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MRO *in* India

Trends, Challenges and Way Forward

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Maintenance, Repair & Overhaul

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Contents

List of Abbreviations and Acronyms

AAI	Airports Authority of India
AIESL	Air India Engineering Services Ltd.
AME	Aircraft Maintenance Engineer
APU	Auxiliary Power Unit
ASEAN	Association of South East Asian Nations
CAA	Civil Aviation Authority, UK
CAGR	Compound Annual Growth Rate
CASA	Civil Aviation Safety Authority
CMMS	Computerized Maintenance Management System
DER	Designated Engineering Representatives
DGCA	Directorate General of Civil Aviation, India
DOA	Design Organisation Approval
EASA	European Union Aviation Safety Agency
EU	European union
FAA	Federal Aviation Administration, USA
FBO	Fixed-Base Operator
FTK	Freight Ton Kilometres
GST	Goods and Services Tax
GTO	Gross Turnover
HAL	Hindustan Aeronautics Ltd.
HSN	Harmonised System of Nomenclature
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IGA	Intergovernmental Agreement
IP	Intellectual Property
IPC	Illustrated Parts Catalogue
ITA	Investment Tax Allowance
ITM	Industry Transformation Map
LCD	Liquid Crystal Display
MIDA	Malaysian Investment Development Authority
MIGHT	Malaysia Industry-Government Group for High Technology
MNC	Multinational Corporation
MoCA	Ministry of Civil Aviation
MRO	Maintenance, Repair and Overhaul
NCAP	National Civil Aviation Policy (2016)
OEM	Original Equipment Manufacturer
PBH	Power by the Hour
PLI	Production Linked Incentive
PMA	Parts Manufacturer Approval
PPP	Public-Private Partnership
R&D	Research and Development
RCS	Regional Connectivity Scheme
RFI	Request for Information
RM	Malaysian Ringgit
RoDTEP	Remission of Duties and Taxes on Export Products
RPK	Revenue Passenger Kilometres
UAE	United Arab Emirates
UDAN	Ude Desh ka Aam Naagrik
UK	United Kingdom
USA	United States of America
USD	United States Dollar
USM	Used Serviceable Material

1.

Executive Summary

1. Executive Summary

Maintenance, Repair and Overhaul (MRO) operations play an important role in ensuring airworthiness and availability of aircrafts for the commercial and defence aviation sectors. With a current fleet size of about 713 aircrafts and more than a 1000 aircrafts planned to be added in the near future, India is poised to become the third largest buyer of commercial planes after US and China. As a consequence of rising fleet size and conducive government policies, the Indian aerospace industry has emerged as one of the fastest expanding markets globally. Buoyed by an annual passenger growth of 15% (pre-COVID), the Indian aviation sector is expected to become the third largest air passenger market by 2024.

The exponentially rising civil aviation industry, therefore presents a strong case for the development of the MRO industry in India. Although at a nascent stage – the size of the industry being USD 1.7 billion as of 2021 – it is expected to reach USD 4.0 billion by 2031, registering a CAGR of 8.9% as compared to the global average of 5.6%. Rising consumer demand, increasing fleet size, favourable policy interventions and labour arbitrage are some of the key factors that can potentially fuel growth and development of MRO services in India. Further, with a substantial portion of the current fleet leased, redelivery maintenance contracts can be seen as an important growth driver to bolster desired capacity expansion in the Indian MRO industry.

The aforementioned statistics substantially validate the potential of India to become a significant regional MRO hub and gradually strive to establish its foothold in the global supply chain. Further, rising demand – as per predictions for the next decade – makes the Indian MRO industry an ideal destination for strategic investors, Original Equipment Manufacturers (OEMs) and global MRO players. As far as systemic developments in the ecosystem are concerned, policy initiatives such as the MRO Policy 2021, National Civil Aviation Policy 2016, rationalisation of GST, removal of Gross Turnover Tax (GTO), etc. reflect the vision of the government to develop India as a global MRO hub. However, the growth of the MRO sector will also depend on how efficiently and collaboratively India can address some of the key challenges faced by MRO players in India. For instance, Indian MROs face considerable barriers to break into the existing value chains, involving OEMs, internationally established MROs and airline operators. Impediments are also faced with respect to implementation of offset clauses, credit accessibility, availability of infrastructure, licensing and certification, taxes/duties and land lease rentals to name a few.

