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REMOTELY PILOTED AIRCRAFT SYSTEMS AND MODERN WARFARE

Lieutenant Colonel Özhan Özvural

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INTRODUCTION

The first recorded organized military structure stretched back to Sumer and Egypt in the 3rd millennium BC.[1] Armed forces have evolved since then. The main driver for this evolution is technology and ideas. Radical changes in technology together with new doctrines have transformed the military and caused new phases in conducting war. For instance, the Blitzkrieg which depended on the extensive use of tanks during World War II tore down the old concepts of the prior world war.[2] Similarly, the widespread use of the Remotely Piloted Aircraft System (RPAS) on the battlefield has created a new era. The latest example of this proposal is the conflict sought in Syria. The Syrian conflict is one of the latest multi-actor conflicts in the world. It is also an arena for testing the most recent military technology. A group of Turkish armed RPAS destroyed Russian made air defence systems in the first days of March 2020 in Idlib province, Syria.[3] It was an example of how a prey hunted its hunter. It was also one of the first examples of a simultaneous armed RPAS group attack. RPAS was used instead of air force because of the restrictions against manned aircraft in Syrian airspace. As in that example, improved technology together with an original doctrine creates a new dynamic on the battlefield. In this context, this paper will demonstrate how RPAS has affected modern warfare as a result of its novel qualifications.

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[1] Richard A. Gabriel and Karen S. Metz, *From Sumer to Rome: The Military Capabilities of Ancient Armies* (London: Greenwood Press, 1991), 2.

[2] William S. Lind *et al*, "The Changing Face of War: Into the Fourth Generation," *Marine Corps Gazette*, 73,10, (October 1989): 23.

[3] Bloomberg, "Turkey's Killer Drone Swarm Poses Syria Air Challenge to Putin," last accessed 19 March 2020, https://www.bloomberg.com/news/articles/2020-03-01/turkey-s-killer-drone-swarm-poses-syria-air-challenge-to-putin.

With this in mind, this paper will first provide background information on the historical development of RPAS. Second, it will demonstrate how RPAS changed the joint planning process (JPP) by using the United States (U.S.) example. Lastly, the paper will show how RPAS can be utilized as a force multiplier on the battlefield.

Rapid renewal of scientific knowledge in the last decades has affected all parts of social life. Every development has triggered another one to create a new solution to human needs. Inevitably, RPAS has been exposed to the same change process which led to emerging of an increased number of new type platforms. Hence, RPAS has become a multi-purpose system. It serves both the military and industry. RPAS supports particularly combat, stabilization, and domestic operations with regards to military use. Yet, RPAS has some limitations since it depends on operators and logistical support. It is difficult to cover all these dimensions on this paper. As such, the paper will focus on combat operations, leaving others to future studies. Further, it will encompass only the Western doctrine and practices for better analysis.

A BRIEF HISTORY OF RPAS

Pilotless aircraft (PA) was defined as an aircraft that was "capable of being flown without a pilot" according to the convention on international civil aviation on 7 December 1944.[4] There is still a disagreement on the definition of that aircraft, although more than 70 years passed over that convention. While some use drone and Unmanned Aerial Vehicle (UAV) terms, others prefer to use Unmanned Aircraft Systems (UAS) and RPAS. UAS is more common than RPAS both in the U.S. and the United Kingdom (UK) However, the International Civil Aviation Organization decisions and publications should

[4] International Civil Aviation Organization, *The Convention on International Civil Aviation*, (Chicago: 1944), 5.

be taken as guides to solve this ambiguity. Therefore, this study adopted a more formal and international approach by defining all remotely piloted aircraft as RPAS.

The history of RPAS dates back to the beginning of the 20th century. The U.S. Navy's interest for the aerial torpedoes helped the development of radio control after 1909. Nonetheless, the level of gyroscopic devices and radio control was not enough to develop a guided weapon in that period. Notwithstanding, the Royal Aircraft Establishment (RAE) succeeded in testing RAE 1921 target aircraft in 1922. Thus, aerial automated system projects focused on building target aircraft.[5]

Both the UK and the U.S. Armed Forces were the pioneers for the target RPAS in the 1930s and 1940s. On one hand, the Royal Navy acquired more than 400 DH 82B Queen Bee target RPAS between 1934 and 1943. On the other hand, the U.S. armed forces were enthusiastic about remote-controlled model airplanes manufactured by the Radioplane Company (RC) during World War II. Northrop's acquisition of RC was the most important development in that period[6] because Northrop became one of the leading companies later in the RPAS industry.

