

A Study on the Combination of Manned-unmanned Teaming for Future Ground Combat Victory

¹Sung-Kwon Kim, ²Sang-Hyuk Park*

^{1,2}Assistant professor, Dept of Military Science, Woosuk University, Korea
plbas@woosuk.ac.kr

Abstract

This study is for manned-unmanned teaming battles for future ground combat victories. The composition of the study is as follows. The introduction to Chapter 1 presents the necessity of this study from a macro perspective, Chapter 2, the review of the complex combat system for both manned and unmanned introduced the paradigm shift of the future battlefield and the cyber area that is superconnected to the network in future wars. Chapter 3 analyzed the combined combat system of manned-unmanned teaming in advanced military countries through the cases of the United States and Israel. In Chapter 4, after discussing the direction of the development of combat performance of the Korean Army, was concluded in Chapter 5. In other words, the purpose of this study is that as the concept of fighting artificial intelligence robots and military innovation changes, the method of performing battles must be changed in order for our military to win the battle.

Keywords: Future, Combat, System, Manned-unmanned, Ground Combat Victory

1. INTRODUCTION

The future security environment is not only related to military threats, but also various factors such as science and technology, environment, and energy. In particular, in the past, the complexation was low due to the relatively simple means of war, but as the complexation of future weapons systems is expected to intensify, the threat facing the military itself will be further diversified, requiring more sophisticated and diverse military preparation methods.

In addition, the concept of 'how to fight in the future and what to prepare for the future' should be established, and the validity of the concept and the required operational capability, and the feasibility of required operational capability should be continuously evaluated and analyzed. Depending on the result, the process of supplementing a concept, or developing a new concept, and developing a new ability to prepare will have to be repeated [1].

2. MANNED-UNMANNED TEAMING

In future wars, who first identifies the enemy's intentions and has a lot of information about targets will be the key to winning or losing the war [2]. In modern wars, the paradigm of how to fight is changing. In the past,

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Corresponding Author: plbas@woosuk.ac.kr

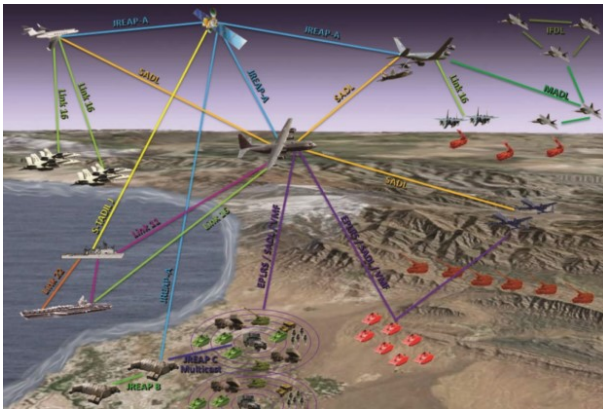
Tel: +82-63-290-1632, Fax: +82-63-290-1632

Assistant Professor Dept. of Military Science, Woosuk University, Korea

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according to the concept of airland battle which is newly established by the U.S. military in the Gulf War, the C4ISR's advanced weapons system can end the war early. In the case of the "manpower war," which reached its peak in the Napoleonic Wars in the past, the main target was the enemy's combatants, while the second-generation war was the "fire war" at its peak in World War I. The Third Generation War was the first "Motor War" attempted during World War II, and it was a war that caused psychological confusion to the enemy and pursued combat missions [4]. The fourth-generation war, which evolved based on these first, second, and third-generation wars, can be said to be a combination of artificial intelligence-based, cyber warfare, or platform combat that transcends time and space [5].

As the information civilization era becomes ubiquitous, all advanced science and information technology, including computer chips, communication bands, new materials, genes and life sciences, computer science, information technology international standards, and public software, are rapidly changing. In particular, the breakthrough development of information technology is fundamentally changing the war pattern, and as shown in the recent war, it is changing in the form of network-centered warfare, information cyberversion, and robot warfare [5].



Source : Min-Sub Jung, et. al(2012).

Figure 1. Battle of mosaic



Source : Min-Sub Jung, et. al(2012).

Figure 2. Battle of mosaic

In addition, artificial intelligence will judge the situation and present an optimal alternative, and machines will replace humans in many fields, such as unmanned autonomous robots fighting with enemies on their own at the battle site. In other words, the physical space of the battlefield is expected to expand beyond the ground, sea, and air to space and be superconnected to cyberspace. Future warfare will be super-connected to the network, and the proportion and importance of the cyber domain will increase significantly, in other words, victory or defeat will be determined by invisible aspects [6].

