

# Concerns for Drone Proliferation in India and Challenges to Air Space Management

*Swaim Prakash Singh\**

*The launch of Drone Policy 2021 has dramatically liberalised the procurement and operation of drones, or Unmanned Aircraft Systems (UAS), in the Indian skies. Prime Minister Narendra Modi's personal insights into the outreach of technology to the masses is a booster step towards the success of drone industry in India. As part of 'Atmanirbharta', the government has rolled out a vision to make India a drone manufacturing hub by 2030. The unprecedented confidence instilled in major companies and start-ups seems to be the direct result of Production Linked Investment (PLI) schemes as incentives by the government. However, even as the drone industry gears up to take flight, it is also prudent to keep pace with counter-drone measures and issues of airspace management. The air defence agencies need to be fully equipped with sensors, shooters, and integrated procedures for the system to develop wholesomely and eliminate any security concerns. This article attempts to provide the details of drone proliferation, counter-drone measures, and the need for air space management.*

**Keywords:** *Drone Proliferation, Anti-Drone Measures, Air Defence Agencies, Complexities of Air Space Management, Drone Air Space Management Cell (DASMC)*

## INTRODUCTION

On the global stage, Unmanned Aerial Vehicles (UAVs) have firmly established their place in the military domain in recent years, having

---

\* Wg Cdr Swaim Prakash Singh, MSc MPhil psc+, is a Senior Fellow at the Centre for Air Power Studies (CAPS), New Delhi. He is currently pursuing PhD (thesis submitted) in Defence and Strategic Studies.



revolutionised the manner in which strategies are carried out and combat zones are perceived. UAVs, which were essentially understood to be tools for gathering intelligence, surveillance, and reconnaissance (ISR), have now prominently found their way into the 'targeting' role of air warfare. The ongoing Russo-Ukraine war has also significantly highlighted the role of not only UAVs but also Unmanned Combat Aerial Vehicles (UCAV) and drones. The killing of Al-Qaeda head Ayman al-Zawahiri by what was probably two laser-guided R9X Hellfire missiles on 31 July this year is the most recent example of using drones in the military domain. Earlier, in January 2020, Qasem Soleimani, an Iranian Major General, was assassinated by a similar drone strike while he was on the move. In a similar operation in 2006, a predator drone was used to hunt down Abu Musab al-Zarqawi, a follower of Osama Bin Laden, in Iraq.

In India, while there has been a great push for drone technologies for the military, the present government, given its top-down approach, has also gone forward to liberalise drone rules and regulations for commercial use under the broad vision of taking 'aerial technology to the masses' and encouraging 'Atmanirbharta' in this field.

During the last three years, having received an impetus from the 'Atmanirbhar Bharat' programme, there has been a remarkable rise in the drone sector and demand from all sides for creating an institutionalised framework for ease of doing business. Drones offer enormous benefits to practically every sector of the economy. Surveillance, geospatial mapping, infrastructure, mining, transportation, agriculture, emergency response, law enforcement, and defence are just a few examples. Drone systems have become key job creators and economic growth generators because of their reach, ease of use, and versatility, particularly in India's remote and inaccessible areas. Due to its traditional effectiveness in innovation, economic engineering, information technology, and massive domestic requirements, India has a very high potential to become a global drone nucleus by 2030.<sup>1</sup>

The benign use of drones to facilitate access to distant locations is a good development. Nevertheless, if drones fall into the hands of rogue actors, they might pose a number of airspace issues for the country's security infrastructure. Drones have been utilised by Anti National Elements (ANE) for unconventional actions, such as dropping improvised explosives and weapons. The recent case of triggering explosions inside the Air Force Station in Jammu should serve as a wake-up call for those promoting liberalisation of drones without addressing security concerns.

Over the last two years, Pakistan-based groups have routinely used drones to drop drugs, guns, and munitions into Indian territory. According to government statistics, there were 167 and 77 drone sightings along the Pakistani border in 2019 and 2020, respectively.<sup>2</sup> Even the safest cities cannot be completely protected from drone attacks due to the rapid development of drone technology and the exponential growth of their global market in recent years. The widespread availability of drones, especially in war zones where ANEs operate, is a major security concern that needs to be addressed.<sup>3</sup>

#### DRONE PROLIFERATION IN INDIA

With the roll-out of the drone policy, for the first time a significant push for drones to enter the civil domain in India has been made. Unmanned Aerial Vehicles, a commonly used word for drones in military aviation, have hitherto been employed exclusively for military intelligence, surveillance, reconnaissance (ISR), and targeting. However, the proliferation of drones has given the civilian sector the confidence to utilise this technology to its fullest. In May 2022, the Ministry of Civil Aviation (MoCA) and the Drone Federation of India (DFI) organised ‘Drone Mahotsav 2022’ as part of the whole-of-government approach. The conduct of India’s largest drone festival was indicative of the goals of the government and the Prime Minister’s impetus for the drone industry. The aim of the event was to reach out to the masses through technology, ensuring ‘last-mile delivery’ and establishing a ‘mid-mile hub center’ by air. In addition, the vision presented showcased the significant potential for job creation, ranging from manufacturers to distributors and operators. With the revolutionary foresight of India’s widespread use of drones, technology that was once only used by the elite is now being made accessible to the common man as well.

