INDIA DRONE MARKET— AN EMERGING OPPORTUNITY

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NEDO

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Product Overview

- An unmanned aerial vehicle (UAV), commonly known as a drone, is an aircraft without any human pilot, crew or passengers on board. The flight of UAVs may operate under remote control by a human operator, as remotely-piloted aircraft (RPA), or with various degrees of autonomy, such as autopilot assistance, up to fully autonomous aircraft that have no provision for human intervention
- Drones, offer tremendous benefits to almost all sectors, including agriculture, mining, infrastructure, surveillance, emergency response, transportation, geo-spatial mapping, defence, and law enforcements, of the economy.

Benefits of Drones

- Maintaining safe environment because of remote control abilities
- Making services and deliveries more accessible
- Cost Saving Technology— Drones can take over several workforces, vehicles, and operational activities in commercial uses
- Replace existing means of transportation, machine, infrastructure leading to energy saving
- Easy deployment and controllable
- Offers security, safety and surveillance
- Helps in imagery analysis and data science across Industries
- Offer safe infrastructure maintenance and management.
- Streamline agriculture management.
- Minimizes obvious danger and health risks

Challenges

- Privacy concern
- Software malfunctions
- Safety issues in heavily-populated regions
- Weather dependence
- Easy to hack
- Vulnerable to wild animals
- Lack of required know-how

Product Overview

Classification of Drone

By Type

- **Single-Rotor Drones:** These are the most basic drones which has a single rotor which is the tail unit that allows it to generate thrust much more efficiently than multi-rotor drones. Single rotor drones can be used for longer flight times.
- **Multi-Rotor Drones**: It is a multiple rotor drone incorporated with four rotors. When it comes to commercial drones Multi-Rotor drone is stable one.
- **Fixed Wing:** Fixed-wing UAVs require much less energy in cruise mode as they capture data. Because of their wings, they can cover more ground, faster.
- **Fixed Wing Hybrid Drone:** Fixed-wing hybrid drone combines the best of both fixed-wing and motor-based designs to create drones that have few rotors attached at the ends of their fixed-wing UAVs. These drones are experimental and are not commercially available.

By Range

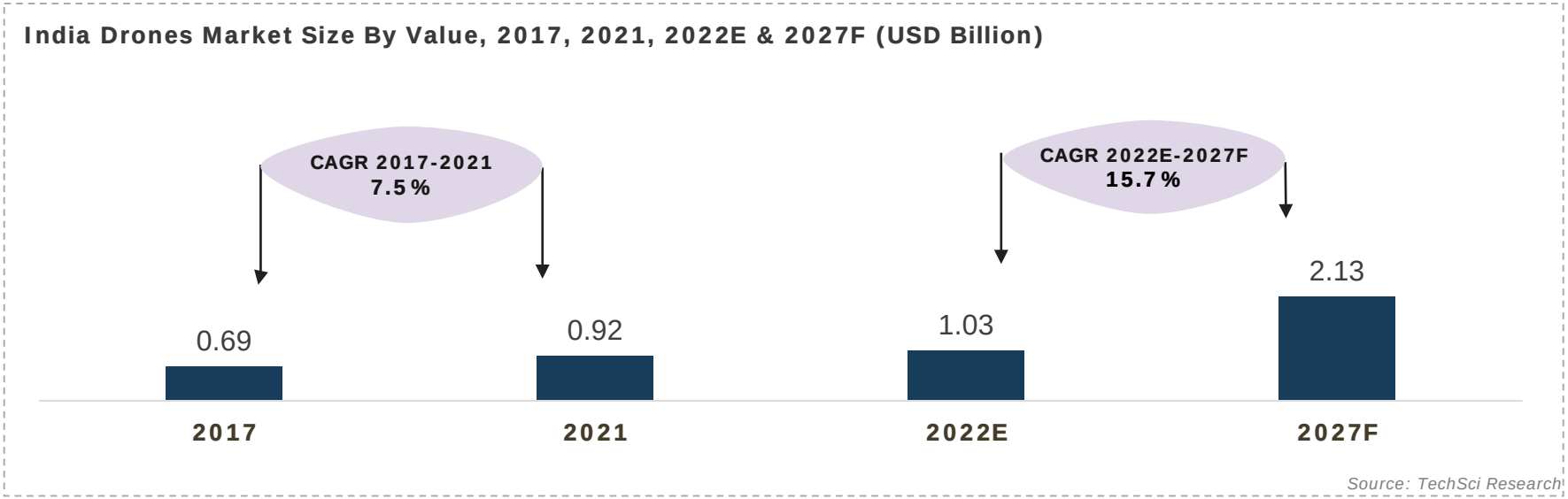
- **Medium Altitude Long Endurance Unmanned Aerial Vehicle (MALE):** The UAVs (Unmanned Aerial Vehicles) with an altitude of less than 9100 m and range of less than 200 km.
- **High Altitude Long Endurance (HALE):** The UAVs with altitude more than 9100 m and indefinite range.
- **Tactical:** The UAVs with altitude less than 5500 m and approximately about 160 km range.
- **Close:** The UAVs with altitude less than 1500 m and approximately about 10 km range.
- **Hand-held:** The UAVs with altitude less than 600 m and approximately about 2 km range.

By Payload

Type	Weight Range	Type	Weight Range
Nano drones	W≤200g	Medium drones	20Kg≤W≤150Kg
Micro drones	200g≤W≤2Kg	Large drones	W≥150Kg
Small drones	2Kg≤W≤20Kg	**Note**: Registration is required for all except for the Nano category.	

India Drones Market Size, By Value

Figure 1: India Drones Market Size, By Value (USD Billion), 2017-2027F

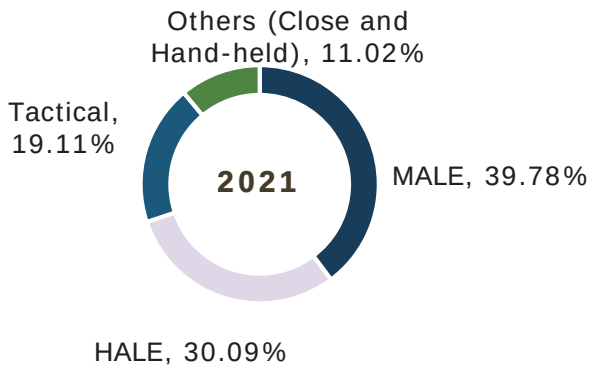


Source: TechSci Research

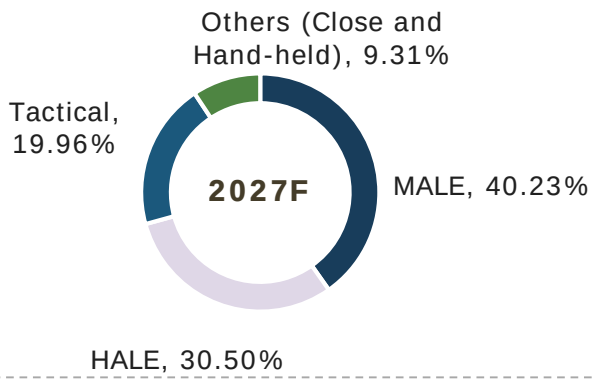
- The Indian Drones market stood at USD0.92 Billion in 2021 and is projected to reach USD 2.13 Billion by 2027, growing at a CAGR of 15.7% through the forecast period.
- Key growth drivers include government's aim to make India a global drone hub through the positive and supportive ecosystem, growing use cases and emerging potential applications, a surging number of start-ups/Investment, and business-friendly new drone policy 2021.
- Drone Industry is expected to be the significant creator of employment and economic growth due to its reach, versatility, ease of use, especially in India's remote and inaccessible areas.
- Aerial cinematography, land surveys, monitoring agriculture & mining & construction activities, disaster management and mapping national highways and railway tracks are critical growing applications of drones in India.

