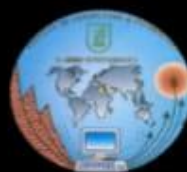

Military Technology



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Under supervision of
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#58

Military Technology

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Military technology

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Objectives

- Introduction to military technology and its development
- Applications of military technology
- Pros and cons of military technology

Intended Audience

This research is directed to the public (general audience) who are interested in military technology and want to know more details about the topic, the purpose of choosing this topic is spreading knowledge of the latest and newest military technology, the impact of technology on warfare, some applications of military technology, pros and cons of military technology and how it affects our world.

The topic will be more useful for specialists and scientists who are able to understand jargon used in this topic, but also some of the technical terms will be defined so that general readers find the topic easy to be understood.

Scope

This project will take us to the field of military technology by knowing what it is, how it affects our lives and our countries. It aims to clarify the risks and dangerous effects caused by military technology and how we can deal with it.

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Summary

Technology is developing day by day; it has a lot of forms and one of the most important forms of technology is military technology.

Military technology can be simply defined as using technology to make more useful, powerful and accurate weapons and military equipment. Weapons have been used in warfare from thousands of years and they are being developed everyday to help in achieving various goals. The use of military weapons started even before the first century, weapons were primitive and they were often handmade, then they kept developing until artificial intelligence is used nowadays in military technology and now, we can make robot soliders and robot pilots, which can extremely help in saving human combatants.

We will discuss in this project some of the applications of military technology such as:

- Radars
- Naval ships
- Armoured fighting vehicles
- Space weapons
- Military robots

Then we will compare between the pros and cons of military technology from the point of views of many experts, specialists and critics, we will talk in detail about each point of view, as this topic raises a wide debate.

We will discuss the dangerous effects and the harms caused by weapons of mass destruction and how countries had used them in the previous century and what they had led to.

We will also talk about the limits and the red lines of using military technology to make the least amount of devastation possible.

Finally, the project will end by discussing how countries can protect the citizens from the dangerous effects of military technology and we will talk about the most powerful countries in the world where USA is ranked first in the list and then we will find Russia following the USA and the third place will go for China.

Introduction

-Purpose

Making people more aware about the field of military technology, spreading the knowledge about the importance of technology in warfare and knowing the limits of using these weapons in order not to lead to mass destruction, in addition to how we can protect ourselves from the dangerous effects of military technology.

-Problem

Many strong countries use military technology to threaten weaker ones, they can use weapons of mass destruction -such as: nuclear weapons and biological weapons- to destroy the whole world. Specialists now are trying to develop laws to limit the use of military weapons in order to save the lives of human beings.

-Procedure

We worked so hard to do this project as we searched a lot about military technology, we read many articles and downloaded different books to collect this information.

Chapter 1: Introduction to Military Technology

1.1 Definition of Military Technology

Military Technology is a bunch of weapons and equipment made by technology to be used in warfare. Including how to make, fix, and renew that kind of technology. It can be divided into five divisions. The first one is offensive weapons that injure the enemy. The second one is defensive weapons which protect the worriers. The third one is communication technology which is used to communicate information. The fourth one is sensors and the fifth one is Transportation Technology.

Technology isn't used in offensive weapons as much as it's used in defensive weapons. Offensive weapons are used by all levels of society, while high-quality defensive weapons are only used by high levels of society which is why offensive weapons increased dramatically in the old times. Some of the weapons disappeared at the early ages, as they got replaced by new weapons except for the halberd and crossbow.

1.1.1 Offensive weapons

Since bronze is extremely strong and hard to be cut, the **ax** was restricted to a comparatively wide blade mortised into a handle at three points and secured with bindings or rivets. The strength problem has increased since the shields has improved, which is why axes has become narrower and taller and used for holing rather than cutting. Axes has become *socketed axes* as its body has become hollow and its hand is put into a hole in the head. For example, Sumerian Smiths used *socked axes* with narrow holes by 2500 BCE, while Egyptians used simple mortise-and-tenon hafting a thousand year after.



Figure 1 A Bronze Socketed Axe



Figure 2 A Through Mortise Is Used in this Wooden Hinge

Another offensive weapon is the **spear** which is a wooden pole that has a sharpened head. The sharpened head may be a part of the pole itself or it may be made by a stronger material such as bronze and iron. Even though the spearhead's materials vary, its shape is almost always the same which is a triangle or a leaf shape.

In the past, when people didn't differentiate between fighting and hunting equipment, the spear's heads were made of knapped stone. After that, the spear has been used for hunting and fighting and was so common and used at almost every war. It was short in the past, less than the height of the soldier, and it was held by one or two hands, commonly with one hand. With time it improved to be taller. The Greek hoplite's spear was about 9 feet long.

Another offensive weapon is the **Javelins** which were so similar to spears but javelins were shorter and had smaller heads than spears. They were alike until the classic times as the spears were much heavier than javelins which is why javelins were used for skirmishing. The javelins are used by throwing them and sometimes it's looped by a robe and the same robe is tied to the warrior's finger so that the javelin spins while flying. That technique made the javelin more accurate and strong.

Another Offensive weapon is the **sling** which is two cords fastened to a pouch, a stone is put in the pouch and the slinger holds the ends of the cords and spin it fast and then stop holding one of the cords ends to release the stone. Although the sling is a very simple weapon, it's so hard to use and needs a lot of practice.



Figure 3 A South American Sling Made of Alpaca Hair

Another offensive weapon is the **sword** which is a long-bladed weapon attached to a thick hand. It can be curved like the ax or straight. It has so many designs to fit its uses which are thrusting and slashing, most of the swords are designed to do both. Swords were short as it was made of bronze which makes it easy to be bend when it's long. For example, the stabbing roman sword was two feet long.

1.1.2 Defensive weapons

Defensive weapons usually take the shape of the human body. The technology of defensive weapons changed a lot through time as it was competing for offensive technology. Defensive weapons were leading at first. For example, a helmet, which is a defensive weapon, was made by 3000 BCE using bronze and other elements, which lead to an offensive weapon called the mace.

The 1st defensive weapon we're going to talk about is the **helmet**. The helmet is a metal piece that covers the head to protect it. It's hard to make a helmet to cover the whole head. Helmets can be made of many materials such as iron and bronze. The Corinthian Greek helmet which has the shape of a bowl with gradual thickness and a piece of bronze is one example of helmets.

The 2nd defensive weapon we're going to talk about is the **Shield**. The shield has appeared in the past for the purpose of hunting and then it evolved to be used to defense worriers. Shields are made in different sizes and it depends on the need of the worrier. The more offensive weapons a worrier has, the smaller his shield will be. In the fourth century, the later imperial legionnaire only fought with a short sword and a big shield which covered his body and protected him from a Roman soldier with a spear and a small shield.

1.1.3 Military communication technology

Military communication is sending and receiving information between two or more units such as communication with the enemy for peace or any other demands or between the soldiers and their leader for commands or any other information.

Military communication includes all kinds of transmitting information whether in the sea or in the land or in the air. Military communication has played a big role in wars, which is why military communication is unreplaceable in warfare.

Although the amount of funds were very few in WW1 and WW2, military technology has evolved dramatically throughout both. Here are some of the changes that happened from World War 1 to 1940 and from World War 2 and after.

The armies' communication equipment varied in WW1 from one army to another. One of those countries is Great Britain with a small but developed signal service. On the other hand, is Russia which had a weak signal service even more weak than the Union Army's signal at the end of the American Civil War. In East Prussia, Russia had lost against Paul von Hindenburg, and communication abilities had a big role in that loss.

There're also Germans who even with the Schlieffen Plan, which took them years to plan, failed to provide communication between higher headquarters and the rapidly marching armies of the right-wing driving through Belgium and northern France. That led to a low of collaboration between those armies which also led to a failure of the plan.

As the war went on, armies have realized the big importance of communication skills which led to creating new communication equipment and improving the old ones. A complex system of telephone lines involving thousands of miles of wires has quickly appeared on each side. Pole lines with many criss-cross wires and circuits came into being in the rear of the opposing armies, and buried cables and wires were laid in the elaborate trench systems leading to the forward-most outposts. The main arteries running from the rear to the forward trenches were crossed by lateral cable routes roughly parallel to the front. Major arteries running from back to forward trenches were crossed by lateral cable routes roughly parallel to the front.

Thus, there arose an enormous grid of cables buried at great depth, especially on the German side and in British sectors on the Allied side, with underground intersection boxes and test points every few hundred yards. Thus, there arose an enormous grid of cables buried at great depth, especially on the German side and in British sectors on the Allied side, with underground intersection boxes and test points every few hundred yards. Electrical communications thus in the form of the telephone and the telegraph gradually extended into smaller units until the front line factions were often kept in contact with the corporate headquarters through these media.

Although all the efforts put to protect wire lines, they were cut and then replaced with radios. Radios were too heavy to be held in trenches and they also needed aerials. Soon radios were evolved to be smaller with batteries and low aerials. Although radios have increased dramatically, the messages through it needed coding which made radios for emergency use only.

Visual signals were back to the field as they started using fireworks, rockets, guns, and flares. Communication equipment has evolved and a lot of new services came out such as the automobile messenger service. Dogs and Homing pigeons were also used to send messages.

A new piece of equipment in warfare has appeared, the airplane. And it made it so hard to communicate. Pilots had to throw messages from the air to the army and receive messages by panels. Engineers worked so hard to use radios to contact land to air. At the end of the war, those radios were made but it wasn't satisfying.

During WW1, wireless telegraphic communication was employed on a large scale by the world's navies and had a great influence on the character of the naval war. Between WW1 and WW2 the printing many things has appeared such as the printing telegraph, FM radio which reduced the noises on the other radios.

At the beginning of WW2, armies have used similar techniques for sending signals like the ones used in WW1 such as airplanes, dogs, fireworks, etc. Radiotelephony and radiotelegraphy were used widely, but radiotelephony wasn't very satisfying. On the other hand, the wireless communication system was very satisfying in WW2 as they improved a lot. Blinker-light signaling was still used, and telephones and the speaker were commonly used.

All kinds of communication technology had improved as researches had increased widely in WW2 even Germans had sorted the communication equipment by its importance. The Air Force has improved and due to that, the communication by radio improved as well. New techniques got out to provide both wired and wireless communication to connect air-to-air and air-to-ground. Portable radios were everywhere, and there was at least one radio in every tank. For wired communication, cables were provided everywhere and it could be easily wrapped out, and they could make four conversations at a time because of it. Germans were the first ones to use that technique followed by the American and the British forces.

There was a need for communication between homes and war fields and because of that, a system of radio teletypewriter has released. Using that system a message can go from anywhere directly to the commander at any war. Resulting in a system of torn-tape relay centers that allow the other side to reply by transferring a perforated tape message from the receiving to the transmitting positions.

At the end of WW2, new communication devices came out such as the long-range electronic navigation device, which was used for both Air Force and ships. Systems that had the perfect combination of radar and communications for landing aircraft in zero visibility have also come out such as GCA.

During WW1 and WW2, the military service learned the big importance of all kinds of science such as communications electronics. Wired and wireless communication has improved a lot during those wars and even after, researches were still going and improvement has never stopped.

1.2 Technology Shapes Warfare

Although military technology seems to be the dark side of technology, many scientists' aims are to use it for the purpose of peace as they think that if they invented very strong weapons nations wouldn't even dare to use them. Some of those scientists are Alfred Nobel and Robert Boyle and others. Melvin Kranzberg (July 1986) "Technology is neither good nor bad" , which means that it only depends on how people choose to use it, not on it itself.

At first nuclear weapons came out, but it didn't end the war, and after more than 6 decades, the hydrogen bomb came out and it was believed that it's the weapon that we've always waited for to end the war. If it was really the weapon waited for, it's going to be the opposite of the old weapons which all that it did is causing more and more destruction throughout the years.

Technology defines warfare not war itself as wars have been going on almost all the time, and it nearly hit every country known whether they wanted it or not. Warfare is the action in the war. And war is the physical process performed by armed forces. The technology of war is the technology used in most violence operations, so if we understand it we'll understand other violence operations as well.

There's no doubt that warfare has been different since the technology of war came out. It became the essential thing that affects warfare. Alexander the Great was a master in war and knew all the techniques of war and understood the principles of war very well. If Alexander the Great were alive, he wouldn't easily understand the technology of war such as Airplanes, tanks, GPS, etc.

1.2.1 WWI: Technology and the weapons of war

A sad fact about WW1 is that many people died in vain as the leaders needed time to understand the new technology of war, which came out in 1914, and renew their old strategies. And because of military technology, offensive weapons were much stronger than the defensive ones which are why WW1 was a bunch of soldiers hiding in the trenches waiting for the next attack.

When attacks are ordered soldiers get out their trenches and climb their way to the enemy trenches, and they had to cut through belts of barbed wire to use their guns, bombs, and other weapons. It's called a victory when they take over parts of the enemy lands after ending hundreds of lives, and the wounded ones who survived but still wounded wait hardly with their suffering, and eventually, they either die or be saved. Between those attacks, many people died, because of toxic gases, snipers and artillery.