The RPAS trend turned from target airplanes into reconnaissance platforms during the Cold War. Equipped with a camera to take photos, the SD-1 had a rocket-assisted takeoff capability and a radar tracking system. That was the first tactical RPAS of the U.S. Army. That model inspired the production of contemporary surveillance RPAS.[7] The Vietnam war was a breaking point for RPAS. The United States Air Force used the Teledyne-Ryan AQM series widely to have real-time and infrared images

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[5] Steven J. Zaloga and Ian Palmer, *Unmanned Aerial Vehicles Robotic Air Warfare 1917–2007*, (Oxford: Osprey Publishing, 2008), 6.

[6] *Ibid*, 7.

[7] *Ibid*, 10.

together with electronic warfare capability from 1964 to 1975. DC-130 airplanes were platforms to launch and direct these systems. The AQM series relied on its parachute to have a safe landing.[8] These systems not only conducted risky missions without human casualties, but they also proved to be a force multiplier on the battlefield. Meanwhile, Canadair Limited started building CL-89 (The Midge) in 1963 both for the Canadian and British Armed Forces. Later, West Germany, Italy, and France bought this system too. The midge even operated during the Desert Storm in 1991 for surveillance purposes.[9]

Tadiran Electronic Systems and Israeli Aircraft Industries came up with the idea of small and low-cost RPAS to neutralize air-defence systems after Vietnam and Yom Kippur Wars. In this regard, those companies manufactured the Mastiff and Scout models respectively.[10] Mastiff was smaller and lighter than AQM-34G/H. The Israel Armed Forces (IAF) used both Mastiff and Scout together with decoy RAPS to neutralize air-defence systems during the 1982 Lebanon war. That kind of inexpensive and simple solution shaped the RPAS doctrine and encouraged other countries like Iran to start working on RAPS.[11]

Desert Storm and Iraqi Freedom operations constituted a milestone for RPAS because of the unprecedented number and types of RPAS use in combat missions as shown in Table 1. These operations also showed how the RPAS technology advanced. Innovations in material management, global positioning and communication systems paved the way for the production of smaller, durable, and effective platforms. These

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[8] Ian G. R. Shaw, *Predator Empire Drone Warfare and Full Spectrum Dominance*, (Minneapolis: University of Minnesota Press, 2016), 102.

[9] Gary Schaub Jr. and Kristian Søby Kristensen, "But Who's Flying the Plane? Integrating UAVs Into the Canadian and Danish Armed Forces," *International Journal*, 70, (2015): 256, https://www.jstor.org/stable/24709460?seq=1.

[10] Ralph Sanders, "An Israeli Military Innovation: UAVs," *Joint Force Quarterly* 33, (2003): 115.

[11] *Ibid,* 23.

platforms could travel longer distances, fly in higher altitudes, and combine the movement and firepower.

Table 1: RPAS Used During Iraq Operations

Type	Operations	Years Used	Locations
RQ-2 Pioneer	Desert Storm	1991	Kuwait, Iraq
	Iraqi Freedom	2003	Iraq
FQM-151 Pointer	Desert Storm	1991	Kuwait
	Iraqi Freedom	2003	Iraq
RQ-5 Hunter	Iraqi Freedom	2003	Iraq
RQ-1 Predator	Southern Watch	1998-2003	Iraq
	Iraqi Freedom	2003	Iraq
MQ-1 Predator	Iraqi Freedom	2003	Iraq
RQ-4 Global Hawk	Iraqi Freedom	2003	Iraq
Dragon Eye	Iraqi Freedom	2003	Iraq
RQ-7	Shadow	2003	Iraq
Desert Hawk	Iraqi Freedom	2003	Iraq

Source: DoD, Defense Technical Information Center, *U.S. Unmanned Aerial Vehicles in Combat, 1991-2003*, 2.[12]

The asymmetric threat became more prevalent in the world after 2003. In a similar vein, the use of limited force was far more widespread than conventional warfare. This trend affected heavily RPAS production and usage concept. For example, the U.S. utilized stealth technology via RQ-170 Sentinel to monitor and verify Osama Bin Laden in May 2011.[13] Also, the U.S. used MQ-9 Reaper to neutralize Qassem Suleimani in Iraq

