Unmanned Combat Aerial Vehicles
Some Ethical Considerations for the Defence Applications of AI

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Combat drones or Unmanned Combat Aerial Systems/Vehicles (UCAVs) refer to automated aerial vehicles, equipped with the capacity to carry and deploy lethal weapons such as missiles or bombs.[1] They are characterised by their maximum take-off weight (less than 150 kgs, 150–600 kgs, and more than 600 kgs) or flight features (High Altitude Long Endurance, and Medium Altitude Long Endurance).[2] Enabled by Artificial Intelligence (AI), the use of these drones has become increasingly popular in combat and counter-terrorist missions. The relationship between AI and a lethal system like the UCAV has given rise to several ethical concerns which range from utilitarian apprehensions to anxieties over automation. This commentary aims to identify the key ethical dilemmas that the use of such drones presents to policymakers and defence leaders, and outlines various policy developments that tackle these dilemmas.

UCAVs in Modern Warfare

In 2020, as the Azerbaijan–Armenia conflict was witnessing an escalation, Turkey sold about US$ 120 million worth of military equipment to Azerbaijan, which included the famous Turkish Bayrakta TB2 drone.[3] Azerbaijan also revamped the Soviet-era Antonov An-2 single-engine biplanes with remote control.[4] The An-2, in combination with the Bayraktar TB2 drones, aided in ambushing Armenia's air defence. In a

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press conference, Azerbaijan's President, Ilham Aliyev, also credited the TB2 drone with the destruction of more than US$ 1 billion worth of Armenian equipment.[5]

Two years later, another theatre of conflict—this time about 2,000 kms from Nagorno-Karabakh—was arriving at its climax as Russia announced its 'special military operation' in Ukraine. In the years preceding the conflict, Russia had been developing its UCAV or drone capabilities, with the formulation of the Forpost-R, Hunter-B, and the Kronshtadt Orion. Reportedly, all these drones have been used in airstrikes during its SEAD/DEAD (Suppression and Destruction of Enemy Air Defences) missions in Ukraine.[6] Ukraine forces have also used the Turkish TB2 drones in combat, allegedly destroying a Russian Navy Project 11770 Serna-class landing craft.[7]

The experience from these wars has led many experts to believe that automation is the future of combat.[8] AI and Machine Learning, complimented by the rise of the Internet of Things (IoT), have accelerated the development of drones much beyond their surveillance and reconnaissance capabilities. And, as the digital epoch advances into newer domains, unmanned aerial systems have begun to eclipse other armaments in the field of modern warfare.

After UK's procurement of the Protector RGI, Air Marshal Sir Michael Wigston, the head of the UK Royal Air Force (RAF), commented that combat drones are a giant leap forward in technology and aircraft performance, enabling governments to act on a world stage within hours at range and precision.[9] Sir Michael Wigston's comments highlight just one of the many advantages that combat drones can equip a nation's defence. Long distance travel without fuel or pilot limitations, quick response time, and the elimination of risk of endangering a human pilot in hostile environments are some of the other benefits of an unmanned combat system.

Another feature that also helps make their use more appealing is the reduced political and diplomatic risks. This is best exemplified by former US President Barack Obama's comment in May 2013: 'The very precision of drone strikes, and the necessary secrecy involved in such actions can end up shielding our government from the public scrutiny that a troop deployment invites.'[10] Due to the unmanned character of these drones, and the low defence costs incurred by their application, it becomes easier for diplomats and politicians to justify their use in warfare, and partake in offences.

This has led to a monumental acceleration in defence budgets, R&D, and manufacturing dedicated to unmanned combat systems. For example, 20 years ago, the UK RAF had no funding or programmes to buy armed drones. But, as the 21st century unfolded, the RAF came to rely heavily on General Automatic's MQ-9 Reaper for its operations in Afghanistan, Iraq and Syria. By 2015, the UK had allocated a programme budget of US$ 1.3 billion to the development of higher quality UCAVs in close collaboration with General Automatic, leading to the development of the Protector.[11] Table 1 illustrates the UCAV capabilities possessed by various countries.

Table 1 Global Proliferation of UCAVs

Country	*UCAVs*	*Leading Manufacturers*
USA	MQ-9 Reaper, Boeing X-75, X-47 Pegasus, Boeing MQ-25 Stingray,	Lockheed Martin, Raytheon Technologies, Northrop Gunman, General Dynamics
China	Wing Loong 1, Wing Loong 2, Wing Loong 10, CH-4, CH-5, Xianglong	DJI, Aviation Industry Cooperation of China
Turkey	Bayraktar TB-2, Bayraktar Mini, TAI Anka	Baykar, Turkish Aerospace Industries
Israel	Heron TP, Hermes 450, Hermes 900	Israel Aerospace Industries, Elbit Systems
India	DRDO Ghatak, AURA, Rustom, Pawan, Abhyas, HAL CATS	Aeronautical Development Establishment (DRDO), HAL, NewSpace

Source: US Department of Defence; Ministry of Defence India; Ministry of Defence Israel; Ministry of National Defence Turkey; Dan Gettinger, 'The Drone Databook', Centre for the Study of the Drone.

