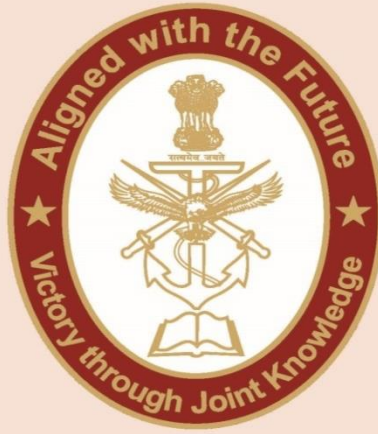


# CENTRE FOR JOINT WARFARE STUDIES



## CENJOWS

### EMERGING DRONE TECHNOLOGY- RELEVANCE FOR INDIA



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### Introduction

**Emergence of Drone Technology and Warfare.** The 21st century warfare is observing the domination of drones or UAVs on the battlefields. Unmanned aerial systems, often known as drones or UAVs (Unmanned Aerial Vehicles), are aircrafts that can fly without a pilot. The ability of drones is to immediately register and monitor a chosen region or a particular thing without needing any extra infrastructure. The Ruston Proctor Airborne Target debuted in 1916 and was the first aerial unmanned vehicle. During World War I, the US and France used drones in an attempt to develop unmanned and automatic airplanes. Around the 1950s, they offered a solution to the frustrating problem of pilots being lost during airborne reconnaissance or photography, which had become crucial in warfare by that point.<sup>1</sup> The usage of drones in non-military or commercial domain has become extremely popular in the contemporary times. They are being utilized for crowd monitoring during events to detect any irregular activity, to gain situational awareness during natural disasters

<sup>1</sup>Col Akshaya Handa, 'Drone and Counter-drone warfare at tactical level', *CLAWS*, (8, February, 2021), <https://www.claws.in/drone-and-counter-drone-warfare-at-tactical-level/>

and plan search and rescue operations, to track criminal activities and boost conservation efforts in the forest and wildlife sector and monitor traffic congestion. According to projections, the market for military drones would increase from \$11.73 billion in 2022 to \$30.86 billion in 2029, with a CAGR of 14.82 percent over the forecast period of 2022-2029.<sup>2</sup> Moreover, the market for anti-drone products is anticipated to reach USD 1323.8 million in value in 2022 and reach USD 5098.4 million in adjusted terms by 2028, with a CAGR of 25.2% during the forecast period.<sup>3</sup> Under the ambit of defence and security, drones are used to detect terror threats, identify risk-prone areas from a remote location, provide battlefield support and use as target decoys, and conduct reconnaissance and surveillance missions to gather intelligence and enhance law enforcement with situations and damage assessment. The development of robotics and the advancing precision of weaponry are two significant advances in military technology that are combined in drones. The employment of drone swarms is also being used in the battlefields with the help of the drone operators, but the aircraft are not capable of acting independently and are instead restricted to the shared perspective provided by the sensors they are equipped with. With the use of software that enables interaction, information sharing, and autonomous decision-making, drones may be controlled as swarms.<sup>4</sup> As drones become more widely used, Counter drone technology is rapidly developing. The two main types of anti-drone systems are detection and mitigation. Infrared sensors to trace heat signatures, radio frequency detection for signals from a drone's remote controller, and audio techniques to identify the distinct drone motor noises are some of the technologies to detect. Technology that can fend off or stop a drone are considered mitigation technologies. The ineffectiveness of existing counter-drone technology is due to its frequent tailoring to a particular situation and setting.

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<sup>2</sup>"Unmanned Systems-military drone market", *Fortune Business Insights*, <https://www.fortunebusinessinsights.com/military-drone-market-102181>

<sup>3</sup>"Anti-drone market to grow USD 5098.4 million by 2028", *PR Newswire*, (17, June, 2022), <https://www.prnewswire.com/in/news-releases/anti-drone-market-to-grow-usd-5098-4-million-by-2028-with-a-cagr-of-25-2-valuation-reports-838088851.html>

