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The Changing Nature of Aerial Warfare: Drones

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Introduction

It is no surprise that drones have changed the nature of aerial warfare. Drones are defined as Unmanned Aircraft Systems (UAS), and it has transformed the nature of aerial combat because minimum human support is required to operate it. Drones can be controlled in various ways: they can be controlled by a pilot; they can be run through pre-programmed plans and operated via automation systems. The adoption of this advanced technological means of warfare is on the rise. Drones are now being used in several fields spanning mainly from military, government and commercial space. The other good thing about the advancement of drone technology is that it has reduced aircraft prices.

Historical Background

Aerial warfare refers to the forms of military operations conducted by airplanes, helicopters or other manned and unmanned craft that are propelled aloft. Air warfare is considered one of the most precious inventions of the 20th century, which became a crucial branch of military operations. The Italians first used aircraft against the Turkish forces near Tripoli in 1911 but the widespread use of aircraft became rampant during the First World War. The primary aim of the plane was to conduct reconnaissance during warfare, basically observing the region to locate an enemy or ascertain strategic features. Armed aircraft became prevalent with the increasing need for air-to-air combat to deny such reconnaissance. Developing fighter planes led to aircraft weaponisation, which allowed the pilot to aim the entire aircraft at the enemy using machine guns. The interesting observation was that these weapons could only reach a range of maximum 200 yards. Fighter tactics reached a new dimension in 1915. Through the contribution of German aviator Max Immelman, aerial combat transformed from horizontal to the vertical dimension. “Immelman Turn” refers to a type of aerial combat where an attacking fighter plane dove past the enemy craft, pulled sharply up into a vertical climb until it was above the target again, then turned hard to the side and down so that it could dive a second time. Back then, fighters could fly 50 to 60 yards apart and the flying speed averaged 100 miles per hour.

In the next phase of development, “ground attack” gained prominence. During “ground attack”, planes were used to attack repeatedly using bombs and machine guns. It helped on several strategic fronts: aid an advance on the ground, cover a retreat and harass the enemy. Owing to the inception of ground-attack aircraft, massive troop movements were infrequent during broad

daylight. Strategic bombing was the final phase of aerial warfare during World War I to demolish the essential elements concerned with the enemy's war capabilities. This could be achieved through bombing factories, transportation networks, supply networks and centres of government. World War II saw the inception of a new all-metal monoplane far superior in terms of performance and firepower compared to the aircraft used in World War I. The new fighters reached an unimaginable speed beyond 400 miles per hour and some could operate at altitudes of 30,000 feet. This was also regarded as The Jet Age. Innovations such as "finger four" and "Thack weave" acquired prominence during this time. The inception of drones will reshape the dynamics of aerial warfare. It is essential to understand the air-to-air weapon system to understand the significance of drones in changing aerial combat dynamics. The diagram for the air-to-air weapon system is given below:

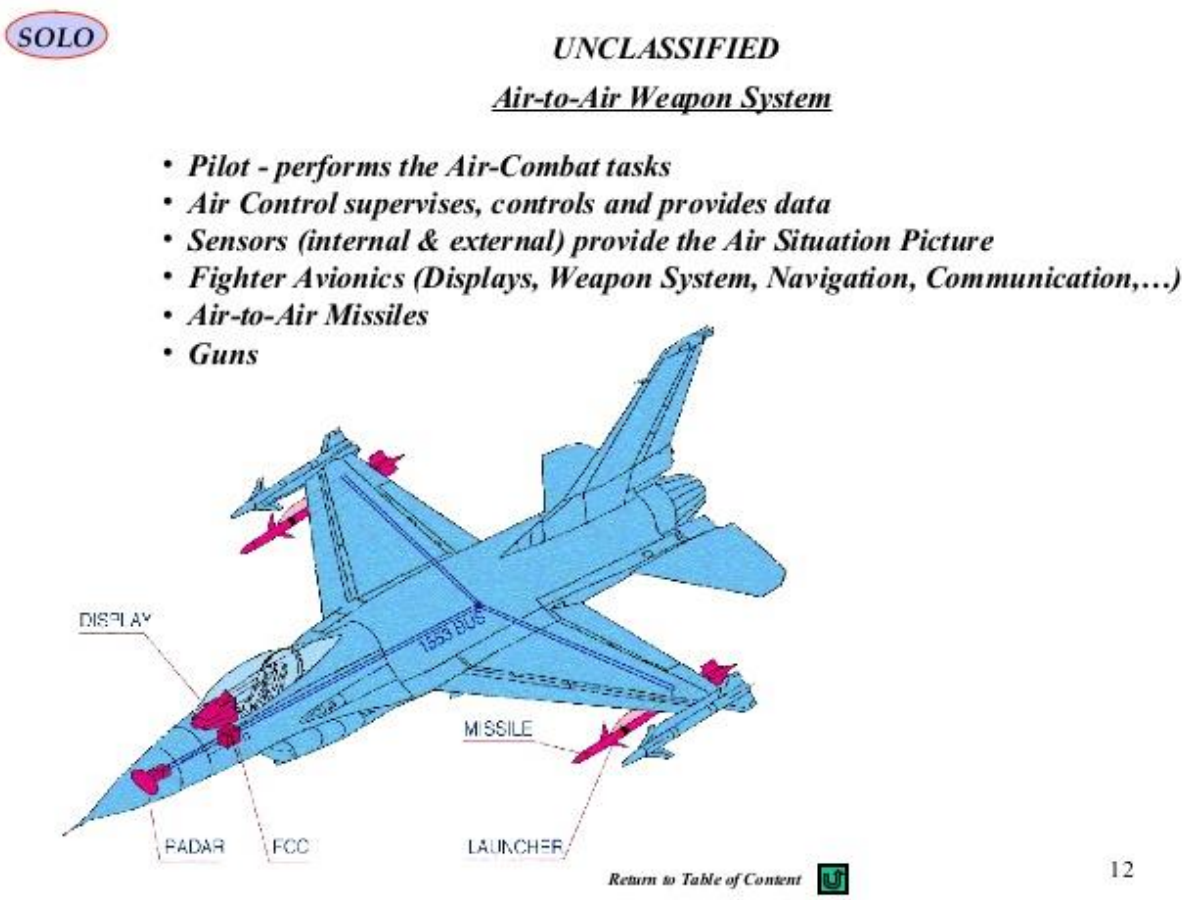

Figure 1: Air-to-Air Weapon System (Source: Slideshare)

How Drones Will Change the Future of Aerial Warfare

The history of drones can be traced back to 1849 when Austrians used the concept of unmanned balloons to attack Venice. With the passage of technological advancements, drones have become more efficient, usable and reliable. During the presidency of Barack Obama, United States of

America has tripled its drone attacks. Drones are taking the foundations of aerial warfare to a new landscape. Such uncrewed vehicles can replace human beings in the conflict.

Furthermore, it paves the way for the inception of robotics into the battlefield. This will take the proxy war to a whole new level. Drones can be used for multiple purposes. The principal function of a drone is to provide logistics support to the soldiers who are operating on the ground. Drones will replace the conventional logistics methods as it allows for more accessibility in the active war zones and stations. Drones can also provide tactical advantages such as the following: carrying out surveillance of a target 24/7, providing real-time updates to the operator, tracking targets using different ways, monitor a place constantly before a drone strike and precise targeting with accuracy. Drones have played a more influential role in limiting insurgencies, minimising civilian casualties, reducing collateral damage and reducing the risk to the forces operating on the ground.

The definition of drones may not always be limited to airspace, but it can also include ground or sea vehicles that can function autonomously. Smaller and portable drones are now used more rampantly by the ground forces. There are broader speculations that military expenditure on the use of drones is likely to increase. The United States of America has more than doubled its military spending on drones (from $4 billion to about $ 9 billion) since 2014. Ten years ago, only ten countries across the world had access to military drone technology. The fast-paced innovation of military drones has now made them accessible to approximately 95 countries around the globe.