There're uncountable weapons that developed in WW1 and here's some of them:

- I. Airplanes
- II. Tanks
- III. Chemical toxic gases
- IV. Machine guns

The 1st one is **Airplanes** which were firstly made of wood, fire, and canvas in WW1. At first, it was used for watching the enemy's moves. When both sides realized how useful the Airplanes were, they started to shoot them down with guns, machineguns, and other weapons from other planes. Airplanes were armed with machineguns by Germans in 1916 resulting in other armies doing the same which made the war in the air dangerous even more than land.

Thus, Airplanes started to attack one another, and pilots who got shot or whose Airplanes fell down didn't have a chance to live as they didn't have parachutes. Pilots at the front usually died first. Germany attacked British and French cities using zeppelins, and large bomber planes. Britain attacked back using bombs.

The 2nd thing that developed in WW1 is the **Tank** which is proved to be the solution to deadlocks in trenches. Tanks worked perfectly on dry, firm ground. Although tanks are slow and have many mechanical issues, it could crush barbed wire and cross trenches perfectly. It can even move through machinegun's fire.

The 3rd thing that developed in WW1 is **chemical toxic gases**. In 1915, Germans used toxic gas while they were attacking Flanders, Belgium surprisingly, and that's when the chemical warfare first appeared in WW1. Other armies started to use toxic gases by 1918, but Germans used them the most. Toxic gases caused a lot of pain, suffering, and death.

4th and last thing is **Machine guns** which may be the weapon that improved the most during WW1, and it was developed by an American, Hiram Maxim. Germans also made a light machine gun, which was easier to carry around, and they also made air-cooled machine guns for airplanes. Germans' efforts in developing machine guns had appeared when they used them in 1916 and killed or wounded 60 thousand British soldiers in one day.

1.2.2 WWII: Technology of war

There's no doubt that WW2 has a permeant effect on life after 1945. Developments that happened in WW2 are still used and improved. Medical improvement during the war became available after the war leading to a healthier society. Commercial products became staples of the American home in the decades following the end of the war. In addition, advances in war technology fuel the development of increasingly powerful weapons that perpetuate tensions between world powers, which changed the way people live in fundamental ways.

Some of the effects of WW2 was on Computers and medicine and here's a brief explanation of it:

Computers were under development before WW2, but under the sequences of war, computer development was needed more than ever, which caused a new computer to come out called ENIVAC as a short for Electronic Numerical Integrator and Computer, and it is one of the first computers ever made and could present thousands of calculation in few seconds. Making ENIVAC was marked as an important moment in the history of computing technologies.

It's known that with every war comes loses and also gains. Although WW2 took people's lives and health, **medicine** had a big improvement during the war. New techniques came out and led to an improvement in blood transfusions, skin grafts, and trauma treatment too. The need for healing soldiers also led to a big improvement in antibacterial treatments, which led to one of the biggest improvements in the field in the 20th century which is the beginning of the commercial production of penicillin. British and American scientists worked and discovered the process needed for the big production of penicillin. That medicine saved millions of lives in and after the war. Even now it's one of the most important treatments used against bacterial infection.

Chapter 2: Future of military technology

2.1 Evolution of war

Trying to predict the future of technology is not an easy task, isn't it? After all, in 1945, Dr. Vannevar Bush, a well-known and an excellent architect predicted that for many years intercontinental missiles would be impossible to build. Well that shows how much military technology has evolved and how capable we are of inventing new devices. No one would've thought that we would go from fighting on a horse with a plain sword to using bombs and nuclear weapons.

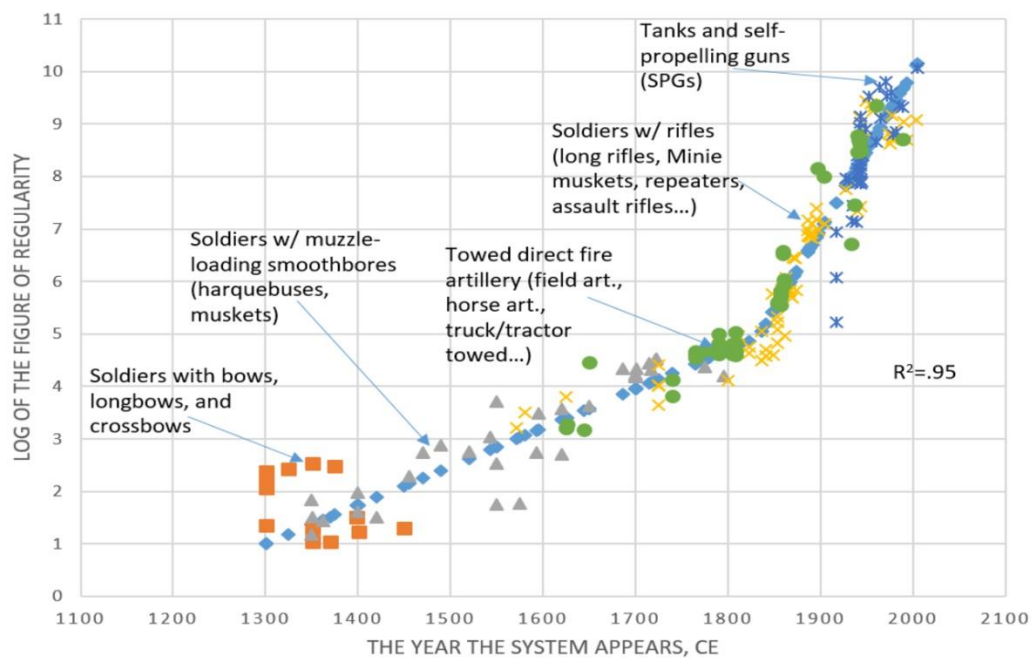


Figure 4 War Evolution over the Years

Military technology has been evolving for several decades and will indeed continue to evolve. The consequences that happened due to war in the past decade have been devastating to the human race, so what does the future of military technology holds for us next?

2.1.1 War in the next 20 years

What is war's future? We have many different possibilities if we base our forecasts on today's conflicts. To reduce risk, some involve using technology. Others involve the most dangerous technology to date—the atom's power.

Future wars will be fought between relatively small, mobile squadrons with flexible equipment. Intelligence is a crucial element of this sort of warfare. It is important to collect the right data, analyze it and act on it to engage the enemy without risking innocent populations. We can see robots used in the future to help clear out enemies, keeping our soldiers out of the way of damage. If only human troops are sufficient, we can see them carrying equipment that enables them to communicate quickly to organize efforts as effectively as possible.

What will warfare look like in the next 20 years? What could the next war look like. Will a recognizable front still be there? Can we, in the classic sense of the word, have a battlefield? Will it be possible to protect our most significant assets?

One of the most notable modifications involves missiles. For years, their range has been growing significantly. We predict a continuation of that. They have become more specific, and large quantities of them have been stored by many nations.

Long-range missiles are one thing, but they can also be seen as part of a larger picture. There has been a step towards long-range artillery in the West, too. Sensor and control systems also advanced at the same time. With that being said, a potential conflict might include players with plenty of ability, from far away, to hit targets precisely. What happens when everybody can do that?

We could be looking at an initial stage, maybe three days or so, where everyone shoots off what they have. That will be a stage in which thousands of missiles and other long-range attempts to destroy the most critical assets of the opponent: military bases, command and control centers, power plant facilities, and so on. We might return to one of the main concepts of the Cold War: to hide for a while in a cave. It is impossible to defend against incoming swarms of missiles unless we have extremely strong (and numerous) air defense systems.

One of the few successful ways to sustain your forces is to use well-protected bases, located deep within mountains, however known entrances are likely to be attacked.

Perhaps an initial phase will see most missiles being used. After that, conventional powers - involved in a classical war of attrition- will once again rise to preeminence. Land forces will also be required on both sides: tanks, troops, artillery, etc. An attacker will need them to exploit a scenario where missiles have destroyed the most significant defensive assets of an enemy. To battle back on the ground and avoid loss of territory, a defender will need them.

Missiles do change a lot. They can be extremely effective, against high value targets. Groups of airlines, air bases, oil platforms and so on. They may also, perhaps, alter the entire strategic situation in a war. Just the presence of military systems that can strike anywhere, anywhere, against any target in entire countries...What will happen to the definitions of a battlefield and a front?

And what about nuclear war? Nuclear arms proliferation became a major concern during the Cold War. The U.S. and then-U.S.S.R. vigorously competed to develop more warheads and missiles. Both nations started eliminating their nuclear programs at the end of the Cold War. Since then, however, nuclear powers have joined other nations and tensions have renewed between countries. Will a nuclear attack really be the future of war?

If it is, the whole planet will feel the consequences. Nations that have been spared a direct attack may have to cope with nuclear fallout. The effect on the global economy would be so massive that it will affect all life on Earth.

2.1.2 Some examples of what weapons will look like in the next 20 years

The latest developments in future weaponry and military hardware shows us a glimpse of the dangerous view of the world of warfare in the future. Weapons are becoming more and more advanced and smart.

Here are some of the weapons:

- *Self-steering bullets*

A .50-caliber bullet under production, packed with tiny sensors, can alter direction rapidly in midair, potentially giving even an average shooter sniper-like precision, with the ability to easily reach moving targets.

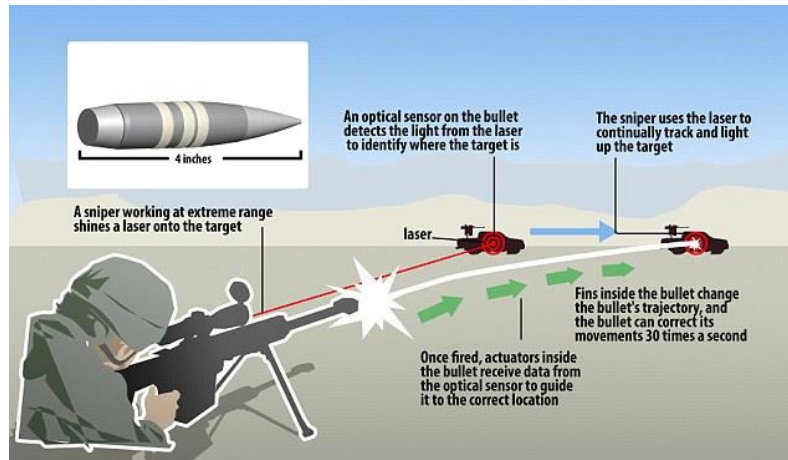


Figure 5 How Self-Steering Bullet Functions

- *Laser cannons*

This laser system allows enemy assets to be targeted and destroyed, including everything from tiny ordinances to enemy craft engines.

One of the many advantages of lasers is that, just the diesel to power the truck-mounted generator that provides the laser concentrates downrange energy bursts, they can fire repeatedly for minimal cost.

- *Personnel Halting and Stimulation Response (PHaSR) Rifle*

First of all, this crazy looking weapon appears as an alien technology or something from a science fiction flick. In fact, it's a non-lethal incapacitation device designed to blind and disorient targets temporarily. A low-intensity laser beam with a blinding effect is fired by the PHaSR rifle and is perfect for a variety of situations where the objective is to disable the target.

- *ADAPTIV camouflage*

The enemy would not be able to shoot what they can't see. That's the purpose of ADAPTIV camouflage from BAE Systems; to mask the infrared signature of a military vehicle and protect them from detection by enabling them to blend in with their environment. This

technology effectively makes thermal imaging systems ineffective and guarantees that some protection from initial detection is provided to friendly combat vehicles.

The ADAPTIV camouflage is made up of a honey-comb like system that can be mounted on any vehicle in modules and heated or cooled to fit the surrounding environment as appropriate. It is also possible to use the same device to highlight allied vehicles to friendly forces and stop blue-on-blue accidents.

- *Hybrid Insect Micro-Electro-Mechanical System (HI MEMS)*

A whole other weapons system straight out of science fiction, in the form of bugs this time around. While it may look like someone is just strapping a circuit board to the back of a beetle, it is actually a fundamental representation of a technology that has been worked on for decades. Since the 1940s, Micro Air Vehicles (MAVs) and Micro-Electro-Mechanical Systems (MEMS) have been in the works, and They are basically cyborg bugs and winged creatures who have been enslaved to serve humans.

2.2 Military technology and AI

2.2.1 Definition of AI

The Defense Science Board's definition, "The capability of computer systems to perform tasks that normally require human intelligence". This definition explains to us briefly what AI is.

2.2.2 Benefits of AI in warfare

AI definitely has many benefits and will affect military technology greatly.

