

# A Case for Developing an Indigenous Drone Maintenance Repair and Overhaul Ecosystem in India

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## Abstract

*The rapid growth of the global drone industry has created immense economic and strategic opportunities for countries worldwide. In India, the drone sector has emerged as a crucial area of focus, with the government recognising its potential to drive economic growth, enhance national security, and foster technological self-reliance. This article delves into the significance of indigenising the drone supply and Maintenance, Repair, and Overhaul (MRO) chains in India. By reducing dependence on imports, stimulating domestic manufacturing, and creating job opportunities, the indigenisation efforts aim to propel India's position as a global leader in drone technology. This article explores the benefits and challenges associated with this pursuit and discusses the strategies required to achieve self-reliance in the drone MRO industry. It concludes with the observation that by embracing a holistic approach and focusing on the long-term vision, having a robust aviation MRO ecosystem can propel India to the forefront of the global drone industry, emerging as a formidable drone hub on the world stage.*

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## Introduction

India's real gross domestic product at current prices is expected to grow at a rate of 8.7 per cent from 2022 to 2028, making it one of the fastest-growing economies globally.<sup>1</sup> The global drone market is expected to touch USD 55.8 bn in 2030, while the Indian drone market is projected to touch USD 4.2 bn, with a further high of USD 23 bn in the year 2030,<sup>2</sup> if India is able to sustain a steady growth rate. Riding on this wave of economic growth, if India aims to become the global hub of drone manufacturing and Maintenance, Repair, and Overhaul (MRO), an environment of mutual interdependence among all stakeholders needs to be created.

The word 'Drone' has been defined, as 'An aircraft that can operate autonomously or can be operated remotely without a pilot on board', in the 2021 Drone Regulations released by the Government of India.<sup>3</sup>

India is also actively adopting Unmanned Aerial Vehicle (UAV) technology across different sectors for quick decision making and problem-solving. The recent expansion of the drone business in India has also been attributed to relaxed laws on drone use and import limitations related to security. Drones have been adopted in a variety of businesses and uses, for both civil and national defence purposes, which has resulted in a major increase in job prospects for drone manufacturing, software development, and related services.

Particularly, the defence industry has expressed a strong interest in purchasing UAVs for border area surveillance and reconnaissance. India's strategic choice to buy drones from local producers is in line with its goal of developing its own drone technology. In addition, the deployment of drones in the logistics sector is gaining steam due to the growing demand for quick and affordable delivery, particularly in the e-commerce sector.

The government has loosened restrictions on drone use and provided incentives for drone makers in an effort to encourage domestic drone development and turn India into a drone superpower. The intention is to draw in foreign capital and energise the ecosystem for drone start-ups. The government has also established ambitious investment goals for the drone manufacturing

sector, with the goal of creating over 10,000 jobs and a Production-Linked Incentive (PLI) programme.<sup>4</sup>

### **Assessing the Current Drone Landscape in India**

In India, drones are classified into five categories based on their weights: nano, micro, small, medium and large.<sup>5</sup> It is also stipulated by law that drone operations apart from the nano and micro categories will require official permissions.

The Government of India has announced supportive measures like: allowing foreign companies to operate drones in India, creating ten thousand jobs in the drone sector by 2026, announcing an investment target of USD 6.0 bn in drone production, activating the PLI scheme for drones etc. It has sought to boost the drone industry from the supply side, through the PLI scheme and banning of drone imports, as well as from the demand side, by releasing and updating drone laws regularly.

Currently, defence drones occupy a share of around 48 per cent of the overall drone market, globally.<sup>6</sup> It is expected to rise further after recent conflicts in Armenia-Azerbaijan and Ukraine-Russia. In India, the defence forces have purchased advanced drones like Heron, Predator, Reaper etc., that are used for security purposes like intelligence, reconnaissance, surveillance and target monitoring etc. These drones are directly bought off-the-shelf from their foreign manufacturers. The Defence Research and Development Organisation (DRDO) has developed its own drones and UAVs like the Ghatak, Lakshya, Black Kite, Golden Hawk etc., to reduce India's dependence on imports of drones.<sup>7</sup>

Apart from these, nations are also looking forward to develop counter-drone systems that can be used to curb the misuse of drones.<sup>8</sup> This includes products like drone guns, drone killer nets, laser units etc., that have an emerging market of their own. On the non-defence side, various departments and ministries are using drones for land mapping, soil surveys, terrain mapping, infrastructure planning and construction, disaster management, town planning, forest and wildlife surveys, crowd control, maintaining law and order etc.