India Drones Market Size, By Value, By Range, By Payload

India Drones Market Share By Value, By Range, 2021

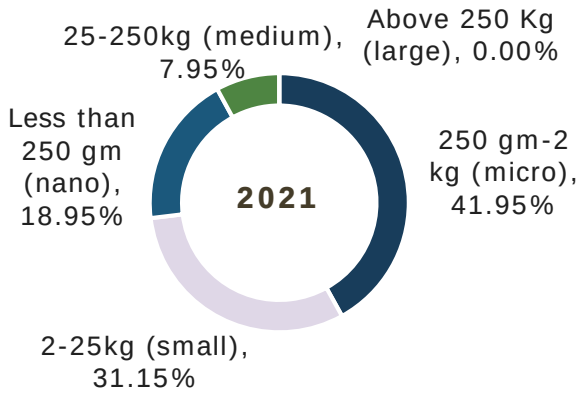


India Drones Market Share By Value, By Range, 2027F

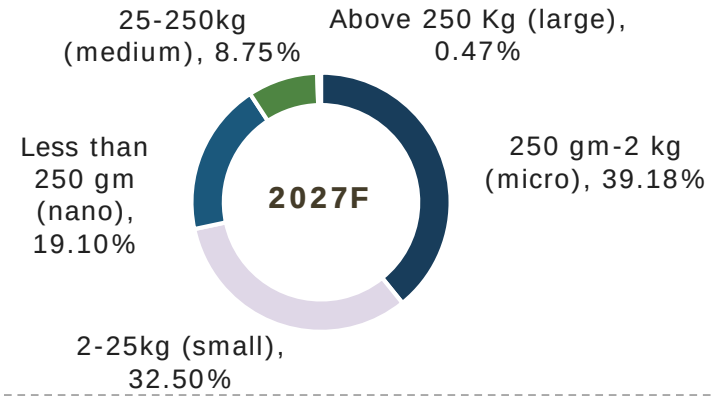


MALE & HALE category offers an extensive range, primarily used in surveillance and monitoring applications

India Drones Market Share By Value, By Payload, 2021



India Drones Market Share By Value, By Payload, 2027F



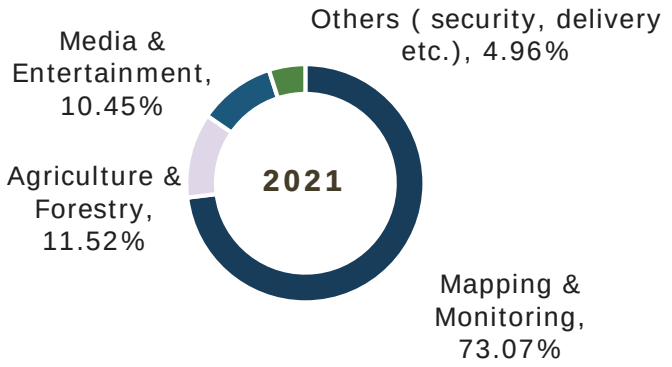
Source: TechSci Research

Source: TechSci Research

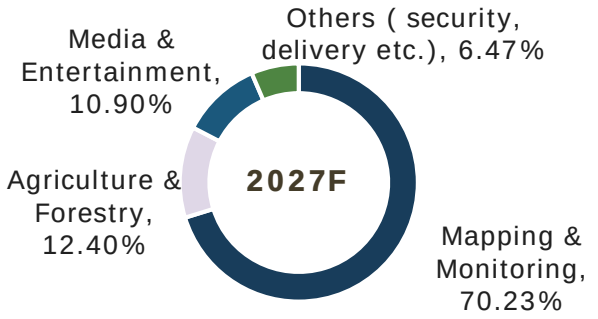
Micro Drones are miniature UAVs that offer quick navigation and the benefit of high communication range operations. Less weight is an added advantage

India Drones Market Size, By Value, Application, By Type

India Drones Market Share By Value, By Application, 2021

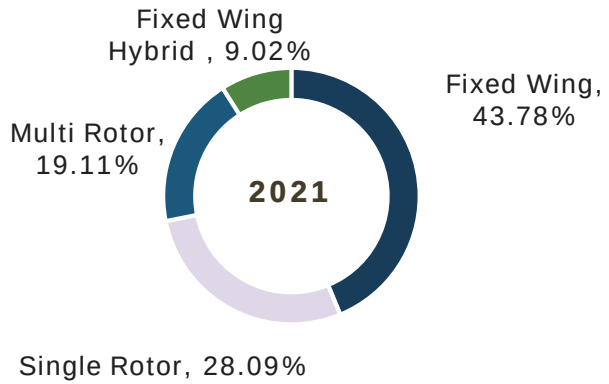


India Drones Market Share By Value, By Application, 2027F



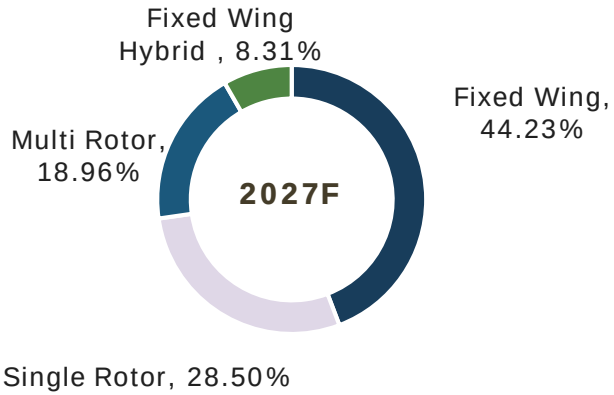
Mapping & Monitoring comprises numerous use of drones that range from large-scale mapping, urban modelling, defence monitoring etc. and find usages across sectors

