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Use of Unmanned Aerial Assault Vehicles (UAAV) as an Asymmetric Factor

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Abstract- In the 21st century, unmanned systems (especially unmanned aerial vehicles) will play a dominant role in the operational fields. Thanks to the technological developments witnessed in many fields, the use of unmanned aerial vehicles for military purposes is becoming easier. Looking at the operations carried out over the last 25 years, it can be seen that most were conducted in residential areas, where and techniques, tactics and equipment with asymmetric effects will make significant differences. In addition to this, the more loss of life in operations, the more governments come under pressure from the public. Taking these factors into consideration, it is believed that unmanned aerial vehicles, which can be used to increase dominance in operations and prevent loss of life, will be used more often and more effectively in the future. It is also believed that unmanned aerial vehicles will be used as assault media in both residential areas and in other operational environments in order to take advantage of the high level asymmetric effect.

Keywords- Unmanned Aerial Vehicle, asymmetry, residential areas, assault, ammunition.

1. Introduction

One of the greatest problems facing modern armies today is how to detect and destroy a target under both symmetric and asymmetric conditions. The most important issues in this regard are to limit loss of life and to avoid collateral damage as much as possible.

The United States is one of the leading users of unmanned aerial vehicles (UAV) in numbers, and over 73 percent of research and development studies in the field are U.S-funded (Steven, 2004). While the ratio of UAVs in military bases was only 3 percent in 2005, this number has increased recently to 30 percent (Samuel, 2014). Taking these numbers into consideration, we can infer that both supply and demand for unmanned aerial vehicles will increase in the near future (Haskologlu et al., 2013; Gertler, 2012).

In this article, the areas of usage of UAV's will be discussed, while different aspects of Unmanned Aerial Assault Vehicles (UAAVs) will be studied including their effectiveness against targets and cost. The article will also propose alternative uses for such systems against possible threats and targets.

2. Asymmetric Effect

Asymmetry, is defined a lack of symmetry, but can also refer to a lack of coherence and proportion between two or more things in terms of location, shape or size. In this regard, asymmetric effects refer to the use of different techniques and

methods in order to gain an advantage against one's opponent. The Kamikaze technique that was first seen in World War II is known for its unique characteristics as an assault technique, requiring the pilot to crash his aircraft deliberately and consciously into a warship or any other target. It can be said that this assault technique is unique in its characteristics, and served in its mission to have an asymmetric effect on the enemy. The main goal behind the Kamikaze technique was to destroy hundreds of soldiers by allowing the loss of one pilot's life, or destroying a large warship by allowing the loss of an aircraft. Japan's motivation in adopting this technique was to create an asymmetric effect on the United States through an extraordinary means of assault.

Today, the technological developments in the creation of unmanned aerial vehicles, their low visibility and the systems they use to detect targets from great distances are their most important characteristics (Gertler,2012).Today's technologies make it even easier and more possible for armies to use the Kamikaze technique more effectively and without the need for an on-board pilot at all.

3. UAVs' Areas of Usage

3.1. Unmanned Aerial Vehicles:

Unmanned aerial vehicles are flying platforms that are controlled by pilots from ground control centers using command and control systems, advanced computers, electronic devices and other necessary equipment (Pardesi, 2005).

Unmanned Aerial Vehicles can be defined under five categories (John, 2010), which are presented in Table 1 below:

Table 1. Categories of UAVs

CATEGORY	**SYSTEM**	**UNIT**
Strategic	Global Hawk	Division/Corps
Operative	Predator, Reaper, Sky Warrior	
Short Range/ Tactical	Hunter, Pioneer, Shadow	Brigade
		Battalion
Small UAV	Raven, Dragon Eye, Eagle Scan	Company/ Smaller Units
Micro UAV		

Unmanned aerial vehicles' have more than one area of usage, including:

- **Reconnaissance and Surveillance:** With the addition of high-definition cameras mounted on unmanned aerial vehicles, these platforms can carry out reconnaissance and surveillance missions day and night to gain instant intelligence (Pardesi, 2005).

- **Destroying Targets:** Unmanned aerial vehicles can destroy targets by firing any ammunition they may be carrying.

- **Naval Operations:** Unmanned aerial vehicles can be used during naval operations carried out by floating platforms. They can be used for detecting targets, reconnaissance and surveillance, covering the target with fire, mine detecting/exploding and search & rescue operations.

- **Reconnaissance for NBC-R:** Unmanned aerial systems can carry operations in environments where people would need masks or other equipment to protect themselves against NBC-R attacks, and can be used for reconnaissance in such environments.