[12] Daniel L. Haulman, "U.S. Unmanned Aerial Vehicles in Combat, 1991-2003," (Technical Document, Air Force Historical Research Agency Alabama, 2003), 2.
[13] Ron Schneiderman, "Unmanned Drones Are Flying High in the Military/Aerospace Sector," *IEEE Signal Processing Magazine* (January 2012): 8.

in January 2020.[14] RQ-4 Global Hawk is another sophisticated U.S. RPAS. It is a high-altitude, long-endurance intelligence, surveillance and reconnaissance (ISR) platform that can fly up to 60,000 feet altitude to protect itself against air defence systems. However, Iran shot down one RQ-4 with a surface-to-air missile in the Strait of Hormuz on 19 June 2019.[15] All these latest examples show how RPAS operations can create strategic effects with neutralizing high-payoff targets and showing of force.

Shortly, new technology initiates the use of new capabilities on the battlefield. Likewise, new capabilities push new doctrines. This is a cycle of modernization. Examples in this part showed that there is a continuum in this cycle. The armed forces have been in fierce competition with their peers to reach superiority in this revolution since ancient times. The reason is simple. The one that produces unique military innovation can reach competitive advantage and change the power distribution in international competition.

THE EFFECTS OF RPAS ON JOINT PLANNING PROCESS

The armed forces develop crisis plans (contingency plans) according to possible threat scenarios. While it is possible to apply these plans to real situations, sometimes it is necessary to prepare new plans due to the increased threat diversity. In any case, joint military planning is one of the basic steps of modern warfare. It is mainly a supportive process to the commanders' (COM) decision to use limited military capabilities in light of inherent risks.[16] Both strategic and operational level joint planning aims to achieve a

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[14] The Guardian, "A Visual Guide to the U.S. Airstrike that Killed Qassem Suleimani," last accessed 21 March 2020, https://www.theguardian.com/world/2020/jan/03/visual-guide-airstrike-that-killed-qassam-suleimani-us-iran.

[15] New York Post, "US Drone Shot out of Sky by Iran Cost $123 Million," last accessed 21 March 2020, https://nypost.com/2019/06/20/us-drone-shot-out-of-sky-by-iran-cost-123-million/.

[16] The Joint Chiefs of Staff, *Joint Planning*, JP 5-0, (Washington, D.C: The Joint Chiefs of Staff, 2017), xi.

political end state. Also, this process is almost similar for both NATO and its member countries. This similarity is necessary because of the interoperability and synchronization of combined efforts. Although the framework of planning has been similar since the end of the Cold War, developments in military technology have brought new perspectives together by themselves. In this regard, RPAS has also influenced the JPP. This part of the paper will show that impact in detail by using the U.S. Armed Forces' JPP as an example.

The JPP is an analytical approach that allows military planners to formulate a problem, analyze the mission, and to frame and compare the different course of actions (COA) to end up with a plan or order.[17] It has seven steps as depicted in Figure 1. The first step is planning initiation which helps to understand the expectations of higher command. The planning guidance triggers this early step. It is rather a mental work for adapting to the complex problem environment. RPAS is a valuable asset for ISR missions. It helps planners observe the operational environment with its real-time, day/night, and the thermal vision capabilities during this step. RPAS can provide initial intelligent products such as full-motion videos.[18] Also, electronic warfare (EW) capable RPAS can jam the adversary's network and detect its radars.

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[17] *Ibid*, V-1.

[18] Derek Gregory, "From a View to a Kill: Drones and Late Modern War," *Theory, Culture & Society* 28, no. 7-8 (2011): 193.

Joint Planning Process

Step 1	Planning Initiation
Step 2	Mission Analysis
Step 3	Course of Action (COA) Development
Step 4	COA Analysis and Wargaming
Step 5	COA Comparison
Step 6	COA Approval
Step 7	Plan or Order Development

Figure 1: Joint Planning Process.

Source: *Joint Planning*, JP 5-0, V-2.