India Drones Market Share By Value, By Type, 2021



Source: TechSci Research

India Drones Market Share By Value, By Type, 2027F

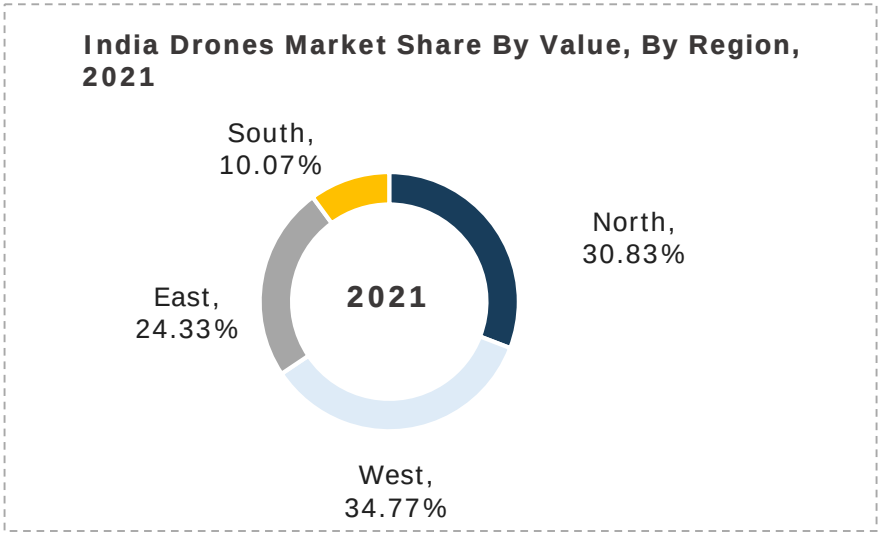


Source: TechSci Research

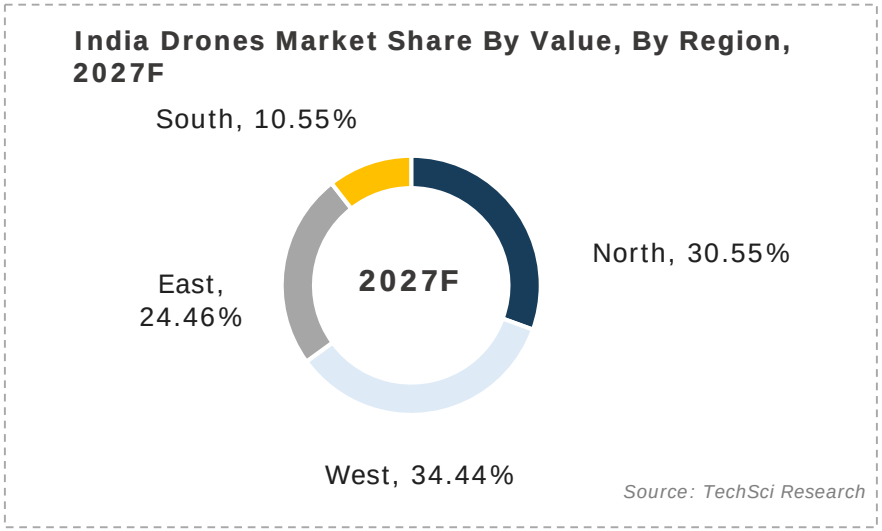
Fixed wing Drone—Flying time, range, and speed are ideal for military, surveillance, and emerging applications

India Drones Market Size, By Region

Figure 2: India Drones Market Share, By Region, By Value, 2017 & 2027F



West India and North India--Higher security and monitoring applications supported with significant commercial usage of Drones



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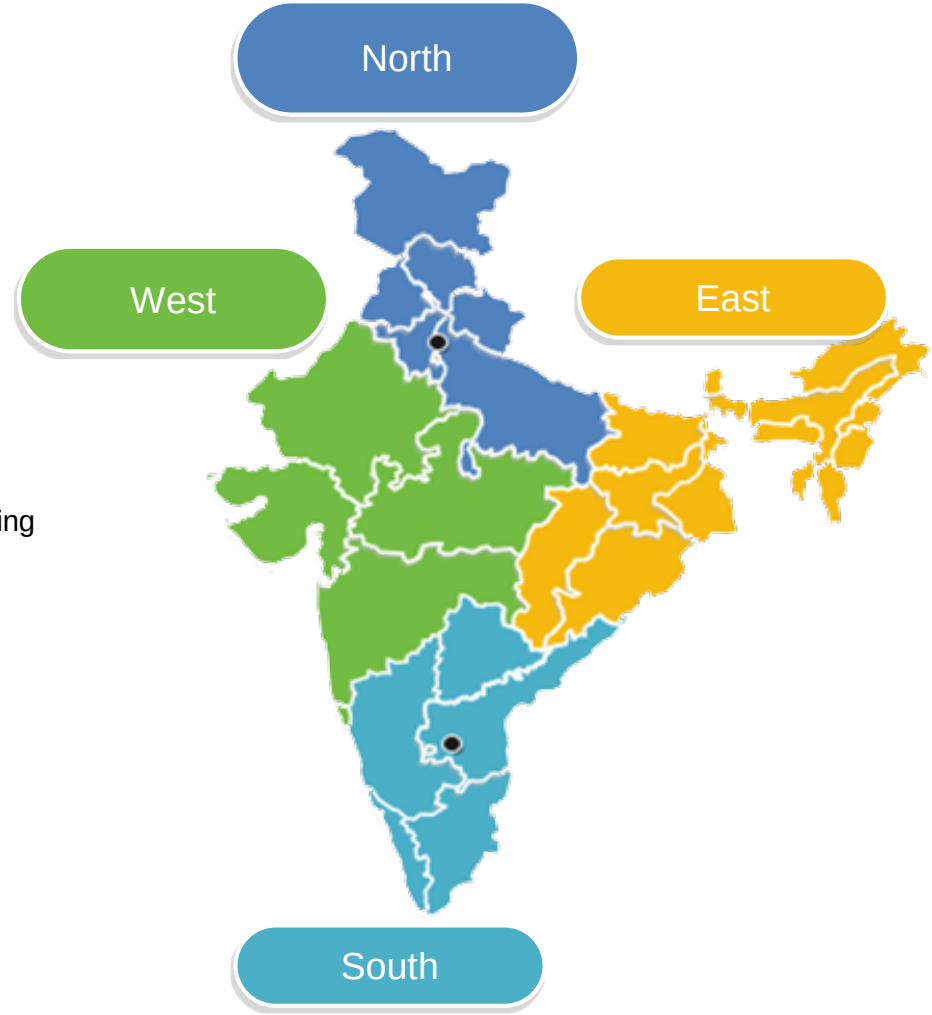
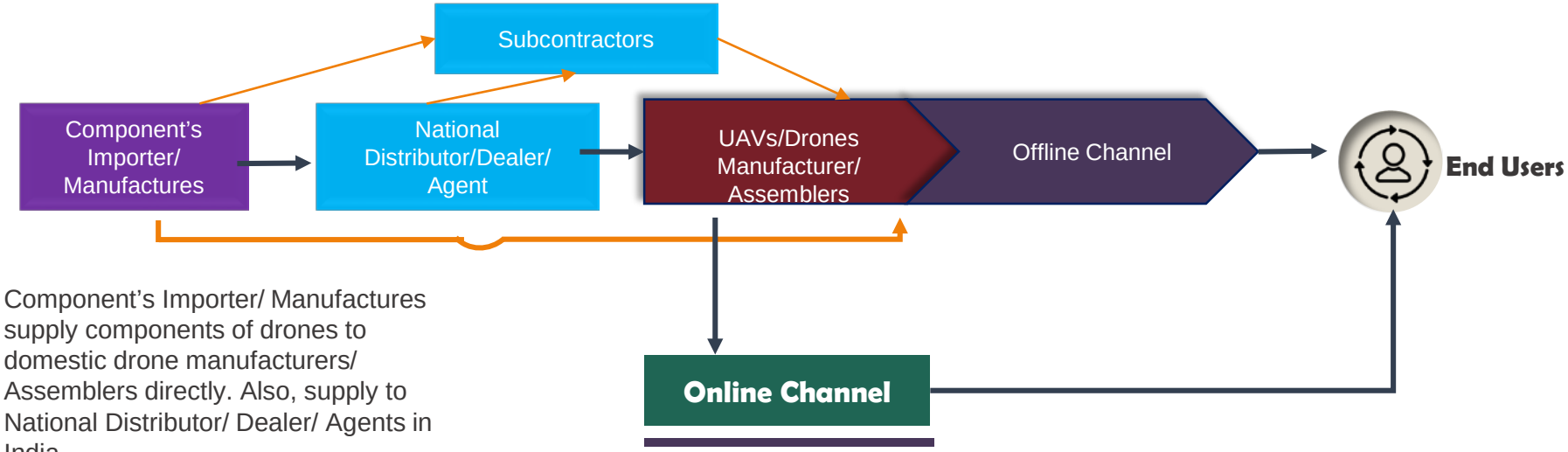


Supply Chain

- As of 2021, around 60% components supply is from China, followed by 5% from EU/US
- Subcontractors supply parts and other products to the UAVs/Drones Manufacturer/ Assemblers. Subcontractors may be group company as well as supply to multiple companies



Component's Importer/ Manufactures supply components of drones to domestic drone manufacturers/ Assemblers directly. Also, supply to National Distributor/ Dealer/ Agents in India

Online sales channel can be used for the Nano Drones across the country in near future, once commercial usage goes up

UAVs/Drones Manufacturer/ Assemblers

ideaForge Technology Private Limited, Asteria Aerospace Pvt Ltd., Aarav Unmanned Systems Pvt Ltd., Tata Advanced System, among others.

