

ANTI-DRONE LASER WEAPON FOR ARTSAKH'S DEFENSE

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"There are relatively few experiments in atomic physics these days that don't involve the use of a laser". Eric Allin Cornell

Prof. Z. S. Andrew Demirdjian, Los Angeles, 25 April 2022

Throughout the military history of the world, winning a war depended on many factors such as morale, generals, size of army, weapons deployed among other reasons. After WWI, air superiority enhanced military firepower and maneuverability and has become critical to battlefield success. Currently, UAS (unmanned aerial systems) as attack drones and drone swarms have become the marquee players in the latest weapons for modern warfare.

According to the military analyst Samuel Bendett, Azerbaijan's drones were indeed a "magic bullet" to turn the tide for Azerbaijan during the 44-Day War with Artsakh (Nagorno-Karabakh), which began on September 27, 2020. The militaries of the whole world began to follow the war closely in order to learn lessons from the deployment of UAS, especially attack drones. As a result, USA, UK, and India to cite a few, have begun seriously to show renewed interest in drones for offense and defense purposes.

Although on an international scale the war between Artsakh and Azerbaijan scored as being insignificant, the international communities' efforts were concentrated on finding how drones made it possible for Azerbaijan to defeat the Republic of Artsakh and the implications for the future of modern warfare based on drone weaponry.

One of the latest inventions is the drone swarms based on Swarm Intelligence (SI), which is making headlines in military circles and publications. For example FP (Foreign Policy) reported that the "U.S. Army goes to school on Nagorno-Karabakh Conflict --Off-the-shelf air power changes the battlefield of the future" with its use of UAS. Research and Development are moving into two major areas: Drones for offense and defense and anti-drone devices to neutralize the power of attack drones.

When Azerbaijan took over the skies in its fight with Artsakh last year, one thing became clear to U.S. Army strategists: "It is becoming easier to hunt and kill troops than ever before". In my previous article on drone swarms, I presented the characteristics of the most recent attack Drone Swarms (DSs) for Artsakh to acquire for defense. In this article, I am going to introduce a rather new anti-drone swarm device based on laser technology.

Basically, attack Drone Swarms (DSs) that operate in groups (as lions do in a pride) to identify, seek, and target enemy positions for destruction without a leader telling them what to do even when difficulties arise. Each and every member of the swarm would know what to do next through a mysterious initiative only present when in a group.

Central to the concept of DSs is the theory and practice of Swarm Intelligence (SI), which comes from nature, especially from biological systems. The source of SI is deeply embedded in the

biological study of self-organized behaviors found in social insects. SI systems consists of a biological population of simple members (aka agents) interacting locally with one another and with their environment.

Surprisingly, the individual members of the swarm follow very simple rules. Although there is no centralized structure (i.e., a leader) to dictate how individual agents should behave, the interactions between such agents lead to the emergence of "intelligent" global behavior unknown to the individual members or agents.

Many examples of SI in natural systems are familiar to us. They include systems such as ant colonies, bee colonies, bird flocking, animal herding, hawks hunting, fish schooling, and microbial intelligence (as in influenza). Individually, they seem dumb, but when in a group they show amazing intelligence to solve problems for the good of the colony. For example, an ant when in a group, becomes an ultimate engineer to build bridges across gaps, to construct mansions underground, to mobilize to defend the nest, just to mention a few feats.

Based on the principles of SI and on AI (artificial intelligence), the most lethal weapon among the UAS is the DSs. The characteristics of SI in military weapons are also frightening. Once DSs are programmed and given a mission, no one can escape from their pursuit until they accomplish their mission. They are the ultimate predator squadron in the sky rendering the battlefield as their own backyard to play lethal games on their enemies.

The good news is that technology is emerging to produce anti-drone swarms based on laser platforms (a "platform" is a system of manpower, material, tactics, techniques, procedures, etc. instantiated to support a mission need). Laser guns are not new, but the use of them in downing drone swarms is very recent. Most likely, Armenia won't be able to buy DSs for being costly, but anti-drone devices would not be that expensive. As a result, they should strengthen their defensive position against enemy attack drones and DSs.