<sup>4</sup>Piotr Kardasz et al, "Drones and Possibilities of their using", *Journal of Civil and Environmental Engineering* (2016) 5-6, [https://www.researchgate.net/profile/Piotr-Kardasz/publication/305273853\\_Drones\\_and\\_Possibilities\\_of\\_Their\\_Using/links/57ddadac08ae4e6f1849aac7/Dr-ones-and-Possibilities-of-Their-Using.pdf](https://www.researchgate.net/profile/Piotr-Kardasz/publication/305273853_Drones_and_Possibilities_of_Their_Using/links/57ddadac08ae4e6f1849aac7/Dr-ones-and-Possibilities-of-Their-Using.pdf)

**Use of Drone Technology by Different Countries.** Drone attacks have been carried out by more than ten nations, including the US, Israel, UK, Pakistan, Iraq, Nigeria, Iran, Turkey, Azerbaijan, Russia, and United Arab Emirates. But several other nations still have armed drones in their arsenals, including Saudi Arabia, India, and China, to name a few. The United States, the United Kingdom, Russia, Germany, and Israel were among the first nations to begin their research on UAVs. The US is a top player in this domain, and Israel, another pioneer in the field, has made considerable use of drone technology for gathering intelligence.<sup>5</sup> Armed Predator drones by the United States were sent to Afghanistan in the early aftermath of 9/11, with the first attack occurring in November 2001. A year later, the CIA conducted the first US drone-targeted assassination in Yemen. Since then, the US has carried out strikes in other nations, both within and outside of armed conflicts, using its sizable fleet of armed drones.<sup>6</sup> The IAI Heron from Israel is made to go up against the Reaper. Israel is the world's biggest supplier of drones. Israel refuses to disclose the whole list of nations to whom it has supplied military equipment, but according to a database created by the Stockholm International Peace Research Institute (SIPRI), Israel accounted for 41% of all drone exports between 2001 and 2011. While the US and Israel historically controlled the market, a surprising variety of nations, including China and Turkey, are now producing and exporting these military drones. China is the leading country in the manufacturing of drones. The Chinese company SZ DJI is the largest manufacturer of drones in the world. As a key user and supplier of armed drones, China has the capacity to deploy its armed drones extensively throughout Asia due to its substantial military and economic might.<sup>7</sup> There is, however, no proof that China has carried out drone attacks during hostilities. The Bayraktar TB-2, the Anka-S, and the Akinci-A are three different models of armed drones that Turkey created on its own and now uses. Additionally, Turkey has sold its weaponised drones to a number of other nations. Turkey is still building and testing updated models of its armed drones. The most significant drone importer between

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<sup>5</sup>Peter Bergen et al, "World of Drones", *New America*, (30<sup>th</sup> July, 2020) <https://www.newamerica.org/international-security/reports/world-drones/introduction-how-we-became-a-world-of-drones>

<sup>6</sup>Hugh Gusterson, *Drone-Remote Control Warfare*, (London; MIT Press, 2016), 11-12

<sup>7</sup>Bergen, "World of Drones"

2010 and 2014 was the United Kingdom, which accounted for 33.9 per cent of all drone imports during this time. A tiny MALE and Watch keeper drone manufactured in the UK is based on an Israeli Hermes 450 drone import.<sup>8</sup>

The US is no longer a drone hegemon; due to its unwillingness to share the technology with other countries, these nations came up with their own alternatives to manufacture or import drones. Today, about a hundred nations have drones; Iran, Turkey, and China have sizable drone arsenals, and new drone coalitions are forming all over the world. Since the middle of the 2000s, civilian use of drones has also skyrocketed.

Insurgents, militants, and terrorists view drones as a chance to reverse their deficit; frequently, they simply purchase quad-copters off the shelf and modify them for sophisticated strikes.

### **Cases from Recent Conflicts Around the World**

The use of drones in the recent Russia-Ukraine conflict has again made the countries rethink their drone arsenal. Drones have been essential in this conflict for both reconnaissance and strike operations. They have been extensively utilised by Ukraine to monitor the movements of Russian troops, gather intelligence about them, and engage in infantry and artillery combat. Notably, their military has targeted the Russians using loitering munition "spy ghost," designed by the US for Ukraine. The Ukrainians have made considerable use of the Turkish Bayraktar drone for both assault and intelligence operations. This use of drones by Ukraine turned a new page in the concept of modern warfare.<sup>9</sup>

The recent Armenia-Azerbaijan conflict can be established as a war that was almost won due to the use of drones. In contrast to Armenia, which primarily used tanks, artillery, and air defence systems, Azerbaijan made extensive use of drones, particularly the Turkish Bayraktar TB2 and Israeli