National Importer/Distributor

Eagleeye Aerospace, Deccanwing Technologies Private Limited, Moxie Supply Private Limited, K K Geo System Private Limited, A & S Creations, TIF Labs Private Limited, Raybotix Technologies Private Limited, among others.

Drivers

Government Aim's to make India as a Global Drone Hub Through Positive and Supportive Ecosystem

- Production Linked Incentive (PLI) scheme worth USD 16 Million to boost the manufacturing of drones in the country.
- Drone Policy 2021 is a crucial growth engine as it has abolished several permissions and approvals, helping to create a positive and supportive ecosystem.
- The DGCA's interactive airspace map is perceived as a backbone to help drone operators check for no-fly zones or where they need to undergo certain formalities before flying a drone.
- The government expects the drone manufacturing industry to invest over USD 670 million in the next three years and generate 10,000 direct jobs.
- The government plans to encourage startups to facilitate Drone-as-a-service (DAAS). Drone-as-a-service allows enterprises to avail various services from drone companies, removing the need for them to invest in drone hardware or software, pilots, and training programmes.
- The drone services industry is expected to grow to over USD 4,000 million in the next three years and generate over 5,00,000 jobs.
- Drone-related courses for skilling will be started at selected Industrial Training Institutes (ITIs) in all states.
- The Centre aim to promote 'Kisan Drones' for crop assessment, digitizing land records, and spraying of insecticides and nutrients.
- SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas) scheme is aimed to do property survey
- Mandatory use of drones by NHAI for monthly video recording of all national highway projects during their different stages of development, construction, operation and maintenance

To boost domestic defense and aerospace manufacturing, the Ministry of Defence (MoD) has launched the Defense Testing Infrastructure Scheme (DTIS) with an outlay of USD 53.55 million to create the testing infrastructure in partnership with the private sector industry.

Drivers

Growing Use Cases and Emerging Applications

India is in process to experiment, explore, and implement drones for various applications across sectors. The prominent ones include photography, agriculture, mining, telecom, insurance, telecom, oil & gas, construction, transport, disaster management, geo-spatial mapping, forest and wildlife, defense and law enforcement. Drones are positioned to find its wider use because of its benefits such as:

- Security needs of office buildings, shopping malls, critical infrastructure, schools, hotels, hospitals, residential complexes, warehouses, and factories
- Growing and emerging usage in railways, metro rails, NHAI, Archaeological Survey of India (ASI), oil & gas industry, renewable energy & waste management, mining, and telecom industry
- Growing relevance for safe, cost-effective solutions ranges from crowd control, emergency response, surveillance, situation awareness, data collection to last mile delivery.
- The mobility, ease of deployment, and versatility of drones making it a valuable tool in the security for both private and public entities.
- Increasing work efficiency and productivity, decreasing workload and production costs, improving accuracy, refining services and customer relations, and resolving security issues on a vast scale
- Drones possess the capability of reaching the most remote areas with little to no manpower needed and require the least amount of effort, time, and energy
- Moreover, the drone industry is a significant source of employment and economic growth due to its reach, versatility, and ease of use, especially in India's remote and inaccessible areas.

Union Budget 2022-23 highlighted "Drone Shakti" and "Drone-As-A-Service" as major commitments of the government's efforts towards "Make in India" and "Atmanirbhar Bharat".

The Union Agriculture Ministry has amended the guidelines of the Sub-Mission on Agricultural Mechanisation to provide subsidies to rural entrepreneurs and farmer producer organisations for purchasing drones to promote Kisan Drone.

Growing Start-ups / Investment in Drone Industry

More companies and startups are likely to enter and raise their investments in the drone sector—India is focusing more on being 'Aatmnirbhar'. As of now, 200+ Startup companies are working in the Drone sector. In addition, there is a growing trend of companies to provide solutions in the area of Mapping, Topographical Surveys, Industrial inspections, Powerline inspections, pipeline inspections, railway line inspections, etc. Notable Start-up include Aarav Unmanned Systems, Aero 360, IdeaForge, CRON Systems, DeTect Technologies, Drone Tech Lab, Indrones Solutions

A trend in foreign investment, collaborations and investment are visible. Few examples include:

- In Sept 2021, RattanIndia Enterprises announced the launch of its drone business through wholly-owned subsidiary NeoSky India Ltd. NeoSky India will develop drone system platform focusing on industry applications. The company recently also made a strategic investment in US-based urban drone logistics, Matternet, working extensively on the drone logistics platform
- In Aug 2021, DCM Shriram Industries announced buying a 30% stake in a Turkish drone company (Zyrone Dynamics) with an aim to create products for civilian use, especially for cargo transportation. Zyrone will sell its products to India and Asian market
- Infoedge India is an Internet-based public company in India and the parent company of Naukri, 99Acres, Jeevansathi, Shiksha.com, and many other popular websites in India. Infoedge India has invested and bought stakes in Skylark Drones, a startup that builds the core infrastructure for the drone ecosystem.
- Established in 2013 and headquartered in Bangalore, AUS is a startup backed by some of the most reputed firms and individuals such as GrowX, 500 Startups, StartupXseed, 3one4 capital, Valpro, Mr. Ashok Atluri (Zen technologies) and Mr Sanjay Jesrani (GoNorth ventures).
- CRON Systems' offerings include the Kavach series of advanced multi-sensor scanners and SenseEdge's perception software, designed to complement the hardware offerings with advanced AI and machine learning-based perception, prediction, and planning features. CRON Systems is backed by top-tier strategic partners and investors, including YourNest Venture Capital, Techstars Adelaide, and Cisco Launchpad.

Barriers

Privacy Issues

The drones generally rely on cameras to operate, which often allow operators to take photos and record videos, and many have shown discontent at being captured without their consent. Several laws exist to restrict drones from intruding too far on privacy, but many users choose to ignore these laws

Airspace Usage

Since drones occupy airspace, with many able to reach heights rivalling those of a jet, numerous concerns have been raised about drones causing or exacerbating disasters and emergencies. Drones can often be hard to track on air traffic radars, presenting new obstacles for plane and helicopter pilots to navigate through while in flight.

Safety Concerns

Unmanned Drones operate on limited battery power at a time and are equipped with propellers that spin quickly to provide lift and have the potential to fall from great heights, posing a significant risk to people, property and the environment as the number of drones in use scale upward.

Limited Know-How

Local players are mostly into 3D modelling, design and testing the airflow, analysis by software of the frame, etc. They would require time and technology to successfully manufacture complete drones, including individual motors and the GPS which will drive the technology development efforts.

Unknown/ Unexpected Changes in Policy Framework

The drone sector in India is going through a transition phase with significant momentum as the demand is growing, but actual implementation in practical scenarios is becoming challenging. The changes in the regulatory environment and emerging potential use cases are happening as the need appear. There are a few policies that the government will release soon which will shape how these rules are implemented. These include standards for import and manufacturing, policy on traffic management and requirement of safety features. It will continue to lead to requests for improvements and revisions of laws and regulations related to technology development efforts.

Use Case: Current, Emerging/ Potential

Urban/ Rural / Infrastructure Development

Use Cases: Andhra Pradesh Government, Government of Karnataka, Government of Tamil Nadu, Government of Haryana, and Government of Maharashtra, NHAI, Survey of India, Indian Railways

- Project Monitoring of urban development projects such as roads, buildings, green development and other infrastructure-related activities
- Property tax estimation and the creation of a base map of a city/town, and to detect building violations and encroachments using aerial view to map each property dimension
- Mapping remote towns and villages in detail to give local authorities accurate data related to land ownership
- Crowd and traffic surveillance, and monitoring of weekend rush hour traffic and accidents to send immediate help
- Map the accuracy with respect to the extent of land required for the highway project and estimate the affected number of coconut, palm and mango trees, other crops and properties
- Map the project progress of the development of corridor

Emerging / Potential Use Cases

City Survey	▪ Geo-referenced, orthomosaic maps processed from high-resolution aerial images can be deployed for land use monitoring and mapping to ascertain wetlands or kharab lands. Illegal land encroachment can also be detected
Improved Urban Planning	▪ Increased visibility of developmental and expansion activities with accurate alignment of roads, canals and drains can assist in urban planning. Moreover, digital elevation models help in understanding terrain stability while planning highways or residential ventures.
Road Surface Condition Monitoring	▪ Roads with heavy traffic movement can be routinely inspected to identify potholes or waterlogged areas, often leading to accidents. In addition, this data can be used by the Public Works Department for tendering maintenance contracts.