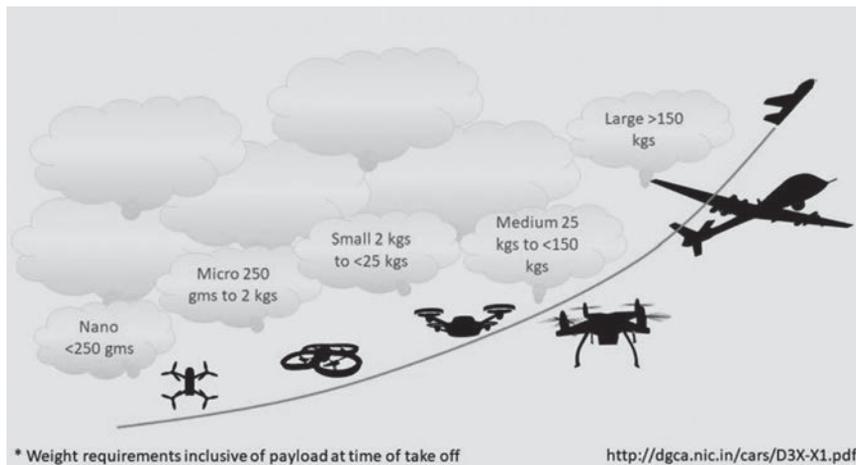
#### LIBERALISATION OF DRONES RULES AND REGULATION

##### **2018: Civil Aviation Requirement 1.0**

Due to their inexpensive production and acquisition costs, drones are readily available to the general population and to organisations. Prior to 2018, there were no civil or commercial drone restrictions in India. Consequently, it was essential to design standardised drone rules that would allow commercial exploitation of various drone technologies.

In 2018, the Directorate General of Civil Aviation (DGCA) and Ministry of Civil Aviation (MoCA) developed a Civil Aviation

Requirement (CAR) for the use of drones in India, considering the country's security environment. The MoCA's top priority was to define 'What constitutes the drone' and 'which systems will be considered drones'. In 2018, the DGCA announced CAR 1.0, which categorised drones according to their size and weight. These drones are suitable for commercial applications, unlike military UAVs, which are considerably larger and heavier (Figure 1).



**Figure 1** Types of Unmanned Aircraft System (UAS)

*Source:* Directorate General of Civil Aviation, Government of India

### 2021: Liberalised Drone Rules

After rescinding the UAS Rules 2021, the MoCA developed the Drone Rules 2021. The new regulations are a notable set of liberalised rules intended to give a fillip to the drone industry in accordance with the goals of 'Atmanirbharta'. They are predominately based on trust, self-certification, and non-intrusive monitoring, and are anticipated to simplify drone operations for civilian drone operators.<sup>4</sup> Simultaneously, they will expedite and simplify the availability of technology to the average citizen, starting in urban regions and then expanding to the country's rural areas. Conditions, penalties, processes, etc., have been kept as simple and lenient as possible so that it may become a great success in a short period of time. The liberalisation of the country's regulations primarily targets the futuristic and audacious concept of the 'drone corridor'.

### **Digital Sky Application Platform (Digisky)**

The government's next task following the liberalisation of the drone policy was to make sure that every drone used in the nation has a legitimate and legal path to operate freely in the airspace. Using a manual tool to notify the nearest Air Traffic Control (ATC) about the drone movement, getting security approval from the DGCA and Air Defence Identification Agency (ADIA), and thereafter carrying out drone activities in the targeted area was hitherto nearly impossible. In order to facilitate registration, licensing, and approval of drone activities, the application-based, fully digital process software Digital Sky Platform 'Digisky' was developed. This application simplified the application and authorisation processes for drone operations. In addition, it has revolutionised the Unmanned Traffic Management (UTM) platform, which implements the 'No Permission-No Take Off' (NPNT) stipulation. To safeguard public safety and avoid unauthorised flights in unapproved drone zones, no drone can be digitally authorised to take off through Digisky. The UTM system has also been tasked with ensuring that all drones stay on their designated flight paths. It functions as a traffic controller in the drone airspace, coordinating with civil and military ATCs simultaneously.<sup>5</sup> The single-window digital sky platform became fully operational on 26 January 2022, in accordance with the Drone Rules 2021.<sup>6</sup>

