Drones: The Emerging Aerial Battle Platform

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In a first of its kind test conducted by the US Air Force, a MQ 9 Reaper shot down another drone by firing a missile and the test is being seen as a watershed moment in the history of aerial warfare as drones start to take nascent steps in unmanned air-to-air combat. The shift in the next decade would be significantly towards high performance unmanned fighting platforms. Unmanned air-to-air combat is inevitable and rather than task high-end fighter aircraft with the missions, drones like the Reaper could fight their own air-to-air battles, shooting down surveillance enemy drones with Stinger missiles.[1] With the global drone market predicted to reach $100 billion by 2020 and the emergence of China as a low cost manufacturer of armed drones, the rapid transformation of drone technology has led to a race to develop more lethal, stealthy and autonomous drones.

Emerging Applications: The advent of new technologies is leading to the evolution of innovative deployment concepts, greater autonomy of operations with longer ranges and better weapon systems. Carbon reinforced polymers with advanced manufacturing techniques like fused deposition modelling[2] and laser sintering will make the drones lighter, cheaper and easier to manufacture. Aerogel batteries using advanced solar cells for recharging will increase the range and also allow more payload to be carried for operations. Also, use of block-chain technology and big data usage will transform battlefield logistics in the coming decades. Some of the emerging applications of drones are discussed in the succeeding paragraphs.

Technology Infusion for Lethal Drones: Innovative technology is being used to make drones lighter, carry greater payloads with increased endurance and a wide

Drones fused with fighter aircraft can greatly enhance target end destruction.

array of onboard systems. Drone sensors combined with machine learning and artificial learning are leading to the development of fully autonomous drones which take undertake well defined missions, repeatedly, reliably and most importantly, without pilot interference. Multi-dimensional sensors will provide increased target signature information by scanning a number of spectral bands. Autonomous radars detecting both air and ground targets would be the next primary sensor in the Unmanned Aerial Vehicles (UAVs). Drones are also being reconfigured to be deployed as unmanned refuelling stations to increase the range of combat aircraft.

Precision Weapon Systems: Drones can utilise their stealth advantage by being smaller than manned systems. Hence, the new range of weapon systems will have to be of smaller size but more lethal and precise. Direct energy weapons and small diameter bombs will witness greater applications. Lasers are going to be the next planned precision strike weapons, planned to be integrated with drones. The US Air Force is planning to integrate laser weapons on drones, with the first tests planned in 2021, to destroy high value targets, conduct precision strikes and target enemy locations.[3] Lasers would complement the existing weapon systems and provide an alternate method of destroying targets with greater precision. Lasers have the advantage of firing multiple shots at the target rather than the fixed number of missiles that can be carried on a drone. Thus, the amount of degradation at the target end would be much greater compared to conventional weapons.

Casualty Minimisation: In the coming decades, drones will be the preferred choice over manned systems in high risk missions. Not limited by human physiology, drones will be able to withstand severe ambient conditions, have greater endurance and simultaneously perform a number of tasks with greater accuracy. The pilot-to-aircraft ratio will also reduce, apart from the reduced costs of training of operators as the bulk of the training would be feasible on high end simulators.

Synchronised Operations: Drones are being fused with the combat aircraft to increase the target end destruction by synchronised operations. China is reportedly working on the synchronised operations by allowing manned aircraft to co-pilot UAVs—this would instantly multiply the warplane's impact and flexibility, with the same pilot directing multiple drones.[4] China also demonstrated its swarm drone capability in December 2017 when over 1,000 dronebots performed a number of tasks autonomously. The demonstration exhibited China's potential skill in swarm capability and the tactical advantage of a number of drones overwhelming a target location

China has emerged as leading exporter of low cost armed drones with CH series sold to more than 10 countries.

was amply displayed. In a similar test carried out by the USA, live and virtual drones were grouped together for a mission. The tests found that drones shared information, planned and allocated mission objectives within themselves, made coordinated tactical decisions, and collaboratively reacted to a dynamic, high-threat environment, with minimal communication. Thus, synchronised operations are going to be a vital component of aerial warfare in the future.

Autonomous Logistics: Use of block-chain technology and big data is likely to transform battlefield logistics to near autonomous levels by anticipating the requirement and also analysing a large number of replenishment requirements to identify units which require the war-like stores more than others. Using technology akin to Amazon's "Anticipatory Shipping", the stores can be moved to the general area of the battlefield and by analysing the requirements mid-flight; the stores can then be delivered to the most required destination. Also, by carrying out analysis of stock holdings, drones will be able to pick up supplies directly from industrial locations if required and, thus, reduce the need for space for storage.

Using Armed Drones for Coercion: As drones become more lethal, in the coming decades, the mere threat of using armed drones may coerce the enemy to change its behaviour, according to Dr Amy Zegart, a Stanford Political Scientist. According to her theory, armed drones are likely to offer coercion 'windows of opportunity' in at least one important circumstance: states that have armed drones confronting states that do not possess them. Drones offer three unique coercion advantages that theorists did not foresee: sustainability in long duration conflicts; certainty of precision punishment, which can change the psychology of adversaries; and changes in the relative costs of war.[5] Drones will effectively signal a nation's resolve more effectively because as a low cost option, they can be part of an enduring campaign against the enemy.

Emergence of China as a World Leader in the Drone Market: China has taken rapid strides in the development of combat drones through the low cost of hardware and software designs and has marketed them at a fraction of the cost of US drones. Its willingness to sell drones to any country that approaches it for purchase, unlike the stringent US export restrictions, has led to the CH series of drones being sold to more than 10 countries. These drones have recently seen action in Syria and Iraq and have been purchased by Jordan, Saudi Arabia, UAE

and Turkey.[6] China has emerged as the largest exporter of armed drones in the world and its sales to Pakistan and the Middle East countries indicate a growing market for armed drones which are likely to feature in the ongoing and future conflicts.