Increased demand for these products and services will create a huge backend ecosystem of ancillary industries and support units for activities of maintenance, repairs and overhaul, collectively

abbreviated as MRO. Opportunities are, thus, available in the sectors of: drone software (for information management), drone hardware (the actual product and its spares) and services (including after-sales services) sub-domains.

As of now, the segment of drone hardware is the one with maximum opportunities on the defence as well as the civil side. This situation is expected to change after 2027, wherein the services and software segments will move ahead of the hardware segment. The drone services market is segmented into three categories: Drone training and education services, Drone platform services/Drone-as-a-Service and Drone MRO.

Currently, the Indian drone market pertaining to all these sectors is at a very nascent stage.<sup>9</sup> It is interesting to note that there are many 'Common Components' that go into the making of a drone, and are also used in other industries, these parts are used in daily life products as well as in drones. Some of these are:

- Electrical parts, motors, rotors, propellers.
- Sensors, audio and video recorders, cameras.
- Communication systems, antennae, micro-chips.
- Batteries, auxiliary power units.
- Various kinds of software and other small parts.

Indian policy planners need to take into account this segment as well to develop a holistic drone MRO in India. The commonality of materials and parts ensures long term sustenance of the business-financially, logistically and technologically. This will benefit the Indian drone MRO industry in two ways:

- India can ban the import of certain parts and systems that can be produced domestically.
- The experience gained from this can be used to make high quality products of global standards.

An overview of India's drone industry reveals:

- A huge dependency on imports of the main products, its systems and sub-systems. Drones have to be sent out of India even for upgrades and repairs.

- Import dependency in spare parts, MRO and other allied services.
- Dependence on foreign technologies with no technology transfer to Indian manufacturers. Almost all drones that claim to be 'Made in India' are actually assembled after putting together components imported from across the world.
- Lack of strong domestic supply chains.

Currently, the Indian drone market is being led by a few known brands like ideaForge, Garuda Aerospace etc., on the start-up side, and Bharat Electronics Limited, Hindustan Aeronautics Limited etc., on the public industries side.

The drone market in India is quite diverse in terms of opportunities, challenges, service providers and the products and services that are available. Most of the manufacturers and service providers in this domain in India are startups. It is also evident that such a big drone market cannot just depend on a few entities and needs to be supported by numerous back-end supply chains and MRO units, which have not yet fully developed in India. The manufacturing and after-sales-service in most cases is also done by the same start-up or company, with support from their local vendors. The Micro, Small and Medium Enterprises in India have not been able to fully integrate into the aviation MRO ecosystem. Also, most of the drones made in India are actually just assembled after putting together various components, systems and sub-systems, which are imported from foreign countries. Consequently, for high tech repairs, upgrades and overhauls the drones have to be sent to foreign countries and then imported back, which is a costly and time-consuming process. This needs to change to truly make India self-reliant in the drone MRO segment.

### **A Case for Developing an Indigenous Drone MRO Ecosystem**

An 'MRO Ecosystem' refers to the presence of various suppliers, vendors, repair units, maintenance depots, recyclers, paint shops, workshops etc., which work as a part of an inter-dependent chain that maintains and services a particular product. MRO serves as the backbone support system during the entire 'Life Cycle' of a product, ensuring systematic and unhindered operations of the entire industry. A good MRO is the one that takes the minimum time to turn-around an object, received for MRO purposes, in an efficient and cost-effective manner.