## **CONCERNS FOR PROLIFERATION OF DRONES**

### **Technology Outreach to the Masses**

There has been a positive trend in drone production in India, which is in line with the government's objective of bringing the drone sector to the general public. Drones can be utilised in a number of applications, including surveillance, monitoring, networking, transportation, farming, etc., indicating that the medium of air can be used to its maximum potential for good governance and the convenience of daily living, even in the most distant and inaccessible locations. Drones are smart tools that will be integral to the lives of common people in the future.<sup>7</sup> Drones that operate in the air and accomplish their missions are becoming the foundation of a great change, particularly in rural areas. As Prime Minister Modi puts it, 'We have made technology a crucial tool to provide the country with new strength, speed, and scale.' Drones are gradually becoming not only an instrument for surveillance, policing, and monitoring but also a crucial 'decision-making facilitator' in other

industries. Agriculture, emergency response, medicine, tourism, shipping, and even entertainment will all benefit greatly from the spread of drone technology. However, if India wants to increase its drone abilities and reach out to the masses, it cannot solely focus on expanding the number of drones it holds and distributes. Drones' potential should be balanced with proper awareness of what they can and cannot perform, and in what scenarios. Extensive training, a sufficient number of committed hardware and software personnel, strong cybersecurity, and a solid ground control infrastructure, including logistics and maintenance, are all necessities.<sup>8</sup> More publicity is needed to raise awareness of the restrictions controlling drone activities. It will reduce drones from being diverted or operated in improper zones or for any other kind of illicit use.

### **Counter-Drone Measures**

Due to the drone industry's enormous growth in India, the counter-drone business is an unavoidable necessity. The government has given this industry a fresh boost with the goal of making India a manufacturing center by 2030. The enthusiasm and encouragement of established enterprises, new start-ups, and drone operators have sown the seeds for India to become a 'drone manufacturing hub' by 2030. In a recent speech, the Prime Minister emphasised the need to adapt as per requirement of the times, saying that 'only when we adapt ourselves and the systems correspondingly can development be achieved'.<sup>9</sup> To maintain the constantly evolving and complicated airspace safe from all rogue drones, a bigger and better push is needed for a commensurate counter-drone business.

A few companies have developed anti-drone devices that are capable of both hard and soft kill. Some of them have even concluded contracts with the Indian Army and the Indian Air Force. However, their effectiveness and integration with existing C2 centres and the sensor-to-shooter cycles have yet to be determined. The Israeli Iron Dome and the American National Advanced Surface-to-Air Missile System are two tested military systems that must be examined (NASAM2) for the Indian scenario especially for the border areas.

The US has collaborated closely with Middle Eastern, Asian, and European allies to co-develop multiple missile defence systems. The relationship between Israel and the US is well-known. The two nations collaborated on Israel's Iron Dome, David's Sling, and Arrow Weapons Systems, resulting in a layered defence architecture that protects Israel

against short, medium, and long-range missiles. Iron Dome is one of the world's most effective missile defence systems.<sup>10</sup> Iron Dome has intercepted about 1,500 rockets, predominantly launched from Gaza by Hamas, since its inception in 2011, with an estimated 85–90 per cent success rate.<sup>11</sup> While Israel developed Iron Dome on its own, the US has provided major funding for the system's acquisition. The US Army secured a deal in August 2019 to purchase two Iron Dome systems as an interim measure against indirect fires.<sup>12</sup> An American version of the Tamir interceptor for Iron Dome is also in development. Since the 1990s, the NASAMS has been cooperatively developed by the US and Norway. This medium-range air defence system can identify and attack aircraft, unmanned aerial vehicles, cruise missiles, and helicopters. NASAMS has become popular beyond its original aim of deterring Russian air threats, despite being primarily designed for that purpose. The US, Norway, Oman, Finland, Spain, Chile, and the Netherlands have already procured the system. Several other countries including Hungary, Australia, India, Lithuania, Indonesia, and Qatar, are considering its induction.

### **Drone Manufacturing vs Assembly Hub**

The objective of lifting all restrictions on the use of UAVs and implementing a liberalised drone policy in 2021 has given this business a new boost. The country's industry is equipped to manufacture drones for various applications. As technology and production facilities multiply, ownership and operating expenses will become more reasonable, reducing staffing requirements while also making technology more accessible to the general population. The government aims to establish a paradigm in which a range of drone services will be outsourced, with the owner collecting hourly charges for operating and offering services. This will provide numerous employment prospects for startups and other associated industries, such as insurance, ML and AI, 3D printing and maintenance. However, the Indian drone manufacturing industry is still dependent on import of components such as electronics, sensors, power sources and silicon chips. The Indian market has, for the most part, acquired the ability to integrate imported components, but manufacturing these at the appropriate scale remains a challenge. In light of the explosive growth of the industry, the accomplishment of becoming a drone-manufacturing hub by 2030 needs to be incentivised. To do so, industry and the government must proactively use the Production Linked Investment (PLI) scheme.