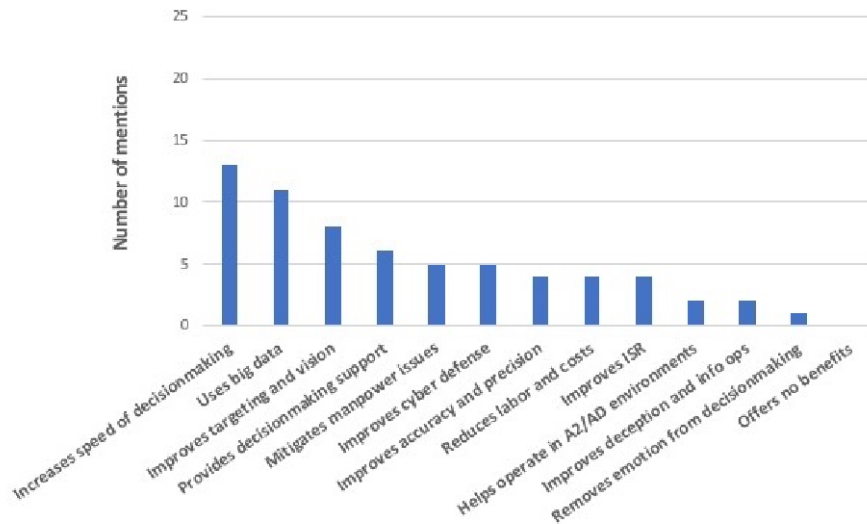


Figure 6 Potential Benefits of Military Applications of Artificial Intelligence Identified in Structured Interviews

- *Speed of decision making:*

One of the most important benefits of AI is speed of decision making. Some experts say that if it is possible to cycle faster than one's enemies through the OODA loop (Observe, Orient, Decide, Act), they would not be able to perform the counteractions required to defend against one's attacks or create their own offensive options quickly enough to overcome counteractions.

- *Use of Big Data:*

Typically, this term is used to define information that is too big to be stored on the memory of a computer, is generated too quickly to be handled by a single computer, or takes several different forms or formats. Because of these three challenges, it can be difficult for people to make sense of the information found in the data, but the more data available, machines and AI seem to work better. This helps improve the performance. The sheer amount of information gathered by different sensors is more than can be processed by a human or human team.

AI is expected to continue to grow in importance, considering the ever-increasing amount of data available in the world today.

- *Improved Targeting and Vision:*

Image-processing is one of the fields where data overload is felt most severely. The number of cameras in domestic and international environments performing surveillance has risen significantly and is projected to continue to do so. There is a real need and encouragement for automation in the process of analysis of incoming video and imagery with all the data being generated.

In at least some cases, automatic image-recognition and object-detection capabilities have exceeded human ability. These systems will gradually be able to recognize items that humans will miss as development continues. For example, Advances in facial recognition may be applied to recognize terrorists or known adversaries easily.

- *Mitigation of Manpower Issues:*

For tasks such as image processing and foreign language translation, there is an often-discussed difference between demand and personnel available. These are the types of activities resulting from the rapid increase in the amount of available data for processing. Fortunately, they are the kinds of tasks for which AI is being well placed to help people.

AI is also essential to providing battlefield robotic assistance, which will enable forces to sustain or extend warfare capability without increasing manpower.

- *Improvements in Accuracy and Precision:*

Machines can be more precise and reliable than humans in general. Because of certain unique properties, such as machine-to-machine uniformity and time uniformity, while individuals have more individual variations and are tired or bored.

- *Labor and Cost Reduction:*

As is happening in the economy, tasks that once required a committed individual to perform are now being carried out gradually by AI or robots. This trend allows a single employee to perform quantities of work that would have traditionally required many individuals. The military, a big employer, is no exception and will find ways to minimize the amount of manpower without sacrificing the services given.

- *Improvements in Deception and Information Operations:*

A large number of autonomous agents producing short conversations could be possible today or in the near future to convince a target audience to believe a specific narrative of geopolitical or military importance.

AI can already analyze the vast volumes of information that people disclose about themselves online and obtain a better understanding of how to customize specific messages to increase the possibility of manipulating them. And it is also possible for AI to produce fake yet realistic photos, video, and audio of individuals that could be used to deceive intentionally.

- *Improvements in Intelligence, Surveillance, and Reconnaissance:*

One of the fields that is seeing the most current investment in military AI is ISR. It is possible that this pattern will continue. The ability to collect intelligence independently from drones, from sensors in the earthly environment and in space, and also in cyberspace, promises to increase the amount of data produced further. And that data volume, speed, and variety will need to be analyzed in part or in full by AI machines.

The level of intelligence extracted from the masses of ISR data collected would be dramatically improved by AI.

- *Decision-making Support:*

Some assume that success in games such as poker demonstrates the potential for strategic planning tasks to be introduced by AI. Even if these technologies are not ideal for use in making suggestions or decisions for combat, experts expect that they may be used in wargaming to provide a larger range of potential opponent behavior.

2.2.3 Risks of AI in Warfare

While it is anticipated that AI's military applications can provide a wide range of benefits, they also raise significant risks.

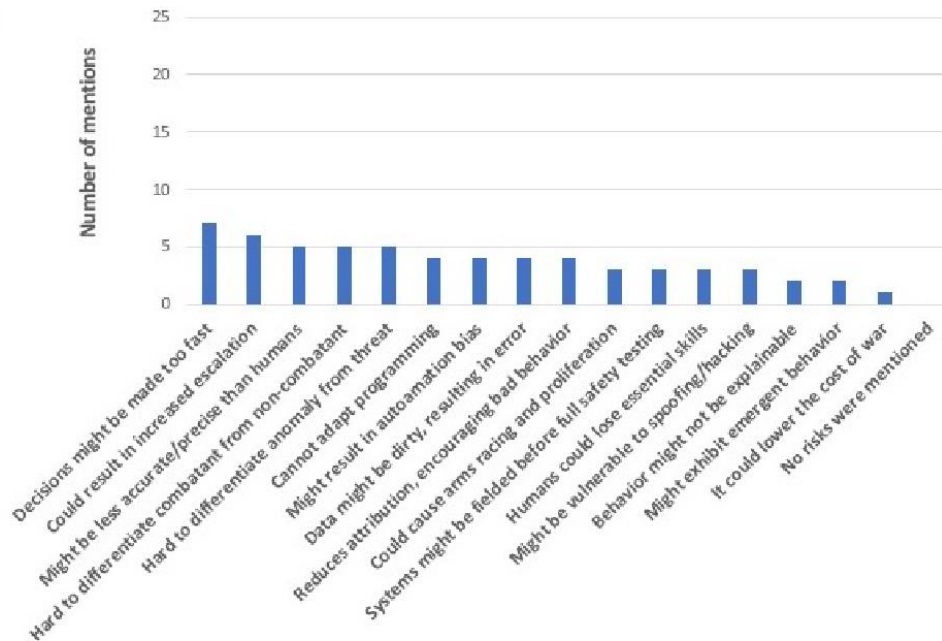


Figure 7 Risks of Military Applications of Artificial Intelligence Identified in Structured Interviews

Table 1 Taxonomy of Artificial Intelligence Risk

Ethical	Operational	Strategic
Law of Armed Conflict Accountability and Moral Responsibility Human Dignity Human Rights and Privacy	Trust and Reliability Hacking, Data Poisoning, and Adversarial Attacks Accidents and Emergent Risks	Thresholds Escalation Management Proliferation Strategic Stability

- *Military operators and leaders may put too much trust in artificial intelligence:*

Military operators and authorities can place too much trust in their AI systems. They can show "automation bias," depending on the results of these AI systems, even when they do not seem to make any sense. In systems in which algorithmic computation is so complex that their outputs are unexplainable, this tendency is amplified, i.e., operators can't easily decide why their systems are providing specific responses or acting in specific ways.

- *Systems of Artificial Intelligence may make dangerous errors:*

While experts we named the potential benefits of military AI improved speed, precision, and accuracy, they also expressed concern that these capabilities may make decisions too quickly or that the systems would not be able to adjust to the unavoidable complexities of war. As a result, they may not be able to differentiate correctly between combatants and non-combatants or threats and system abnormalities, and may consequently be less reliable and precise than human operators are. If systems are fielded before being properly checked or if attackers succeed in spoofing or hacking into them, these concerns may be magnified. Machine learning systems may exhibit evolving behavior in dangerous ways.

- *Artificial intelligence can trigger racing or escalation of weapons:*

Experts also expressed considerable concern that the pursuit of military AI by each nation in hopes of gaining a warfighting advantage over possible opponents could lead to proliferation and weapons racing. Autonomous weapons may not be appropriately sensitive to political factors or limits of escalation in battle. In locations or with levels of intensity that amplify conflicts, they might strike. The fact that it would be difficult to assign liability or responsibility for these actions to human operators, would even complicate matters even more.

Concluding artificial intelligence:

AI's military technologies are progressing at an exponential rate. Some of the above-mentioned advantages are already being realized in currently deployed systems. Other advantages have been demonstrated, in managed applications or lab conditions. Based on predictions of what future development in AI can provide, even more are expected.

Yet, there are major threats to all the possible advantages of military AI. Some are ethical; others are strategic and practical. Without studying the risks more closely, it would not be advisable to rush into indiscriminate production, implementation and usage of these capabilities.

2.3 Space warfare

2.3.1 Militarization of space

Space warfare is a battle in outer space. The militarization of space includes the positioning and production in outer space of weaponry and military technology. In the mid-20th century, the early exploration of space had, in part, strategic motive, as it was used by the

United States and the Soviet Union as an opportunity to showcase ballistic missile technology and other innovations with the potential for military use.

Since then, outer space has been used as an operational place for military spacecraft such as satellites for imaging and communications, and during their flight, some ballistic missiles travel through outer space.

2.3.2 What would war look like in space

Electronic warfare:

How precisely can sabotage and warfare occur? One technique requires shooting a powerful microwave radiation beam at an object. In reality, the police had previously tested such ideas as a means of stopping a speeding car by disabling electrical devices on the vehicle.

A "directed-energy weapon" would represent such a concept deployed on satellites, allowing nations to disable the satellites of other countries without producing huge clouds of space junk. Potentially, you might make such an attack look like an accident and deny participation.

Countries could also take advantage of the use of "radio jamming" to interrupt radar and communications, this goes back to World War II. The transmission of genuine signals can be blocked by swamping a radio receiver with radio noise, effectively, and making the device inoperative. This is a bit like trying to find a candle's light against the car headlights' glare.

For military planners, space-based electronic warfare is likely to become a growing concern. Actually, many of the Earth's military services now rely on space technology to operate.

Kinetic kills and lasers:

A solid projectile is by far the most apparent means of messing with a satellite. Moving satellites have very high energy and momentum. If it is possible to momentarily position a slower moving object in the path of a satellite, then the resulting collision would be especially devastating.

Previously, these so-called "kinetic kills" were only used to eliminate satellites from service at the end of their lives, with the US, Russia, China, and India proving their ability to do this. This form of removal consists of a ground-launched missile targeting the satellite. If fired at an opponent's satellite, such a missile would be reasonably obvious and could be detected by other nations using radar.

A more subtle approach would be to destroy a satellite operated by the missile launching country or corporation and seek to create as much rubble as possible, which then lies in the intended target's orbital direction. This could look like an accident and in 2007 it really happened unintentionally.

Lasers could also be used in space warfare. Lasers are often considered as defense weapons, with the idea of knocking out the solar panels of attacking satellites. The satellite will not be able to communicate with the ground station without any power, and it is effectively lost. The rebound from a laser is much smaller and it will allow them to work better than on the surface of the Earth because of the lack of atmosphere.

2.3.3 What does a space war on Earth look like

While science fiction films have conditioned us to assume that visible light can be used by space lasers, shorter wavelengths actually generate more power. Any surface observers will be unable to see any space warfare results directly, unless a kinetic kill actually breaks up a satellite, with rubble lighting up as it re-enters the atmosphere. That said, our lives on Earth could still be disrupted by attacks, affecting GPS, television services and even cash withdrawals.

2.4 Cyber warfare

2.4.1 Definition of cyber warfare

As its name implies, cyber warfare refers to the use of technology to target the computers or information networks of a country, causing equivalent harm to physical warfare - whether damage, death or destruction.

Governments are becoming increasingly conscious that, in order to operate everything from financial services to transport networks, we are now relying on computer systems and that an attack on these systems could be just as devastating as a conventional military operation using soldiers armed with weapons and missiles. Also, Cyber warfare is harder to track, unlike conventional weapons of destruction, since components can be secretly embedded in a system.

2.4.2 Weapons used in cyberwarfare

The tools of destruction used in cyber-attacks carry some similarity to weapons widely used in other criminal attacks, since they have the same effect.

In order to bring cyber criminals closer to the targeted networks, spear phishing (a scam of email or electronic communications aimed at a particular person, organization or company) and

social engineering are tactics introduced. Inside threats pose a high threat for organizations hoping to protect their networks against intruders, enabling hackers to expose a network to a threat directly, or enable a group to steal data that is confidential.

Stuxnet, which was first encountered 10 years ago, is one useful example of how multiple layers of attack can be used to great effect. An employee inside an Iranian nuclear power site inserted, either knowingly or unknowingly, a flash drive implanted with the Stuxnet worm into an air-gapped system. This malware searched for specific software running centrifuges using several zero-day exploits (A cyber-attack is found in software on the same day that a deficiency is detected), and ordered them to spin extremely fast and then slow for a period of months without it being detected. Eventually, these centrifuges broke and more than 1,000 devices were left useless.