Use Case: Current, Emerging/ Potential

Urban/ Rural / Infrastructure Development

Emerging / Potential Use Cases

Road Surface Condition Monitoring	▪ Roads with heavy traffic movement can be routinely inspected to identify potholes or waterlogged areas, often leading to accidents. In addition, this data can be used by the Public Works Department for tendering maintenance contracts.
Improved Traffic Management and Feedback	▪ City traffic maps can be created to get real-time information on traffic jams, accidents, etc., which will help plan appropriate diversions to decongest specific areas. Furthermore, video analytics will help drive decision-making and assist in traffic management and route planning. ▪ Real-time information on vehicular and pedestrian traffic movement and congestion will enable evidence-based decisions on new roadway constructions, traffic signal requirements, pedestrian signal requirements, etc.

Survey of Village Abadi & Mapping with Improvised Technology in Village Areas (SVAMITVA) Scheme, Data Lake Project of National Highways Authority of India making Drone Survey Mandatory for All National Highways Projects are key drivers

Mining

Use Cases: *Government of Andhra, Government of Karnataka, and Government of Jharkhand.*

- Monitoring of stockpile storage, 3D mapping and volumetric analysis of limestone
- Detect illegal sand mining, and inspection of coal and iron mines.
- Counting of vegetation in reclaimed areas, and profiling of quarry and dump for volume calculations

Emerging / Potential Use Cases

Contract Monitoring	▪ Based on the volume of minerals extracted, mining contracts can be monitored using aerial photos taken at separate time intervals for effective enforcement and implementation.

Use Case: Current, Emerging/ Potential

Environmental Monitoring & Wildlife Conservation/ Agriculture

Use Cases: Haryana Forest Department, Government of Maharashtra, Government of Tamil Nadu, Iotechworld Avigation/ Dhanuka Agritech, Karnataka Forest Department, National Environmental Engineering Research Institute (Neeri), Telangana government / India's First Aerial Seeding Campaign, General Aeronautics, Maruti Drone, Wildlife Institute Of India (WII), and Forest Survey of India and Karnataka Government

- Monitor wildlife, wildlife population tracking, track the health of forests, tree felling, forest fires, poaching, status of water bodies, biodiversity protection, mangrove conservation and prevent illegal activities like tree cutting, encroachment and road construction
- Spraying plant protection chemicals in Farms and Crop health monitoring with achieving controlled MRL (Maximum Residue Level)
- Real-time concentrations of pollutants that helps in making data prediction and modelling
- Aerial seeding by dispersing seed balls over thin, barren and empty forest lands
- Reduce the spread of malaria and dengue by enabling reforestation, empowering surveillance and ferrying medical supplies through AI-

Emerging / Potential Use Cases

Compensation plan for Farmers	▪ Site-specific crop damage reports using drones can be generated for appropriate action. In addition, it will help governments to ascertain a proper compensation plan for farmers.
Soil Health Assessment	▪ Soil quality can be monitored using parameters such as soil moisture through remote sensing, which can help develop fertility maps and consequently assist in planning for more optimal crop rotation or irrigation.
Improved Resource Utilisation	▪ Ascertaining areas within a most fertile field requiring additional water, fertilizers, or chemicals can help farmers optimize resource utilization.

Kisan drones will be used for crop assessment, digitization of land records, and spraying of insecticides and nutrients. The Union Agriculture Ministry has amended the guidelines of the Sub-Mission on Agricultural Mechanization to provide subsidies to rural entrepreneurs and farmer producer organizations for purchasing drones to promote Kisan Drone.

Use Case: Current, Emerging/ Potential

Healthcare

Use Cases: *Indian Council of Medical Research (ICMR), Spice Jet,WEF, State Governments , PHFI, and NITI Aayog.*

- Delivery of COVID-19 vaccine, medical and essential supplies in remote areas.

Emerging / Potential Use Cases

Epidemic Control	▪ Thermal imaging, combined with topographic, weather and population density data, can help develop heat maps to ascertain breeding zones for mosquitoes carrying dengue, malaria, chikungunya, etc.
Cleanliness and Hygiene	▪ Information on exposed garbage piles, open drains and sewers, dead animals on roads, etc., can be captured and used to control health hazards.

Disaster Management

Use Cases: *National Disaster Relief Force, and Government of Tamil Nadu.*

- Disaster management through survey in mines and aerial photography, landslide site survey, search and rescue operations.
- To map toppled monuments, ruined heritage sites and devastated homes.

Emerging / Potential Use Cases

Real-time Surveillance	▪ A high-resolution live video feed of disaster-struck areas can help create 3D models for efficient decision making.
Search And Rescue	▪ Heat maps can be generated to determine survivors and livestock' exact locations for effective rescue operations.
Delivery Of Essential Goods	▪ Food supplies, water, medicines, etc., can be dropped quickly without endangering more human lives in hard-to-reach disaster-struck areas. It will also reduce the high cost and time savings

India, with its varied topography from hills to dense forests to marshy river deltas, can use drones for timely delivery of essential medicines, test kits and vaccines to these hard-to-reach areas.

Use Case: Current, Emerging/ Potential

Oil, Gas and Power Utilities

Use Cases: Garuda Aerospace, and Gas Authority of India Limited., Tata Power Delhi Distribution Limited

- Aerial surveillance of pipelines
- Mapping and topographical survey needs of energy companies like Reliance, Adani, Vedanta, and Tata projects, among others
- Patrolling transmission lines.

Emerging / Potential Use Cases

Emergency Response	▪ Information on pipe leaks and spills can be readily available to respond quickly and effectively without endangering human lives. Moreover, the evacuation operations can be closely monitored.
Asset Safety Monitoring	▪ Routine monitoring of assets will ensure that any repair requirements are highlighted and addressed timely, significantly reducing the downtime and generating considerable cost savings.
Security	▪ Improved security by providing a 360-degree aerial view of the surrounding area and sending intrusion alerts, which are especially useful in piracy-prone areas.

Good and Service Delivery

Use Cases: Zomato Delivery and TechEagle , Swiggy and ANRA Technologies

- Delivery of Goods

Emerging / Potential Use Cases

Delivery and Real-time Support and	▪ Delivery of Goods, Services and Essentials in normal and emergency conditions

Use Case: Current, Emerging/ Potential

Defence & Surveillance

Use Cases: *Government of Maharashtra, Government of Tamil Nadu, SMART SHOOTER, Hindustan Aeronautics Limited (HAL) , ideaForge*

- Confirm suspicions and gather evidence of bootlegging helping to do effecting raids
- Murder investigation
- Help military and law enforcement professionals swiftly and accurately neutralize their targets.
- Equip aircraft infrastructure with various UAV support, enhancing war capabilities, surveillance

Emerging / Potential Use Cases

Enhance Defence and Investigation Capabilities	▪ Develop UAV versions of fighter planes ▪ Incorporate Drone in investigation and Surveillance

Telecom

Emerging / Potential Use Cases

Routine inspection	▪ Drones allow for auditing and inspecting telecommunication assets, including towers and wireless infrastructure, through high-resolution imagery and video, thus reducing the need for tower climbers. In addition, they assist in identifying any damages, making repair and maintenance activity quick.
Structural Preservation	▪ Drones assist in locating erosion, cracks, and general wear and tear and detect unseen electrical malfunctions using infrared imaging. Any vegetation overgrowth on telecom lines can also be quickly identified and managed.
Infrastructure planning	▪ Telecommunication towers and cables can be geotagged to ensure infrastructure planning and ease of monitoring.

