THE IMPORTANCE OF ELECTRONIC WARFARE SYSTEMS IN THE SECURITY OF THE FUTURE

AND

TURKEY'S ELECTRONİC WARFARE SYSTEMS

Contents

THE IMPORTANCE OF ELECTRONIC WARFARE SYSTEMS IN THE SECURITY OF THE FUTURE

AND

Turkey's Electronic Warfare Systems

ABSTRACT

Security has always been the most important point of view to understand international relations and to make sense of state behavior. However, there is already in-depth debate on a precise definition of security in international relations. When it is looked at, the security has been within the framework of a variable meaning in the period from ancient times to the present and has gained different meanings depending on the truths of the period it is in. In addition, changes that occurred during the period caused changes and transformations in the conceptual meanings that security gained. Looking at today's age, the concepts of conflict and war have evolved from a classical structure to a multi-actor, multi-dimensional and flexible structure. With the development of information technologies and increasing globalization, cyber and information fields have been added to war programs, and today security is mostly shaped by the hybrid war model in which cyber and information technologies are active. Electronic warfare systems, which were used before the hybrid war model, needed improvement with the change and development of information technologies and warring elements, and gained great importance in terms of support, defense and offensive gains and combat capabilities. Electronic warfare systems, which are an indispensable gain factor of today's war model, are also very important in the security of the future.

In this study, the hybrid warfare model, which is a sub-tab of new generation wars, and electronic warfare systems, which are very impressive and added value for future security, the usage purposes of these systems and the advantages they bring to the state or non-state actors using these systems in the conflict zone.

1. Introduction

According to Kenneth Waltz, classical philosophers have different views and differences of opinion about the factors causing war[1]. While some of these philosophers argue that wars stem from the reflection of human anarchic structure on state behavior, the other part argues that the state's own pure structure is an important and decisive factor in the outbreak of wars. Against this, another part accepts that the anarchic structure of the international system, rather than human or state nature, is effective in the wars. On the other hand, in the light of these discussions, Kenneth Waltz states that there are fundamental differences between philosophers that the action of conflict or war, which cannot be reached an agreement, can be reduced or eliminated altogether. In this case, it is seen that the differences of ideas between the Realist and Idealist thought bases arise in the discussion of whether war or conflict is an absolute phenomenon based on human nature within the perspective of international relations.

Thinkers who have these basic views generally appear as realist and idealist thinkers based on Hobbes and Kantian traditions. In addition to these two basic views, Grotiusian thought reveals a different perspective in international relations. Hobbesian-minded thinkers, known as realists, argue that the violent structure of the world in which we are located will not change. On the other hand, the Kantist view, known as an idealist, argues that it may be possible to go beyond the conflict situation that developed due to violence and to make the world environment more peaceful. On the other hand, Grotiusian thinkers argue that it is not impossible to completely eliminate conflict and war actions, but it is a very difficult situation and at the same time, rules and norms can be developed that will reduce the numerical value of conflict and war actions (Wight, 1979).

The issue of ending conflict and war actions has become a central point in the work of international relations, which has emerged as a systematic academic discipline since the end of the First World War. While the League of Nations, which was established after the First World War, appeared as a structure that would reveal the linearity of the idealist thought in this regard, the Second World War that followed came almost as a picture of the failure of this theory.

---

[1] Kenneth N. Waltz, Man, The State and War: A Theoretical Analysis, New York, Colombia University Press, 1954.

In the post-World War II era and the Cold War eras, the subsequent period demonstrated the periodical linearity of the thoughts that ideologies had over war or conflict, but it was revealed that no views or thoughts could be based or permanent and were always in deficiency.

While every new war period that arises reveals that it is not possible to end the conflict and the definitive end of the war in the global system, on the other hand, there are differences in the period of wars or conflicts and the parties involved in this action develop themselves in each new period, thus the nature of the conflict and war actions. The fact that it has changed has emerged. Unfortunately, the issue of ending war and conflict actions, which have been done a lot of work for many years, could not reveal a model that has succeeded in international relations.

These clashes and war periods, which already have a classification, first describe it as the first-generation war. The source of this qualification is the form of action in which the human power was used as a whole in the war or conflict action in question, and the regular armies participated in the conflict in the lines and branches. The second-generation war that follows comes as a form of war based on intense firepower, for example, seen in the First World War. The third generation war in another level is known as a form of war where the maneuverability and real-time communication and correspondence we see in World War II are of great importance, and strategies such as infiltration, containment and isolation by destruction against enemy elements[2].

Today, the existence of a new generation war or conflict strategy is accepted in the world. This new understanding, called the fourth-generation war, highlights asymmetric actions that warring or fighting elements have applied against each other using advanced technological possibilities. The importance and surplus of information technologies and especially cyber or informatics fields have increased and proved itself in these fourth-generation wars or conflicts determined as the understanding of war in the period we are in. In this context, electronic warfare systems, which contribute a lot to the support, defense and attack capabilities in new generation wars or conflicts, appear as an issue that cannot be ignored in military technology in order to gain profit (Ertürk, 2013).

---

[2] : Canan-Sokullu, Ebru, "Savaş Türleri", Güvenlik Yazıları Serisi, No.22, Ekim 2019.
https://trguvenlikportali.com/wpcontent/uploads/2019/11/SavasTurleri_EbruCananSokullu_v.1.pdf

2. History of Electronic Warfare

High-tech weapons and tactics based on them have always been advantageous in wars or conflicts, and the development of countermeasures or countermeasure strategies in this direction is not just a topic that has recently emerged or has been used. The use of electrical, electronic and electromagnetic spectra during the war showed that electronic signals could spread over a field by a study conducted by German Heinrich Hertz in 1888[3]. Shortly after this study, the states started to use this electronic signal technology for military purposes in order to develop traditional operations for advanced communication tool, navigation service, targeting and detection of conflict area. This development in the military field has undoubtedly made the electromagnetic spectrum and radar systems an even more important tool for states.