2.4.3 Forms of cyber warfare

- Viruses, computer bugs and malware capable of taking down water, transportation networks, energy grids, critical infrastructure and military systems.
- (DoS), (DDoS) attacks, cybersecurity incidents that occur when attackers take steps to prevent authorized users from accessing targeted computer systems, computers or other resources on the network.
- Sensitive data hacking and stealing from institutions, governments and companies.
- Ransomware that keeps computer systems hostage until ransom is paid by the victims.

Speaking of Denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks in more detail:

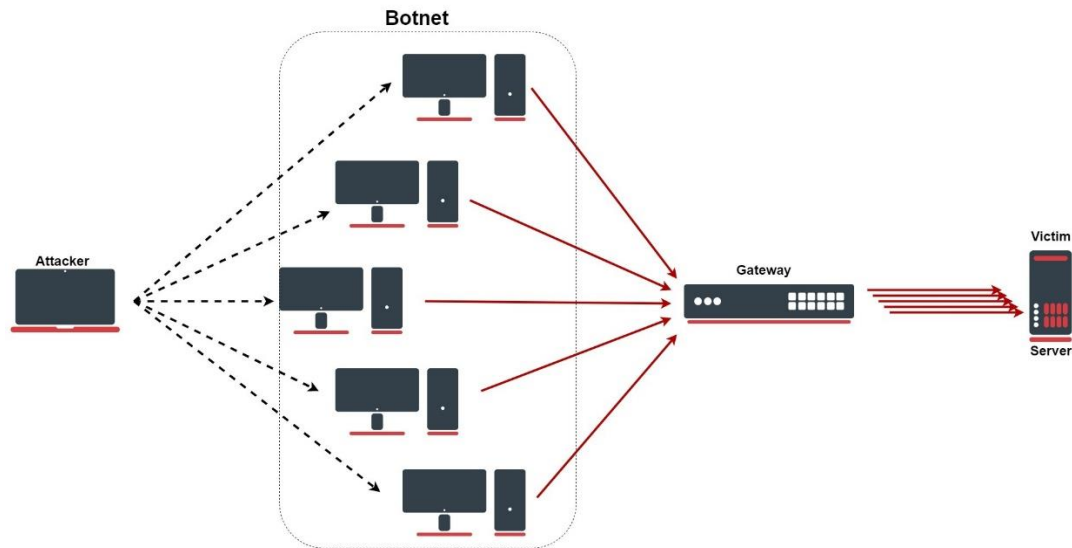


Figure 8 Representation of How DDoS Attacks Happen

It is made up of many infected systems that all target a single system in order to make it inoperable. The combined infected systems are referred to as a botnet and target the victim by flooding their device with too much traffic, causing it to crash. DDoS attacks are not intended to steal information or impose security threats, unlike other attacks, but rather to make the website unavailable, which can cause great losses to any online company.

DoS vs DDoS:

It's very easy to distinguish between a DoS and a DDoS attack. In general, a DoS attack targets a victim on the application layer, with the same purpose of making a website unusable. A DoS attack is carried out using a single internet connection by a single person.

Chapter 3: Types of military technology

3.1 Radar

Radar It is an electromagnetic sensor used to detect and identify different things, and its most important uses in the field of military, as it is used in the continuous defense role and means that it is on combat readiness in peace and war and is always ready to detect and warn about the detection of any interference or air attack whose source is unknown.

Radars have achieved many successes in confronting and confronting air threats, as a third of a century ago, the use of disinformation and jamming methods that claim to be electronic deception devices has brought about the radar conflict into an endless set of problems and obstacles, because it is still at the top of the list of modern weapons, so we can say that the military radar is the master of the situation in the modern battle.

One of the most important radars is the three-dimensional (3D) radars that are based on detection and tracking by determining the height of the target and determining its angle and distance from the radar. There are two types of three-dimensional radars, the first is used in the transmission, which has a vertical elevation angle of (20-30) degrees and is received through (6_12) an overlapping vertical radiation model, which is characterized by a high rate of information flow on targets, especially moving targets (mtd). The difference in the frequencies returned from the target does not affect the accuracy of the altimeter, and the second type uses a radiation model in the vertical plane with a precise angle and the vertical radiation is controlled by means of control the angle of the radial wave, such as the American radar (59_AN / TPS) and the radar (AN / TPS_32), which is characterized by the lack of influence of the reflections of the ground phenomena.

Among the types of military radars:

1. Underground radars that are used to detect mines that are found under the surface of the earth by some centimeters and are very dangerous not only in time of war, but rather ten years later, and the radar finds them and destroys and removes them and because of the radar signals penetrate into the soil and reveal the presence of underground equipment. Its surface is in the presence of high soil moisture.
2. Alarm radar, which is used as a kind of guard means, to monitor a specific place and issue an alert on the occurrence of any variable emergency.

3. Air surveillance radars that are used to detect enemy aircraft and direct defensive measures against them. This radar was used in the second world war in the British forces as a series of developments, and to obtain the maximum coverage, the radars are installed at high places and also reveal objects flying at a low altitude.

Example 1: Radar 55ZH6UE NEBO_UE is desto detect, track and identify air targets that are at low altitude, especially small ones such as ballistic missiles, and to identify flight and to identify and distinguish friend from the enemy. Control systems for automatic and non-automatic air defense units



Figure 9 55ZH6UENEBO-UE

From its advantages is detection of small and accurate targets, processing data automatically, determining the path of air targets, developments presented in preventing obstruction and interference, and one of its most important characteristics is its ability to work in various natural atmospheres, where temperatures range from 50 below zero to 50 degrees Celsius and at an altitude of 1000 meters above sea level, so it is considered the best type.

Example 2:

Radar AN / MPQ_64 was provided by Raytheon to the US Army. It is a radar that is used in automatic detection and tracking of tracks and determines the quality of targets and identifies them. The scan rate in altitude reaches 30 laps per minute on an effective coverage for a distance of 40 km and can work on an operating system of up to 75 km.



Figure 10 AN/MPQ_64

The most important types of military radars in terms of missions and operations

1.Radar detection of personnel and mechanism:

It is a small radar that uses land, sea and air and translates its vibrations into audio signals. It has been developed in the form of very small devices that are installed under the helmets of fighters

2. Aerial photography radar:

A radar that can be used in the civil and military fields, and its method of operation is based on flying with small antennas, as it is able to record the signals reflected on the ground on a sensitive plate

3. Radar Guidance:

It is used to verify friendly and enemy radars and carries satellites that are used in meteorology, so the satellites collect information

4. Battlefield radars:

It is used in public surveillance, border and coast watchdogs, spying on hostile areas, controlling targets, identifying the locations of bombs and missiles, and has been prepared to identify the sources of sounds issued by the enemy artillery

5. Tracking radar:

It is used in estimating area and altitude and its most important advantages are the pursuit of several goals at once, which prompted the development of high-capacity radars is the presence of intercontinental missiles with multi-nuclear warheads, which are used in early warning systems, especially in major countries such as the United States of America and Russia

3.2 Computer

The computer is of great importance in the field of the army, as the army depends on it in a range of tasks and operations such as analyzing intelligence information, organizing wise data for commanders, geographic analysis, controlling smart weapons or the field of communications as it provides a direct network to allow multiple communication paths between the various parties within the army, and communication is important. It is very important in the army because it speeds up operations and makes decisions more flexible, and the other major development is the global positioning system (GPS), it is considered as important as bombs and missiles in the army because it accurately targeting certain places, and that the computer provides information on the ground level to the commanders of fighters and from the advantages The presence of the computer makes the army more advanced, it facilitates communication lines and allows the military to gain knowledge faster and then inform the commanders because it provides the military with modern and accurate data

because it works to check the information and helps the computer to watch what is happening now with advanced technology such as the presence of drones with self-control.

The United States of America used the quantum computer that has atoms inside it that solve complex problems immediately and give instructions in reorienting.

The radar groups when pursuing and targeting regular aircraft, and a company, Coldquanta, has already set up with the US Defense Research Agency (DARPA) to build the quantum computer.

3.3 Armour

Armour is used to protect the body from penetration and lethal effect from weapons attacks. The shields were only intended for military personnel and law enforcement officers. At the present time, citizens and guards can use shields, but there is a specific type of armor that the average citizen can use. A citizen is allowed to wear armor when he feels it. There is a danger in the surrounding environment, such as jewelry store owners, ATM repairmen, politicians, businessmen, firefighters and others, and all this is for the personal safety of the citizen.

There are two types of protective jackets, soft shields that protect against small firearms and hard shields that protect against high-caliber firearms and bullets. The protective jackets are distinguished from bullets that have additional protection that makes them more resistant to weapons and bullets, as they protect most parts of the body And by the American National Institute and the United Kingdom Center for Applied Science and Technology for Justice and Technology, levels and standards for the protection of body armor were formed, and these two bodies are constantly concerned with the updating and development of armor standards for the body.

Ballistic protection panels are added to bulletproof vests to cover the neck, throat, thigh and upper arms, and this is to provide additional protection against burning. Solid armor panels are used to strengthen



Figure 11 Armour

bulletproof vests when there are large gunshots and because the protective jackets are equipped with ballistic panels made of Kevlar, ceramic, steel and semi-Aramid materials. It is cumbersome and is not used except when necessary by the military.

3.4 Artillery

Artillery is used in war to fire massive projectiles to long distances and high accuracy, developing since the twelfth century and the current caliber in the world is 155 mm with a range of 40 km, it is possible that artillery will be used in the future due to the high intensity of battles because artillery is responsible for detecting and destroying enemy artillery and missiles, and the dependence will increase on artillery to achieve success in victory over the enemy.

Types of artillery: They are classified into three types: light, medium and heavy, classified according to the trajectory of the projectile. The cannon uses a flat projectile trajectory at a very high speed, and the howitzer uses a high arc trajectory and is used against targets and hidden behind barriers. Mortars, rocket launchers and rifles without wearing wear are artillery, and the gunless rifle fires projectiles of the size of light artillery that can be transported manually or carried in mechanisms.



Figure 12 Artillery

The artillery is the most important part of the battle to have a prestigious place for its ability to carry fire and most important tasks to destroy the hostile purposes so the artillery is implementing many of the tasks from us Destruction of hostile establishments

1. Destruction of hostile establishments
2. Conflict against tanks and targetsy
3. Lighting land and enemy
4. Destruction of enemy precautions before intervention in combat
5. Destruction of monitoring, leadership and radar station

3.5 Fortification

The fortification is a building designed to defend territory in war and strengthens the position against attack. The fortifications consist of two types: permanent and a field. The fortifications include military shelters and are constructed in time of peace or when the threat of war. Field fortifications consist of bunker sites for personnel and weapons, obstacles such as mines, explosives, anti-tank trenches, and entangled wires.

The effect of fortification on the First World War was the defensive thinking based on the permanent fortification, the fortress was built from concrete at a distance of four miles on average from the city, as the fortification led to the protection of the large cannons in his forts with steel towers and some castles were five-pointed and some were triangular with a lot of underground construction, and the castles at that time were known as (land battleships). In the end, the city was seized and then the forts were systematically reduced.

Many European countries built permanent and elaborate fortifications in the period between the two wars, the largest of which was the French line, which was a system of giant masinot forts that stretched from Switzerland to the Belgian border.

The concrete was thicker, the rifles were larger, the trenches and the compact steel beams, and the rights of mines were protected from the attack of tanks. A large part of the work was underground and the outposts were linked by concrete tunnels.

At the end of the second world war, the military considered that the permanent fortifications were not economically practical due to their vulnerability to nuclear explosives such as the vertical envelope from the air, but we exclude the reinforced concrete and the deep tunnels that protect the missile launch facilities.

3.6 Laser Weapon

Laser weapons have been a part of science fiction movies and are now on the battlefield thanks to optical fibers.

Laser weapons are a staple in modern video games, and ray guns stemmed from science fiction movies and the first realistic laser appeared in the 1960s.

the "Potting" model of weapons that appeared in recent years. Capacity of laser weapons is measured in kilowatt units, which are for the American strategic defense initiative. They used lasers in cold wars that seek to disable ballistic missiles.

The US sea has found a new weapon from the laser, where these arms managed to drop an unmanned airplane. He is a high-energy laser weapon where he launches a huge quantity of photons on the target and hit the target quickly at a record time so that this weapon contains 150 kW either an ancient laser weapon that was not exceeding 50 kW and the laser radiation derived from fiber guard provides military support.

Lockheed Martin is developing laser weapons to protect the military. Laser weapons are designed to defeat a growing set of threats. Today, technologies are ready to defend against missiles, mortars, air vehicles, and others. All these developments in laser weapons will be able to disrupt all of that.

The US military arranges for the deployment of the first laser weapons in 2023 and the air force is working to develop offensive laser and ride on AFSOC_AC_130 aircraft.

3.7 Naval warfare

The Maritime War is an exclusive area for the great powers because the ocean contains two-thirds of the planet area, so they are a strong weapon for those who own a naval fleet.