The Role of AI in UCAVs

Artificial Intelligence and Machine Learning serve as unique enablers in weapon systems, particularly UCAVs. Although the development of AI in defence applications is in its nascent stages, it can provide drones with optimisation in processing, an ability to perform automatic coordination with other entities in the battleground, better target identification, optimisation of communication and data exchange, self-damage negotiation, and gun and missile dodging capabilities, among many other things.[12] Experts often call the inclusion of AI in weapons the

third revolution in warfare, the first two being gunpowder and nuclear technology.[13]

The Ethics of AI

AI's inclusion in defence produces a set of ethical dilemmas that require the urgent attention of policymakers and defence intellectuals. As shown in Table 2, the very character of AI that renders its usage in UCAVs so beneficial also presents the defence sector with an array of challenges. The unmanned nature of these lethal weapons, and the implications it holds for warfare norms are some of the common issues observed by experts. Other concerns also include pacifist anxieties, policy constraints, technology-related unease, and strategic considerations. Concerns also emerge out of various schools of ethics, such as utilitarianism, virtue ethics, Levinasian ethics, Kantian ethics, and so on.

Table 2 Advantages of UCAVs and Related Ethical Dilemmas

Characteristics of UCAV	Ethical Dilemmas
Unmanned, automated	Should drones be permitted to make autonomous decisions that may directly cause human death?
Target-precision	Are assassinations where the enemy cannot defend himself ethical? Does it promote more extra-judicial killings?
Cheap, Easy to make	Does it make war more likely by reducing both the human and material costs of war? Does it impact warfare norms and laws?

In 2018, 4,000 employees of Google signed a petition urging the company to discontinue its work on Project Maven for the Pentagon which encompassed equipping AI to identify suspected militants for possible elimination through drone attacks. Google subsequently announced that the contract for Project Maven would not be renewed, and "weapons or other technologies whose principal purpose or implementation is to cause or directly facilitate injury to people" would not be developed by Google.[14]

The development of AI for defence applications in the US and elsewhere in the world has regularly been a joint public–private venture. In India, companies like Larsen and Toubro have frequently collaborated with the defence ministry to aid the development of high-tech weapon systems, or the technology required to manufacture the said systems.[15] At the same time, the case of Google in the US highlights the emerging discourse on ethics that largely looms over this sector. Opposition from

employees or criticism from other entities (for instance, the Stop Killer Robots campaign) is a frequent feature through all stages of production.

After Google's termination of Project Maven, the US's defence department leadership realised the need to address the ethical challenges that face the development of combat drones and other autonomous lethal weapons, and demonstrate its commitment to an ethical application of AI to defence usage.[16] Soon thereafter, the Defence Innovation Board (DIB), an advisory arm of the Office of the Secretary of Defence, issued a set of recommendations on the same. Following these recommendations, the US Department of Defense officially adopted a series of ethical principles for the use of Artificial Intelligence.[17] The European Union also released a non-binding Declaration on Cooperation on AI in 2018 to serve as a framework for ethics and cooperation.[18]

Before discussing the policy recommendations outlined by the aforementioned bodies, an outline of the main ethical concerns that arise out of AI's military application needs to be highlighted. At the outset, two main concerns become immediately obvious. The first is the close relationship between an AI algorithm designed by a human developer, and the decision-making of AI-enabled weapon systems in hostile environments.[19] Traditionally, policies and ethics in weapon systems are determined by the end-use; and the ethical dilemmas that a weapon system entails are usually the responsibility of the user. However, in the case of combat drones and other defence applications of AI, the end-use is entirely automated, and involves no human participation. The only party that manipulates the end use of an automated drone is the developer, and in some cases, the man-in-the-loop. The lack of human participation in decisions that can potentially cause the elimination of an entity has become subject to many complications and controversies. In addition, a related question influenced by Aristotelian virtues often surfaces: is it 'humane' for a drone to indulge in killing?[20]

Scholars and experts of this persuasion, most notably Peter Olsthoor and Jessica Wolfendale, also ask if it is possible to create a 'virtuous drone' that could behave in accordance with war principles and codes.[21] To this end, many experts recommend that policies related to drone development be installed right at the outset—during the designing and engineering stage.[22] Eliminating any discrimination that the drone may make, and installing ethical conduct in its programming, ensures the minimisation of any non-ethical actions that the machine may take in a combat situation.