Following the developments, the first example of the Electronic Warfare in active field conflicts is encountered during the Russian-Japanese war between 1904-1905. During the war, the Russians squeezed the communication signals of Japanese warships to control the sea fire from Arthur Harbor. The Electronic Warfare, which emerged as a successful strategy with this tactic, became more and more important during the Second World War and its balance changing feature was fully understood here[4]. On the other hand, Electronic Warfare systems were recorded to be used to attack or disable the enemy elements on the radar, communication and navigation systems in the war named as "Battle of the Beams" by Winston Churchill. In addition, in the Battle of Çanakkale in 1915, the Star Wireless Radio Station was connected to the communication frequency of the Queen Elizabeth warship with the flying elements and the shelling was unsuccessful with radio mixing action.

In addition, electronic warfare systems, which first made progress in the Vietnam War, demonstrated its importance during the 1991 Gulf War and signaled that it would be an indispensable system. However, the use of electronic warfare systems in these wars or clashes was limited to jammers used against explosives controlled by enemy elements with remote control.

Besides, NATO, which ignored the development of electronic warfare systems for a long time, has taken the electronic warfare systems into the lens, even as a result of the developments seen in today's security environment. The fact that information technologies and

---

[3] Heinrich Hertz, Electric Waves: Being Researches on Propagation of Electric Actions with Finite Velocity Through Space, Macmillan 1893.

[4] Vladimir Semenoff, The Russo – Japanese War at Sea 1904–5: Volume 1 – Port Arthur, the Battles of the Yellow Sea.

cyber areas are widely used within the scope of the security threat and block countries such as Russia and China have made great investments in this area, and caused NATO to make improvements in this area and to strengthen the defense and response mechanisms against threats that may arise. Recently, Russian-backed special forces in eastern Ukraine have used the complex compression and intervention strategy to neutralize the communication and observation drones. In other words, these electronic warfare systems, the first usage records of which were found in 1904, have evolved until today with the development of each new period conflict and today they have become an indispensable operational instrument of the armies or warring elements.

3. Electronic Warfare Systems

Today, the electromagnetic spectrum (EMS) is used in remote control devices and many electronic devices that take up a lot of space in our lives, such as smartphones. This technology, which is present in all areas of our lives, is of course at a very important point, which is used to increase operational efficiency and achieve absolute success among the military systems of the states. As we have already mentioned, electronic warfare systems have been an effective tool to meet and strengthen the need of defense in the event of a possible conflict or war after the invention of radar.

When we look at the last years of the century we are in, the importance of electronic warfare systems has increased in order to provide security with the development of the military and operational capabilities of the systems that have EMS. The fact that these systems, which did not attract the attention of NATO especially in the first phase of their use, have been brought to the agenda as a matter of priority in NATO development recently, reveals the importance of these systems.

While electronic warfare systems appear to be a system that Russia and China mostly emphasize, with the understanding of the share behind the successes in the field, technologically developed and developing countries have become an important issue especially in terms of closing the deficit. This system, which is very effective in the use of autonomous weapons in general and in providing vision, intelligence and management support to active elements in the field, is also very reliable and effective with tactics such as information transfer, misleading, signal cutting, signal strangling and target surprise on the electromagnetic fields of enemy elements. reveals an operational capability.

Russia, which is one of the most actively using electronic warfare systems, has shown the level of electronic warfare capabilities, especially in Syria. Russia, which utilized electronic warfare systems mostly through signal cutters in the Syrian field, has frequently interrupted the communication between the troops in the operations carried out using the US warplanes and unmanned aerial vehicles, according to the statement made by the US Special Operations Commander General Raymond Thomas in August 2018. It is known to be. In addition, in 2017, it was noted that Russia, which uses electronic warfare systems intensely at its borders during ZAPAD exercise, caused problems in GPS and mobile networks due to confusing signals in regions such as Baltic countries and Norway (Lagneau, 2018).

On the other hand, as we said before, one of the countries that actively use and develop electronic warfare systems is China. In general, China, which is not active in many conflict areas around the world and uses the soft power factor like global economy in global expansion, has made great efforts to nationalize and develop its military industry by taking big steps within the scope of technological developments in recent years. The biggest source of China in the South China Sea is the struggle of China, which has developed electronic warfare systems or more radar systems in an integrated manner not only in land areas but especially in water-mobility elements.

The USA, which is the biggest user of electronic warfare systems, paid more attention to this issue, especially with the Vietnam War and the Gulf War. The US, which first turned unmanned aerial vehicles used for reconnaissance and surveillance into a flying electromagnetic spy, showed its greatest development with spy ships that it added to its navy. The USA, which uses the electronic warfare system actively from the sea, unmanned aerial vehicles and air, which has the capacity to access a very large radar network, finally added a vehicle that could detect and compress enemy communications and networks to the land army inventory in 2018, showed that he was actively benefiting.

In terms of its general scope, the electronic warfare systems in question are divided into different departments and functions within themselves in case of a possible or current operation, conflict or war. These systems, which are responsible for various tasks in use, are not only used in one way, such as assault or just defense in possible conflict situations, but also against active elements such as espionage, assault support and protection support in developing cyber areas and also for information flow and intelligence. it is used.