But there is a complicated correction after the emergence of defenders with huge huge people, which are installed in the battleships and the advantages of ships carrying defender, missiles and radars, and the US fleet appeared on any fleet in the world in terms of size, type and numbers.

3.7.1 Naval ships

It is armored that carries weapons that are used in war and that naval ships are larger and better in armament than destroyers and boats, and it is constantly being developed and incorporates all new technologies.

The world is witnessing advanced technology where warships are in the language of progress

Some types of important ships in the world such as:

. **The US Ghost steal the boat** is a military vehicle distinguished from others in that it is fast to carry out tasks and provides support in the open seas and since its discovery in 2015, the radar cannot detect it and its length is not more than 20 meters. It is not considered a warship, but it has many advantages and it has great dribbling and maneuvering capabilities.



Figure 13 The US Ghost Steal Boat

. **Cannon** This ship is distinguished in that its missiles are very accurate and sophisticated as they are able to join the target while it is moving at speed of sound and of its great importance

The ship HMSDefender entered the British Maritime Service 2013 operating with the firing of blind surface-to-air missiles consisting of 48 attack cells, anti-ship launchers, cannons and turrets .



Figure 14 Cannon

. **An aircraft carrier** is a ship equipped to deploy and restore aircraft to be an aircraft base in the seas and oceans, and it is considered the most powerful warship and is called the flat tops and oil tankers, and it is a large ship carrying aircraft.

It is also used to pursue the enemy by firing at it with artillery and missiles, and radars, destroyers and submarines from one surface to another.



Figure 15 An Aircraft Carrier

3.7.2 Submarine

The submarine is a ship that can dive and move underwater and its importance in the elements of naval weapons was used in the First World War and from the countries that are frequently used and developed by Russia, the United States and France.

Submarines are formed by a nuclear plan and require high staff and education for forming weapons and there are three types of US submarines.

- **SSN** is smaller and faster and mission of collecting and collecting indifference information and has a more technical task than ships and other submarines.
- **SSBN** works as a strategic shield for the sea and made the United States threatening nuclear destruction if it is urgent.
- Cruise submarines or guided missile **SSGN** that carry weapons and carry missiles.
- **INS Arihant(S_73)** The submarine is one of the most important submarines. Which we have to board gives an underwater extent to lay the rockets and this is considered to be the latest Indian fleet's development but did not enter the service in India's sea and when this is done in a market that increases the Balisieh Pay Indian Marine will increase.

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Figure 16 INS Arihant(S_73)

3.8 Autonomous system

- **The weapon system**

Every Autonomous weapon system consists of a sensor to search for the enemy and detect targets, a decision-making element that decides whether to engage the target or not, and a munition that engages the targets.

Sometimes weapon system includes a single platform such as aircraft, for example, the weapon system consists of the aircraft radar, pilot, and missile.

The radar searches for the target, the human decides whether to engage, and the missile carries out the engagement, all of these elements are important for the engagement to work.

- **OODA loop**

So every weapon system contains the necessary components to complete an entire combat OODA loop.

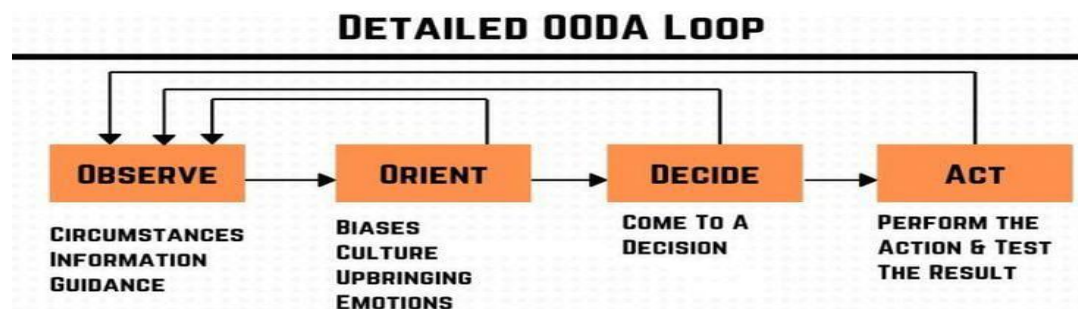


Figure 17 OODA Loop

In other cases, components of the weapon could also be allocated across multiple physical platforms, for instance, an ocean-going patrol aircraft might discover an enemy ship and pass the situation data to a close-by friendly ship, which dispatches a missile. Protection strategists relate to a larger, distributed system with multiple components as a battle network.

Automation is employed for several engagement-related tasks in weapon systems and battle networks: finding, specifying, tracking, and prioritizing potential targets; timing when to fire; and managing munitions to the target. For most weapon systems in use nowadays, a human decides whether to engage the target or not.

If there is a human in the loop deciding which target to engage, it is a semiautonomous weapon system, in autonomous weapon systems, the whole engagement loop-searching, detecting, deciding to interact, and engaging-is automated. Most weapon systems in use nowadays are semiautonomous, but a couple of crosses the line to autonomous weapons system.

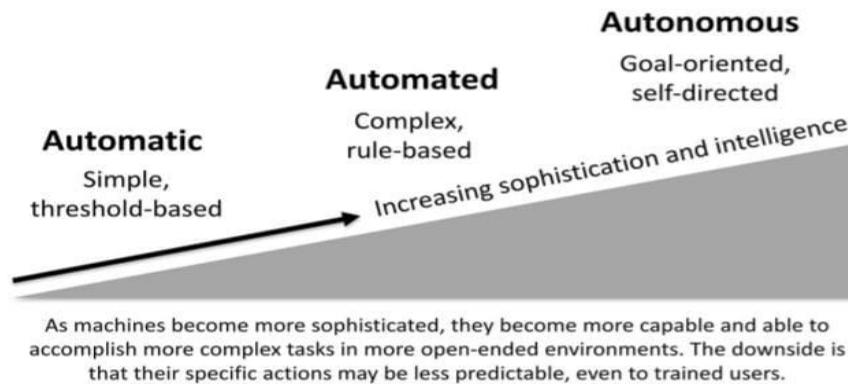


Figure 18 Increasing weapon intelligence

- **Supervised Autonomous Weapon System**

In autonomous weapon systems, the complete engagement loop-searching, discovering, deciding to have interaction, and engaging-is machine-controlled.

Because homing munitions can target ships, military bases, and vehicles, they can overcome defenders through saturation attacks with waves of missiles. In an era of unguided munitions, defenders could ride out an enemy barrage, trusting that almost all of the incoming rounds would miss. However, the defender should notice a way to successfully intercept and defeat incoming munitions before they impact.

At minor thirty nations use supervised autonomous weapon systems of different types to protect ships, vehicles, and military bases from the enemy's attack. As soon as the weapon is placed in automatic mode and activated, these systems can have interaction with incoming rockets or missiles all on their own without needing human intervention. However, these supervised autonomous weapons are essential for situations in which the speed of engagements might overwhelm human operators.

Machine-controlled securities are an important part of surviving attacks from the enemy's smart weapons For example ship-based defenses. While these weapon systems are used

for a spread of various situations-to defend ships, land military bases, and ground vehicles they operate in similar ways, in which Humans set the parameters of the weapon, establishing the threats which the system should target and that it ought to avoid.

Depending on the system, different rules could also be used for threats coming back from completely different locations, and speeds. Some systems could have multiple modes of operation, authorizing humans to control, and therefore the human's superintendence the system physically collocated with it, which means, in essence, they might physically disable it if the system quit responding to their commands. So, they are considered as *semi-autonomous* weapon systems.

- **Fully Autonomous Weapon System**

Generally speaking, fully autonomous weapons that operate with no human are not in wide use, but there are a couple of select systems that cross the line. These weapons can search for, plan to engage, and have interaction targets on their own and no human can step in. Loitering munitions are one example.

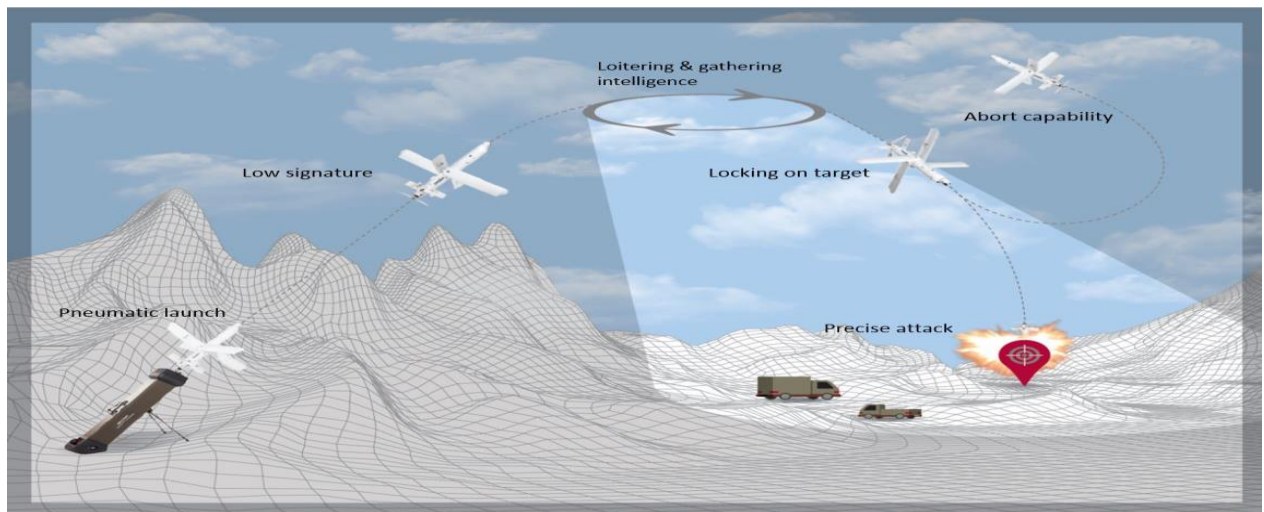


Figure 19 Loitering Munitions

Loitering munitions can spin overhead, searching for probable targets over a wide area and, once they discover one, destroy it. It is not like homing munitions, loitering munitions do not require detailed intelligence on enemy targets before launch. Therefore, a loitering munition is a complete weapon system. A human can launch a loitering munition into a container to search for enemy targets without knowledge of any specific targets beforehand. Some loitering munitions may keep humans in the loop by using a radio connection to certify targets before engagement, which can make them semiautonomous weapon systems. However, they can be used as fully autonomous weapons.

3.9 Armoured fighting vehicles

- **Armoured personnel carrier**

Armoured personnel carriers (APCs) are armoured tracked vehicles used to take troops into combat. Early in World War II, when the German army introduced them to bring the infantry contingents of their panzer and panzer grenadier divisions into combat, APCs first emerged in large numbers. Improvements to APCs made them much more capable of following tanks into combat during World War II.

Armored personnel carriers have evolved enormously over the past years, and here are some of the best kinds of APCs.

1. Patria AMV

The Patria AMV (Armoured Modular Vehicle) is a new 8-8 armoured wheeled vehicle developed by Patria, a company headquartered in Finland. Following the 2004 market introduction, the armed forces of Finland, Croatia, Poland, Slovenia, South Africa, Sweden and the UAE have so far ordered more than 1,600 Patria AMVs.



Figure 20 Patria

The Patria AMV has three crew members and up to ten soldiers to protect the crew from improvised explosive devices (IEDs) and explosively shaped penetrators (EFP). Its forward hull has up to 30mm of ballistic protection against

Armour Piercing Fin Stabilized Discarding Sabot-Tracer (APFSDS-T). The vehicle can also survive explosive mines weighing up to 10 kg.

The Armoured Personnel Carrier (APC) model of the Patria AMV is mounted with a 12.7mm heavy machine gun and a Patria PML 127 OWS turret. The top speed of the vehicle approaches 100km/h and the driving range is 800km.

2. Boxer APC

The Boxer APC model, developed by ARTEC, a joint venture between Krauss-Maffei Wegmann (KMW) and Rheinmetall, is one of the best armoured personnel carriers in the world. The Boxer APC, mainly run by the German Army, is able to carry 11 occupants safely, including three crew members and eight infantrymen.



Figure 21 Boxer

For protection against bombs, IEDs and ballistic attacks, the vehicle is integrated with scattered and sloped armour solutions. It defends the crew from anti-tank and anti-personnel bombs, bomblets and mortar rounds, as well as

provides up to 14.5 mm at a 30 ° elevation of all-round ballistic defense against guns.

With a 12.7mm heavy machine gun or a 40mm automatic grenade launcher, the FLW 200 remote-controlled light weapons station on board the vehicle is mounted. IdZ (Infantryman of the future) technology developed by the German Army is also sponsored by the truck. There is a maximum speed of 103km/h and a class-leading range of 1,050km for the Boxer armoured personnel carrier.

3. Pandur II 8×8

An upgraded model of the Pandur I 6-6 wheeled armoured vehicle developed by General Dynamics European Land Systems-Steyr is the Pandur II 8-8 armoured personnel carrier.

The Pandur II APC provides 14 troop seats, including crew, which can be integrated with modular, flexible armored solutions for ballistic hazard defense, mines, IEDs, and rocket-propelled grenades (RPGs).