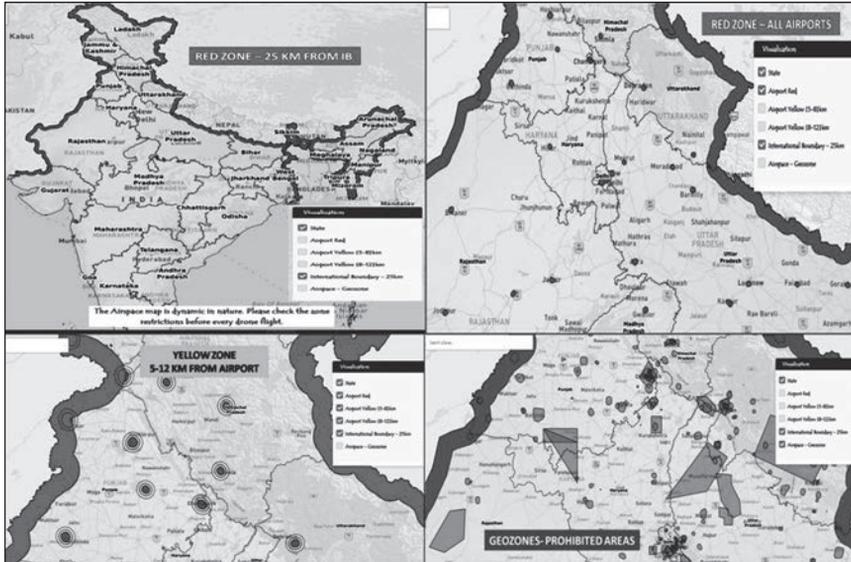
### NEW POLICIES FOR AIR SPACE MANAGEMENT

The introduction of the Digisky application in 2020, the liberalisation of drone policy in 2021, and the Unmanned Aircraft System Traffic Management (UTM) Policy in early 2022, have made it extremely simple for the drone industry to flourish in all fields. The liberalised drone policy has eased most of the limitations on drone usage by the civil sector to a degree wherein roughly 70 per cent of the Indian airspace has been designated as the 'Green Zone' for drones to operate at altitudes of up to 400 ft. If all drone operators adhere to this guideline, it will be a significant step forward for drone operations. However, India presently lacks the capacity and necessary sensors to identify, track, monitor, and destroy such drones should they go rouge. This has the potential to create chaos in airspace.

Technology is a two-edged sword that simultaneously helps us create a better society while increasing threat to security.<sup>13</sup> Apparent ordinary technology creates a fine line between imperviousness and threat. For instance, a drone system might be extremely beneficial up until rogue elements gain access to its control. These days, such gadgets are increasingly used as weapons by ANE. Even though the start of the drone industry was a huge success and a huge opportunity for everyone, there are still a lot of questions about how it will affect the safety and security of important locations and points of national interest.

#### **Drone Air Space Map 2021**

The introduction of Drone Rules, 2021 necessitates clear identification of designated regions for drone activities. In 2021, MoCA published an interactive drone airspace map that marked yellow and red zones around India. In order to fly drones in the defined yellow zones, one must first obtain the necessary authorisation from the relevant air traffic control authority. The 'No Drone Zone' is the red area where drone operations require authorisation from the Centre. Drones can be used up to 400 feet in the green zone without a permit. For drone operations in the yellow zone, it is imperative to get clearance from relevant air traffic control authority—IAF, Airport Authority of India (AAI), Hindustan Aeronautical Limited (HAL), Navy, etc., as the case may be. Additionally, the distance to be maintained from the airport perimeter has decreased from 45 km to 12 km. Anyone who intends to fly a drone must look for any changes to zone borders on the airspace



**Figure 2** The Complexity of Air Space Zones

Source: Directorate General of Civil Aviation, Government of India, available at <https://digitalsky.dgca.gov.in/airspace-map/#/app>

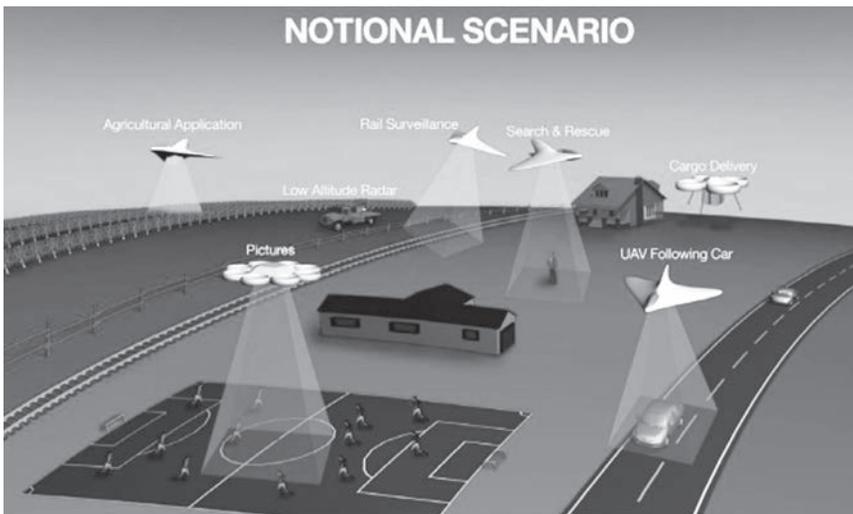
Note: This is the author's creation of Digisky map for earlier web article on Liberalisation of Drone policy.