As a result of information technology and cyber space developing in today's conflict and struggle environment, being able to control and control over the electromagnetic spectrum used in military fields is one of the biggest works to be done in terms of defense. The military action statement used by the U.S. Department of Defense for the definition of electronic warfare, which is used to control the electronic spectrum and attack the enemy using electromagnetic and directed energy, is a sufficient explanation to clearly state the purposes and areas of use of electronic warfare and electronic warfare systems.

When electronic warfare is analyzed in this context, it can be examined under three main headings as Electronic Attack (EA), Electronic Defense (ED) and Electronic Support (ES) for purposes.

3.1. Electronic Attack (EA)

The electronic attack carried out within the scope of electronic warfare generally includes the action of preventing enemy elements from using activities such as radar that can use electromagnetic energy. The purpose of this stage of electronic warfare is to prevent or largely prevent enemy elements from using the electromagnetic spectrum effectively. This phase, which is mostly used in an integrated and coordinated manner with flying air elements in today's examples, appears as an effective form of attack in order to minimize operational cost and loss of life and to react more quickly to possible counter attacks. At the same time, the electronic attack phase consists of two stages as active assault and passive attack (Yaylacı, 2020).

3.1.1. Active Electronic Attack

Active electronic attack, which is a stage of electronic attack, is an action used for purposes such as mixing and misleading the radio communication of enemy elements by breaking the frequencies, covering the frequency range used by the enemy as well as high power[5].

3.1.2. Passive Electronic Attack

Passive electronic assault, another stage of electronic assault, is a form of assault left especially by warplanes to surprise radars. We can say that this system, which generally involves deceptive and confusing actions, does not have hot contacts and is actually called

---

[5] Yaylacı, M. (2020). Elektronik Harp Nedir?. Retrieved from: https://www.savunmasanayist.com/elektronik-harp-nedir/

passive electronic assault, although it may appear as part of the electronic defense phase, even though it is mostly involved in offensive actions.

3.2. Electronic Defense (ED)

The purpose of electronic defense, another stage of electronic warfare, is to protect the generally owned electromagnetic spectrum, that is, electronic elements, communication tools and channels, and systems of operational importance such as electronic system infrastructure from electronic attacks that may come from hostile elements. When looking at the systems used in the defense phase of the electronic war, systems such as self-protection, warning receiver and radar frequency mixer are seen (Osmanoğlu, 2019).

3.3. Electronic Support (ES)

Electronic support, which constitutes another stage of the electronic warfare, is used to detect the positions, movement flows, speeds, firepower and communication contents of the friend or enemy elements in the conflict or war zone, and to find the signals emitted by the enemy elements. It is stated as a system that has a great influence on its analysis. Thanks to this system, states can make important strategic decisions at the political and military level. At the same time, electronic support provides the most accurate selection of tactics in the event of a possible war, operation or conflict. If we mention the most important feature of the electronic support phase, it is very difficult to detect and detect by the enemy element since it does not reveal any electromagnetic traces against the enemy elements in the region in terms of being a passive usage form in general[6].

4. Republic of Turkey and the Defense Industry

Ongoing development of the defense industry since its establishment until the present day Republic of Turkey and investigate possible changes in four main phases of the period. We can classify these periods as 1923-1950, 1950-1974, 1974-1998 and finally 1998 and after.

4.1. 1923-1950 Period

---

[6] Osmanoğlu, O. (2019). Görünmez Savaş 'Elektronik Harp'. Retrieved from:
https://www.ceyrekmuhendis.com/gorunmez-savas-elektronik-harp/

Mustafa Kemal Atatürk emphasized that it is very important to crown military victories with economic victories after the establishment of the republic. As a result of this result, in the period between 1923 and 1950, when Atatürkist thought was also very effective, industrialization was supported as a state policy. In this period, the state, leading the industrialization, supported its establishment by financing rather large industrial facilities such as sugar and textile factories that the private sector could not establish.

State policies, which show the same support in the defense industry, which is an important element of security, prioritized national production policy in this regard. In this period, industrial establishments, the majority of which belonged to the state, gathered under one roof in the following period and formed the Machinery and Chemical Industry Corporation.

At the same time, the initiation of relevant technical training and the establishment of technology centers were supported in order to strengthen the basis of the national production program. As an example, we can say that the establishment of the aircraft and engine factory in Ankara for the establishment of the national aviation industry, the establishment of wind tunnels for testing works, the opening of aircraft engineering at Istanbul Technical University.

4.2. 1950-1974 Period

Looking at the developments achieved in the previous period, we can see that the state deviated from the development and strengthening policy of the defense industry in the period between 1950 and 1974. In this period, the state prioritized a policy of defense industry development, based on imports rather than supporting national production. The original technology production required for defense systems, which is one of the main elements of security, was left in this period, even the wind tunnel, which was ready to be used in 1950, was not used and the need for defense system was tried to be provided mostly by borrowing, purchasing or conditional aid from foreign countries.

4.3. 1974-1998 Period

The date of 1974 is of great importance for the policies in the defense industry. Cyprus Peace Operation on the specified date as a result of the decision of the Republic of Turkey to implement the arms embargo, by authority of the state has been a major factor in the return to policies aimed at improving the defense industry. As a result of this situation, military foundations and state authority established new companies such as Aselsan, Havelsan, İşbir and

Aspilsan and supported their establishment with incentives. However, entrepreneurship was mostly supported by military foundations by the establishment of these companies.

The state initiative for the development of the defense industry and the transition from nationality to the production of domestic systems was seen later than the military foundation initiatives mentioned above. These subsidies provided by the state were also made through the Defense Industry Support Administration, which was established under the Ministry of National Defense. This establishment was transformed into the Undersecretariat for Defense Industries in the following years.