The second step of the JPP is the mission analysis. This step enables both a COM and staff to formulate the tasks and their purpose that causes the actions to be performed. It is more complicated and lengthy than the first step. However, it allows checking basic requirements essential for the mission. In this regard, RPAS can provide better risk analysis and fulfil the COM's critical information requirements (CCIR). A cutting-edge ISR capability of RPAS can detect risks more accurately. RPAS can also operate deep behind the enemy lines with a minimum radar footprint and collect high priority, critical intelligence in the absence of boots on the ground.

The mission analysis requires joint intelligence preparation of the operational environment (JIPOE). JIPOE is a process that helps to define the operation environment, finding its impacts, analyzing the adversary and the other actors.[19] During the JPP, the

[19] The Joint Chiefs of Staff, *Joint Intelligence Preparation of the Operational Environment*, JP 2-01.3, (Washington, D.C: The Joint Chiefs of Staff, 2014), I-1.

biggest impact of RPAS is on JIPOE since it is an intelligence-based process. ISR missions help RPAS to form more effective JIPOE. They also make it easier to envision the battlespace. RPAS can shape the targeting process with its precision characteristics.[20] It can also detect high-value targets (either fixed or moving) and their latest situations instantly as a result of multiple deployments and extended operation time. It is worthwhile to explain RPAS' ability to provide target information at this point. In a digital era, RPAS can extract the geographical location of the target at any given time. This feature makes the RPAS unique when compared to human sensors since reconnaissance units have difficulties associating a target with its geographical coordinates.

The third step of JPP is COA development. COA is any feasible method to achieve the given mission. RPAS capability enables in finding decisive points during this step. Also, RPAS strike/attack missions contribute to the success of this stage. Strike missions are parts of the elements of the economy of force. They affect time, space, and force structure. It takes less time and force to conduct RPAS precision attacks deep behind the enemy lines. Also, RPAS can monitor urban areas and conduct patrols. It can confirm, follow, and hit high payoff targets. RPAS can both create a surprise effect and increase the flexibility and morale of the forces. In a nutshell, the planning group can exploit the new capabilities RPAS brings to the battlefield when formulating COAs.

The fourth step of JPP is COA analysis and wargaming. RPAS can have little influence on this step. However, the work of previous steps can ease wargaming through red-cell contribution. Step five and six are COA comparison and approval. Similarly,

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[20] Neal Curtis, "The Explication of the Social: Algorithms, Drones and (counter-)Terror," *Journal of Sociology* 52, 3 (2016): 522.

RPAS has less contribution to those steps. Lastly, RPAS can provide information to form the annexes of the operation plan (OPLAN)/operation order (OPORD) at the end of JPP.

The above considerations showed the influences of RPAS on each JPP steps. However, RPAS has also an impact on the whole of JPP. This can be analyzed with the help of the modern airpower theory. Boyd was one of the airpower theorists. He brought a comprehensive approach to military operations with formulating observe, orient, decide and act (OODA).[21] JPP steps are in parallel with the first three parts of the OODA. All JPP efforts are directed to reach superiority against adversaries both in decision and act. RPAS can accelerate the OODA process with its new capabilities. Thus, it can help to reach superiority against the adversary. On the other hand, air-mindedness is another explanation for the total influence of RPAS on JPP. RPAS operators are airmen who carry certain characteristics of their services. They have an offensive mind-set. They also concentrate on the desired-effects instead of thinking platform-based.[22] They don't witness the humanitarian effects of their missions since they are closed in a ground station.[23] Missions are like playing a computer game instead of combating for them. These features create more advantages on each JPP step compared to land force sensors. In summary, all these superiorities coming from using RPAS enhance the effectiveness of JPP.

One can also argue that a joint planning group has other means to do the tasks of RPAS. Fighter jets, manned reconnaissance airplanes and satellites are some of those

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[21] Frans P.B. Osinga, *Science, Strategy and War, The Strategic Theory of John Boyd*, (New York: Routledge - Taylor & Francis Group, 2007), 255.

[22] Dale L. Hayden, "Air-Mindedness," *Air & Space Power Journal* 22, no. 4 (Winter 2008): 44.