map (Figure 2). Everyone has free and simple access to the dynamic drone airspace map on the digital sky platform without the need to log in.

### National Unmanned Aircraft System Traffic Management (UTM)

Drone Rules 2021 mainly deal with two categories: registration of operators and methods of operations and production-linked incentives (PLI) to help start-ups invest. The policy framework makes it clear that UTM stakeholders are responsible for the whole process of making policy and operations for drones. The central government, the Directorate General of Civil Aviation (DGCA), the Bureau of Civil Aviation Security (BCAS), the Airspace Management Agencies, the Air Traffic Control Authority (ATC Authority), and the Air Defence Authority (ADA) are all stakeholders in the UTM. The UTM policy framework asserts 'Real-time Identification and Tracking of the unmanned aircraft would allow other airspace owners and people on the ground to share the identity of the UAS and its location'. It would let people know what is going on

and let law enforcement and security agencies keep track of unmanned aircraft when they need to. However, it is crucial to understand that identifying and monitoring an unmanned aircraft flying in Indian airspace while supporting high-density, complicated manned aircraft operations is a critical necessity. While de-regulation has greatly aided suppliers and operators, executing drone operations in the skies remains a significant challenge for air defence organisations across India. The NASA concept of possible UTM is shown in Figure 3.



**Figure 3** NASA Concept of Possible UTM

*Source:* 'NASA and AT&T research for developing drone traffic management system', Geospatial World, available at <https://www.geospatialworld.net/news/nasa-att-research-developing-drone-traffic-management-system/>

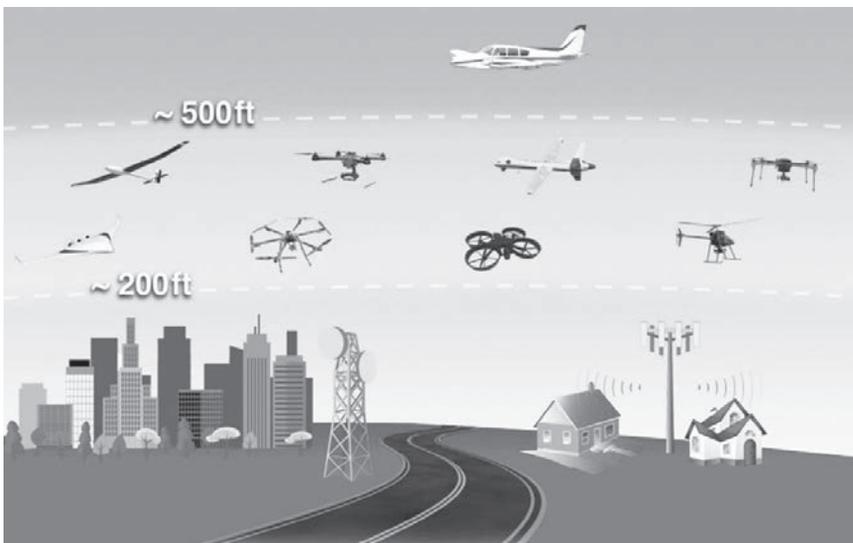
#### GROWING COMPLEXITIES OF AIR SPACE MANAGEMENT AT VERY LOW LEVEL BAND

Assuring the safe and effective coexistence of manned and unmanned aircraft in airspace will be one of the main aviation issues of the next few decades. In combination with the expansion of civil and military UAS, the desire for free use of the skies has intensified. It is commonly agreed that the low-altitude use of tiny UAS is currently a substantial contributor to economic growth. This big change, which is based on disruptive technology, has already led to new services for many industries and job opportunities that were either impossible or too expensive before.

The safe integration of UAS into the present circumstances requires modification as it may pose new dangers for manned aircraft airspace users. A concerted effort should be made to minimise these operating limits and eliminate safety concerns to the greatest extent possible while preserving or enhancing the current standards of safety and security in the skies. The greatest challenge for air space management defenders is to ensure that all air operators, including military, civil, rescue, and Human Assistance and Disaster Relief (HADR) aircraft, have total freedom to operate in the air. The air space management authority must keep up with the growing demand for multiple UAS lingering within their designated zones. The current standard operating procedures and working procedures along the international boundary and surrounding airbases are sufficient, but this is not the case in metropolitan areas, where de-confliction of civil aircraft with small drones is a challenge in itself. It may be noted that though the regulation specifies that unmanned aircraft can operate below 400 ft, this does not preclude the operation of human aircraft below this level. All helicopters fly below this level, which is regarded as the Very Low Level (VLL). Therefore, there needs to be a special agency in charge of this band of altitude where drones and manned aircraft can fly without being in danger.