With the law numbered 3238 issued in this period, it became one of its priorities to support the defense industry facilities to be established in our country with the 'foreign capital and technology contribution of the public and private sectors'. At the same time, this law appears as a law on the establishment of the Undersecretariat for Defense Industries. After this step, many partner companies such as FNSS, Marconi, Mikes, Ayesaş were established across the country and large production projects tenders were created. State policy of foreign companies that have more technology at that time, was headed to production in Turkey with Turkish partner companies.

In this period, it was seen that the efforts for the development of the defense industry were not based on any national policy or strategy. Aselsan company, a military foundation company, was similar to the industrial policy implemented in the period of 1923-1950 under the leadership of the General Manager M. Hacim Kamoy. has followed the national technology development policy. In this context, Aselsan company;

- The importance of design and technology in the defense industry
- A technology that fulfills features such as competitive advantage, confidentiality and reliability is not shared with other manufacturers.
- Due to the technology being state-controlled, it has developed production and research with the principles of the necessity of national production without technology or knowledge transfer.

Aselsan company managed by Hacim Kamoy has succeeded in adding 115 devices and systems on average until 2000, as a result of developments. 95 of the mentioned products emerge as original products with advanced technology, which are produced by Turkish engineers as a result of collaborations with universities. The important detail here is that these products are highly competitive, have low external dependencies, and are tactical such as'

Frequency Hopping Radios, Electronic Warfare Systems, Land Surveillance Radars, Tactical Field Battle System, Pedestal Mounted Stinger and Thermal Camera Systems. are products that will provide an advantage (Ziylan).

4.4. The Period From 1998 to Today

Since 1998, starting in the 1975-1988 period based on the experiences of Turkey's defense industry development adopted at the interval Defense Industry Policy and Strategy Principles comes to the fore. This study was prepared with the focus of technology and divided the required technologies into three groups as compulsory nationality, critical and other technologies. This distinction is important in terms of developing stable projects for the technologies needed by the country and adopting an institutionalized approach. On the other hand, the 'compulsory nationality' and 'critical' group were created to ensure the stability and safety of the technologies produced, based on the prevention of projects leakage, the lack of information transfer, the development of the domestic industry in production. If these criteria are met in Turkey improved national technology and to compete with foreign firms can become a national defense industry companies might occur.

5. Study Electronic Warfare and Electronic Warfare Systems in Turkey
5.1. Developments in The Field of Electronic Warfare

It has unique wars that have occurred in line with the opportunities it has been in every period. Technological, ideological and structural changes and developments during the period also have a significant impact on the war or conflict areas of the current period. New opinions emerging in the context of this conclusion reveal that the wars or conflicts of the future will be mostly in the fields of electronics, informatics and cyber. Especially in the strategy, which shows itself prominently in the 1991 Gulf War, it is a very effective tool to win the war by ensuring that the enemy elements lose their functionality by suppressing or controlling the electronic command control systems with electronic attacks. The intelligence, communication and command-control network established between the allied groups during the war provides the opportunity to monitor the conflict area from a wide angle. The way to deprive enemy elements from the same advantage is to implement the electronic offensive phase with electronic warfare systems. In this way, enemy elements will be prevented from seeing the conflict area from a wide perspective, and strategy change, moves and attack power will be provided more actively and reliably.

In the Republic of Turkey, these issues especially in informatics, such as Aselsan and advanced technology on the work that the companies very well by starting with them many electronic attack extant, defense and support systems have been developed and Turkey have brought to the Armed Forces and still continue to win.

6. Turkey's Electronic Warfare Systems

Especially left behind the period, taking lessons from the past without ignoring emphasis on national-tech manufacturing Republic of Turkey, technology and manufacturing on defense industry and the support of many companies, such as projects to develop Aselsan offers in every field. In return, it uses the electronic warfare systems, which it obtains in return for this support, both in the fight against terrorism, in ensuring border security and in protecting the security and peace of the public. When viewed quickly and walking confidently Republic of Turkey in the national technology manufacturing state, assault electronics that have joined the Army inventory, the region in which the defense and support systems have gained a lot of power and have an advantage in getting the results he wanted.

6.1. Electronic Defense Activities in the Turkish Armed Forces Inventory

6.1.1. Frequency-hopping Spread Spektrum

This activity is the activity of randomly sharing the signals to multiple frequencies or changing the channel in order to prevent the enemy from detecting radio signals. Frequency-hopping Spread Spectrum (FHSS) activity is much safer in the face of the enemy's signal shuffling activities than single-channel radio communication.

6.1.2. Automated Gain Control

Automated Gain Control (AGC) monitors the receiver output power and adjusts the gain so that the output power is always at the same level.

6.1.3. Electronic Masking

Electronic Masking activity is the use of non-hazardous electromagnetic energy and allied communications and electronic systems in a controlled manner against enemy electronic warfare support measures.

6.1.4. Broadcast Control

It is the selective and controlled use of electromagnetic, acoustic and other emission sources for the safety of the operation.

6.1.5. Side Beam Suppression

In order to reduce the effect of noise and intentional blending that degrades the performance of radar and communication systems using phase shift antennas, these signals are suppressed by shifting the zero points of the antenna's radiation pattern to the points where the mixers are located or in the direction of unwanted signals.