[23] Caroline Holmqvist, "Undoing War: War Ontologies and the Materiality of Drone Warfare," *Millenium: Journal of International Studies* 41 no.3 (2013): 541.

capabilities. Basically, RPAS provides low-cost, high endurance and long operational duration without human limitations when compared to manned aircraft.[24] It has less dependence on massive infrastructures like sizeable airfields and hangars. Even the largest class RPAS uses a smaller airfield. Middle and smaller class systems do not need airfields either. Also, RPAS can be operated with a limited risk of human loss.[25] It can eliminate inexperienced staff (low and middle-level leaders) decision mistakes by allowing high-level leaders' fast intervention to the decision-making system. Although high-ranking leaders are far away from the operating environment, they have real-time remote vision ability with the help of RPAS technology. Thus, they can assess strategic situations instantly and make more accurate decisions centrally. When compared to the satellites, RPAS is more efficient due to having longer operation time and continuous tracking capability.[26] Also, it is more economical and user friendly.

RPAS ON BATTLEFIELD

According to Clausewitz, the objective of war is to force the adversary to accept our will.[27] Clausewitz emphasizes a balance between three main aspects to reach that objective: the people, COM and the government.[28] Developments in the last century made the human dimension (the people) to become more important compared to the other two elements of Clausewitz's approach. For example, societies have turned out to be more sensitive to human casualties during an armed conflict. In addition to increased

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[24] Frank Sauer and Nikolas Schoernig, "Killer Drones: The Silver Bullet of Democratic Warfare?" *Security Dialogue* 43, 4 (2012): 370.

[25] Frank G. Hoffman, "Will War's Nature Change in the Seventh Military Revolution?" *Parameters* 47, no. 4 (Winter 2017-2018): 29.

[26] Tyler Wall and Torin Monahan, "Surveillance and Violence from Afar: The Politics of Drones and Liminal Security Scapes," *Theoretical Criminality* 15, no. 3 (2011): 241.

[27] Carl Von Clausewitz, *On War,* (New Jersey: Princeton University Press,1989), 75.

[28] *Ibid,* 89.

sensitivity for casualties, technological innovations have helped to the widespread use of unmanned systems in the military. Having been one of the examples of this system, RPAS has been transforming the fundamentals of war. As such, this part will focus on displaying how RPAS is shaping the concept of operations.

First of all, there are five principles to employ RPAS on the battlefield. RPAS has to allow *interoperability* since the area of operations has become more congested. The battlefield has enlarged in terms of space, time, and force. There are more and complicated military systems on the battleground than before. Therefore, RPAS needs to work harmoniously with all these systems. In this regard, the command and control (C2) ability of RPAS is a prerequisite. RPAS is dependent on radio signals and global positioning systems (GPS) since it is remotely piloted through networks. It should communicate with other systems easily through these means. Further, RPAS should also transmit the data it collects. Its architecture has to be compliant with other aerial systems. It is also essential to *secure the communication network* of RPAS. If this is not possible it should have *a self-destruction* mechanism for the reason of counter technical intelligence. Each RPAS has a unique technical specification. If an adversary learns them, then friendly forces can lose their strategic superiority.

As technology allows to have more *autonomous* systems, RPAS needs to be adaptive to that innovation. Currently, RPAS has autonomous taking off and landing capability in addition to following a pre-programmed route. However, it is also in need of having both motion-detection and identification of friend or foe (IFF) capabilities. If RPAS detects motion changes and analyzes them autonomously then it will become a unique platform. Nonetheless, that demands high investment in science and technology.

According to the adoption capacity theory, if the unitary cost of RPAS becomes low and bureaucratic barriers are eliminated[29] then it will spread on the battlefield very quickly. Hence, RPAS will become a more powerful force multiplier. At present, operators control RPAS centrally. Actually, some projects involve developing miniature systems such as Perdix[30] relying on group interaction. If these projects become successful, an operator will be able to control a group of RPAS at the same time with the help of autonomous interaction in the group. Although unmanned aircraft is the visible part of the RPAS, ground stations and the operators are complementary parts of the whole system. As such, *human-machine collaboration* is the core principle of RPAS.[31] Developments in this principle will contribute considerably to the effectiveness of the total system.