- **Residential Area Operations:** Unmanned aerial systems can carry operations in environments where people would need masks or other equipment to protect themselves against NBC-R attacks, and can be used for reconnaissance in such environments.

- **Logistics Support:** Unmanned aerial systems can be used for the transfer of supplies from logistic centers to operational fields. In addition to this, they can be used to monitor and secure routes used by convoys carrying supply materials**.**

➢ **Border Patrol:** Since unmanned aerial vehicles can fly for long periods and be equipped with high definition cameras, they can be used for the protection of borders and to patrol regions that may be geographically inaccessible (Haddal, et al., 2010).

In addition to these missions, unmanned aerial vehicles can also be used for other purposes, including base defense; unit support; detecting, confirming and monitoring targets; securing routes; border patrols; meteorology; landing and flight support for other aircraft; directing air support, etc (Glade, 2000, Drew, et al., 2005, Kelly, 2004).

4. Definition of Unmanned Aerial Assault Vehicle (UAAV)

Unmanned Aerial Assault Vehicles (UAAV) are remotely controlled air munitions. UAAVs can take off from the ground or they can be deployed into the operational field from other aerial vehicles.

UAAV systems comprise a battery; explosives (type depending on different types of targets), and monitoring, command & control and parachute systems. The explosives can be mounted for use against either metal-cased weapon systems or human targets.

5. UAAV's Concept of Use

UAAVs can be used for defense or assault purposes. Thanks to their low radar visibility, it is very difficult to detect them before they reach their target. They also provide an almost 100 percent hit rate and ease of handling for the operator due to their low speed. Thanks to the mounted cameras, UAAVs can react against any target almost immediately.

The operation of using multiple UAVs requires decision making processes such as task planning (Murray, 2007). Each UAAV can be commanded by one operator or by an autonomous system. In addition to this, assault clouds consisting of several UAAVs can be flown at on a secure altitude for deployment in different missions. Depending on the mission and conditions, operators can pull a number of UAAVs or the autonomous system can assign the most suitable UAAV or UAAVs from the assault cloud and direct them to a target (Haulman, 2003; Eun, 2009). For example, during an operation in which a number of operators are participating, they can send another UAAV to an operational field after other UAAVs have completed their missions (Fig.1).

Fig. 1. UAAVs in the operational field.

UAAVs can be armed (ready to explode) as commanded by the operators after leaving the assault cloud and reach a safe distance. In other words, meaning that no UAAVs are armed while in the assault cloud. Targets can be destroyed by directing one or more UAAVs to engage them. UAAVs' operational support capabilities can be enhanced with the installation of solar panels, which can increase their endurance. UAAVs in the assault cloud that are not used during the operation can be retrieved from a safe area after deploying their parachute (Fig.2) systems upon the command of the operators.

Fig. 2. Parachute landing.

Fig 3. Use of UAAVs in residential areas.

After landing safely, they are picked up by the ground crew, and their batteries and parachute cartridges are replaced, ready for the next operation. In case of an emergency in which UAAVs cannot be pulled out of the operational field, operators can order the self-destruction of the assault cloud at a safe altitude.

UAAVs can be used effectively against light armored vehicles and personnel during conventional wars. In addition to this, it is believed that they may be used effectively in residential areas (Fig.3). Residential area missions require Special Forces, the capability to transport Special Forces safely to the operational field, effective command and control coordination and high firepower.

One of the most difficult operational environments for modern armies are residential areas, and looking at today's conventional wars, it is an obvious fact that most take place in residential areas. Take the existing capabilities of UAAVs into consideration we can conclude that they have the mobility and capability to destroy targets with minimal collateral damage (Gertler, 2012; Haulman, 2003; Lovelace, 2014).

Thanks to their low visibility and velocity (Haulman, 2003) UAAVs have the ability to secure a street or a building, and to destroy a threat when needed before Special Forces are sent into the operational field. UAAVs can destroy targets in such areas successfully due to their small size and high maneuverability, giving them an advantage over other air vehicles. UAAVs that are pulled from assault clouds by operators can approach the same target from different directions, or they can destroy more than one target at the same time.

One of the most important advantages provided by UAAVs is their contribution to decreasing the demoralization of units and personnel resulting from the loss of helicopters or armored vehicles that are used in residential areas very often. In addition to this, UAAVs are extremely effective against helicopters sent by the enemy for regional dominance.

UAAVs can also be used effectively for interior security operations. UAAVs equipped for day and night operations can detect a possible threat in advance and they can carry out operations to destroy the source of threat. At the same time, thanks to their day and night vision, UAAVs are effective defense and assault vehicles against attacks planned and carried out to damage guardhouses.