6.2. Electronic Support Systems in the Turkish Armed Forces Inventory
6.2.1. MILKED-3S3

MİLKED-3S3 Fixed V / UHF Shortcut and Listening System has been developed by ASELSAN in order to rest, find directions and determine the positions of the broadcasts in the V / UHF band in the frequency range of 20-3000 MHz. Thanks to its specially designed shortcut antenna, MILKED-3S3 provides accurate and stable direction information for target broadcasts. With the use of two or more systems, it can determine the location on the digital map for target broadcasts[7].

6.2.2. ARES-2LC/T

ARES-2LC / T ED / ELINT System produced by ASELSAN; It has detection, diagnosis and classification features of radars on air, land and sea platforms. The system, which is portable and can be put into use in a short time by only four, five personnel, can be easily transferred to the areas that mobile systems cannot reach in the war field[8].

6.2.3. Radar Electronic Support System

---

[7] Aselsan, "MİLKED-3S3 Sabit V/Uhf Kestirme Ve Dinleme Sistemi", https://www.aselsan.com.tr/c71c3c3f-6500-4dfe-9867- 50686dea7ba7.pdf. (Erişim Tarihi: 22 Temmuz 2019

[8] Aselsan, "Man-Pack ESM/ELINT System ARES-2LC/T", https:// www.aselsan.com.tr/tr-tr/cozumlerimiz/elektronik-harp-sistemleri/elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/man-pack-esm-el%C4%B1nt-system-ares-2lc-t. (Erişim Tarihi: 22 Temmuz 2019)

Radar Electronic Support System; Threat radars are used to detect, diagnose and find directions. The diagnosis of target radars can be made instantly by comparing the threat parameters measured by the system with the data received from the library[9].

6.2.4. ARES-2N

ARES-2N is a Marine Platform Radar Electronic Support system. It has the capabilities of detection, diagnostics, classification, tracking, navigation, locating, audible warning, platform association and electromagnetic broadcast recording. The broadband structure gives the system the ability to detect very high. The high processing speed and sensitivity level provides the ability to detect long distance and detect low output radars[10].

6.2.5. ARES-2SC/NS

It was developed by ASELSAN in order to carry out Radar Electronic Support activities of submarine platforms with national and modern technologies. At the first stage, the system integrated into two AY Class (Type 209) Submarine platforms forms the basis of ARES-2NS Submarine Radar ED System, which is being developed by ASELSAN for New Type Submarine (Type 214) Platforms. For radar systems broadcasting in the 2-18 GHz band including ARES-2SC, LPI Radars; It is designed to perform functions such as detection, diagnosis, identification, display in suitable format, automatic and manual recording and playback capability[11].

6.3. Electronic Attack Systems in the Turkish Armed Forces Inventory
6.3.1. REDET

---

[9] Aselsan, "Radar Elektronik Destek (ED) Sistemi", https://www. aselsan.com.tr/tr-tr/cozumlerimiz/elektronik-harp-sistemleri/ elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/radar-elektronik-destek-(ed)-sistemi. (Erişim Tarihi: 22 Temmuz 2019)

[10] Aselsan, "Deniz Platformu Radar Elektronik Destek (ED) Sistemi ARES-2N", https://www.aselsan.com.tr/tr-tr/cozumlerimiz/elektronik-harp-sistemleri/elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/deniz-platformu-radar-elektronik-destek-(ed)-sistemi-ares-2n. (Erişim Tarihi: 22 Temmuz 2019)

[11] Aselsan, "Denizaltı Radar Elektronik Destek Sistemi ARES-2SC/ NS", https://www.aselsan.com.tr/tr-tr/cozumlerimiz/elektronik-harp-sistemleri/elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/denizalti-radar-elektronik-destek-sistemi-ares-2sc-ns. (Erişim Tarihi: 22 Temmuz 2019)

Radar Electronic Support and Electronic Attack System (REDET), produced by ASELSAN, is a product with electronic support function as well as electronic attack. The electronic support function of REDET, which is to detect the enemy radars in the tactical field, is to attack and deceive the target radars whose positions are determined during the attack phase. It also transmits the signs of mixing or deception in noise or different modulation while performing the attack function[12].

6.3.2. HAVA SOJ

Remote Electronic Support and Electronic Attack System (HAVASOJ) on the Air Platform, which has both offensive and support functions, is still under construction even though it is not in the army inventory. It is an air platform product that will be used for the detection of radars of enemy communication systems and air defense and early warning systems and to prevent the use of detected systems against friendly elements especially in cross-border operation[13].

6.3.3. KARA SOJ

It aims to deactivate the command control and air defense systems of enemy elements by creating a weakness in the detection and tracking capability of the target element's early warning and air defense radar systems in the operational zone with the Land Based Remote Electronic Support and Electronic Assault System (KARASOJ). This system, which performs the detection, diagnosis and direction finding functions of radar broadcasts, undertakes the task of mixing, deceiving and rendering it useless[14].

6.3.4. RFKS

The Radar Frequency Mixer System (RFKS) acts in coordination with the Radar Warning System, ensuring that the aerial platforms are protected from radar threats. RFKS, a

---

[12] Aselsan, "Radar Elektronik Taarruz (ET) Sistemi", https://www. aselsan.com.tr/tr/cozumlerimiz/elektronik-harp-sistemleri/elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/radar-elektronik-taarruz-et-sistemi. (Erişim Tarihi: 22 Temmuz 2019)

[13] T.C. Cumhurbaşkanlığı Savunma Sanayii Başkanlığı, "HAVA SOJ", https://www.ssb.gov.tr/website/ContentList.aspx?PageID=1081&langID=1. (Erişim Tarihi: 22 Temmuz 2019)

[14] Aselsan, "KORAL MOBİL RADAR EH SİSTEMİ", https://www. aselsan.com.tr/tr-tr/basin-odasi/Brosurler/Elektronik-Harp-Sistemleri/KORAL_TR.pdf. (Erişim Tarihi: 22 Temmuz 2019)

DRFM based deception system, performs threat tracking and threat-specific mixing and deception functions in the broad frequency band[15].