New Drone Policy, 2021 and Ecosystem: Key Highlights

Classification

Type	Weight Range
Nano	≤250g
Micro	>250g<=2Kg
Small	>2Kg<=25Kg
Medium	>25Kg<=150Kg
Large	>150Kg

Registration, UIN and Type Certificate

- To operate an unmanned aircraft system, it is mandatory to get registration on the digital sky platform and obtain a unique identification number, unless exempted from the requirement of a unique identification number under Drone Rules, 2021.
- Type Certificate is mandatory expect for R&D entities. Importing and manufacturing drones purely for exports are exempted from type certification and unique identification number
- Testing of drones for issuance of Type Certificate to be carried out by Quality Council of India or authorized testing entities.
- Nano and model drones (made for research or recreation purposes) are exempted from type certification.

Remote Pilot License

- No individual other than a holder of a valid remote pilot license enlisted on the digital sky platform shall operate an unmanned aircraft system. A remote pilot license shall specifically mention the category, sub-category and classification of the unmanned aircraft system or a combination of these, for which it is issued are exempted from type certification.
- Eligibility for Pilot License: 18+ Years Old and 10+2 Qualification+ Training Certificate
- DGCA shall prescribe drone training requirements, oversee drone schools and provide pilot licences online.

- Drone Rules 2021—Based on a premise of trust, self-certification and non-intrusive monitoring.
- Designed to enter in an era of super growth while balancing safety and security considerations.

New Drone Policy, 2021 and Ecosystem: Key Highlights

Zone

Type	Definition	Permission to Operate
Red	Airspace of defined dimensions, above the land areas or territorial waters of India, or any installation or notified port limits	Central Government
Yellow	Airspace above 400 feet in the designated green zone and the airspace above 200 feet in the area located between the lateral distance of 8 KMs and 12KMs from the perimeter of an operational airport	Air traffic control authority
Green	Excluding Red and Yellow Zone, Up to 400 feet	No permission for all-up weight up to 500 kg

Airspace Map for Drone Operations

- The map is available on DGCA's digital sky platform at https://digitalsky.dgca.gov.in/home.
- An interactive map of India that demarcates the yellow and red zones across the country.
- Mandatorily check the latest airspace map for any changes in zone boundaries.
- Freely available on the digital sky platform to all without any login requirements

Role of Digital Sky Platform

- Digital sky platform is a user-friendly online single-window system to make sure minimal human interface and rapid self-generated permissions
- Facilitate registration and licensing of drones and operators in addition to giving instant (online) clearances to operators for every flight. The Digital Sky Platform will enable online registration of pilots, devices, service providers, and NPNT (no permission, no take-off).
- Easier process specified for transfer and deregistration of drones through the digital sky platform
- Standard operating procedures (SOP) and training procedure manuals (TPM) will be prescribed by DGCA on the digital sky platform for self-monitoring by users. No approvals required unless there is a significant departure from the prescribed procedures.

New Drone Policy, 2021 and Ecosystem: Key Highlights

Imports

- Regulated by DGFT, requirement of import clearance from DGCA abolished.
- No security clearance required before issuance of any registration or license.
- Coverage increased from 300 kg to 500 kg covering drone taxis also
- Imports of drones in completely built-up (CBU), semi-knocked-down (SKD) or completely knocked-down (CKD) form is prohibited. Imports of drone components is, however, free.

Production-Linked Incentive (PLI) scheme for Drones and Drone component

- Allocated money : INR 120 crores (INR 15.7 million) spread over three financial years
- Value Addition—incentive as high as 20% of the value addition. It is calculated as the annual sales revenue from drones and drone components (net of GST) minus the purchase cost (net of GST) of drone and drone components.
- Eligibility norm for non-MSME companies in terms of annual sales turnover: INR 4 crores (USD 0.52 million) (for drones) and INR 1 crore (USD 0.13 million) (for drone components).
- Coverage—
    1. Airframe, propulsion systems (engine and electric), power systems, batteries and associated components, launch and recovery systems
    2. Inertial Measurement Unit, Inertial Navigation System, flight control module, ground control station and associated components
    3. Communications systems (radio frequency, transponders, satellite based etc.)
    4. Cameras, sensors, spraying systems and related payload etc.
    5. 'Detect and Avoid' system, emergency recovery system, trackers etc. and other components critical for safety and security

No restriction on foreign ownership in Indian drone companies.

Safety and security features like 'No Permission – No Takeoff' (NPNT), Realtime tracking , geo-fencing etc. to be notified in future. A six-month lead time will be provided to the industry for compliance

New Drone Policy, 2021 and Ecosystem: Key Highlights

Defense Testing Infrastructure Scheme

- The test sites are to be approved by Defense Testing Infrastructure Scheme (DTIS)
- To boost domestic defence and aerospace manufacturing, the Ministry of Defence (MoD) has launched the Defense Testing Infrastructure Scheme (DTIS) with an outlay of INR 400 crore (USD 53.55 million) to create testing infrastructure in partnership with private sector.
- The scheme was launched on 8 May 2020 and would run for five years, setting up 6-8 Greenfield Defense Testing Infrastructure facilities required for Defense and aerospace-related production.
- The projects under the scheme is provided with up to 75% government funding in the form of 'Grant-in-Aid'. The remaining 25% of the project cost is borne by the Special Purpose Vehicle (SPV) constituents, the Indian private entities and state governments
- In this regard, the Department of Defense Production/Directorate General of Quality Assurance (DDP/DGQA) has published eight Expression of Interest (EOIs) regarding setting up Defense test facilities in selected areas.

Green Zone Sites for NPNT

- Ministry of Civil Aviation has permitted "No Permission- No- Take-off" (NPNT) compliant drones' operations at 166 additional green zone to strengthen, support and enhance drone operations in the country.

Counter Drone Measures

- Indian Navy has signed contract with Bharat Electronics Limited (BEL) for supply of the first indigenous comprehensive Naval Anti Drone System (NADS) with both hard kill and soft kill capabilities on August 31, 2021.
- The NADS which is developed by DRDO and manufactured by BEL, is the first indigenously developed anti-drone system to be inducted into the Indian Armed Forces. Both the static and mobile versions of NADS is to be developed for the Indian Navy. The BEL is to sign similar contracts with Army and Air Force

New Drone Policy, 2021 and Ecosystem: Key Highlights

UNMANNED AIRCRAFT SYSTEM TRAFFIC MANAGEMENT (UTM) Policy Movement

The UTM Policy framework has been issued under the Drone Rules, 2021.