Since they are small in size and they can fly at low altitudes at low speed, UAAVs can be used effectively against floating platforms that are defended by radars and sonars, and can be directed against the most vulnerable areas of floating platforms (radar, steering wheel, etc.).

6. Characteristics of UAAV

The characteristics of UAAVs can be listed under such titles as low cost, operational resilience, logistical advantages, educational convenience and safety.

6.1.Low Cost

Compared to other aerial vehicles, UAAVs are more economical and effective in many aspects (Kelly, 2004; Gertler, 2012; Haulman, 2003).

- If we compare the cost of modern ammunitions per sortie with the cost of a UAAV, it can be seen that a UAAV is much cheaper, in that the UAAV parts are very cheap and can be produced by national defense companies.

- Since UAAVs are battery powered, considerable savings are made in fuel costs and depreciation values when compared to existing aerial vehicles. UAAVs can fly even longer when installed with solar panels.

- Another factor contributing to the low cost of UAAVs is the fact that all parts can be produced in Turkey by national defense companies. It is assumed that Turkey has the manufacturing substructure to be able to produce UAAV parts. For example, monitoring and command systems can be produced by ASELSAN, battery systems can be produced by ASPILSAN, explosives can be produced by MKE and the main body can be produced by most of the firms operating in the plastics sector. In this regard, UAAV can be 100 percent national and can be sustained with national capabilities, contributing further to low costs.

- When it is aimed to hit a target with 90 percent accuracy, the cost of modern ammunition and the cost of sorties to deploy this ammunition is very high when compared to the cost of a UAAV

In the near future, it is expected that the technologies we are using to create unmanned aerial vehicles will develop very fast, and so it stands to reason that while UAAV effectiveness increases, costs will decrease continuously (Samuel, 2014).

6.2.Operational Resilience

- One of the advantages provided by UAAVs is their low speed when compared to fighter jets and their mounted cameras. This will help them to maintain visual contact with the target and increase the hit rate up to 100 percent.

- Operator(s) can command and direct one or more than one UAAVs from the ground.

- UAAVs overcome the limitations of fighter jets in having to fly over a certain altitude due to security concerns (Gertler, 2012; Haulman, 2003).

- Unless UAAVs are intercepted by special defense systems, they can carry out operations for long periods of time in the operational field.

- A number of UAAVs can serve as a flying arsenal in the sky, and the desired number of UAAVs can be pulled from this arsenal during an operation.

6.3.Logistical Characteristics

One of the most important aspects of UAAV systems are their logistical advantages. UAAVs can be considered as ammunition systems that are easy to produce, transport, store and sustain.

- **Manufacturability:** The fact that UAAVs comprise few parts increases their manufacturability. Almost all of the parts used to produce UAAVs have been used actively in the aviation sector for a long time.

- **Transportability:** Since UAAVs are easy to mount and dismount, they can be transported in small boxes or containers. Their size and the space they occupy make them highly transportable through various means (Haulman, 2003).

- **Storability:** A number of UAAVs can be stored in small containers thanks to their size and portability (Haulman, 2003).

- **Sustainability:** All parts of a UAAV can be produced by national industries, making these systems sustainable in terms of both production and technical improvement.

6.4.Training Convenience

When compared to other aerial vehicles, training personnel to fly UAAVs is much easier and cheaper. The need for operators to command UAAVs will be met by cheap and simple simulators in a short time. There are already companies and institutions in Turkey with experience in aviation – especially simulators. In addition, it is assumed that Turkey has sufficient manufacturing substructures to produce and maintain UAAV simulators.

6.5. Safety

- Since UAAVs are radio frequency (RF) controlled, they are vulnerable to electronic intervention (jamming). This may lead to problems if such safety requirements such as cryptographic interaction, the use of mechanical equipment for arming, signal jamming, and auto landing in a safe area after detecting an unsafe situation are not met. These issues can be resolved during the engineering phase by taking the necessary precautions.

- Steps should be taken to protect assault clouds by accompanying them with interceptor fighter jets.

7. Conclusion

In this article it is emphasized that Unmanned Aerial Assault Vehicles (UAAVs) can be used effectively in operational environments by making use of their technical qualifications. Thanks to their mounted cameras, UAAVs, as aerial assault vehicles with the ability to observe, pursue, evaluate and hit targets with a high hit rate, are believed to be one of the most important force multipliers in operations. UAAVs can be used effectively both in conventional and unconventional warfare, and can make a difference especially when used in residential area operations. Taking into consideration the fact that asymmetric factors provide obvious advantages to their users, it is believed that any party that puts UAAVs to effective use will be one step ahead of its opponents.

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