of the military grade technology. A system of systems of UAS adds coherence to operations across domains. It has become an inevitable technology in the evolution of the existing capacity and construction of the future force.

In a conflict or disaster scenario it is first and foremost about gaining and maintaining SA. This is then used to stay on top of events unfolding or seize the initiative to catch an adversary of balance. It is about winning the fight before it begins, reducing the pain and consequence to an achievable and acceptable level. UAS like the Heidrun platform can contribute to the best possible outcome.

On the other side, too much hesitation in equipping the force or organization with UAS risk compromising coherence in own forces leaving it exposed to asymmetric threats going up against adversaries that has embraced the advantages of evolving technologies. Whether it is desirable or not from a Western or ethical point of view, the complex future operating environment and scenarios short of war is increasingly evolving into an unmanned battle space. This development needs to be considered when designing the future force.

CASE STUDIES

Appraisal is one thing; practical application is another. Is there evidence of benefits when deploying UAS in real world events? The answer is undoubtedly yes. They've played decisive roles in the 2nd war in Nagorno-Karabakh in 2020 and in the Ethiopian governments counter-offensive towards the Tigray-based rebellion forces in the latter half of 2021.

CASE STUDY #1

TOP ATTACK: LESSONS LEARNED FROM THE SECOND NAGORNO-KARABAKH WAR

Nagorno-Karabakh in 2020 served as a combat proving ground, facilitating the testing of new operational concepts and weapons systems for Armenia and Azerbaijan respective sponsor states, Russia and Turkey. The lessons learned there resonate across the operational environment.

These lessons include: the failure of national defence establishments with archaic acquisition processes to recognize and rapidly incorporate emergent technologies; Electronic Warfare's central role on the battlefield; shortcomings of current Air Defense command and control and target acquisition systems; and the key role ISR and strike drones may play in establishing air superiority in future armed conflict.

The Azeris had reviewed the underlying causes of their previous defeat at hands of the Armenian armed forces, meticulously studied their current capabilities, and adapted new ways of warfare, enabling them to decisively win this conflict in 44 days. Better equipment, organization, training, preparation, and leadership are key to bargain from a position of strength, potentially avoiding armed conflict because of it.

The innovative use of obsolete, remotely piloted air assets to probe and force Armenian air defense radars to "light up" enabled the Azeris to then fix, target, and destroy the Armenian layered air defenses using precision weapons, granting them first mover advantage.

The Azeris managed to dominate all other domains, successfully synchronizing actions across the Air, Land, Cyber, and even the Space domains with their Turkish-supplied Bayraktar TB2 ISR and strike UAS leveraging Turkish satellites for communications links.

The battlefield is becoming increasingly transparent. Despite camouflage, Armenian command posts and air defense assets were easily targeted and destroyed. If you are sensed, you are targeted; and if targeted, you are neutralized or destroyed. Sensors are more important than shooters, enabling shooters to now execute with greater precision than ever before. Full motion real-time videos from UAS and loitering munitions not only allowed the Azeris to target and destroy Armenian systems and personnel, but provided intelligence, battle damage assessment, and video content used to win the information war. There is nowhere to hide.

Top Attack is becoming the decisive method of war and armed conflict. Azeris' UAS and loitering munitions provided them with a relatively inexpensive substitute for conventional air power. Any state (or non-state actor) with the resources to purchase top attack systems on the global market has the potential to achieve air supremacy.

Long range precision fires will dominate future fights. Azeris use of both dumb and smart artillery fires, in conjunction with UAS and surgical loitering munitions, enabled them to win decisively in just 44 days. There was no decisive close combat fight. Nations need to develop standoff strike capabilities, while simultaneously denying adversaries the use of theirs.

Active defense systems are needed to survive in the new battlespace. Armenian ground forces had about seven seconds to react to incoming strikes by UAS and loitering munitions, resulting in devastating crises in their soldiers' morale and will to fight. Layered, multi-capable, air defense against top attack munitions, missiles, aircraft, and low-speed and high-speed threats, is vital. This increases the necessity of an "Iron Dome-like" top attack protection capability for all components of the total force and vital infra-structure.

Roboticization and automation mean battles will be increasingly executed faster than before. This trend will turn the existing "kill chain" into a "kill web," where artificial intelligence (AI) will prioritize and synchronize weapons engaging targets across multiple domains. This acceleration of warfare will happen regardless of ethical considerations since there are differing priorities and perspectives on universal values and human rights globally.

Technology development has allowed an increased number of actors to engage in warfare using inexpensive drones. In the future, mercenary forces may serve as "drones for hire," further expanding access to this disruptive technology.

In the Karabakh conflict, UAS have become not just a means of reconnaissance, target designation, and carriers of high-precision weapons. In this war, with their help, air superiority was first established.

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CASE STUDY #2

TIPPING THE BALANCE IN ETHIOPIA'S CIVIL WAR

Multiple purchases of armed surveillance drones at a fraction of the cost of fighter jets and bombers have provided Ethiopia's leader, Abiy Ahmed, with a war-winning weapon that has forced the Tigray People's Liberation Front (TPLF) into retreat.