The second concern arises from a utilitarian reading of AI. Ethics in the utilitarian school dictate that the best course of action at any given point is one that produces the greatest good.[23] Describing the 'goodness' of an action in the domain of international politics is a rather complex undertaking, and can depend on several factors, including a sovereign state's national interest and the interests of its citizens. This school, however, posits an important question: does the benefit of including AI in defence systems like drones outweigh the disadvantages? This school argues that, in order to continue the inclusion of AI in defence, policies must be formed in a way that an ethical balance can be established by surveying all characteristics of this technology.[24]

Policy Insights from the US

More and more engineers and developers are growing sceptical of the military's use of AI in drones, and the consequences this holds for the future development of AI. AI researchers believe that any large-scale public backlash will inevitably impact the advancement of this technology. In an open letter signed by leading scientists in AI, it is stated that 'just as most chemists and biologists have no interest in building chemical or biological weapons, most AI researchers have no interest in building AI weapons'.[25]

Various policies outlined by the US and Europe aspire to address the aforementioned concerns in order to continue fostering a functional relationship with scientists and private tech companies, as well as eliminate any excesses committed by AI-enabled UCAVs. The issue of automation and self-direction in these lethal weapons is addressed by US's DIB. It states that such weapons must be 'responsible, equitable, traceable, reliable, and governable'.[26] It also stresses on the ultimate human responsibility over all AI-enabled weapon systems operated by the Department of Defense. It recommends that all biases in the algorithm development stage must be eliminated by the developers. The traceability factor, which stresses on identifying and correcting any programming flaws before weapons are deployed in combat, also helps alleviate anxieties related to unethical behaviour of UCAVs. It also dictates that all AI-enabled systems must possess the capacity to deactivate upon human command.

Conclusion: The Future of UCAV Ethics in India

The NITI Aayog released a National Strategy for Artificial Intelligence in June 2018 which also included many recommendations advanced

by US's DIB.[27] The importance of tackling biases, transparency, and accountability was highlighted in the document. NITI Aayog also recommended that India follow UK's model of establishing a Centre for Data Ethics and Innovation, which would ensure the ethical usage of AI.[28] While this document does not directly focus on AI's defence applications, the aforementioned recommendations can be applied to the same. In 2018, the Srikrishna Committee also released a draft Personal Data Protection Bill that outlines a similar framework for data privacy in India that directly impacts the development and usage of AI.[29]

However, an AI framework that explicitly addresses its inclusion in drone technology and other military application is yet to be formulated by India. As mentioned in Table 3, transparency, elimination of biases, mechanisms to designate human responsibility for the actions of the drone, and the development of an algorithm in adherence to war norms should be the key priority for policymakers in India. In addition to this, a survey of the impact of drones on the legal structure of warfare needs to be undertaken.

Table 3 Key Areas of Policy Development

Key Areas of Policy Development
Transparency of AI algorithm
Elimination of biases in algorithm
Human responsibility and the need for a 'kill switch'
War norms and impact on legal structure of wars

Source: Michael Klare, 'Pentagon Board Issues AI Guidelines', *Arms Control Today*, Vol. 49, No. 10, December 2019, pp. 28–29.

Recently, the Indian Army, in collaboration with the Drone Federation of India, has launched the 'Him Drone-a-thon' programme to foster India's drone ecosystem and enhance development in the following categories: load carrying drones in high altitude areas, surveillance drones, and nano drones for fighting in built-up areas.[30] This is a part of the Ministry of Defence's effort to build India's domestic UCAV capabilities. Projects like DRDO's Ghatak and Rustom, and NewSpace and Larsen & Toubro's submarine-launched drone also exhibit India's strive towards a domestic drone industry.

However, the push for the domestic development of drones by the Ministry of Defence would be incomplete if not complemented by the development of ethical standards that best suit India's domestic situation and military codes. The inclusion of ethics at all stages of drone

production would ensure a decrease in excesses committed by the drones. Navigating the addition of drones to pre-established war norms is also a delicate exercise, and one that is still in its infancy. By constructing policies that illustrate the ethical conduct of AI in drones, India stands to add its perspective to the global process of norm formation in this domain.

Notes

1. This article uses the terms 'UCAV', 'Drone' and 'Combat Drone' interchangeably.
2. These classifications are in adherence to the NATO Standardization Agreement 4670.
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