6.3.5. SPEWS-II

This system, called SPEWS-II, is a self-protection system developed for F-16C Block-50 aircraft in the Turkish Air Force inventory. This product, which was developed by ASELSAN and BAE Systems, consists of a radar warning system and radar deceptive and mixer working integrated with it[16].

6.3.6. EHPOD

Electronic Warfare POD (EHPOD), developed by TUBITAK BILGEM, is an electronic warfare system designed for self-protection for the F-16 Aircraft. This system, which is also used to mix or mislead enemy radars, has the ability to create multiple false targets on the radar screen, hide real targets and move them randomly[17].

6.3.7. HEHSIS (HEWS)

Helicopter Electronic Warfare Self Protection System (HEHSIS) is an integrated system developed by ASELSAN for fixed and rotary wing air elements. This electronic warfare system, which includes the Radar Warning Receiver System (RWR), the Missile Warning System (MWS), the Laser Warning Receiver System (LWR), the Radio Frequency Mixer System (RFJ) and a Counterparting System (CMDS), is in the spectrum thanks to the radio frequency mixer system. It provides coverage and application of advanced countermeasure techniques[18].

6.3.8. GERGEDAN

---

[15] Aselsan, "RFKS RF KARIŞTIRICI SISTEMI", https://www.aselsan.com.tr/tr-tr/basin-odasi/Brosurler/Elektronik-Harp-Sistemleri/RFKS_TR.pdf. (Erişim Tarihi: 22 Temmuz 2019)

[16] T.C. Cumhurbaşkanlığı Savunma Sanayii Başkanlığı, "SPEWSII", https://www.ssb.gov.tr/website/contentlist.aspx?PageID=1344&LangID=1. (Erişim Tarihi: 22 Temmuz 2019)

[17] Millisavunma.com, (2018), "EHPOD Elektronik Harp Podu", (12 Nisan 2018), http://www.millisavunma.com/ehpod-elektronik-harp-podu/. (Erişim Tarihi: 22 Temmuz 2019)

[18] Aselsan, "HEWS", https://www.aselsan.com.tr/tr/cozumlerimiz/ elektronik-harp-sistemleri/elektronik-harp-kendini-koruma-sistemi/hews. (Erişim Tarihi: 22 Temmuz 2019)

Portable Radio Frequency Active Blinding and Mixing System (GERGEDAN), produced by ASELSAN, ensures the prevention of Radio Frequency Controlled Handmade Explosive (RFEYP) substance assemblies and its active mixing application. This system, which also has the ability to be programmed, can be used against multiple threats and can be integrated into any vehicle and easily moved from one vehicle to another[19].

6.3.9. SAPAN

The programmable Active / Reactive Electronic Mixing System (SAPAN) produced by ASELSAN prevents remote explosion of Radio Frequency Controlled Handmade Explosive (RFEYP) device assemblies with active / passive mixing applications. Being a portable system, SAPAN also detects instantaneous trigger signals in the air and propagates the mixing signal, which algorithm neutralizes the trigger signal[20].

6.3.10. KIRPI

The Software Based Mixing System (KIRPI) has been developed against possible attacks with remote control bombs produced by ASELSAN. This system, which has the ability to be programmed, can provide the most effective solution to tactical and operational needs. In addition, in accordance with the frequency and output powers of multiple Radio Frequency Controlled Handmade Explosive (RFEYP) threats that are aimed to be mixed at the same time, the user can define "mixing profiles", such as pedestrian personnel protection, VIP vehicle or service vehicle protection, Bomb Disposal Team protection, and order protection. can be used in applications[21].

---

[19] Aselsan, "GERGEDAN Taşınabilir RF Aktif Köreltme/Karıştırma Sistemi", https://www.aselsan.com.tr/tr/cozumlerimiz/elektronik-harp-sistemleri/elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/sapan-programlanabilir-aktifreaktif-elektronik-karistirma-sistemi. (Erişim Tarihi: 22 Temmuz 2019)

[20] Aselsan, "SAPAN Programlanabilir Aktif/Reaktif Elektronik Karıştırma Sistemi", https://www.aselsan.com.tr/tr/cozumlerimiz/ elektronik-harp-sistemleri/elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/sapan-programlanabilir-aktifreaktif-elektronik-karistirma-sistemi. (Erişim Tarihi: 22 Temmuz 2019)

[21] Aselsan, "KİRPİ Yazılım Tabanlı RFEYP Karıştırma Sistemi", https://www.aselsan.com.tr/tr/cozumlerimiz/elektronik-harp-sistemleri/elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/ kirpi-yazilim-tabanli-rfeyp-karistirma-sistemi. (Erişim Tarihi: 22 Temmuz 2019)

6.3.11. IHASAVAR

IHASAVAR, another electronic warfare system developed by ASELSAN, is designed to neutralize unmanned aerial vehicles that can be used by enemy elements for reconnaissance, espionage, harassment, armed attack and bombing. IHASAVAR Anti-Drone Radar Frequency Mixing and Blinding System provides protection by blocking the drone or mini-UAV flyover with the active mixing application near military facilities / bases, government institution buildings, high-level authorized residences, ceremonial areas, order and control points. IHASAVAR, which has a weapon type design, gives security personnel the ability to remove drone or mini-UAVs as soon as they appear[22].