Interestingly enough, the hunt with DSs is compounded. While attack drones are launched individually, DSs are unleashed as a group for mass destruction. Therefore, the current anti-drone devices are normally very effective against individual drones, but not yet so effective against a self-organized, self-motivated, self-directed squadron of drones flying in the sky as a flock of birds.

Having said that, laser technology is coming to the rescue to effectively fight against DSs as a gang and disable them before they would accomplish their mission. Drone robotics will continue to produce all sorts of counter UAVs in the near future for laser rays can cut through mountains instantly. Currently, the emphasis has been on laser-based anti-drone technology, justifiably so.

As Azerbaijan gained mastery over Artsakh's forces mainly due to the deployment of attack drones operated by Israeli and Turkish remote pilots, the attack-drone based war with Artsakh in 2020 gave the impetus to world's militaries to either produce or acquire counter drone devices for defense. Ideas have changed the world, ideas may very well advance Artsakh. So, let us heed the buzz about

the counter DSs measures based on laser technology, which is predicated on the following benefits and versatility of the weapon instantiated as the world's most "intelligent weapon":

I. Anti-drone laser device is a portable laser system (platform) designed to shoot down unmanned aerial systems, including swarms of drones with mathematical precision. It is important to emphasize that the device is not bulky or heavy as an elephant's huge mass.

II. Anti-drone laser device is small, one soldier can carry it as a ray gun like in science fiction movies. So, it can be moved and used at different locations of the military war theater like a large golf-course umbrella.

III. The entire system fits on the back of a Land Rover and is controlled by a single operator to carry it over every hill and dale.

IV. The system is pretty straightforward, utilizing a combination of radar/electro-optical tracker/laser weapon. As an option, it can be mounted in turret, a tower on top of a tower on armed vehicles just like the stacked up towers of the glorious castles of the medieval age.

V. According to Rafael outfit, the makers of Drone Dome (a laser gun), their counter DSs device can detect objects as small as 0.002 square meters at 3.5 kilometers (2.1 miles). Once detected, the system locks onto the drone, keeping it in its crosshairs, targeted as if through an aiming device like a bulldog's grip on an intruder.

VI. While using Drone Dome laser gun, the operator can select "coarse view" (a more distant view of the drone that allows the operator to maintain a visual perspective) or a "fine view" (for close up examination of the drone or aiming the laser at precise locations) like in shooting an outdoor scene for a movie, either you pan over the area or focus the camera on specific objects found in that scene.

VII. Generally speaking, when the laser engages, it causes structural failure as it melts away the plastic housing and causing the drone's electronics to fail. Hot melted plastic and metal fly off in increasingly larger pieces and then Mother Nature's Miss Gravity takes care of the demolition of the rest. Based on a number of field testing, it is believed that Drone Dome can even take on swarms of drones, torching them one after another. Oh, if only Artsakh had such an anti-drone weapon in September of 2020, Armenians around the world would have renewed confidence in getting back some of their other ancestral lands lost to the Turks.

VIII. The anti-drone laser innovation can also deal with incoming enemy artillery, rockets, and mortars on the ground. The DE M-SHORAD platform, the U.S. Army says, will intercept those munitions (e.g., military weapons, ammunition, and equipment) in mid-flight, using the intense laser beam to explode or incapacitate them before they can come too close to troop positions. The anti-drone laser device would act just like a bug zapper to kill flying insects.

IX. While these new laser weapons aren't as powerful as a megawatt laser mounted on a 747, they are more reliable, more rugged, and cheaper than ever. If speed and agility are required, the

cheetah beats the King of the Beasts with hands down.