VLL UAS activities are anticipated to occur below 500 ft above ground level. This threshold appears to have been selected by many stakeholders based on the incorrect idea that manned aviation does not typically operate below 500 ft AGL. The height band indicated above can potentially encompass all sorts of airspace. As ICAO has not identified a general lower limit of application, all rules must be adhered to from the ground up. The primary purpose of any UTM system is to organise a safe and orderly traffic flow. Similar to manned aircraft, the establishment of cruising altitudes or levels is one of the conceivable methods for achieving this. However, the close vicinity to the ground and varying certification criteria and equipment levels may hinder the application of this concept to VLL. Specifically, the fact that manned aircraft users typically keep their height within a 100-ft or greater margin could threaten the use of cruising altitudes. However, this might be used to safely separate UAS from one another. The manned aviation fraternity recognises UAS as a stakeholder. However, it is neither desirable nor feasible to exclude human aviation, especially helicopter, military combat and Search and Rescue operations, from certain airspace regions for the advantage of UAS operations.

The International Civil Aviation Organization (ICAO) mandates manned aircraft to maintain a minimum height of 500 ft above ground level except when authorised and during take-off and landing (Figure 4). As a result, some believe that the airspace below 500 ft is devoid of aircraft. The level below 500 ft is consequently sometimes referred to as ‘non-navigable airspace’. Nonetheless, many manned airspace users legally fly below 500 ft, including HADR and Heli Air ambulances, military aircraft, training flights practicing emergency procedures, glider aircraft, and others, leaving many airspace users vulnerable to collisions with other aircraft. The greatest hazard posed by unannounced helicopter flights in this VLL band occurs during election time in India. Even though it is expected that UAS will replace some of these flights, manned airspace users will still be an important part of the aviation community for the foreseeable future, and their services will still be needed. The development of a buffer zone between 500 ft and the area of VLL UAS flights is one way to increase the safety of manned aviation aircraft flying slightly above 500 ft (similar to a transition altitude). The altimeters on UAS and smaller aircraft are typically not licensed to the standard of industrial manned aviation, and large differences can be expected when



**Figure 4** Representation of Complex Air Space at VLL

*Source:* NASA. See NASA’s Research Efforts and Management of Unmanned Aircraft Systems’, Report No. IG-17-025, Office of Inspector General, NASA, 18 September 2017, p. 12, available at <https://oig.nasa.gov/docs/IG-17-025.pdf>

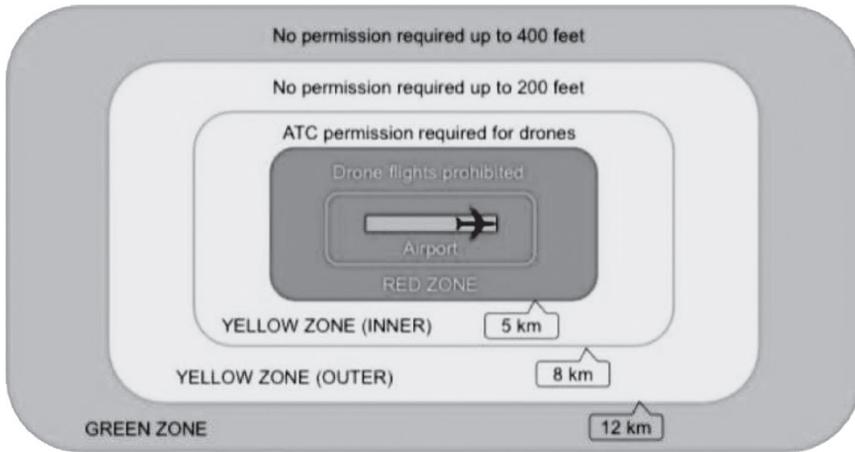
flying at the same indicated altitude. In addition, it is impossible to pilot an aeroplane at the exact same altitude for an extended period, and a 100-ft fluctuation in altitude is often regarded as acceptable.<sup>14</sup>

It will be important to organise the airspace that UAS make use of based on their needs and abilities, among other things. Even though large-scale solutions have been put in place for manned aviation, the short range of many UAS flights, their greater manoeuvrability compared to larger fixed-wing aircraft, and their different flight profiles call for detailed small-scale categorisation of airspace. It remains to be seen how all of this can be done in an effective way. More details have been added to the Air Space Map for 2021, but it remains to be seen how well the rules are followed. Sometimes, it might be necessary to change how UAS can get into the airspace very quickly, for example while blocking the area around an accident site. This information should be sent right away to UAS pilots, and autonomous UAS should be able to receive, process, and use this information to change their flight paths in real-time. To do this, one needs a constant and reliable data connection. A proposal for the setting up of a Drone Air Space Management Cell (DASMC) discussed at the end of the article could be the nodal point to facilitate such changes.