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<sup>8</sup>"Who has Armed Drones" *Drone Wars*, (2022), <https://dronewars.net/who-has-armed-drones/>

<sup>9</sup>Vikram Mittal, "Drone ships poised to play important role in Russia-Ukraine War", *Forbes Magazine*, (23<sup>rd</sup> May, 2022), <https://www.forbes.com/sites/vikrammittal/2022/05/23/drone-ships-posed-to-play-important-role-in-russia-ukraine-war/?sh=2c76dfb95304>

Kamikaze models. The two drones each were able to carry a bomb weighing up to 55 kg or 15 kg. Drones and artillery fired by Azerbaijan successfully attacked Armenia's expensive military equipment, most notably T-72 tanks and S-300 air defences. Strikes against air defence systems, particularly, limited Armenia's capacity to block Baku's UAVs, enhancing their effectiveness. The short-range air defence (SHORAD) arsenals of both Armenia and Azerbaijan were small and of poor quality. With its vast fleet of highly developed drones, Azerbaijan was able to take advantage of this weakness.<sup>10</sup>

In the last five years, a number of nations have used drones in wars or conflicts; Nigeria used them to fight Boko Haram, Turkey used them in attacks on Syria, the UK used them in Iraq and Syria, and the US used them in Libya. Drone warfare has deposed the most powerful nations, including the US, Russia, and Saudi Arabia. In 2011, Iran shot down a US Sentinel. In order to strike Saudi Arabia's oil fields in September 2019, a drone swarm managed to elude air defences. Iranian-backed Houthi militants in Yemen took credit for the attack. In Syria, drones have also engaged in combat as Turkey targeted the forces supported by Russia.<sup>11</sup>

For the first time, the Israel Defense Forces utilised a swarm of AI drones to geolocate, target, and attack Hamas militants during the fighting in Gaza last year. These cutting-edge weapon systems appear to be designed to overwhelm the enemy's air defences so that even if the majority of drones are shot down or captured, some will be able to carry out the targeted strike on their own. There are concerns that the use of AI swarms of drones will intensify the arms race, particularly between the US, Russia, China, Iran, and Israel, despite the cutting-edge technology that is being used to enhance the military capabilities in different countries.<sup>12</sup> The capabilities for offensive or defensive military operations are pushed beyond what is humanly conceivable by AI drone swarming, which is not attainable with

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<sup>10</sup>Shaan Sheikh, "The Air and Missile war in Nagorno-Karabakh", *Center for Strategic and International Studies*, (8<sup>th</sup> December, 2020), <https://www.csis.org/analysis/air-and-missile-war-nagorno-karabakh-lessons-future-strike-and-defense>

<sup>11</sup>Gopal Dhok, "Drone Warfare-Challenges and Opportunities" *FINS India*, (9<sup>th</sup> February, 2021) <https://finsindia.org/drone-warfare-challenges-and-opportunities/>

<sup>12</sup>Gp Capt AK Sachdev, "Drone Swarms; Asset and Threat-Is India Ready?", *Indian Defense Review*, (2022) <http://www.indiandefencereview.com/news/drone-swarms-asset-and-threat-is-india-ready/>



traditional methods. Groups of drones may either be entirely autonomous or be individually controlled by human operators. A swarm's main weakness is the network it relies on, in contrast to unitary autonomous drones, which may be totally isolated while doing their task. Members of the swarm must constantly interact in order to exchange duties, information, and status.<sup>13</sup> The potential of swarms of autonomous, AI-powered, and networked drones to complete missions that are far larger and more capable than a single drone is challenging the military industry.