Second, the RPAS concept should be considered for achieving strategic goals in light of the security environment.[32] Threat perception changed after the 9/11 attacks and moved into a new dimension. Low-intensity conflicts became more widespread than high-intensity conflicts since than. President Obama put into practice a drones-first counterterrorism policy against Al-Qaeda in this era.[33] This policy required using armed RPAS against high-payoff targets such as Ayman al-Zawahiri and Osama Bin Laden.[34] Likewise, the U.S. conducted many RPAS attacks in Afghanistan, Pakistan, Yemen and

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[29] Andrea Gilli and Mauro Gilli, "The Spread of Military Innovations: Adoption Capacity Theory, Tactical Incentives, and the Case of Suicide Terrorism," *Security Studies* 23, no. 3 (2014): 517.

[30] U.S. Department of Defense, "Department of Defense Announces Successful Micro-Drone Demonstration," last accessed 23 March 2020, https://www.defense.gov/Newsroom/Releases /Release/Article/1044811/department-of-defense-announces-successful-micro-drone-demonstration/.

[31] Departments of Defense, *Unmanned Systems Integrated Roadmap FY2017-2042* (2018), v.

[32] The Joint Chiefs of Staff, *Doctrine for the Armed Forces of the United States*, JP 1, (Washington D.C.: The Joint Chiefs of Staff, 2013), xxvi.

[33] Michael J. Boyle, "The Costs and Consequences of Drone Warfare," *International Affairs* 89 no.1 (January 2013): 1.

[34] *Ibid*, 9.

Somalia during that period.[35] Effectiveness of the U.S. new counterterrorism policy encouraged other nations to start building RPAS capabilities, as well. Thereby, the U.S. created new competitors in the 2000s. However, the U.S. started shifting its military concept towards multi-domain operations (MDO) in 2018. This new concept is a reaction to the peer competitors' anti-access/area denial efforts. MDO aims to operate across all domains including cyber and space. Although MDO looks like an army-only concept, it is a joint one. The Army cannot follow MDO by itself.[36] As the superpowers were preparing for the next war, a pandemic hit the world in February 2020. It forces the implementation of unprecedented measures like lower human visibility in every part of human life. Also, it creates a high uncertainty for predicting the future security environment. As such, both MDO and COVID-19 conditions push the armed forces to acquire more RPAS. In this regard, RPAS will replace air force gradually because it will facilitate autonomous and unrestricted air manoeuvres by eliminating human restrictions and visibility on the battlefield. Also, innovations in missile technology will decrease dependence on manned aircraft because RPAS will fire those missiles from long distances. In any case, RPAS will adapt itself to antiair warfare to be the sole air force.

On the other hand, air superiority demands suppression and destruction of enemy air defence systems. Current characteristics of RPAS such as being slow and having shorter-range missiles make RPAS a vulnerable target against air defence systems. As stated above, Turkish Armed Forces' use of armed RPAS groups, or deploying kamikaze and EW capable RPAS can be a solution for this deficiency. Also, Joint force COMs

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[35] *Ibid*, 2.

[36] U.S. Army Training and Doctrine Command, *TRADOC Pamphlet 525-3-1, The U.S. Army in Multi-Domain Operations 2028,* (Virginia, 2018), vii.

need a real-time picture of the battlefield. Therefore, RPAS missions are generally intelligence centred. RPAS can collect extensive intelligence and helps to make an instant intelligence analysis. It also directs artillery fires, analyzes the targets before and after the joint attacks to increase the effectiveness of operations. Thus, it increases the speed of C2 by allowing COMs to make quick decisions. This increased speed in making decisions helps to act before the adversary and seizing the initiative. In this regard, RPAS continues to create a competitive advantage in today's digital battlefield.

In addition to the ISR ability, RPAS started providing offensive air support after 2000. The hellfire missile test made from the Predator in that year started a new period in air support operations.[37] RPA platforms turned into a hunter-killer by combining the fire and movement ability. These platforms are one of the deadliest weapons on the battlefield. The number of hunter-killer missions increased considerably after the 9/11.[38] Those attacks create a surprise because RPAS can catch enemy forces without notice. RPAS keeps track of targets for long periods silently and hits at the appropriate time with lethal surveillance ability. Given the little sign of attack, this hunter-killer capability forces adversary to use its forces in smaller echelons. That also creates adverse effects on the enemy`s morale because its forces are vulnerable to RPAS strikes. The adversary needs to increase force protection measures by dispersing its units. Those types of precautions create C2 problems. It is difficult to command disintegrated units. The battlefield becomes more lethal for the reason of hunter-killer RPAS. That trend will highly likely to continue with increased speed. In this regard, RPAS can conduct close air

[37] Michael P.Kreuzer, *Drones and Future of Air Warfare* (New York: Routledge Taylor & Francis Group, 2016), viii.