Figure 22 Pandur II 8-8

At the top of the Pandur II, the SP30 turret is armed with a Mauser 30mm MK 30-2 cannon, while the tanks used by the Czech Army are fitted with RAFAEL RCWS-30 and ATK MK44 30mm. A 7.62mm machine gun and 76mm smoke grenade launchers provide secondary armament. The top speed of the vehicle is 105km/h and the length is 700km.

- **Tanks**

Armored tank, armoured spelled armored vehicle, combat vehicle designed with partial or full metal plating to protect against missiles, fragments of shells and other projectiles. Armoured vehicles can drive either on wheels or on continuous tracks for military use. The primary combat armoured vehicle is the tank. Tank destroyers and attack weapons have other models armed with large-calibre main guns. This article traces the production of armoured personnel carriers, military vehicles for troops, and other armoured vehicles specifically equipped as attack troop platforms.

Major main battle tanks (MBTs) have developed from basic and compact to heavy, modernized and highly versatile since the Cold War, with improvements in weapons and countermeasures, and here are some of the best kinds of tanks.

- 1. Abrams M1A2**

The Abrams M1A2 is a combat-proven main battle tank designed specifically for the US Army by General Dynamics Land Systems. Based on the experience obtained from the success of the M1A1, the tank was developed and integrates modern technology to provide superior firepower and mobility, making it one of the world's best combat tanks.



Figure 23 Abrams M1A2

A manually loaded 120mm XM256 smoothbore cannon, which can fire a variety of Nato ammunition against armored vehicles, infantry and low-flying aircraft, is the main weapon of the tank. The tank is also fitted with two 7.62mm M240 machine guns and a .50 cal

M2 machine gun and can carry 42 120mm bullets, 11,400 7.62mm rounds, 900 50-caliber ammunition rounds, 32 scanning grenades and 210 5.56mm ammo rounds.

The Abrams M1A2 features heavy composite armor on the outside and steel-enclosed depleted uranium armor on the front hull and turret to provide its crew with a high degree of protection. The tank has a 426 km cruise range and is capable of operating at a speed of 67.5 km/h max.

- 2. K2 Black Panther**

A new MBT produced by Hyundai Rotem for the Republic of Korea Army, the K2 Black Panther is a (RoKA). High mobility, firepower and self-protection are

expected to provide the MBT. In 2014, The Black Panther entered action with RoKA.



Figure 24 K2 Black Panther

A 120 mm smoothbore gun that can fire specialized kinetic energy ammunition is the primary weapon of the K2 Black Panther and is fitted with an autoloader for firing on-the-go ammunition, also in rugged terrain. 7.62mm and 12.7mm machine guns became part of the secondary armament.

The top speed of 70 km/h and the 450 km range make the K2 incredibly mobile on the battlefield. For all-round defense from direct fire, the tank combines reinforced armour and explosive reactive armour (ERA). To defend from fires, the ammo rack often utilizes blow-off doors.

3. Type 10 (TK-X)

The Type 10 (TK-X) is an advanced fourth generation main battle tank designed for the Japan Ground Self Defense Force by Mitsubishi Heavy Industries (JGSDF). The tank entered service in 2012 with the JGSDF and claims excellent versatility.



Figure 25 Type 10 (tk-x)

A 120mm smooth-bore gun, a 12.7mm heavy machine gun and a 7.62mm Type 74 cannon improve the firepower of the Type 10 MBT. During coordinated war operations, the advanced C4I system guarantees interoperability with infantry troops.

With modular ceramic composite armor providing protection against rocket-propelled grenade (RPG) rounds, HEAT projectiles and anti-tank rockets, the tank's hull is attached. To change the security levels, the add-on modules can quickly be removed and mounted. A top speed of 70km/h is provided by the 1,200hp water-cooled diesel engine.

3.10 Military robots

- **Unmanned ground vehicle**

Unmanned ground vehicle (UGV), it is the vehicle that performs in touch with the ground and without human behavior, it is used for many applications where it might be problematic, dangerous, or impossible to the human, there are two classes of unmanned ground vehicles which are Remote-Operated UGV and Autonomous.



Figure 26 Unmanned Ground Vehicle

UGV has a set of detectors to identify the environment, it is either autonomously makes the decisions by its behavior or pass the information to the human operator who controls the vehicle.

The remote-operated UGV is a vehicle under human control through an interface, capable of carrying out all the operator's activities by means of direct visual observation or through remote use

of detectors and digital video cameras, in dangerous conditions such as explosions and bomb-disabling vehicles, remote-operated UGVs are used to replace humans.

UGVs are developed for peacekeeping operations, ground guard, and urban street existence and to enhance the police and military raids in the urban settings, they are used in the rescue and recovery missions. They can reduce the military and police fatalities. In autonomous usages UGV autonomous robot which operates without the need for human control, it uses its detectors to define the following action to take in the context of the human-provided mission purpose, it can remove the explosives and it can repair itself without outside assistance.

The fully autonomous robot can collect environmental information, such as building interior maps, finding objects of interest, such as people and vehicles, Without human navigation guidance, it can pass between the way-points.

Without human interference, the autonomous robot can operate for longer durations, it can prevent conditions that are dangerous to humans, property, or itself unless they are part of its configuration and requirements.

UGVs have some technical issues that can happen to the robot during the wartime scenario and becoming worthless, Which will give a huge improvement in the probability of the

soldiers being wounded or killed by the enemy, UGVs can be used to see the portion of the environment for our armed forces and if there are the technological failures they can be used against our military.

- **Unmanned aerial vehicle**

The unmanned aerial vehicle (UAV) is known as the drones have categorically changed the character of warfare in technique, action, and awareness. The era of armed drone use has arrived, and the rapid expansion of drone technology among states and militant groups alike extends a new threat to the international community.



Figure 27 Unmanned Aerial Vehicle

Drones can be controlled by a computer or a commander and in both cases, they can carry out specific actions without a direct human leading, so it can be fully autonomous or semi-autonomous.

The unmanned aerial vehicles are needed for missions that are too dangerous or dull for humans, they give the attack capability for high-risk missions and they are founded mostly in military applications.

Unmanned Aerial Vehicle gives a less stressful environment, it is used for better decision making, it grants a safer environment, and they can fly extended hours as long as the vehicle qualifies for it.

Unmanned Air Vehicles can remain up to 25 hours in the air, performing unique tasks, searching the area continuously, day-after-day, night-after-night in total darkness, clouds or fog, and under computer control.

Unmanned Air Vehicles can protect lives, incredibly reduce putting the military personnel in damage's way or combat, they need low cost, and they need cheaper fuel and maintenance than regular airplanes.

A failure may happen to the computer systems or the software which may lead to loss of plane or fatalities on the ground, Losing the plane costs millions, The drones causes civilian deaths, drone warfare causes huge losses in civilian lives and property, such as killing

civilians and damaging civilians property as well as the traditional war too, some cultures believe that the use of drones is not brave and cold-hearted, drone warfare makes combat too easy by reducing ethical decisions.

So After all the human mistake in the remote controls can cause the plane to crash and they have limited abilities.

- **Remotely-operated underwater vehicle**

A Remote Operating Underwater Vehicle (ROV) is a vehicle that is controlled by an operator that is not in the vehicle. It may be operated by radio control or by a cable or line linking the vehicle to the position of the operator. It may use a powerful deep or rough water umbilical cable and tether management system.

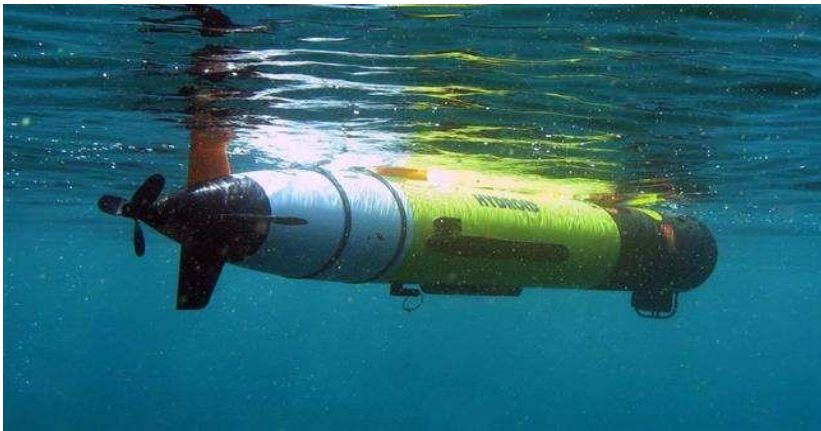


Figure 28 Remotely-operated Underwater Vehicle

The researchers used the ships to explore the depths, bring the floats and drifters into the currents and collect water, rock, and marine life samples, the analysis methods available have evolved to include human-

inhabited submersibles, remote-controlled aircraft, and autonomous robots.

Human Occupied Vehicles (HOVs) hold three persons and are developed to handle the huge pressure thousands of meters below the ocean surface and allow scientists to make detailed analyses gather specific samples, and position, collect or perform experiments on the seafloor and in the deep ocean.

Remotely Operated Vehicles (ROVs) are the attached robots that allow researchers to analyze, gather samples and perform tests while managing the vehicle from the surface. They are used by the science community to explore the ocean, and with the use of ROVs, many deep-sea animals and plants are discovered.

ROVs can stay below the surface for more than a day, and they can hover over the seafloor target like a helicopter or examine the wide-area, send or receive the control signals, the

sensor data of the vehicle and the images, allow the pilot to control the manipulator arm of the vehicle in real time to help perform detailed ocean observations.

It is connected to the operator via the cables that relay the command and control signals to and from the ROV and the operator, which allowing the vehicle to operate remotely.

ROV is designed with at least a video camera and lights, extra equipment is usually installed to extend the capability of the vehicle, such as sonars, magnetometers, many kinds of detectors, a manipulator or cutting machines, water samplers, and instruments that measure the purity of water, water temperature, water density, sound acceleration, light penetration, and temperature.

Autonomous Underwater Vehicles (AUVs) are programmable, robotic vehicles that can float, move or glide across the ocean without the guidance of the human operator, can communicate frequently or constantly with the operator via satellite signals or underwater acoustic beacons, and can make their own decisions.

They are designed for military use and have not yet been sold to other industries, they mostly stalk the enemy ships, defend the harbors and the sweep of the mine, do not need the tether, once they have developed the niche in deep-sea exploration and development, they are intended to become usable for marketable applications.

Remote control range for the underwater ROV is restricted by many variables, radio waves do not travel well through the water in the form of the electromagnetic field unless the frequency is so low that the bandwidth is limited, the frequency limitation makes it difficult to transmit high data transmission rates needed for full-motion video.

3.11Space weapons

Space weapons include a variety of warheads capable of targeting space targets on Earth, intercepting and disrupting missiles passing across space, or destroying orbiting space systems or satellites. The U.S. and the former Soviet Union also developed space weapons during the Cold War, when diplomatic tensions intensified.

Although space militarization remains contentious, anti-satellite missiles have been developed by the U.S., Russia and China. Several test firings of these warheads have succeeded in destroying orbital satellites, including a Chinese anti-satellite missile test in 2007 that smashed one of the obsolete weather satellites in the region.

- **Fly by wire technology**

For certain flight control devices that use computers to process flight control inputs created by the pilot or autopilot, Fly-by-Wire (FBW) is the commonly agreed term; it is a technology that substitutes manual flight controls with an electronic interface that uses computer-generated signals and wires to transfer control mechanisms. More accurate machine guidance and control was made possible by the advent of fly-by-wire systems in aircraft. For starters, without relying on manual inputs from the pilot, fly-by-wire systems might automatically help stabilize airplanes.

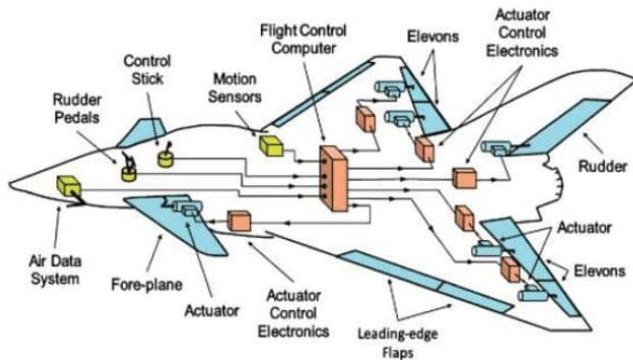


Figure 29 Fly by Wire

The term used is that of error management in which the location of a control surface is constantly sensed and fed back to its flight control computer (FCC). The discrepancy between the actual control surface location and the target control surface position implied by the instruction is measured by the

computer when a command input is made by the pilot or autopilot and an effective correction signal is transmitted electrically to the control surface. Feedback compensation acts as error management, and by matching output signals to input signals, the FCC controls the system. Every failure between the two becomes an order to the surface of the flight control before input equals output.