Unmanned combat systems have already been used in battlefields only for some equipment such as UAVs since the early 2000s, but in the future, unmanned combat systems will be more generalized and advanced, and fighter jets, helicopters, armored vehicles, tanks, and combat vehicles will be unmanned and intelligent without direct human intervention [6]. In particular, as individual and cluster drones are developed into new combat systems, they will become a major ground combat vehicle in the future, and a more drastic change is that the subject of combat will gradually be replaced from human combatants to combat robots [6].

↑ Return to Competition ↓ Armed Conflict ↓ Competition	Strategic Support Area Friendly area; where friendly strategic and national forces gain their combat power, sustain operations, and project power into the Support, Close, and Deep Areas	Operational Support Area Friendly area; where friendly operational forces gain their combat power, sustain operations and project power into the Support, Close, and Deep Areas	Tactical Support Area Friendly area; Where friendly tactical forces gain their combat power, sustain operations and project power into the Close and Deep Areas	Close Area Friendly areas in the competitor's "near abroad", the focus of their strategic aims which U.S forces and allies must protect, defend, and liberate, when necessary. Ground forces operate here.	Deep Maneuver Area	Operational Deep Fires Area Competitor's non-permissive area where all-domain fires originate, targetable by friendly; only special operations forces (SOF) ground forces operate here	Strategic Deep Fires Area Competitor's non-permissive, policy-restricted area where all-domain fires originate
	5000s+ km	1500s+ km	500s+ km	200s+ km		500s+ km	1000s+ km

Source : U.S. Army(2018).

Figure 3. United states army's battlefield area

They will perform combat missions autonomously without direct command and control by humans at the battle site, such as exchanging information based on hyper-connected and super-intelligence to identify the battlefield situation, judge on their own, and take autonomous situation measures [6]. In the past, subordinate units had limited intelligence surveillance and reduced comprehensive judgment, relying heavily on intelligence and detailed operational instructions from superior units, but future small-unit combatants and unmanned combat systems (Edges or Units) will be able to act on their own without specific operational instructions from upper units or commanders. Under the super-intelligent and hyper-connected operational environment, cyber warfare is a key field that determines the overall war, and it is necessary to establish an operational execution system by artificial intelligence [6].

In addition, the concept of manned-unmanned teaming combat in which combatants and autonomous weapons systems jointly operate should be established, including them, and a network-based combat platform that structures interactions between big data, clouds, artificial intelligence, and command centers [6]. In order to win the cyber version of the future, it must first be prepared for any type of cyber threat, and prepared for cyber preparedness to strike the origin at the same time as identifying the cyber threat [6].

To this end, a plurality of artificial intelligence specialized for a specific function in the cyber area is modularized and designed and operated [6]. This is because hyper-connected networks have complex and complex structures that are connected to numerous sub-networks and objects, limiting timely and appropriate responses by manpower alone [6]. Cyber artificial intelligence modules between cyber battlefields should be combined and operated [6].

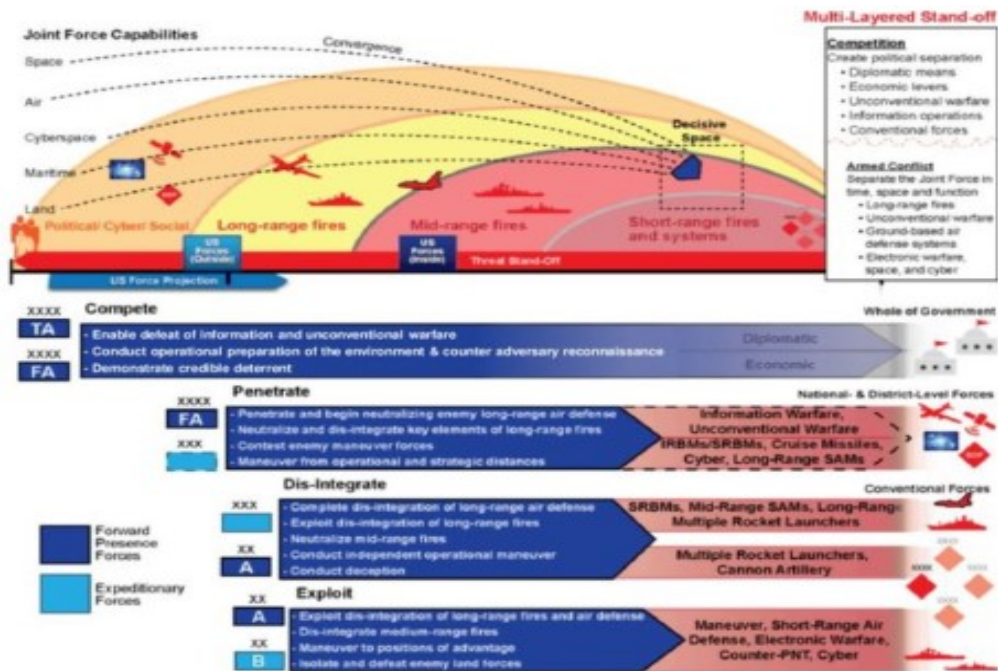
3. ANALYSIS OF MANNED-UNMANNED TEAMING IN MILITARY ADVANCED COUNTRY

3.1 US "Squad-X" Program

The "Squad-X" program is a fundamental element of the Revolution in Military Affairs (RMA) for the future infantry units of the US Army and Marine Corps [7].