#### CHALLENGES FOR AIR DEFENCE AGENCIES

CAR 1.0 stipulates that all RPAs, excluding those in the Nano category, must be registered on Digisky to get a Unique Identification Number (UIN). This mandate excludes the RPAs managed by NTRO, ARC, and the central intelligence agencies. It permits commercial drones to fly within visual line of sight (VLoS), only during daylight hours, and at a maximum altitude of 400 ft. Flying in regulated airspace requires obtaining an Air Defence Clearance (ADC) or Flight Information Centre (FIC) number from ADIA/FIC. For the smooth conduct of drone operations, geographic areas have been designated as different colour zones, namely the Red Zone, where flying is prohibited; the Yellow Zone, which is controlled airspace where permission is required before flying; and the Green Zone, which is uncontrolled airspace where automatic permission is granted. The regulation also delineates 'No Drone Zones' surrounding the airport and key places of strategic importance, vital military installations, and other sensitive areas. To ensure compliance with security requirements, the mandatory equipment required for the operation of RPAs other than those in the micro category comprises

Onboard GPS, Anti-Collision light, Return to Home (RTH), Flight Controller with the capacity to log flight data, identification plate, and NPNT (Figure 5).



**Figure 5** Drone Airspace Map 2021

*Source:* 'The New Drone Regulations in India 2021: A Complete Guide', Flykit Blog, available at <https://blog.flykit.app/drone-regulations-in-india-2021-updated/>

According to the Union War Book of India, the Indian Air Force (IAF) is responsible for protecting the Indian skies. The ADIA of the Indian Air Force is responsible for monitoring all human and unmanned aircraft operations within national airspace. The Air Defence Authorities shall give Air Defence Clearance (ADC) via the Digital Sky platform for unmanned aircraft operations in the yellow zone. After obtaining the required authorisation from the MoCA, the drone operator will be granted the air defence clearance.<sup>15</sup> Nonetheless, the air space management method has remained mostly unchanged for decades. The ADIAs have a challenging assignment with the kind of infrastructure that is available in terms of sensors, communications, and the intertwined network-centric environment with all interested agencies. The nationwide capabilities of real-time monitoring and identification of their flight routes are a challenging assignment for the ADIAs.

Airspace management in times of war has connotations of choosing between fratricide and enemy attrition. However, this decision-making reaches a new degree of difficulty in peacetime, when ADIA must pick between friendly and other unfriendly aircraft that may have turned

hostile. At any given time, the entire airspace is filled by thousands of different types of aircraft, including fixed-wing, rotary, manned, and unmanned aircraft. Each of these machines has a unique route, level, speed, and function. There are also countless restrictions on the airspace usage of numerous aircraft. No-fly zones are classified as banned and restricted airspace. The flexible use of airspace has imposed a constraint on all users and ADIAs that must be strictly adhered to. The airspace is becoming increasingly crowded. To protect the skies, air defence operators must be watchful and glued to the radar sight 24 × 7 × 365. Despite the technology revolution in military affairs, a lot of these efforts are manual, and fundamental automation is far ahead. The easing of drone rules has made it more important for operators to stay alert at all times.

### **Drone Air Space Management Cell**

The current ADIA already has phenomenal flight plans to manage at any given point of time. The creation of a parallel air space authority within the ADIA placed at geographically dispersed locations and termed 'Drone Air Space Management Cell' (DASMC) may be considered. The DASMC could be fully integrated with the IAF ADIA to ensure the task of defending the national skies. The cell would need to work along with the C2 centres of the IAF, coordinating with the existing systems of ADIA and the newly instituted Digisky platform. There needs to be a requirement for all sensors to be hooked up to this network at all times. The sensors would remain switched on throughout the highly intense and vulnerable zones. In other zones, it could be switched on along the route of a filed flight path or based on intelligence inputs. To equip the DASMC, the government and the security establishment will have to work out a holistic requirement of sensors and anti-drone systems along with the induction of trained manpower. The numbers of such DASMC would be quite high, but with an approach of foolproof air space management, this concept is both practicable and implementable.