6.3.12. KANGAL

This system, which has been developed for the protection of vehicles against handmade explosive devices controlled by remote control, covers all frequency bands (VUHF / UHF amateur radios, PMR / FRS radios, remote control devices, ISM Band, Wi-Fi, GSM, 3G, 4.5G, etc.) can prevent potential threats simultaneously. Thanks to its compact structure, KANGAL is a portable independent system, it can be integrated in different types and can be easily transported from vehicle to vehicle[23].

6.3.13. AKKOR

Developed to detect rockets and anti-tank ammunition approaching the ALTAY main battle tank, AKKOR creates a 360-degree protection shield[24].

6.3.14. DAKA

DAKA is Turkey's first submarine torpedo counter measure system. It started on April 15, 2008 and was completed on October 1, 2014. Within the scope of the project, 280 acoustic

---

[22] Aselsan, "İHASAVAR, Anti-Drone RF Karıştırma/Köreltme Sistemi", https://www.aselsan.com.tr/tr-tr/basin-odasi/Brosurler/ Elektronik-Harp-Sistemleri/IHASAVAR_TR.pdf. (Erişim Tarihi: 22 Temmuz 2019)

[23] Aselsan, "KANGAL Araç Tipi Portatif RF Karıştırma/Köreltme Sistemi", https://www.aselsan.com.tr/tr-tr/basin-odasi/Brosurler/ Elektronik-Harp-Sistemleri/KANGAL_TR.pdf. (Erişim Tarihi: 22 Temmuz 2019)

[24] Aselsan, "AKKOR Aktif Koruma Sistemi", https://www.aselsan. com.tr/tr-tr/basin-odasi/Brosurler/Elektronik-Harp-Sistemleri/ AKKOR_TR.pdf. (Erişim Tarihi: 22 Temmuz 2019)

deceptive and mixer for AY class submarines and 360 for Preveze and Gür submarines were produced[25].

6.3.15. ZOKA

Developed by ASELSAN, ZOKA is an acoustic mixer and deceptive system against submarine torpedoes. ZOKA has features that will be effective against all torpedo threats that can operate in active, passive or combined mode with acoustic motive. ZOKA effectors are used in HIZIR Surface Torpedo Countermeasure System and ZARGANA Submarine Torpedo Countermeasure System. There are two different types of ZOKA effectors in both systems, deceiving and mixing. ZOKA mixers broadcast broadband high-level noise, covering the acoustic working frequency range of torpedoes. In this way, while masking submarine noise against passive torpedoes, it increases the ambient noise against active torpedoes and reduces the detection distance of the signal reflected from the submarine[26].

6.3.16. LSS

ASELSAN's Laser Defense System (LSS) has been developed with high energy laser systems to eliminate UAVs up to 500 meters and to neutralize explosives up to 200 meters[27].

6.3.17. SAHI 209

Studies are carried out to bring Directed Energy Weapons to the Turkish Armed Forces. To this end, T.C. Presidency of Defense Industry and Anadolu Direndir Energy Technologies Inc. An agreement was signed between (YETEKNOLOJİ) in May 2018. The weapon, which was produced by YETEKNOLOJİ with the agreement, and named as ŞAHİ 209, was supplied by the Defense Industry Presidency in July 2018. ŞAHİ 209 can push the magnetic field created by high current, ammunition or bullets at very high speeds such as five times the speed of sound. This electromagnetic gun has 1 MegaJoule charging energy, multi-stage and electronic ignition

---

[25] Aselsan, "DAKA Teslimatları Tamam", https://www.aselsan.com. tr/tr/basin-odasi/haber-detay/daka-teslimatlari-tamam.(Erişim Tarihi: 22 Temmuz 2019)

[26] Aselsan, "ZOKA - Akustik Torpido Karşı Tedbir Karıştırıcı ve Aldatıcıları", https://www.aselsan.com.tr/tr/cozumlerimiz/deniz-sistemleri-test/torpido-ve-torpido-karsi-tedbir-sistemleri/zoka-akustik-torpido-karsi-tedbir-karistirici-ve-aldaticilari. (Erişim Tarihi: 22 Temmuz 2019)

[27] Aselsan, "LSS Laser Defence System", https://www.aselsan. com.tr/en-us/press-room/Brochures/Electro-Optic-Systems/ LSS_ENG.pdf. (Erişim Tarihi: 22 Temmuz 2019)

system. It is stated that ŞAHİ 209 can "fire in the missile range at the price of the shell," its power will be further increased and it will be developed for the navy after the ground forces[28].

6.3.18. EJDERHA

EJDERHA is a high power electromagnetic weapon, all of which is domestic design. This weapon, produced by ASELSAN, can produce high power electromagnetic (EM) radiation for a limited time by means of a single pulse or a series of pulses using a specially designed directional antenna / reflector set. Electromagnetic energy produced by High Power Microwave sources is used to prevent the operation of targeted electronic devices, to send them to malfunction or to render them inoperable by being damaged. The EJDERHA has been particularly successful in neutralizing handmade explosives and can also destroy electronic devices used for intelligence purposes[29].

6.3.19. KORAL

The KORAL Electronic Warfare System is a product of a program launched in 2000 with the decision of the Defense Industry Executive Committee (SSIK) to meet the remote electronic mixing (Stand-off Jammer) requirement of the Air Force Command. The KORAL system, which is part of the Land Based Remote ED / ET Capability Project, consists of one Electronic Support (ED) and four Electronic Attack (ET) components. The KORAL system developed by ASELSAN makes a difference in terms of its capabilities among the other systems mentioned above.