The ultimate background driving factor behind the "Squad-X" program is the increasing possibility of large-scale combat operations between the US and China, with China creating a virtual chain of islands in the South

China Sea and Pacific to deny access to the US and the Western world [7]. The US refers to this as Anti-Access/Area Denial (A2/AD) [7] and is organizing the Quad with Japan, Australia, and India to attempt to encircle and isolate China. To carry out these operations, the US Army has developed the concept of Multi-Domain Operations (MDO) [7]. This means that each branch of the military would integrate ground, sea, air, cyberspace, electronic, and space operations in two or more domains beyond their traditional domains [7].



Source : U.S. Army Future Command (2022).

Figure 4. United states army's multi-area operational system

3.2 ISRAEL'S 'DIGITAL ARMY' PROGRAM

The Digital Army Program (DAP) being pursued by the Israel Defense Forces (IDF) involves the integration of unmanned tactical vehicles (Guardian), dog-horse robots (RHEX), unmanned armored vehicles (Carmel), and other core technologies of the Fourth Industrial Revolution to transform the structure of the military into a combination of manned and unmanned forces [8].

Since 2001, the Israeli Ministry of Defense has conducted research to develop the existing C2 (Command ·Control) system into a C4I (Command ·Control ·Communication ·Computer ·Intelligence) system to implement digitalization of the battlefield, which is representative of network-centric warfare [8]. The DAP began in earnest with a 10-year contract with Elbit Systems in December 2004 [9]. DAP is designed to implement an advanced combat concept that increases the efficiency and interoperability of operations across all ground forces in all combat situations under the concept of integrated operations [8].

The first application of DAP was in 2005 when the location of soldiers and vehicles in a battalion responsible for border operations in the Gaza Strip and West Bank was displayed on a digital map [8]. The main features of DAP are improving the cooperative ability and situational awareness between units at various command levels to enable more efficient utilization of force, and maximizing combat efficiency by connecting combat platforms operated in multiple domains [8].



Source : Sang-Keun Cho, et. al(2023).

Figure 4. DAP in the Israeli ground forces

4. DISCUSSION ON THE DEVELOPMENT DIRECTION OF COMBAT PERFORMANCE IN THE ARMY

The development process of the army's unmanned and manned combat performance is as follows. The formation of an unmanned system considering the control ability of combat personnel. This will allow for both unmanned and manned combat performance by considering a one-to-one unmanned system (combat load, etc.). In addition, in the context of military innovation (RMA), multi-faceted research on the concept, structure, and weapon systems of unmanned and manned systems should be conducted.

Finally, human combat personnel, autonomous combat weapons, and combat units will be connected to a single platform and perform combat missions.

First, if we design the concept of unmanned and manned combat performance in the army, it will be as follows. Artificial intelligence-based autonomous robots and human combat personnel must work together to perform combat and play a role in a multi-domain battle that disables the enemy's strategic center in a hyper-connected battlefield environment.

The key to unmanned and manned combat will be the intelligent robot system. To achieve unmanned and manned combat, multi-sensors such as heat or sound are used to collect enemy information, and the data is analyzed by artificial intelligence and reported to the commander. Super soldiers and intelligent robots perform missions in a mixed manner, with human combat personnel wearing autonomous flight-capable robot suits and forming teams with autonomous robots to control them. Real-time communication between unmanned and manned combat systems is also possible. To build the foundation of such unmanned and manned combat systems, human combat personnel, autonomous combat weapons, and combat units are connected to a single platform, and the mix ratio of unmanned and manned combat is differentiated according to the nature and level of danger of the combat mission.

5. CONCLUSION

The future combat performance of the army should effectively utilize the key capability of unmanned combat robots to achieve "shortest time, minimum damage, maximum effect" by neutralizing the enemy's center of gravity through the interaction of the prevision, pre-decision, attack, defense, and support system. To this end, military science and technology should be developed and the future trends of warfare should be

tailored to fit Korean characteristics. It is also necessary to concretize the concept of unmanned combat performance, establish a basic system for efficient combat performance, and utilize it as a game changer for the future.

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