In order to develop a self-reliant drone MRO market, India will have to look for avenues beyond the drone sector, to develop the overall civil and military aviation MRO ecosystem in India, of which the drone MRO is a subset.

The market-leader in any industry is always, the Original Equipment Manufacturer (OEM), since they are the ones who develop the product (including its design, data, blueprints, service and user manuals etc.) and have full knowledge of the systems as they also control the Intellectual Property (IP) rights of the product and/or the processes. But most OEMs in developed countries do not carry out in-house MRO, they instead contract it out totally to other businesses, commonly called 'Outsourcing'. Therefore, it is sensible and feasible for entities engaged in MRO operations to collaborate with the OEMs, instead of getting into a competition with them. Economies of scale and direct contact between the OEM and the MRO entities ensures profitability. In case of India's aviation market most OEMs are foreign based multi-national companies. It is well known that India does not have any robust manufacturing capabilities in the aviation sector (civil as well as defence) at the moment. Therefore, collaborations and joint ventures are the only logical way to get started.

India offers a huge market in terms of manufacturing and MRO services not just in the drone sector, but in the entire civil and military aviation industry. The government has shown willingness to create 'Ease of Business' for foreign OEMs wanting to setup shops in India. Under the new drone policy, the government announced setting up new aviation training schools and testing facilities for new products. Drones, helicopters and civil aircraft are now a priority under these rules. It is evident that in the future these machines will require trained manpower and MRO support for continued operations. But, more than 75 per cent of all MRO business from India is currently outsourced outside the country.<sup>10</sup> This needs to change.

Indian stakeholders in the overall aviation MRO industry will need to learn the 'Know-How' as well as the 'Know-Why' of this entire ecosystem. Optimum utilisation of every available opportunity will have to be done to institutionalise the knowledge and experience acquired from dealing with the OEMs. The 2021 Policy now needs to be revised with a special focus on the drone sector.

In addition to this, state governments are also expected to come out with their own complementary policies that will help establish the drone MRO ecosystem in India.

Integration of this ecosystem with global value supply chains is nowhere near the horizon currently, as Indian entities need to start from the lower end of the spectrum that has minimal challenges in terms of Internet Protocol like avionics, mechatronics, electrical parts, frame and structure repairs etc. This will then have to be followed by moving towards the technically intensive side like developing indigenous engines. It must be remembered that this entire ecosystem has to be end-to-end, catering to all probable customers and end users in the civilian as well as the defence market. India stands to gain from an extensive domestic and worldwide market with its ambitious intentions to increase regional air connectivity for the benefit of passengers as well as goods and services, by combining the use of aeroplanes, drones, helicopters, etc. Meeting the demands from both the civil and defence sectors goals requires a strong MRO ecosystem.

Having the entire MRO activities in-house will help India in the following ways:

- At the financial level, drone users and manufacturers will have to pay less for after-sales and repair services.
- The turn-around time can also be lessened in this case if the MRO units are located within India.
- The technologies and machinery used in the MRO services will also have to be manufactured in India, which will boost allied industries.
- From a technological perspective this is important if India wishes to keep away from any issues of IP violations, and technology denials by other countries.
- Having developed control over the entire production process of drones and their logistic supply chains, India can then look forward to export these drones to foreign customers and dominate the global aviation market.

This author argues that owing to India's huge market size, domestic demand for the drones will be a bigger factor in sustaining the sector financially, rather than the exports. Another benefit that

accrues from an indigenous MRO is the control over misuse of the drone technology. The purchases, upgrades, usage patterns, locations etc., of virtually every drone can be managed via a central database combined with a regulatory system. The indigenisation of the drone supply and MRO chains in India will, thus, offer numerous advantages, including reduced reliance on imports, job creation, technological self-reliance, and enhanced national security. To accomplish self-reliance in the drone industry, India could also learn from countries like China, which mandate that OEMs producing aircraft, engines, and other crucial components must establish their supply chains, manufacturing units, and MRO establishments within the country to create a sustainable domestic ecosystem.