Joining the TAF inventory in 2016, KORAL can produce maximum power in a wide frequency range. The best and the nearest functioning experience of Turkey in Syria, which was conducted in Idlib Spring Shield this system, which has shown in the Operation, the flight is closed airspace interact with the flying elements and as one of the success thanks to radar attack caused at the enemy system key actors recorded history. Looking at this system, the importance of which has become much better and understandable after this experience, the power and importance of electronic warfare systems in shaping the war or conflict areas of the future becomes even better. KORAL and such systems are an indispensable element for the Turkish

---

[28] Akşam, (2018), "Türkiye'nin elektromanyetik silahı: ŞAHİ 209", (19 Ekim 2018), https://www.aksam.com.tr/ekonomi/turkiyenin-elektromanyetik-silahi-sahi-209/haber-784823. (Erişim Tarihi: 22 Temmuz 2019)

[29] Aselsan, "EJDERHA Yüksek Güçlü Elektromanyetik Sistem", https://www.aselsan.com.tr/tr-tr/cozumlerimiz/elektronik-harp-sistemleri/elektronik-harp-istihbarat-ve-taarruz-faaliyet-alani/ejderha. (Erişim Tarihi: 22 Temmuz 2019)

Armed Forces and the future to ensure security in the future by successfully performing their duties and ensuring the security of friendly elements by leaving enemy air defense systems and air platform vehicles under intense pressure and ineffectiveness[30].

7. Conclusion

Looking at its historical background, electronic warfare systems, which are a very effective method of winning important victories or achieving operational success, and which have become more important in the conflict or war environments that have changed since the Second World War until today, after the end of the Cold War. for a long time did not receive enough attention. Today, with the changing nature of security - threat perception and the nature of conflict, the importance of electronic warfare systems has reappeared, especially in unstable and unstable conflict situations, and states have made efforts to make rapid developments in this area. US, Russia, China, Israel, Turkey, the UK and some European countries such as global or a regional power candidate states from having advantages in areas of conflict in recent years, only to be connected to military personnel, unlike that cause less loss of life information technology and electronics in areas such as cyber He realized that elements such as warfare systems were even more effective. We can see that we are already in the fourth generation war period and that the threats are not only brought by fierce military equipment, especially the states use hybrid warfare and asymmetric warfare tactics to create pressure on each other, and that areas of war or conflict have evolved and developed within this framework. Considering the effectiveness of the electronic warfare systems we mentioned above in the period when the hybrid and asymmetrical war we are in, are used intensely, it will not be wrong to say that these systems will be one of the key points of the future security parameters.

Especially by developing countries with the desire to become a regional power like Turkey of electronic warfare systems at the point we have reached in this context, it will undoubtedly have a significant impact on new battlefields will emerge in the future. Electronic warfare systems have become and must not be ignored in ensuring security and victory in the next war or conflict areas.

---

[30] Aselsan, "KORAL Mobil Radar EH Sistemi". Retrieved from: https://www.aselsan.com.tr/1a8b7437-1ca0-4652-bd30-d71640c857b2.pdf (Erişim Tarihi: Mart 2017)

References

Akça, S. (2015). Elektronik Harp ve Radar Sistemleri. Retrieved from: https://www.elektrikport.com/teknik-kutuphane/elektronik-harp-ve-radar-sistemleri/15026#ad-image-3

Alemdar, A. (2018). Koral Elektronik Harp Sistemi. Retrieved from: https://kreatifbiri.com/koral-elektronik-harp-sistemi/

Baylis, John, "Uluslararası İlişkilerde Güvenlik Kavramı", Uluslararası İlişkiler, Cilt 5, Sayı 18 (Yaz 2008), s. 69-85

Kamoy, H., M. Türk Savunma Sanayiinin Duayeni ve Önceki Aselsan Genel Müdürü. Retrieved from: http://www.inovasyon.org/pdf/AZ_H_Kamoy_edited.pdf

Lagneau, Laurent; (2018), "La « guerre électronique » prend de plus en plus d'importance dans les opérations navales", Zone Militaire, (13 August 2018), http://www.opex360.com/2018/08/13/ guerre-electronique-prend-de-plus-plus-dimportance-operations-navales/. (Date of access: 22 July 2019)

Martin Wight, Power Politics, Londra, Penguin, 1979.

Osmanoğlu, O. (2019). Görünmez Savaş 'Elektronik Harp'. Retrieved from: https://www.ceyrekmuhendis.com/gorunmez-savas-elektronik-harp/

Özkan, A. (2005). Türkiye'nin Milli Savunma Endüstrisine İhtiyacı Var. Retrieved from: https://tasam.org/tr-TR/Icerik/146/turkiyenin_milli_savunma_endustrisine_ihtiyaci_var

Seffers, I., G. (2020). Army Reintegrating Electronic Warfare Into Force. Retrieved from: https://www.afcea.org/content/army-reintegrating-electronic-warfare-force

Spreckelsen. Electronic Warfare-The Forgotten Discipline. Retrieved from: https://www.japcc.org/electronic-warfare-the-forgotten-discipline/

THINTECH. (2019). Elektronik Harbin Yeniden Yükselişi ve Geleceği. Retrieved from: https://thinktech.stm.com.tr/uploads/raporlar/pdf/682019113141917_stm_elektronik_harbin_yeniden_yukselisi.pdf

Vladimir Semenoff, The Russo – Japanese War at Sea 1904–5: Volume 1 – Port Arthur, the Battles of the Yellow Sea.

Yaylacı, M. (2020). Elektronik Harp Nedir?. Retrieved from: https://www.savunmasanayist.com/elektronik-harp-nedir/