- The Civil Aviation Ministry has notified a traffic management framework for drones. Public and private third-party service providers are expected to manage their movement in the airspace under 1,000 feet.
- The framework allows third-party service providers to give services such as registration, flight planning, dynamic deconfliction and access to supplementary data like weather, terrain and position of manned aircraft. Moreover, a set of additional service providers is also be permitted under the framework to provide services such as insurance and data analytics to support the UTM ecosystem.
- This policy framework defines the architecture and mechanism for unmanned aircraft traffic management in Very Low Level (VLL) airspace up to 1000 feet above ground level. This airspace shall be defined as UTM Airspace. Further, this framework establishes the roles and responsibilities of key stakeholders who are a part of the UTM ecosystem in India.
- UTM systems are envisioned to enable safe and complex operations in the UTM Airspace. They shall assist in achieving the following objectives:
    - Allow identified stakeholders to seamlessly communicate with each other
    - Assist in separating unmanned aircraft from other manned and unmanned aircraft
    - Provide situational awareness of VLL airspace to concerned stakeholders

UTM stakeholders include Central Government, Directorate General of Civil Aviation (DGCA), Bureau of Civil Aviation Security (BCAS), Airspace Management Agencies, Air Traffic Control (ATC) Authority, Air Defence Authority, UAS Traffic Management Service Provider (UTMSP), Supplementary Service Providers (SSP), General Public and Law Enforcement and Security Agencies

New Drone Policy, 2021 and Ecosystem: Key Highlights

BVLOS (Beyond Visual Line of Sight)

- Ministry of Civil Aviation has granted conditional exemption from Unmanned Aircraft System {UAS) Rules, 2021 to 20 entities to conduct Beyond Visual Line of Sight (BVLOS) experimental flights of drones.
- The Central Government had constituted the BVLOS Experiment Assessment and Monitoring (BEAM) Committee to invite Expression of Interest (EOI) to undertake BVLOS experimental flights of drones.
- The preliminary permission grant is envisioned to assist the supplementary framework development of subsequent UAV rules pertaining to Beyond Visual Line of Sight (BVLOS) drone operations.
- The BEAM Committee evaluated the 34 EOIs received and selected 20 consortia for the experimental flights.

List of Selected Consortia/ Companies for Experimental BVLOS Drone Operations:

Aerospace Industry Development Association of Tamil Nadu (AIDAT), ANRA Consortium , Asteria Aerospace Pvt. Ltd., AutoMicroUAS Aerotech Pvt. Ltd., Centillion Networks Pvt. Ltd., ClearSky Flight Consortium, Dhaksha Unmanned Systems Pvt. Ltd., Dunzo Air Consortium, Marut Dronetech Pvt. Ltd., Sagar Defence Engineering Pvt. Ltd., Saubika Consortium, Skylark Drones, ShopX Omnipresent Consortium, Spicejet Ltd., Terradrone Consortium, Throttle Aerospace Systems Pvt. Ltd., Value Thought IT Solutions Pvt. Ltd., Virginia Tech India

- This BVLOS project within India seeks to fast-track its policies and prepare the local industry for a significant global push into the drone services segment.

New Drone Policy, 2021 and Ecosystem: Key Highlights

Urban Air Mobility

The new drone policy announced by the government in 2021 will encourage increased adoption of drones in India by pushing the growth of the urban air mobility segment in India. Notable use case and recent development includes:

- BLADE A joint-venture with Hunch Ventures, an equity investment firm has invested more than USD 100 million in India.
    - BLADE has partnered with several key Hunch portfolio companies, including Quintessentially (one of India's largest luxury travel concierge), and GoodTimes (a television network).
    - Citizens in Mumbai and Pune have been using its services since 2019, the service has been rolled out under the 'Urban Air Mobility (UAM) pilot program, and the company plans to add more routes in the future.
    - Blade Care, in collaboration with My Healthcare, has announced its medevac services to provide end-to-end patient transportation with a team of doctors and paramedics aiming to help tier 2 and tier 3 cities to fly for better aid and care. flights.
- **Vinata Aeromobility:** Established in 2020, the company has announced that it will unveil Asia's first hybrid flying car at the Helitech Expo, London in September 2022. Vinata is a two-seater, hybrid electric flying car based on electric vertical takeoff and landing (eVTOL) technology with a range of 100 km and a cruise speed of around 120 km per hour created with the aim of personal air mobility.
- **Air Taxi India**: The air taxi service is operated by AirTaxi India, which was granted the Scheduled Commuter Airline Permit by the Indian aviation regulator Directorate General of Civil Aviation (DGCA) in December 2020. The airline reportedly has 26 routes in the regional connectivity scheme (RCS) UDAN.
- **The ePlane Company:** The ePlane Company has developed a prototype electric flying taxi for commuting within the city. This vehicle can transport two passengers at one time and is likely to cost about two times the cost of a regular taxi, making it highly affordable.

Technology Development Efforts

Key Factors Responsible for Technology Development Efforts

While the New Rules have opened the drone sector entirely to domestic and global players, the work is far from finished. Indian stakeholders have opinions about the improvements and revisions to laws and regulations, which will lead to technology development efforts as the manufacturing intensity and Know-how are limited. Overall situation will lead to requests for improvements and revisions soon related to Technology Development Efforts. **Few factors include**

- **Ban on Imports –** According to a notification issued by the Directorate General of Foreign Trade (DGFT) in Feb 2022, the import of drones in completely built-up (CBU), semi-knocked-down (SKD) or completely knocked-down (CKD) form is prohibited. Imports of drone components shall be, however, free. Stakeholders generally believe that the ban is a step in the right direction as it brings clarity after the blanket ban on drones imposed in 2018. There are, however, some grey areas around policy even now which requires the government's immediate attention. As domestic players brace themselves for indigenous manufacturing, they need to tackle the technological challenges. Moreover, the next few years could define the need of technology development by those stakeholders who are heavily reliant on imports.
- **Possible Change in Component Category—**The use of similar drone components across multiple sectors may define the need of technology development efforts. For example, GoPro camera (mounted on drones) is used by other sectors as well and, therefore, the issue of duality comes up. A new classification (If happens) may change the current manufacturing and technology practices.
- **Need for Technology Know-how—**Local players are mostly into 3D modelling, design and testing the airflow, analysis by software of the frame, etc. They would require time and technology to successfully manufacture complete drones, including individual motors and the GPS which will drive the technology development efforts
- **Growing Role of AI**— It may be predicted that security and surveillance industry will see significant activities by big companies such as Google, Apple, Infosys, TCS and Wipro offering AI, IoT and machine learning coupled Drone solutions.

Possible Collaboration Between India and Japan

India and Japan can be the part of collaborative research and policy initiatives to benefit both Japan and India market

Japan can bring technology and components towards the aim of making tailer-made solutions meeting Indian needs. Japan can also find ways to effectively manufacture drones in India by involving Japanese stakeholders (like ACSL India) and supply in Japan market

Contributor in Research and Development

- Various research institutions have been set up and are working to handle drone development, usage, and application challenges. Japanese Organizations may like to approach these organizations to offer its expertise and Know-how supported with Japanese stakeholders.
- Suggested organizations include Drone Application and Research Center (DARC), Uttarakhand, Centre for Airborne Systems, Defense Avionics Research Establishment (DARE), Bangalore, Centre for Military Airworthiness and Certification, Bangalore, Indian Institute of Technology, Kanpur (IIT-K) , Indian state of Andhra Pradesh unveiled the Cyber Security Operations Center, etc.

Contributor in Policy Framework/ Public Affair

- New Drone Policy (about a year old) and guidelines given by associated organizations (Wireless Planning and Coordination (WPC) Wing, Department of Telecommunication, Bureau of Civil Aviation Security, Airports Authority of India etc.) are the only directions available in India that sees random changes/additions as there are still gaps and changes required. With the increasing number of stakeholders in the Indian Drone Industry, new regulatory and security concerns will arise, which needs to be evaluated by the participants in the Indian Drone Industry. Japanese Organizations may consider working with government organizations responsible for policy development by actively sharing information / Know-how to accelerate initiatives and technology adoption.
- Suggested organizations/ Ministries include Directorate General of Civil Aviation (DGCA), Ministry of Defence, Wireless Planning and Coordination (WPC) Wing, Department of Telecommunication, Bureau of Civil Aviation Security, NITI Aayog, Department of Science & Technology (DST), Ministry of Panchayati Raj, Ministry of Agriculture and Farmers Welfare, Bureau of Civil Aviation Security (BCAS), Airspace Management Agencies, Air Traffic Control (ATC) Authority, Air Defence Authority, UAS Traffic Management Service Provider (UTMSP).