### **CONCLUSION**

The liberalisation of drone regulations is an undeniable step toward 'Atmanirbhar Bharat' and for maintaining technological parity with the rest of the world. In the last three years, the current government's top-down approach has led to an exponential increase in awareness of drone

usage in the civil sector, particularly in the fields of medicine delivery, farm spraying, soil management, disaster relief, law enforcement, and data collection, among others. The government's PLI initiative has bolstered the confidence of small entrepreneurs, or 'dronepreneurs' and attracted major corporations to invest in this aerial vehicle industry. This proliferation of UAS is unquestionably a game-changer for the civilian sector, but the security and defence agencies, particularly the security and air defence agencies of the country, will need to remain vigilant and adapt to the new rules and procedures. Along with the enactment of such rules, there is also a need to intensify the country's air defence architecture, which justifies the spirit of the Union War Book in its entirety.

To maintain battlefield superiority, it is essential to deny the enemy's effective use of drones; thus, it is necessary to create and implement counter-drone systems. India must establish a global framework for the development of regulations governing the design, export, and use of drones, as well as stricter controls on the transfer of military technologies. All sensor-collected data must be transmitted to a DASMC. In the event that a protected facility is assaulted during an active crisis, the operator at the DASMC should have full authority to make any decision necessary to effectively manage the situation. In addition, the drone industry must create a parallel 'counter-drone industry' in order for this sector to be truly successful for the national cause. The drone industry needs to be sensitised to evolve an equally potent and capable counter-drone technology and related communication grid with DASMC for the Indian context. These counter-drone systems would be required to operate at multiple locations of varied topography with limitations of terrain, weather, temperatures, etc.

#### NOTES

1. 'Ministry of Civil Aviation Releases India's Airspace Map for Drone Operations', Press Information Bureau, Ministry of Civil Aviation, Government of India, 24 September 2021, available at <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1757850>.
2. Anil Bhat, 'India Needs to Become Drone-Conscious to Counter Aerial Cross-Border Threats', *Indian Defence Review*, 7 August 2021, available at <http://www.indiandefencereview.com/news/india-needs-to-become-drone-conscious-to-counter-aerial-cross-border-threats/>.
3. Ibid.

4. 'Ministry of Civil Aviation Notifies Liberalised Drone Rules, 2021', Press Information Bureau, Ministry of Civil Aviation, Government of India, 26 August 2021, available at <https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1749154>.
5. 'Government Announces Regulations for Drones', Press Information Bureau, Ministry of Civil Aviation, Government of India, 27 August, 2018, available at <https://pib.gov.in/newsite/Printrelease.aspx?relid=183093>.
6. 'National Unmanned Aircraft System Traffic Management (UTM) Policy Framework', Ministry of Civil Aviation, Government of India, 24 October 2021, available at [https://www.civilaviation.gov.in/sites/default/files/National-UTM-Policy-Framework-2021\\_24\\_Oct\\_2021.pdf](https://www.civilaviation.gov.in/sites/default/files/National-UTM-Policy-Framework-2021_24_Oct_2021.pdf).
7. 'Ministry of Civil Aviation Releases India's Airspace Map for Drone Operations', n. 1.
8. Mihir Vikrant Kaulgud, 'India's Response to Drone Proliferation', USANAS Foundation, 10 February 2022, available at <https://usanasfoundation.com/indias-response-to-drone-proliferation>.
9. 'English Rendering of PM's Address at Inauguration of Bharat Drone Mahotsav at Pragati Maidan, Delhi', Press Information Bureau, Prime Minister's Office, 27 May 2022, available at <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1828729>.
10. Kevin Fashola, 'Five Types of International Cooperation for Missile Defense', Center for Strategic and International Studies (CSIS), 2020, available at <http://www.jstor.org/stable/resrep27645>.
11. Jeremy M. Sharp, 'U.S. Foreign Aid to Israel', Congressional Research Service Report, 16 November 2020, available at <https://crsreports.congress.gov/product/pdf/RL/RL33222/40>.
12. Jen Judson, 'It's Official: US Army Inks Iron Dome deal', *Defense News*, 12 August 2019, available at <https://www.defensenews.com/digital-show-dailies/smd/2019/08/12/its-official-us-army-inks-irondome-deal/>.
13. Bushra Tunekar, 'Are Drones a Threat to National Security? Are the Drone Laws in India Strong Enough?', IP Leaders Blog, 28 July 2021, available at <https://blog.ipleaders.in/are-drones-a-threat-to-national-security-are-the-drone-laws-in-india-strong-enough/>.
14. 'Operation of Unmanned Aircraft Systems in Very Low Level Airspace', Position Paper, ECA, 1 July 2019, available at <https://www.eurocockpit.be/positions-publications/operation-unmanned-aircraft-systems-very-low-level-airspace>.
15. 'National Unmanned Aircraft System Traffic Management (UTM) Policy Framework', Ministry of Civil Aviation, Government of India, 24 October 2021, available at [https://www.civilaviation.gov.in/sites/default/files/National-UTM-Policy-Framework-2021\\_24\\_Oct\\_2021.pdf](https://www.civilaviation.gov.in/sites/default/files/National-UTM-Policy-Framework-2021_24_Oct_2021.pdf).