- **Satellite melter**

If there is one way for an enemy satellite to be removed, it will be melting it. A program with Northrop Grumman and Raytheon sponsored by DARPA is designing a satellite that will be built to hunt and track the defense satellite of an enemy. If done right, basic mechanics will work, reflecting a sunbeam on the enemy satellite that will heat the opposing satellite just enough over weeks to make it slip out of orbit and burn up on re-entry into the upper stratosphere.



Figure 30 Satellite

It's not going to seem like a brilliant strike in the sky. It won't even be seen. That's the definition, with a prototype in 2018 and a production planned in 2021, it's a five-year project.

Chapter 4: Pros and cons of military technology

4.1 The positive side of military technology

4.1.1 Arguments supporting the use of military technology

Autonomous weapons systems (AWS) are evolving from science fiction movies to designers' drawing boards, to engineering laboratories and then to the battlefield. These machines can perform advanced functions with little or even no human oversight. Some military experts think that autonomous weapons systems are preferable on moral grounds to the use of human combatants.

4.1.2 Pros of military technology

Autonomous weapons systems can act as a force multiplier which means that fewer warfighters are needed for a given mission and the efficiency of each fighter is greater.

AWS help in expanding the battlefield, this allows combat to reach areas that were inaccessible before, they also help to reduce casualties by removing human warfighters from dangerous missions.

This means that robots can replace humans in dirty, dangerous-such as crawling through caves- or dull missions, and this helps in protecting the lives of soldiers by reducing their number without any reduction in effectiveness.

Autonomous weapons are more accurate so, their performance is much better than human warfighters in functions as targeting.

Army robots are now used in battlefield, they can make faster decisions than humans who may hesitate to make a decision under pressure, robots are emotionless, they are unaffected by stress or fear, they won't feel tired, hungry or thirsty, army robots can be sent into places where it is hard for humans to go to as extremely hot or cold areas. Robotic soldiers won't hesitate to kill any enemy, they are sent to the battlefield instead of humans to save their lives which means that fewer people will die. Technology allows military personnel to engage the enemy at safer distance.



Figure 31 Army Robot (Rescue Robot)

Robots don't need to be trained they can simply be upgraded, they are easily replaceable at a cost unlike human lives, they can endure damage caused by bombs or other weapons that can destroy human body, they can also replace humans in security services in places which are either too difficult or too expensive to guard.

Robots can see and hear better than humans, they usually come with infrared cameras to be able to see at night and through smoke, they have thermal cameras, radioactivity sensors, flame or smoke detectors and they also come with directional microphones which can detect unusual noises.

Robot soldier can navigate on his own, this robot can get around obstacles and can detect anomalies more efficiently than humans, it can also read license plates.

Security robots can detect an intrusion using video monitoring and announce by means of loud speakers or sirens, they can report problems to scare away intruders by using sound alarms and then everything will be handled by humans.

Robot pilots would not be subjected to mental and physiological constraints, fully autonomous planes can be programmed to take random and unpredicted actions to confuse the opponent, they are used to destroy enemy targets, they can perform maneuvers that can't be done by human pilots, they can select and engage targets without further intervention by a human operator and the most important thing is that the loss of a plane doesn't mean a loss of a pilot.

Military robots don't close their eyes, they don't hide under trees when it rains, they increase the chance of capturing enemy combatants, robots have ability to identify friendly forces. Most military robots are teleoperated and not equipped with weapons, they are used for sniper detection, surveillance, neutralizing explosive devices, reconnaissance and finally robots that

are equipped with weapons are teleoperated which makes them not capable of taking humans' lives autonomously.



Figure 32 Robot Soldiers

4.2 The negative side of military technology

4.2.1 Arguments opposing the use of military technology

Autonomous weapons have been described as the third revolution in warfare, after gunpowder and nuclear arms, critics see that AWS must be limited -if not banned- for a variety of moral and legal reasons, weapons can be extremely destabilizing if it allows one nation to launch a nuclear strike against another without fear of retaliation, they may cause a high level of collateral damage. The main reason for those who oppose autonomous weapons systems is that they are worried about the delegation of life-or-death decision making to nonhuman agents, AWS will find it very hard to determine who is civilian and who is combatant.

Experts are trying to set limits on the development of autonomous weapons systems technology and drawing red lines which the future technological developments should not be

allowed to cross, some weapons (e.g., biological weapons) are unlawful even if they are used against combatants, so autonomous weapons are preferred to be used in situations where no citizens are present such as in desert against tanks or in the sea against warships.

4.2.2 Cons of military technology

Robots can be hacked by the enemy and can be used against you, they are exposed to software issues and malfunctions which may cause casualties or injuries, the development of their software is difficult, it takes long time and there aren't a lot of experienced programmers to upgrade them, they can't tell right from wrong and that can make them attack civilians or allies, computers are heavy so they add more weight to vehicles and personnel which makes it harder to move.

Table 2 Advantages and Disadvantages of AI in the Military Field

Advantages and Disadvantages of AI in the Military Field		
	Benefits and Potential Advantages	Disadvantages and Risks
Strategic Decisionmaking	<ul style="list-style-type: none"> - More precise, faster situation assessments and analyses - Offsetting emotions and prejudices - Rational behavior in crisis situations 	<ul style="list-style-type: none"> - Low crisis stability due to acceleration of decisions - Prejudices can be inherent in algorithms - Problems regarding the balance of power within states, for example between the military and the civilian leadership.
Training and Organization of Armed Forces	<ul style="list-style-type: none"> - Personalized training, fair assessments and promotions - More realistic exercises, maneuvers and simulations - Credible simulations of future technologies and their applications 	<ul style="list-style-type: none"> - Overestimation of AI-generated results - Cultural and personnel problems due to incompatibility between military culture and values held by specialized personnel - Military cast system due to higher technical specialization
Military Operations	<ul style="list-style-type: none"> - More efficient processing of data from different sources - Reduction of administrative and staff work through forward-looking logistics - Reduced risks for troops through autonomous logistics - Improvement of support and reconnaissance systems 	<ul style="list-style-type: none"> - Potential dependencies that cannot be replaced in the field - Risks in supply chains due to lack of inventories and reserves - Unclear whether autonomous vehicles can be used in complex scenarios - Reduction of strategic stability

As the technology becomes more developed its effectiveness and efficiency increases and that can cause danger to both sides of the battle field, technology made warfare more deadly and enabled war to spread into environments that used to be inaccessible to it before.

Military technology is expensive which means that not all countries have the ability to possess them and therefore they do not have the ability to repel enemy attacks due to the mismatch of forces.

Using biological weapons which are also called germ weapons can destroy the ecological balance as it depends on spreading disease-producing agents such as viruses, bacteria, fungi, toxins or other biological agents which act as weapons against humans, animals or plants, these infectious agents can be used in warfare against enemies to spread diseases which can evolve to cause deaths, they were used in WWI, WWII and in the cold war.

Nuclear weapons and atomic weapons in addition to biological weapons are referred to as weapons of mass destruction, the most famous examples of atomic weapons are the atomic bombs which were dropped over Hiroshima and Nagasaki in 1945 during WWII, the explosion immediately killed thousands of people, tens of people died later due to the effect of radiation, the two cities were completely destroyed, but it didn't stop here, as a result of the explosion and the exposure to the blasts and the effect of radiation people had deformities, and it even caused that many babies were affected by this radiation and were born with birth defects and the birth of deformed babies lasted for several years.

Chapter 5: Protection and most powerful countries

5.1 Application to protect human from military technology

In the military world, every measure has a countermeasure to impede enemy equipment. Defense and offense both need to know the countermeasure and an attempt to foil it with countermeasures to protect it from its publication.

5.1.1 Laser protection from missiles

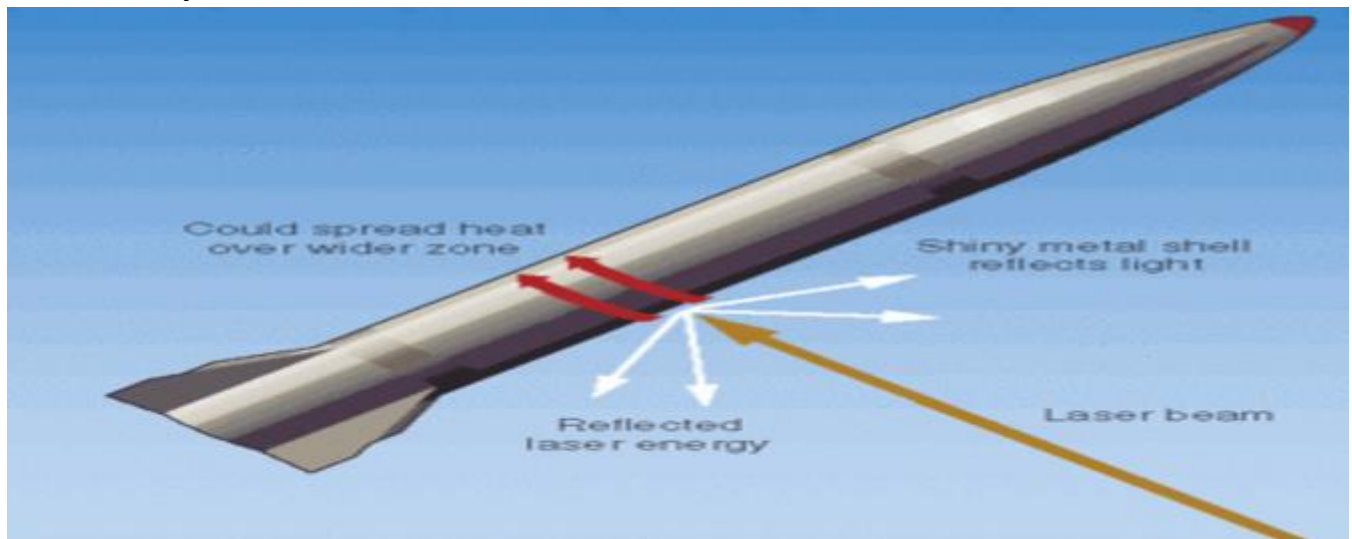


Figure 33 The Laser Attack Missiles

Laser produces light energy to destroy offensive attack missiles traveling within the atmosphere or space. It generates first laser beam from first location and second laser beam from second location at the same time, either through atmosphere or not. The first chemical laser weapon produced a first beam of radiant heating energies with a continuous wave of a specific energy level. A second chemical laser weapon produces a second beam of radiant heating energies of a continuous wave of a given energy level. Focus on location of the missile with a view to release its radiant heat producing energy at the same time. First and second laser weapons produced power levels by said beams being sufficient in combination in intensity to at least weaken a spot of the wall of a missile located in the most distant portion of the atmosphere. The spacing between two positions prevents the laser rays from crossing with each other to be spread on their specific path to the missile. The aforementioned specific composition means to mount the laser beam in succession to the overall targeting motion to allow the associated laser weapon to be aimed at any spot within a specified field of view within the atmosphere via non overlapping ray paths. The first and second paths alternate with

the movement of the attack missile, and simultaneously firing means firing the laser weapons first and secondly to direct a continuous wave radiant heating energy from each laser weapon to the aforementioned point on the missile for a period sufficient to weaken it at the point and destroy it. The disadvantage of a laser system is that it does not work well in times of low visibility when there is heavy cloud cover and other inclement weather.

5.1.2 Laser to address threats of nuclear weapon

The Air Defense Agency worked to invention a laser weapon that is launched in the air and has a high ability to destroy nuclear armed missiles. It is destroyed by combining laser energy and energy for making a bore in the metal. The laser devices fired from ships, and the grounds are able to target and destroy enemy aircraft. Through research, researchers have concluded that sufficient height is the key to a successful laser interception. It is well to fire the laser from a small device working at the highest altitude inside the atmosphere because it takes advantage of thin air. The device used to transmit to offensive laser beams will need to travel with large amounts of energy at high altitudes, and some fire control systems, targeting devices and sensors. It may involve a high-flying unmanned aircraft adapted to laser weapons. When the laser collides with the nuclear missile, it may destroy it or fall on the country that launched it. Depending on the strength of the laser beam and the quality of the beam, the energy affects the target to achieve the effect.



Figure 34 The Laser Against Nuclear Weapon

5.1.3 Protection from terrorists with W- BAND

W-band technology is developing and operation radar and satellite communications. Security search devices could be used to detect concealed weapons. There are applications in which W-band electromagnetic radiation is used to protect from enemy. Terrorists may carry concealed weapons and hide in a crowd. It is better to disperse the crowd than attack by shooting bullet at the people. A crowd can dispersed with electromagnetic radiation at W-band. It spread out varied weather, fog, snow, cloudy and dusty. When it reaches the person it passes through clothes and reflects from skin. Millimeter waves with X-ray body scanners that seem to have been adapted from airport baggage scanners. W-BAND is located between the infrared and microwave regions of the frequency spectrum defined as the frequency band between 30 GHz and 300 GHz. This spectral is able to penetrating most non-metallic objects. In the field of security, MMW body imaging is a progressing technique. It uses in passenger security screening at airports in the United States and other countries. This device could effectively detect the things hidden in the human body under the clothes without the need for direct contact with the body. It is harmless to humans. It is decrease the action of the security and improves security efficiency. Passive imaging uses waves emitted from the human body to execution imaging. Active imaging is like a camera flash that emits a BMW radiation source on an object to be detected and is used to security checks at airports, industrial imaging radars and others.