### **International Law and Human Rights Implications**

The contemporary use and popularity of drones among the countries for fighting terrorism has very much increased the dangers to citizens' human rights, particularly their right to life. In at least four countries, such as Afghanistan, Pakistan, Yemen, and Somalia, the US has been conducting drone attacks to murder suspects of terrorism. In 2009, during the Obama Administration, when the US Secretary of State visited Pakistan, she was asked if killing people through drone attacks can be defined as terrorism. And the Secretary very clearly replied that drone attacks are not acts of terrorism and are very good at eliminating terrorist agents in hard-to-reach places without significantly harming civilians. The number of drone strikes by the US alone had significantly increased, with 288 strikes (86% of the total) carried out in Pakistan alone between January 2009 and October 2012. According to TBIJ reports of 2012, 176 kids have died in drone attacks in Pakistan since 2004.<sup>14</sup> Also, by removing the soldiers from the battlefield, drones have dehumanised warfare and made it much more devastating than ever before. In this scenario, drones are similarly used as gaming systems in which targets are not visible as humans but as insignificant icons on the screen.<sup>15</sup>

States frequently use drones for signature attacks and targeted killing as a reaction to growing terrorist concerns and these attacks often result in the death of their targets, in violation of Article 14 of the International

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<sup>13</sup>Tamir Esher, "Countering the Swarm", *Europe, Security & Defence*, (27<sup>th</sup>, April, 2022), <https://euro-sd.com/2022/04/articles/exclusive/25769/countering-the-swarm/>

<sup>14</sup>John Kaag and Sarah Kreps, *Drone Warfare*, (Cambridge, Polity Press, 2014) 11-12

<sup>15</sup>John Kaag and Sarah Kreps, *Drone Warfare*, 89-92

Covenant of Civil and Political Rights (ICCPR), as there is no identification procedure and no right to a fair trial. Militants who live with their families and associate themselves with shopkeepers, drivers, etc., are sometimes also presumed guilty, violating the principle of non-combatant immunity under the International Humanitarian Law.<sup>16</sup>

Due to their lack of transparency in ensuring that targeted killing is morally justifiable, drone attacks violate international humanitarian law. As long as drone strikes on civilians fall under one of the Geneva Conventions' three definitions of armed conflict, international armed conflict, internationalised armed conflict, or non-international armed conflict, they can be justified as legitimate under international humanitarian law. These legal reasons have vague legal definitions, making it easy for drone strikes to go unpunished and establish a precedent for future usage.<sup>17</sup> A universally integrated agreement on the manufacturing and sale of drones, which may define standards and criteria for their usage, can be followed will more precise definitions.

### **Why and How India Needs to Boost its Drone Technology?**

According to the Indian Ministry of Civil Aviation, India has the potential to be the global drone hub by 2030.<sup>18</sup> The use of drones in many different industries is being promoted by the Indian government and the entire approach towards its development has changed. The largest drone festival in India, Bharat Drone Mahotsav 2022, was recently held in India. In 2021, over Rs 500 crores worth of drone technology contracts were negotiated by the Indian Army, Navy, and Air Force.<sup>19</sup> Indian government announced the Drone Rules in August 2021, which simplified the certification process and replaced the intricate clearance procedures needed to fly drones and promoted R&D. Drones can be flown in green zones without a permit, and

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<sup>16</sup>Jessica Lynn Corsi, "Drone deaths violate Human Rights", *International Human Rights Law Review*, (2017), [https://brill.com/view/journals/hrlr/6/2/article-p205\\_205.xml](https://brill.com/view/journals/hrlr/6/2/article-p205_205.xml)

<sup>17</sup>"Human Rights implications of the usage of drones and unmanned robots in warfare", *European Parliament*, (May, 2013), [https://www.europarl.europa.eu/RegData/etudes/etudes/JOIN/2013/410220/EXPO-DROI\\_ET%282013%29410220\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/etudes/JOIN/2013/410220/EXPO-DROI_ET%282013%29410220_EN.pdf)

<sup>18</sup>Press Release, *Press Information Bureau, Government of India*, (May, 2022), <https://pib.gov.in/PressReleasePage.aspx?PRID=1824140>

<sup>19</sup>Jyoti Yadav, "Growing Importance of Drone in India", *The United Service Institution of India*, (June 2022), <https://usiofindia.org/publication/cs3-strategic-perspectives/growing-importance-of-drone-in-india/>

micro and nano-drones can be used for non-commercial purposes without requiring a remote pilot's licence. Additionally, foreign ownership of businesses that use drones is now permissible. The government has also approved the Production-Linked Incentive (PLI) scheme for drones and drone components and the amount allocated on INR 120 crore. Over the next three years, the manufacturing industry of drones and drone components may get investments more than INR 5,000 crore.<sup>20</sup> By enacting new regulations, India has also moved in this direction by allowing for more freedom in drone operations, which will help the country's many companies that want to use drone technology flourish and thrive. India is also trying to overcome the gaps within the R&D cycle, absence of integration between R&D and acquisition and lack of involvement of defense personnel in R&D process.