Possible Collaboration Between India and Japan

Experimental BVLOS Drone Operations

- Ministry of Civil Aviation has granted conditional exemption from Unmanned Aircraft System {UAS) Rules, 2021 to 20 entities to conduct Beyond Visual Line of Sight (BVLOS) experimental flights of drones.
- Japanese Organizations can reach these 20 entities to offer know-how, drone designing, etc., meeting their objective in assisting the supplementary framework development of subsequent UAV rules about Beyond Visual Line of Sight (BVLOS) drone operations. Target organizations include Aerospace Industry Development Association of Tamil Nadu (AIDAT), ANRA Consortium, Asteria Aerospace Pvt. Ltd., AutoMicroUAS Aerotech Pvt. Ltd. Centillion Networks Pvt. Ltd., ClearSky Flight Consortium, Dhaksha Unmanned Systems Pvt. Ltd., Dunzo Air Consortium, Marut Dronetech Pvt. Ltd., Sagar Defence Engineering Pvt. Ltd., Saubika Consortium, Skylark Drones, ShopX Omnipresent Consortium, Spicejet Ltd., Terradrone Consortium, Throttle Aerospace Systems Pvt. Ltd., Value Thought IT Solutions Pvt. Ltd., Virginia Tech India, Drone Federation of India (DFI).

Work with Startups towards meeting their Business Objectives

- Startups are pushing the envelope for drone applications in India with deeper analytical and decision-making capabilities supported with VCs. These startups need support in the areas of drone development, related services, etc.
- Japanese Organizations may like to approach these organizations to offer its expertise and Know-how supported with Japanese stakeholders. Suggested Start-up include ideaForge, TartanSense, Skylark Drones, HUVIAiR, IoTech World, Grene Robotics, General Aeronautics, AUS, Redwing Aerospace Labs, Terra Drone , etc,

Participate and Contribute in Various Ongoing Initiatives to Get an Early Advantage

Possible Collaboration Between India and Japan

Participate and contribute to Defense Testing Infrastructure Scheme (DTIS)

- To boost domestic Defense and aerospace manufacturing, the Ministry of Defence (MOD) has launched the Defense Testing Infrastructure Scheme (DTIS) with an outlay of INR 400 crore (USD 53.55 million) to create testing infrastructure in partnership with the private sector industry. In this regard, the EOIs (Expression on interest) has been published regarding setting up Defense test facilities in selected areas domains Japanese Organizations can find opportunities to contribute as a knowledge partner for interested and selected private players, including government stakeholders, to develop these greenfield projects. The government stakeholders include Department Of Defence Production (DDP) / Directorate General Of Quality Assurance (DGQA) Ministry Of Defence (MOD) Government Of India (GOI) Development Of Defence Testing Infrastructure (DDTI).

Participate and Contribute in Various Ongoing Initiatives to Get an Early Advantage

Concluding Remarks

Market Opportunity: India

- The Indian Drones market stood at USD0.92 Billion in 2021 and will reach USD 2.13 Billion in 2027 with a CAGR of 15.7%.
- Micro Drones will be in demand as they are miniature UAVs that offer quick navigation and the benefit of high communication range operations. Less weight is an added advantage
- Fixed wing Drone will be preferred because of its flying time, range, and speed are ideal for military, surveillance, and for emerging applications
- West India and North India will remain key regions for drone demand because of higher security and monitoring applications supported with significant commercial usage of Drones
- The government expects the drone manufacturing industry to invest over USD 670 million cover the next three years and generate 10,000 direct jobs.
- The drone services industry is expected to grow to over USD 4,000 million in the next three years and generate over five lakh jobs.

New Drone Rules 2021:India

- Government of India had notified the revised law on drones in March 2021 with restrictions and compliance requirements, despite years of consultations and negotiations with various stakeholders. In August 2021, Government overhauled the rules known as “New Rules”
- Covid-19 came as a push to accept Drone as a need rather than just an interesting technology. A shift from operations within visual line of sight (“VLOS”) to operations beyond visual line of sight (“BVLOS”) was realized and greater relaxations was allowed for undertaking BVLOS operations
- New Rules 2021 enables greater flexibility for drone operations towards the growth and development of numerous industries that seek to adopt drone technology for their services.
- It is perceived that Drone Rules 2021 is based on a premise of trust, self-certification, and non-intrusive monitoring and designed to enter in an era of super growth while balancing safety and security considerations

Concluding Remarks

Drone Relevance/ Benefits: India

India faces many challenges regarding reachability and finding cost-effective solutions, specifically in cases where areas are not easily accessible. Drones are solutions in critical sectors such as Urban/ Rural / Infrastructure Development, Agriculture, Telecom, Healthcare, Oil, Gas and Power Utilities, Defense & Surveillance, Good and Service Delivery, etc., including the need for Environmental Monitoring & Wildlife Conservation.

India is transitioning to experiment, explore, and implement drones for various applications across sectors. The prominent ones include photography, agriculture, mining, telecom, insurance, telecom, oil & gas, construction, transport, disaster management, geo-spatial mapping, forest and wildlife, defense and law enforcement . Drones are positioned to find its wider use because of its benefits such as:

- Security needs of office buildings, shopping malls, critical infrastructure, schools, hotels, hospitals, residential complexes, warehouses, and factories
- Growing and emerging usage in railways, metro rails, NHAI, Archaeological Survey of India (ASI), oil & gas industry, renewable energy & waste management, mining, and telecom industry
- Growing relevance for safe, cost-effective solutions ranges from crowd control, emergency response, surveillance, situation awareness, data collection to last mile delivery.
- The mobility, ease of deployment, and versatility of drones making it a valuable tool in the security for both private and public entities.
- Increasing work efficiency and productivity, decreasing workload and production costs, improving accuracy, refining service and customer relations, and resolving security issues on a vast scale
- Drones possess the capability of reaching the most remote areas with little to no manpower needed and require the least amount of effort, time, and energy
- Moreover, the drone industry will be a significant source of employment and economic growth due to its reach, versatility, and ease of use, especially in India’s remote and inaccessible areas.

Concluding Remarks

Role of Government is Crucial and Has to be Supportive

- Production Linked Incentive (PLI) scheme worth USD 16 Million will boost the manufacturing of drones in the country.
- Union Budget 2022-23 highlighted “Drone Shakti” and “Drone-As-A-Service” as significant commitments of the government’s efforts towards “Make in India” and “Atmanirbhar Bharat” will cerate the momentum towards intensifying drone usage.
- The Union Agriculture Ministry’s subsidies to rural entrepreneurs and farmer producer organizations for purchasing drones to promote Kisan Drone will help to showcase the acceptance of Drones.
- Drone-related courses for skilling at select Industrial Training Institutes (ITIs) in all states will be helpful to spread the know-how about drones.
- The Ministry of Defence (MoD)’s Defense Testing Infrastructure Scheme (DTIS), with an outlay of USD 53.6 million, will create testing infrastructure in partnership with the private sector industry
- Key instrumental initiatives that will shape the Drone Industry include
    - The Centre aim to promote ‘Kisan Drones’ for crop assessment, digitizing land records, and spraying insecticides and nutrients
    - SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas) scheme aimed to do property survey
    - Mandatory use of drones by NHAI for monthly video recording of all national highway projects during their different stages of development, construction, operation, and maintenance

The use of drones for surveying, disaster management, search, and rescue operations, etc. will be crucial in ensuring that they can be used to save human lives including wildlife and resources. While the New Rules have opened the drone sector entirely to domestic and global players, the work is far from finished. With the increasing number of stakeholders in the sector, new regulatory and security concerns will also arise, which will need to be evaluated by the participants. In addition, the development of public trust in drones will require considerable efforts from all stakeholders towards ensuring that drone operations are safe and welcome.

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