X. Although we won't likely see a handheld laser blaster (small gun like a revolver used by Jessie James) anytime soon, but a breakthrough in energy storage technology could push a true ray ban gun forward into that final frontier. One can stand in his or her backyard and shoot at invading drone swarms of the enemy while keeping an eye on the hamburger patties on the BBQ grill. Nothing seems impossible for science and technology when research is persistent.

In all fairness, Artsakh has proven for nearly 30 years to be a responsible, well functioning republic meeting all the requisites of a State set by the United Nations. As a result, Artsakh conflict must receive its final resolution through peaceful negotiations within the framework of the OSCE (Organization for Security and Cooperation in Europe) Minsk Group Co-Chairmanship and based on the self-determination principle deeply rooted in democracy. Anything short of that, the freedom-loving Artsakh Armenians would go to war to protect their ancestral lands. On the other hand, Azerbaijan demands complete return of Artsakh under its rule. This impasse spells renewed conflict; it even portends war.

Ruefully, we all have come to realize that Artsakh is no match for the enemy. To gain the mastery over its opponents, the tasks are difficult, but not impossible. Unequivocally, Artsakh Defense Forces should, therefore, be prepared to face a formidable aggression within a matter of a few years. The potentially explosive situation necessitates the addition of UAS-based weapons in its arsenal, such as attack drones and anti-drone devices. Granted, attack drones and drone swarms are expensive, but the light at the end of the tunnel is the inexpensive anti-drone laser devices to neutralize enemy's aerial and even land attacks. China has recently begun to sell counter drone laser guns for a fraction of the price of an attack drone.

If we uphold justice, if we love Artsakh, if we want to see Artsakh prevail, and I bet we all do -- Armenia, Artsakh, and the Diaspora should pool their mental and monetary resources together to equip Artsakh with the necessary weapons and equipment to protect its rights. If you are interested in making a difference, let us hear from you. This time around, after the conflict, let us search for what made us win the war against the fierce and devilish spirit of President Ilham Aliyev rather than bemoan the defeat again for lack of the right weapons to arm Artsakh's brave soldiers. Please do not forget that we can shed tears about the defeat to fill up a sea, but we shall never swim out of it because of our "unforgiveable negligence" for repeating the same mistake the second time around.



The Harop drone made by Israel Aerospace Industries was deployed during the 44-Day War between Artsakh and Azerbaijan in September of 2020. Operated by a remote Israeli pilot, this is one of the drones that tipped the balance in Azerbaijan's favor. This drone actually can lay in wait (loiter) over the battlefield and when the opportunity presents itself, can strike its target riding on the radiations emitted by such a target. Had Artsakh soldiers anti-drone devices, this killer drone would have become a dead bird and in the process saved the lives of many soldiers. Armenia, Artsakh, the Diaspora should never send our soldier to the front without making sure they are equipped with the right weapons to face up the adversary's challenge.



Compared to the counter drone gun in the picture, currently lighter anti-drone laser devices are being produced. The proliferation of the use and threat of drones and the lack of a dependable network to take counter measures against them has been identified by the U.S. Central Command as a "concerning tactical development". The Pentagon has also identified the lack of institutionalized training in defeating the ever-increasing drone threat, is developing a joint strategy aimed at countering unmanned aircraft systems. Armenia, Artsakh, and the Diaspora should earnestly begin to equip Artsakh's Defense Forces with attack drones (if possible), and definitely with anti-drone devices which are very inexpensive from China.



U.S. Army Sgt. Gage Stancell, right, looks through binoculars as Sgt. Gentry Squier describes where he saw a drone during an unmanned aerial system training exercise at Irbil Air Base in the Kurdistan

Region of Iraq on April 24, 2020. Right after the Second Artsakh War of 2020, The Pentagon announced to open a new school in the coming years specifically to teach troops to spot and kill small enemy drones, as the military seeks a uniform approach to defeating UASs, which officials have labeled a growing battlefield threat. Armenia, Artsakh, the Diaspora should do the same for Artsakh's Defense Forces.

Comments



Dave – 2022-05-10 12:38:12

Very timely and informative article.