With around 100 Searcher Mk II and 60 Heron systems in stock, the Indian military has been using UAVs for more than a decade. India has made considerable use of Heron and Searcher drones developed by IAI for surveillance and reconnaissance since they were first utilised in the 1999 Kargil war with Pakistan. India was forced to buy Israeli off-the-shelf versions because of the significant financial and technological restrictions of its military sector as well as the ongoing delays.<sup>21</sup> The Defence Research & Development Organization (DRDO) of the Indian government has created many UAV systems, including Lakshya, Nishant, Abhyas, TAPAS-BHI-201, Fluffy, Imperial Eagle and Rustom 1 and 2, other medium-altitude, long-endurance (MALE) UAV.<sup>22</sup> The DRDO is working to create the Ghatak drone, which is probably going to include a deck-basedUCAV derivative for the Indian Navy as well.<sup>23</sup>

The Indian air force now uses Heron UAVs close to the Line of Actual Control between India and China in a national security setting. Heron systems are thought to be the best for surveillance missions in mountains

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<sup>20</sup>The Drone Rules, 2021, *Press Information Bureau, Government of India*, (2022), <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2022/jan/doc202212810701.pdf>

<sup>21</sup>Dr. Monika Chansoria, "Proliferated Drones: A perspective on India", (2022) *Center for New American Security*, <http://drones.cnas.org/reports/a-perspective-on-india/>

<sup>22</sup>Aravind J, "Complete List of Drones used by the Indian Armed Forces" (2022), <https://ssbcrackexams.com/complete-list-of-drone-used-by-indian-armed-forces/>

<sup>23</sup>Aritra Banerjee, "India's Most-awaited stealth drone Ghatak breaks cover" *Eurasian Times*, (28 October, 2022) <https://eurasianimes.com/india-stealth-drone-ghatak-breaks-cover-early-induction/>



and high-altitude areas since they can fly at heights of 30,000 feet. Similar to this, the Indian Army first acquired Searcher Mk I and II aircraft capable of flying at altitudes of 15,000 feet for usage along the Pakistani border. However, because of their short endurance and poor performance at high altitudes, these systems were replaced by the Heron by the Army. In the case of Jammu and Kashmir, more particularly, UAVs with electronic sensors, onboard cameras, and rechargeable batteries are desired because they offer helpful information on incursions and cease-fire violations along the Line of Control and the International Border in Jammu and Kashmir.<sup>24</sup> Pakistan will make every effort to surpass India or at the very least maintain up. Pakistan has looked to other suppliers, such as Turkey and it has already inducted Turkish drones to fill any gaps in its own development of drone technologies. It will see this as a challenge in two ways as India's drone investments start to provide more capable border monitoring along its land and water borders. Drones might provide India with advance notice of Pakistani military actions, making a surprise infiltration such as the one in Kargil even less likely while also revealing gaps in Pakistan's own defences.<sup>25</sup>

India has been trying to set up a robust counter-drone technology of its own due to its dangers from its immediate neighbours. But there are challenges, those need to be addressed promptly. These advanced drones are difficult for contemporary radars to detect because of their small size, extremely low radar cross-section (RCS), and lack of audible output. Also there is no restriction on the spread of these drones; they are readily accessible off the shelf anywhere. These days, drones that are freely accessible on the market and capable of can hovering in the air for several hours.<sup>26</sup> In case of India, building a reliable system over such vast and diverse terrain or our borders will be incredibly expensive and challenging to implement. While managing a few of these drones may be simple, India needs a complete system capable of managing hundreds or even thousands of these drones swarming a location of tactical or strategic

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<sup>24</sup>Dr. Monika Chansoria, "Proliferated Drones: A perspective on India"

<sup>25</sup>Dr. Daniel Markey, "Proliferated Drones: A perspective on Pakistan" (2022) *Center for New American Security*, <http://drones.cnas.org/reports/a-perspective-on-india/>

<sup>26</sup>Arthur Holland Michel, "Counter-Drone systems" *Center for the study of the drones at Bard college*, (2019), <https://dronecenter.bard.edu/files/2019/12/CSD-CUAS-2nd-Edition-Web.pdf>

importance. India needs a multi-layered detection and an advanced neutralization system. Even though C-UAS technology is advancing and trying to catch up to the ever-evolving drone technology, many drones are also manufactured to make them safer and easier to use.