However, achieving full indigenisation comes with its own challenges, such as limited initial capabilities, the need for significant Research and Development (R&D) investments, access to advanced manufacturing technologies, and competition from established international players. Addressing these challenges requires a long-term commitment, collaboration between stakeholders, and a supportive policy environment.

### **Recommendations for Drone MRO Indigenisation**

**Promoting R&D.** For India to create its own drone technologies, R&D spending is essential. The creation of cutting-edge airframes, propulsion systems, sensors, and software can result from cooperation between governmental organisations, academic institutions, and business stakeholders. To promote R&D efforts, financial assistance, grants, and incentives ought to be made available. To overcome global supply chain interruptions and lessen dependency on imported drone parts, R&D capabilities must be strengthened. The identification criteria for drones under R&D must be re-evaluated in order to address safety issues, even though broad exemptions on drone research are advantageous for innovation.

**Education and Skill Development.** The drone industry and educational institutions working together can advance skill development and research. The design, manufacture, and maintenance of drones should be covered in specialised courses offered by universities and technical institutions. Partnerships between business and academia can encourage industry innovation



and offer useful training. India should concentrate on developing a competent labour force for MRO and drone production. To guarantee a consistent supply of qualified technicians, engineers, and operators for the drone sector, vocational training programmes, certification programmes, and skill development efforts should be implemented. Partnerships between businesses and institutions of technical education can offer practical training and exposure to the real world. Industry and academic institutions can work together to design curricula and enable placements, among other things.

**Government Support and Policies.** The Indian government is essential in helping to domesticate and support the emerging drone sector. The DRDO has established itself as a leader in the development and production of drones among public businesses. It is essential for the government to play a market-maker role and create demand by implementing drone technology in transformative initiatives in order to support the scaling up of the industry. The key to overall success would be a joint two-pronged strategy that supports both large firms and startups. To foster a thriving indigenous drone ecosystem, the government should now provide support through funding, industry-academia partnerships, and a thriving startup ecosystem. Concrete actions on the ground, beyond conferences and exhibitions, are essential to achieve the objectives set for collaborations and professional engagements.

**Public-Private Partnerships.** Promising companies might benefit from programmes like the Atal Innovation Mission and Startup India, which can offer materials, mentorship, and funding. Government assistance is also required for companies in their early phases because product failures are a normal part of the innovation process. It is time to get rid of the mentality that dismisses businesses that do not deliver. To keep a competitive edge and promote innovation, manufacturing standards for software and hardware must be consistent. In order to ensure uniformity in industrial processes, the Bureau of Indian Standards can assist in drafting standards that are consistent throughout India. To safeguard against potential liabilities brought on by drone operations, more clarity regarding 'Drone Insurance' is also required. Instilling confidence in the market will require the establishment of clear regulations and the definition of optional coverages, such as breach of privacy.

## Conclusion

In conclusion, India's quest for self-reliance in the drone industry holds immense promise for the nation's future. Indigenising the drone supply and MRO chains offers a plethora of advantages, including reduced reliance on imports, technological self-reliance, and bolstering national security. By stimulating domestic manufacturing and supporting startups and academia, India can develop a vibrant indigenous aviation MRO ecosystem and contribute significantly to its economic growth and technological sovereignty.

The government's role as a facilitator and the implementation of strategic policies will be critical in navigating the challenges and ensuring a sustained and timely supply of drone products and services for customer agencies. With patience, commitment, and collaboration between all stakeholders, India's defence and aerospace ecosystem has the potential to become a strategic asset, not only achieving self-reliance in national security but also complementing India's foreign policy objectives. By embracing a holistic approach and focusing on the long-term vision, India can propel itself to the forefront of the global drone MRO industry, emerging as a formidable player on the world stage.

## Endnotes

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<sup>9</sup> Mughilan Thiru Ramasamy, "India as a Global Drone Hub: Wishful Thinking or Realistic Scenario?", Business Today, January 11, 2022, <https://www.businesstoday.in/opinion/columns/story/india-as-a-global-drone-hub-wishful-thinking-or-realistic-scenario-318690-2022-01-11>.

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