[38] Peter M. Asaro, "The Labor of Surveillance and Bureaucratized Killing: New Subjectivities of Military Drone Operators," *Social Semiotics* 23 no.2 (2013): 196.

support, surface attack, and persistent strike missions. Increased precision strike capability of RPAS contributes to the success of those missions.

Both hunter-killer and ISR capabilities create conditions for friendly forces to influence and manipulate the adversary's decision-making process. War is an expensive political decision. It has disruptive outcomes both for winners and losers. As such, RPAS can test the adversary's determination and intention by using limited force at any time.[39] That can happen either during or after JPP. RPAS strikes against high-payoff targets may facilitate an adversary to accept our will before a full-scale armed conflict.

Third, C2 relations can influence the effectiveness of RPAS use. The classification of RPAS is a baseline for that arrangement. NATO is one of the international organizations which is doing detailed arrangements for RPAS because of its collective structure. In this context, there are three main RPAS subgroups according to NATO standards. They are depicted in Table 2.

Table 2: The RPAS Classification According to NATO Standards

Class	Category	Normal Employment	Normal Operating Altitude	Normal Mission Radius	Primary Supported Commander	Example Platform
Class III (>600kg)	Strike/ Combat	Strategic/ National	Up to 65,000 Feet	Unlimited (Beyond Visual Line of Sight)	Theatre COM	Reaper
	High Altitude Long Endurance					Global Hawk
	Medium Altitude Long Endurance	Operational/ Theatre	Up to 45,000 Feet Mean Sea Level		JTF COM	Heron
Class II (150 kg - 600kg)	Tactical	Tactical Formation	Up to 10,000 Feet Above Ground Level	200 km Line of Sight	Brigade COM	Sperwer
Class I (<150 kg)	Small (>15 kg)	Tactical Unit	Up to 5,000 Feet Above Ground Level	50 km Line of Sight	Battalion Regiment	Scan Eagle
	Mini (<15kg)	Tactical Sub-unit (Manual or Hand Launch)	Up to 3,000 Feet Above Ground Level	Up to 25 km Line of Sight	Company Squad Platoon Squad	Skylark
	Micro (<66J)	Tactical Sub-unit (Manual or Hand Launch)	Up to 200 Feet Above Ground Level	Up to 5 km Line of Sight	Platoon Section	Black Widow

[39] The Joint Chiefs of Staff, *Joint Operations*, JP 3-0, (Washington D.C.: The Joint Chiefs of Staff, 2017), V4.

Source: NATO Science and Technology Organization, *State of the Art of Airworthiness Certification,* 5.[40]

Accordingly, NATO's RPAS classification will be a guide for this part of the paper. To illustrate, Class I RPAS is very suitable for tactical units' needs. It is cheap, light and easy to use. Army and Special Operations Forces (SOF) have relatively higher needs for this system than the Air Force and the Navy. RPAS is an organic asset for the friendly forces from regiment to section. The COMs at those levels face very little restrictions in deploying that class RPAS unless there is a safety concern. Yet, the real challenge is not those restrictions. All kinds of adversaries from non-state actors to small scale countries can acquire that capability. For example, Dà–Jiāng Innovation (DJI) Technology Company's Phantom 4 RPAS was on sale on the internet with a $1,400 cost in 2017.[41] That low-cost RPAS creates an enormous risk to friendly forces. It is difficult to detect and neutralize Phantom 4 RPAS because tactical units don't have enough radars and anti RPAS weapons. Further, one of the DJI Phantoms crashed into the garden of the White House accidentally in 2015.[42] Although there was no terror intention behind this incident, it showed how Class I RPAS could create a strategic effect by penetrating the friendly forces center of gravity.

Class II RPAS is an organic asset for brigade-level units. It is under the direct control of unit COM. That system provides enough capability with its 200 km mission radius. Therefore, all services can benefit Class II RPAS. However, there are more restrictions on that class RPAS deployment because of indirect fires and air traffic control

[40] NATO Science and Technology Organization, *State of the Art of Airworthiness Certification,* (Maryland, 2017), 5.