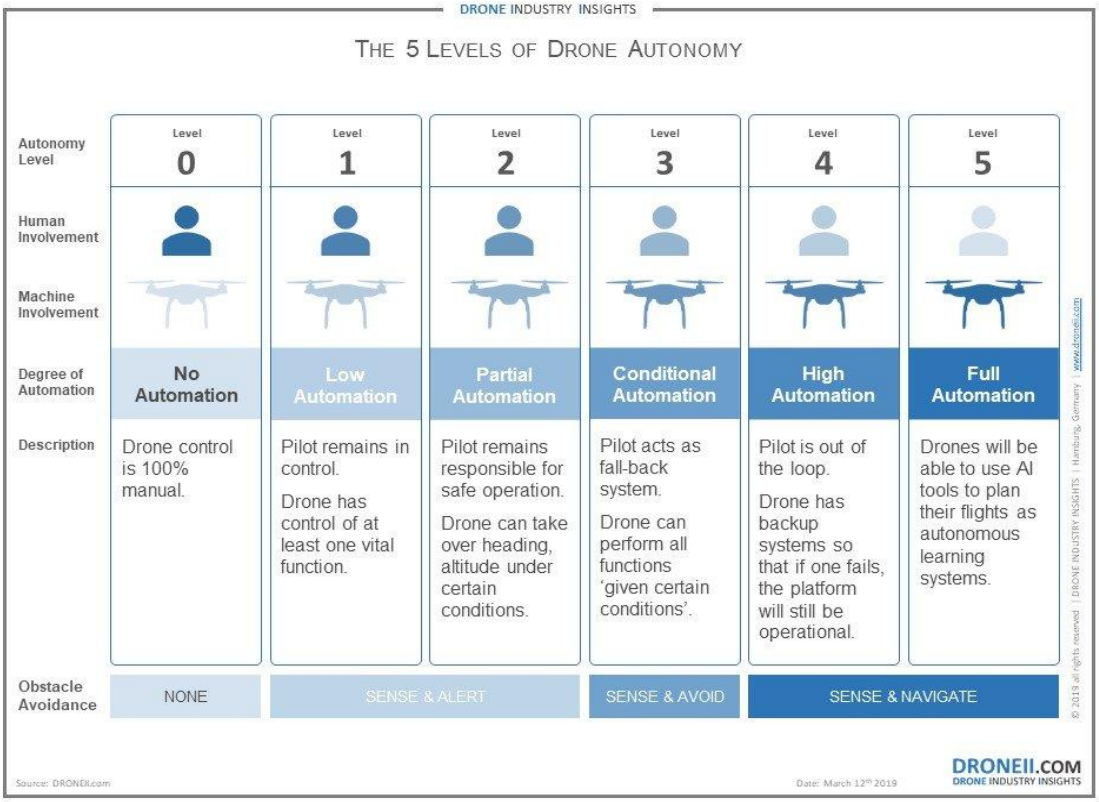

Figure 2: 5 Levels of Drone Autonomy (DRONEII.com)

The diagram above discusses the five levels of drone autonomy. Autonomy refers to freedom from external control or influence, which is linked to the level of independence. There is no automation at Level 0 and the pilot needs to control every moment. That is why perhaps Level 0 is termed as "No Automation." Racing is a classic example in terms of such usage. Level 1 is termed "Pilot Assistance," and in this scenario, the drone controls at least one vital function while the pilot controls the overall operations. The function of the drone is only to provide support for navigation and keep altitude and position. Examples of applications are inspection & maintenance, localization & detection, photography & filming, protection & security, and monitoring. Level 2 is known as "Partial Automation," in which case the pilot is responsible for safe operations of the vehicle. In the meantime, the drone is responsible for taking overcharge in terms of heading, altitude and speed. Examples of Level 2 usage can be found in mapping, surveying, spraying & seeding and measuring. Level 3 is called "Conditional Automation," where the pilot acts as a fall-back system and the drone can perform all functions "given certain conditions." For instance, a drone can fly along until the onboard sensors detect an obstacle. This detection will stop the drone and send an alarm of an object in close proximity with the pilot. Later, the pilot will intervene to correct the altitude before the drone continues to fly along its pre-programmed path. Mapping, surveying and delivery are the best application methods that fit Level 3. Automized Drone Deployment is not given in the diagram, although it belongs to Level 3+- and the autonomy of such drones can be measured through its working environment. The idea behind such drone deployment is to perform the same task repetitively.

The current application methods can be seen in mapping, surveying and protection & security. Level 4 is referred to as "High Automation". In such instances, the pilot is out of the loop and the drone has backup systems so that if one fails, the platform will still be functional. Examples of using drones in such cases could be found in photography and filming. Level 5 is called "Full Automation". Drones will use Artificial Intelligence (AI) tools to plan their flights as autonomous learning systems. This is the ultimate level of automation where drone controls itself in all situations without any form of human intervention.

Conclusion

Aerial warfare has evolved over the years and drones have an integral role to play in such evolutions. Drones are here to stay and their usage will transform modern warfare into a whole new level with least or no human interference.

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