Thus, coming out of 2021 Ethiopia's 13-month war has seen yet another dramatic turn as the federal government's counteroffensive against fighters from the northern Tigray region has made substantial advances, reversing the gains made recently by the Tigrayan forces in their push southwards.

As fighting drags on, the government, with its tiny air force of 22 combat-capable aircraft, seems to have realized that air power and timely intelligence can make all the difference in a conflict – especially one fought over vast and often mountainous areas like in Ethiopia's north. Although there has been no official confirmation, analysts have pointed to credible reports saying Ahmed's government has reached out to manufacturers of cheap and efficient armed drones hoping that air power will turn the tide in its way.

Drones, or UAS, bring several desirable capabilities together in one neat package. They are principally security cameras in the sky and can beam high-definition real-time imagery back to the headquarters. Once a target has been identified, it can be destroyed on the spot by the guided munitions carried by the drones or other effects delivered from afar. This potent mix of intelligence gathering, reconnaissance, strike, and damage assessment capability can be decisive in a conflict, if UAS are used properly.

The government forces suffered a humiliating defeat last summer when Tigrayan rebels forced them from Tigray, then started to push south. By late November the Tigrayans were approaching the city of Debre Birhan, about 85 miles north of Addis Ababa. But they could go no further. Swarms of drones appeared overhead, striking soldiers and supply convoys, General Tsadkan Gebretensae, a leading Tigrayan commander, said in an interview with The New York Times: "At one time, there were 10 drones in the sky," he said. "You can imagine the effect. We were an easy target."

The impact of foreign armed drones was striking; pummelling Tigrayan rebels and their supply convoys as they pushed down a major highway toward the capital, Addis Ababa. The rebels have since retreated roughly 270 miles by road to the north back to the borders of Tigray, erasing months of battlefield gains.

Increasingly, unmanned systems are becoming a game changer. It's not just about the raw capability of the UAS themselves - it's the multiplying effect they have on nearly every other human and system in the battlespace. Drones and combat drones have become a significant factor in the fight even the dominant one. It has turned into a demonstration of drone power.

CONCLUSION

To win the fight before it begins is desirable since the consequences of armed conflict and warfare on society, property, and humans often are devastating. This requires SA in all domains to obtain and maintain the upper hand in a developing crisis potentially leading to armed conflict.

Thus, UAS have become and will remain important tools in a nation's toolbox. Mini-UAS' low relative cost and reliability allow several to be flown at once and enables the maintenance of a near-constant presence in the battlespace, meaning that surprise tactics by one's adversary will be spotted and much less likely to succeed.

Mini-UAS in concert as part of a system of systems constantly search the battlefield, guided by remote pilots. Analysts, intelligence specialists, military planners, and commanders can see and share the high-resolution images being fed back giving a far clearer picture of events unfolding and the adversary's intentions, preserving the art of C2 and the upper hand advantage. Sensors are more important than shooters.

It is becoming increasingly apparent that relatively inexpensive and effective drones are making themselves felt on battlefields in recent armed conflicts, even becoming decisive. UAS need to be factored into the air superiority equation. Meanwhile, the asymmetry between the offensive use of drones and drone defence in terms of cost is a cause of concern for national defence forces.

That said, it is evident that without UAS, you leave your soldiers exposed to asymmetric threats going up against adversaries that has embraced the advantages of evolving technologies like UAS. You deprive them of force protection and the SA to ensure a position of strength, regardless of circumstances.

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EPILOGUE: THE CHANGING CHARACTER OF WARFARE

Extracted from:

Redefining the role of soldiers of the future battlefield

Mad Scientist Laboratory, U.S. Army Training and Doctrine Command, Combined Arms Center.

Conflict in the Mid-21st Century will witness the proliferation of unmanned, robotic, semi-autonomous, and autonomous weapons, platforms, and combatants that will dramatically change the role of Soldier on the battlefield. These capabilities will supplement or supplant humans in both support and combat roles that are dull, dirty, and/or dangerous. Potential adversaries may also use them to undertake operations that are morally, legally, or ethically questionable.

AI and autonomy will provide essential time-critical decision-making support to leaders and warfighters regarding force employment courses of action and the authorization or ordering of lethal force. While the nature of warfare will remain intrinsically human as long as its aim is the imposition of our will over that of an adversary, the character of warfare will change as the tools used to execute warfare become increasingly less human.

As AI matures and machines on the battlefield become more pervasive, the future soldier will be equipped to offload an increasing number of responsibilities normally reserved for a human. This will range from the obvious mundane and repetitive tasks to ones that require accuracy and speed that only a machine can deliver. This will also include tasks that are inherently dangerous or life threatening. As the intensity of conflict increases, machines will occupy a greater portion of the range of military operations and human occupation will diminish.

This is not to say wars will no longer be fought by humans, rather it will mean that the role of the human on the battlefield will need to be redefined. In the context of the range of military operations, in the 2030-2050 timeframe, human operations will be machine-assisted (i.e., fully integrated man-machine), then move on to machine operations that will be human-assisted. Certain operations, especially those on the low-intensity spectrum, will remain better served with machine-assisted humans; conversely, high-intensity conflict operations will be fought and occupied largely with robotic systems with the potential for human intervention (man-on-the-loop).

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