[41] Dillon R. Patterson, "Defeating the Threat of Small Unmanned Aerial Systems," *Air & Space Power Journal* 31, no.1 (Spring 2017), 16.

[42] *Ibid,* 18.

measures. The main problem of that level is how to satisfy all operational needs with a limited number of RPAS. As such, brigades generally want to assume operational or at least tactical command of operational level RPAS for a certain period. At this point, a question about how to use Class III RPAS more effectively at an operational level arises. Decision-makers can compare three COAs: to use these RPAS centrally like air force, to employ them separately under unit COM's operational command, to decide on a mission-based by combining the first two COAs. The last COA is more effective because, on one hand, it allows using operational level RPAS centrally during theatre opening and closing. On the other hand, it permits units to use RPAS under their full operational command when the fight intensifies. Thus more empowered brigades/regiments can better exploit their expertise of the battlefield since their staff know the area of operations better than remotely employed operators. Contrary to central use, this type of mission-based use allows operative units to react fast in decision and action. As a result, friendly forces seize the initiative and force the adversary to comply with their battle rhythms.[43] There is no doubt about the use of strategic level RPAS. In any case, strategic RPAS operates centrally since they need large logistic support.

Forth, the vulnerabilities of RPAS can both inspire producers to fix those deficiencies and practitioners to develop countermeasures. RPAS is sensitive to severe weather conditions for two reasons. Primarily, it is lighter than a manned aircraft. Therefore, it cannot take off and reach the designated spot in case of adverse weather conditions. The wind is one of those bad conditions and it hampers Class I and II RPAS negatively. Also, the weather conditions can affect the control of RPAS since it is

[43] *Ibid*, V-10.

remotely piloted. An operator can lose contact with the aircraft due to adverse weather conditions. This should be taken into consideration during mission planning. Currently, remote control creates another weakness because EW systems can jam RPAS and make them inoperable. As such, the EW system is a part of counter RPAS tactics.

CONCLUSION

RPAS conducts preassigned duties mostly with human interaction. The need for that system arises in a wide variety of areas such as agriculture, transportation, defence, and construction planning. Although those needs are different, the objective of RPAS use is the same: creating cost-effective, safe and fast solutions to the problems. In this regard, efforts to develop RPAS started at the beginning of the 20th century and moved according to technological innovations up to now. A small aerial torpedo project has turned into a large scale industry today. Although the U.S. and UK were the pioneers for those developments, easy and affordable access to RPAS permit many actors to use RPAS for military purposes. Thus, both JPP and operations have transformed into a new form as a result of increased RPAS use on the battlefield.

RPAS contributes to JPP mainly with its ISR capability. Especially the first two steps of JPP necessitates efficient intelligence products. RPAS improves those steps by providing real-time remote vision with its cutting-edge capability. In this context, it enables a better-managed JIPOE. It provides valuable intelligence for CCIR. RPAS accelerates the OODA loop and creates a competitive advantage against adversaries. The planning phase of the operations helps COM and staff officers to understand the problem, create feasible, suitable and acceptable COAs to make better OPLAN/OPORD. The planning has direct effects on operation success. As such, RPAS contributes to the operation's success through its contribution to the planning process.

The conflict continuum may demand the execution of OPORD after having prepared it. In this regard, RPAS should be deployed according to interoperability, autonomy, network security, human-machine collaboration and self-destruction principles. It should be also administered in support of strategic goals. Nonetheless, the security environment of today and future shapes the RPAS concept. Still, C2 relations are one of the main parameters of RPAS effectiveness. Currently, the most significant RPAS contribution to the operations is its hunter-killer characteristic. It allows friendly forces to exploit surprise effect. Additionally, innovations in technology and doctrine bring new abilities to the battlefield. All these novelties also require developing countermeasures.

As a conclusion, this paper shows how RPAS affects modern warfare from a combat operations perspective. Future studies can investigate stability operations to improve RPAS knowledge. Also, they can focus on human and logistic dimensions of RPAS. Moreover, future studies can apply this paper's approach to eastern countries such as China, Russian Federation and Iran. The RPAS concept has been in continuous transformation for almost a century. Almost all actors of modern warfare from terrorists to non-state actors and superpowers use RPAS in a wide spectrum today. The armed forces should adapt themselves to the continuously changing security environment, as they have done so since 3,000 BC.

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