5.1.4 Protection from chemical and biological weapon



Figure 35 Soliders Wearing Protective Clothing During Disasters

Chemical weapons and biological weapons are arms of mass devastation. They are easy to manufacture. Countries with limited resources or security concerns choose chemical and biological weapons. There are treaties that cautions against the use of chemical and biological weapons. Attacking with a chemical or biological performed to enormous death and destruction. Biological weapon is harmful to the respiratory system. Protective equipment involves full face masks, surgical masks to protect the respiratory system and protective gloves

in a biological attack the importance for using medical precautions is to prevent and reduce the effect of biological attack. And to get rid of the effect of harmful chemicals, it is necessary to take off the clothes, and avoid any touch between the faces and hands, and clean your skin with soap and water. It is necessary to use gloves, and gas mask.

5.1.5 Protection assets from directed energy laser

Military weapons must be protected from laser beam that speed across space. A laser warning system was built to protect military from laser. The threat is from a variety of lasers devices. For example, the target may be great in relation to the diameter of the laser beam that threatens the ship and may from fog. The eyes and skin must be protected from laser radiation by heavy-duty welding glasses, hoods and protective blinds. Laser is used to distract people and blinds the eyes. Researchers are studying the use of a liquid crystal embedded with glass to scatter and block out the laser light that reaches it. Its aims to convert the windshield to opaque when the laser light illuminates the glass the rest of the glass remains transparent, and then the glass return quickly to transparent after the disappearance of the laser.



Figure 36 Visor Anti Laser

5.1.6 Plasma protection field

Researchers tried to build defines system. So researchers could invention to protect military vehicles from wave after the explosion. It uses a combination of lasers, electricity and microwaves to heat air. This heat made a plasma shields and it is dense from air and is able to absorb the energy from the wave. This defines system installs on military vehicles, sensors detect the threat. Computers and sensors are calculating the time, and direction of shock wave. Then the system heats the air around the target and cover to protect it .In a short time, the use of an electromagnetic arc to create a medium in the air using an amount of the energy to the heat the air into the plasma. It is possible to use a laser beam to generate a region of the

plasma. The plasma fields enough to absorb and reflected the energy. This plasma can protect military vehicles and people, and soldiers from an enemy attack.

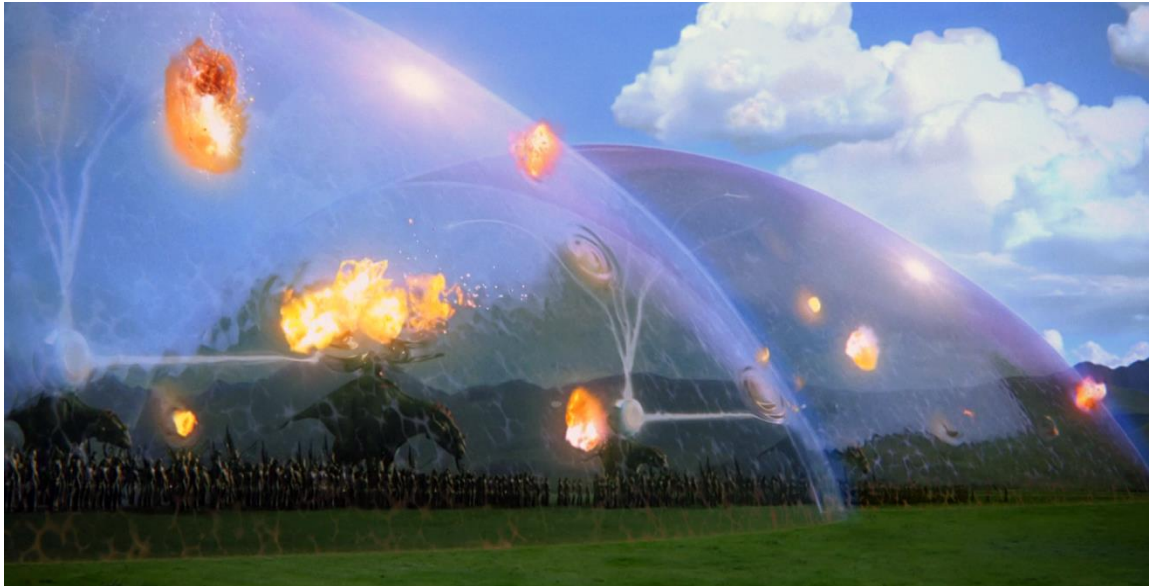


Figure 37 The Plasma Against Shock Waves

5.2The most powerful countries in the world

5.2.1 United States of America

It has a most powerful military force in the world. And it is the largest economy else. It includes a huge army of more than a million soldiers and spends more than billions of dollars on them. America depends on the drone. The Air Force launched an automatic spacecraft, in 2011. The US Navy has developed a technology for converting seawater into fuel. The US has many of aircraft, advanced technology, and a large human force, and includes the largest arsenal in world. US Army receives final trophy APS. APSs are designed to shoot down threats like anti-tank missiles and rocket-propelled grenades. The United States of America has increased the budget and the effort to use artificial intelligence (AI) in a military field.

5.2.2Russia

The Russian armed forces are second strongest military in world. Russia has the largest tank fleet in world. It has the largest aircraft fleet after the United States of America. Russia was able to deploy its soldiers abroad by deploying them to Syria. The Russian elite offered its arsenal of protective armor and armor-piercing weapons. Russia has thousands of aircraft. The

Russian predator unmanned aircraft was launched with great efficiency. The Russian Air Force Orion launched missiles for the first time, which represents an important step for the country. Russia also possesses a strong naval force. Russia never ceased to be one of the largest military powers in the world. The country retained its military strength after the collapse of the Soviet Union.

5.2.3China

China has become a global economic powerhouse by developing its army. Some argue that China is militarily superior to that the United States through its population and generous military spending. In 2014, China unveiled new weapons such as the Liaoning aircraft carrier and the J-15 fighter, which carries a type of capsule and enables the supply of fuel during flight. In this year, China announced a military use of space. China developed the JF-17, and it was used in air skirmishes. China's economic rise is working on its progress militarily. China has the second largest tank fleet after Russia and the second largest submarine fleet after the United States. In 2017, China began developing next-generation AI (AIDP). China has developed a range of military technologies such as ballistic missiles, and fifth generation aircraft. The Chinese army lacks real wars as it has not conducted combat operations since the Chinese war.

5.2.4India

India is one of the most militarily powerful nations in the world. It is the largest importer of military goods. It possesses the most active human force, in addition to tanks and aircraft. Furthermore, it has access to nuclear weapons. Likewise, it becomes the fourth highest military spender in the world. India is the largest buyer of weapons in the world, and the transfer of technology from other countries to India has increased. India has made a giant leap in the space technology. India is progressing militarily slowly as it has introduced aircraft that are used for border guards.

5.2.5Japan

Although Japan is the third largest economic country in the world, it does not occupy the first place militarily. Japanese submarines are seen as the best. Japan occupies the first place in technology, as it is always the progress in the innovation of technological devices. Japan plans to deploy first unmanned fighter air raft in 2025. Japan possesses the ability, knowledge and materials needed to make a nuclear bomb. In 1995, it was attacked by chemical weapons.

5.2.6France

France is one of the most powerful forces in the world, and is associated with modern military power. It has hundreds of tanks, and thousands of armored fighting vehicles and armored vehicles, and possesses mine warfare equipment.

5.2.7United Kingdom

The United Kingdom is a major NATO member colony and possesses one of the leading military forces. The UK includes supersonic aircraft, a sniper rifle that carries the record for the longest killing distance of a sniper, an attack helicopter and air defense destroyer capable of shooting down small moving objects at speed.

5.2.8Turkey

Turkey has one of the world's toughest military capabilities. Its formidable military force has matured. Turkey's armed forces are one of the largest in the eastern Mediterranean. Turkey is a committed member of the F-35 program.

Conclusion

Military technology can be considered as a double-edged weapon as there are some countries that use this technology in a peaceful way as surveillance and to protect the lives of human combatants while other countries use them to destroy their enemies and to kill people even if they were innocents, as the explosion of the atomic bombs that were dropped over Hiroshima and Nagasaki in WWII.

There are many forms of military technology, each of them can be used in peace and in war, which is related to the country using this technology.

There are a lot of rules that limit the use of military technology in order to save the lives of human beings and to minimize the devastation.

There are many organizations which are responsible for monitoring the use of military technology and mass destruction weapons.

We should spread awareness of the harms and the risks of using military technology between the next generations in order to help them to live in a more peaceful world.

Glossary

ADAPTIV. It is an active camouflage technology created to shield military vehicles from detection by night vision systems in the far infrared, providing disguise in the infrared.

AI (Artificial intelligence). It refers to the simulation of human intelligence in devices built to think like humans and imitate their actions.

AIDP (Artificial intelligence development plan).

APCs (Armoured Personnel Carrier). An armoured personnel carrier is a wide range of armoured fighting vehicles intended for the transport of personnel and equipment in war zones.

APS (Active protection system). It is a system (usually for military applications) aimed at preventing the possession and/or destruction of a target by line-of-sight guided anti-tank missiles/projectiles.

AUVs (Autonomous Underwater Vehicles). An autonomous underwater vehicle is basically a robot traveling underwater without needing guidance from an operator.

AWS (Autonomous weapons systems). A weapon system(s) that can identify and engage targets once triggered without further interference by a human operator.

DDoS (Distributed Denial-of-Service). A distributed denial-of-service attack is an attempt to interrupt the regular traffic of a targeted server, service or network by a flood of Internet traffic overwhelming the target or its surrounding infrastructure. The victim's incoming traffic flooding originates from several distinct sources.

DoS (Denial-of-Service). Like DDoS attacks, DoS attacks aim to interrupt the regular traffic of the targeted server except that the victim's incoming traffic flooding originates from a single source.

ERA (Explosive Reactive Armour). Reactive armour is a form of vehicle armour that responds to the impact of a weapon in some attempt to reduce the harm caused to the protected vehicle. Explosive reactive armour is the most common type.

FBW (Fly-By-Wire). It is a system which replaces an aircraft's traditional manual flight control with an electronic interface.

FCC (Flight Control Computer). A civil and military Hardware aircraft Control Solution (engine, steering, landing gear). The primary flight control surfaces are controlled by the flight control computer to guide the aircraft's flight route, while providing fine stability control as well.

GCA (Giant Cell Arteritis). It is a medical condition that can cause blood vessels to undergo pain and swelling.

GHz (Gigahertz).

GPS (Global Positioning System). It is a satellite-based radio navigation system that provides a GPS receiver with geolocation and time information anywhere on or near the Earth where four or more GPS satellites have an uninterrupted line of sight.

HI-MEMS (Hybrid Insect Micro-Electro-Mechanical-system). A project to control the locomotion of insects by putting a mechanical device inside an insect.

HOVs (Human Occupied Vehicles). Human Occupied Vehicles carry small teams of scientists and engineers for short periods of time straight to the seafloor.

ISR (Intelligence, Surveillance and Reconnaissance).

MAVs (Micro Air Vehicles). It is a type of unmanned aerial vehicles but of smaller size.

MBTs (Main Battle Tanks). A main battle tank, also known as a universal tank, is a tank that provides many advanced armies with the armor-protected direct fire and maneuver role.

MEMS (Micro-Electro-Mechanical-Systems). It is a small device with parts that are mechanical and electronic.

MMW (Millimeter wave). The spectrum band with wavelengths between 10 millimeters and 1 millimeter is a millimeter wave and is also known as a millimeter band.

OODA (observe, orient, decide, act). The cycle observe-orient-decide-act, established by the strategist of the military.

PHaSR (Personnel Halting and Stimulation Response). It is a rifle-sized laser weapon device using two non-lethal laser wavelengths to discourage, prevent or reduce the effectiveness of an opponent.

ROV (Remotely-Operated Vehicle). Remotely operated vehicles are unoccupied, highly maneuverable underwater devices that, while being operated by someone on the water surface, can be used to explore depths of the ocean.

RPG (Rocket Propelled Grenade). A shoulder-fired missile arm that fires missiles loaded with an explosive warhead.

SSBN (Ship Submersible Ballistic Nuclear). They are nuclear-powered submarines which are built for carrying long-distance missiles. Strategic attacks are carried out primarily by them.

SSGN (Submersible Ship Guided Nuclear). They are nuclear-powered submarines intended mainly for cruise missiles, whether nuclear or otherwise.

SSN (Ship Submersible Nuclear). It is a general-purpose attack submarine operated by nuclear power and usually referred to as the fast attack submarine.

UGV (Unmanned Ground Vehicle). An unmanned ground vehicle is a vehicle that functions without an onboard human presence when in contact with the ground.

UK (United Kingdom).

US (United States).

USSR (Union of Soviet Socialist Republics).

WWI (World War One).

WWII (World War Two).

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