The military culture and environment in India is changing with regard to drones. The Indian Army Aviation Corps is currently responsible for ensuring the most efficient use of drones, which was formerly handled by the artillery. For the first time, the Army is now pursuing loitering weapons, which were previously solely employed by the Indian Air Force (IAF).<sup>27</sup> India might employ UAVs extensively for its challenges, ranging from urban terrorism to armed insurgencies as well as law enforcement, anti-smuggling, border surveillance, coastline monitoring, and early warning in defence of crucial assets such as nuclear plants, power-producing facilities, significant grid installations, dams, reservoirs, and airports.<sup>28</sup> India does have a strong aerospace industry, and unmanned aircraft remains the country's most promising future technology. India must take into account the potential and difficulties presented by the development of warfare when making investments in next defence systems.

## Conclusion

The recent use of drones on battlefields has underlined the significance of the technology in reconnaissance and surveillance missions as well as for taking punitive action, making the defence sector one of the essential uses for drones. Therefore, it is reasonable to conclude that drones are not the technology of the future anymore; they have become the assets and liabilities of the present. It has been employed as a weapon of war in several theatres of conflict for more than a few decades. Drone technology is not anymore operated according to a concrete set of processes, which

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<sup>27</sup>Wg Cdr Vikas Kalyani, "Drones and Future Conflict, *Salute*, (6<sup>th</sup> January 2021), <https://salute.co.in/drones-and-future-conflict/>

<sup>28</sup>Wg Cdr Swain Prakash Singh, "Liberalised drone policy calls for strict airspace management mechanism" *Centre for Air Power Studies*, (10<sup>th</sup> November, 2021), <https://capsindia.org/liberalized-drone-policy-calls-for-strict-air-space-management-mechanism/>

leaves it to a person's imagination on how to use it. This makes it dangerous and useful for entities at the same time.

Regarding human rights violations, there should be transparent and independent judicial oversight of individual countries' activities, which should be ensured through national and international institutions and procedures. Organisations like the International Court of Justice, International Criminal Court and various International Human Rights bodies can take up ad hoc cases relating to victims of armed drone attacks. A unified set of legal standards that would apply to the use of force by States both in wartime and beyond the context of hostilities should be provided by the human rights law and humanitarian law. The concepts of specific terms like state and individual responsibility, collateral damage, armed conflict, self-defence, and non-combatant collateral harm should be made more clear. The use of drones on battlefields straddles the line between authorised use of force and extra-judicial or unlawful executions. The states must revise their perceptions of their responsibilities under international law to protect and facilitate the enjoyment of human rights.

India is looking at a fast emerging UAVs industry where it will have to focus on manufacturing drone and counter-drone technology along with enhanced software installations. Focused investments in cyber and electronic countermeasures, combined with domestic unmanned system manufacturing, will be advantageous as the nation tackles tactical and strategic challenges. India is being encouraged to use drones immensely in the commercial sector as well, including in industries like agriculture, construction and real estate, land surveys, mapping National Highways and railway tracks, energy production, mining, industrial asset inspection, power transmission and so on. As the nation looks at startups booming in the UASs domain, the regulations relating to their production, sell and use have become more flexible. Still, they need to be integrated with other sectors too.

Beyond the unsettling possibility of a physical terror strike, the potential of rogue, malicious drone use in civilian situations is continuing to increase.

Counter-drone systems must be adaptable enough to find and destroy drones of all sizes and shapes as the market for unmanned aircraft systems grows. The types of easily accessible aircraft have become more diversified. The challenges posed by counter-drone technology include the effectiveness of detection systems, distinguishing between legitimate and illegitimate drones, decision-making during the response window, the significance of interdiction and so on.

Drones might spread out of control, be abused by states and non-state actors, and might end up being a tool of repression for power without a system of universally accepted rules or norms controlling their sale and usage. It is also crucial to consider drones as an addition to many military and surveillance choices rather than as a substitute. Drones have become a game-changing technology that will probably revolutionize defense as well as the civil domain in ways we have never envisioned.

### **CERTIFICATE**

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