Image Reference: Chinadaily.com.cn dated November 06, 2018

Stealth Drone CH-7: China displayed its latest drone, the CH-7 which is a high altitude high endurance stealth drone at the 12th China International Aviation and Aerospace Exhibition held at Zhuzai in November 2018. The drone is expected to make its first flight in 2019 and mass production is planned from 2022. The CH-7 has a flying wing design, with a wing span of 22 metres, length of 10 metres and maximum takeoff weight is 13 metric tonnes.[7] Driven by a single jet engine, the CH-7 is able to fly at about 920 km per hour. The unmanned aircraft's flight ceiling is 13 km, high enough to evade virtually all short-range and medium-range air-defence missiles, and it has an operational radius of around 2,000 km. The drone can intercept radar electronic signals and simultaneously detect, verify and monitor high value targets.

Image Reference: South China Morning Post dated August 25, 2018

Drone Killer Silent Hunter: China has also been developing counter-drone systems to protect its drones from spoofing and other counter-systems. One of the counter-drone systems under development is the Silent Hunter. A portable laser anti-drone laser system, it can intercept low level drones. Having a range of 4 km, the 30-100 KW laser is capable of piercing five

layers of 02 mm thick steel plates at a distance of 800 metres.[8] The weapon system had shot down a drone at a distance of 300 metres at a demonstration at the International Exhibition of Weapon Systems and Military Equipment in May 2018 at Astana, Kazakhstan.

WING LOONG II

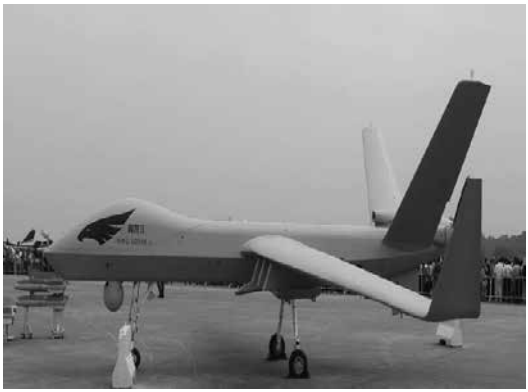

Image Reference: Armyrecognition.com dated October 11, 2018

Neighbourhood Impact: China agreed to sell 48 high end armed drones, the Wing Loong II to Pakistan a week after India sealed the purchase of the S 400 missile defence system from Russia. As per another report published in Reuters.com in July 2018, the US had offered India 22 Guardian drones. The Guardian armed drone is a variant of the Predator B drone and can be used for wide area Intelligence Surveillance and Reconnaissance (ISR) missions. Having an endurance of 40 hours, it has a maximum altitude ceiling limit of 50,000 ft and can carry upto 1,400 kg of ammunition on its seven hardpoints. It has a wingspan of 20 metres, is 11 metres long and has a height of 3.8 metres. In contrast, the Wing Loong II which has been developed by Chengdu Aircraft Industry group, has a wingspan of 20.5 metres, length of 11 metres and height of 4.1 metres. It can carry up to 400 kg of armaments, has an endurance of 20 hours and maximum speed of 370 km per hour. Wing Loong II can carry 12 BA-7 air to surface missiles and had entered into service with the PLA Air Force (PLAAF) in November 2018. Though its capabilities are vastly less than those of the Guardian drone, the most significant factor remains the cost, with the Wing Loong II costing around $ 1 to 2 million which is a small fraction of the Guardian drone cost.

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Notes

1. Kyle Mizokami, "A Reaper Drone Shot Down Another Drone in First Unmanned Air to Air Kill", September 19, 2018. Popularmechanics.com and available at https://www.

popularmechanics.com/military/aviation/ a23320374/ reaper-drone-first-unmanned-air-to-air-kill. Accessed on December 12, 2018.

2. It is a 3D printing process wherein the 3D printer uses a thermoplastic filament heated to its melting point and then extruded to create a three-dimensional object.
3. John Keller, "Air Force Unmanned Aerial Vehicles and Jets to Fire Laser Weapons by Early 2020s", *Military & Aerospace Electronics,* December 03 2018. Available at https://www.militaryaerospace.com/articles/pt/2018/12/laser-weapo,ns-jet-fighters-unmanned.html. Accessed on January 21, 2019.
4. "China's Military Drone Programme Enters a New Phase", Asgardiaspace.com
5. Parker Clifton, "Armed Drones Changing Conflict faster than Anticipated", *Stanford News*, March 05, 2018. Available at https://news.stanford.edu/2018/03/05/armed-drones-changing-conflict-faster-anticipated/. Accessed on December 18, 2018.
6. Dudley Dominic, "How China is Fuelling the Arms Race in Drones in Middle East", Forbes website on December 17, 2018 and available at https://www.forbes.com/sites/dominicdudley/2018/12/17/china-fueling-drones-arms-race-middle-east/#46f991cb4bb4. Accessed on January 19, 2019.
7. Lei Zhao, "Stealth Drone About to Hit World Market", Chinadaily.com.cn on November 06, 2018 and available at http://www.chinadaily.com.cn/a/201811/06/WS5be0e888a310eff303286bac.html. Accessed on 14 December 2018.
8. Huang Kristin, "China in Race for Counter Drone Technology and Laser Weapons as it Tries to Catch up with the US", *South China Morning Post*, August 25, 2018,.Available at https://www.scmp.com/news/china/ diplomacy-defence/ article/2161331/china-race-counter-drone-tech-and-laser-weapons-it. Accessed on December 12, 2018.