Though the Government of India has initiated an array of reforms, integrating with the global value chain – in line with the progress made in other global MRO hubs like Singapore, Malaysia and Turkey – will be a long-term process for India. Incremental steps such as joint ventures with established global MRO players, focus on MRO segments with lower IP control (electrical and electronics, avionics, structural repair, etc.) and a gradual shift towards the higher end of the MRO value chain (such as manufacture of landing gears, etc.) is recommended in order to establish a robust MRO industry in the country.

India can ensure substantial advancements by developing a sustainable end-to-end ecosystem for commercial, general and military MRO activities. The benefits would potentially include reduction in foreign exchange outflow, greater employment opportunities and augmentation of domestic MRO capability. Complementary benefits to airline operators would include lower MRO costs, reduced turnaround time and less inventories. This study intends to delve deep into various aspects influencing the MRO ecosystem in India, identify the challenges faced by various stakeholders and finally, outline a roadmap for near and long term developments in the sector.

2.

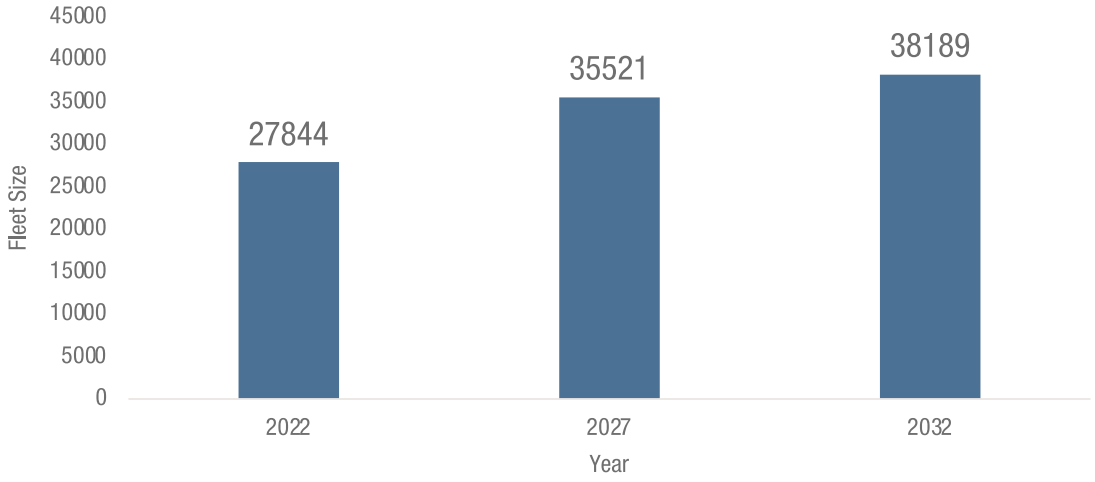
Global Aviation Scenario: Key Trends

2. Global Aviation Scenario: Key trends

For the greater part of the last decade, the aviation sector has been bolstered by a strong foundation of positive economic trends, low unemployment, low inflation and strong consumer purchasing power. These factors contributed to the globalization of the middle class, and the consequent increase in demand for air travel. On the supply side, low borrowing rates, growing financial markets and stable operational expenses made it possible for airlines, OEMs and service providers to grow significantly between 2010 and 2019 while still remaining profitable.[1]

However, during the pandemic, the growing trend of Revenue Passenger Kilometers (RPK) regressed across all markets, particularly in mature aviation markets such as Europe and the United States. Consequently, global efforts against the pandemic – widespread dissemination of vaccines, government stimulus, etc. – and a resultant revival of travel demand has led to optimistic growth predictions for global aviation in the coming decade. The global fleet size, which stands at 27,844 in 2022 is expected to reach 38,189 by 2032 at a CAGR of 2.7%.[2] . Figure 1 depicts the global fleet forecasts for 2027 and 2032.

Figure 1- Global Fleet Forecast, 2022-2032



Source: Oliver Wyman

Globally, the overall passenger traffic in 2021 was around 47% of the 2019 levels, and is predicted to improve to 83% in 2022, 94% in 2023, 103% in 2024 and 111% in 2025.[3] Similarly, the air cargo market, which was valued at USD 130.1 million in 2019, is expected to reach USD 223.29 billion by 2028, registering a CAGR of 8%.[4] The rise in fleet size, as a result of increased trade and passenger movement, is therefore expected to

1 *https://www.bcg.com/en-in/publications/2020/seven-trends-reshape-airline-industry*

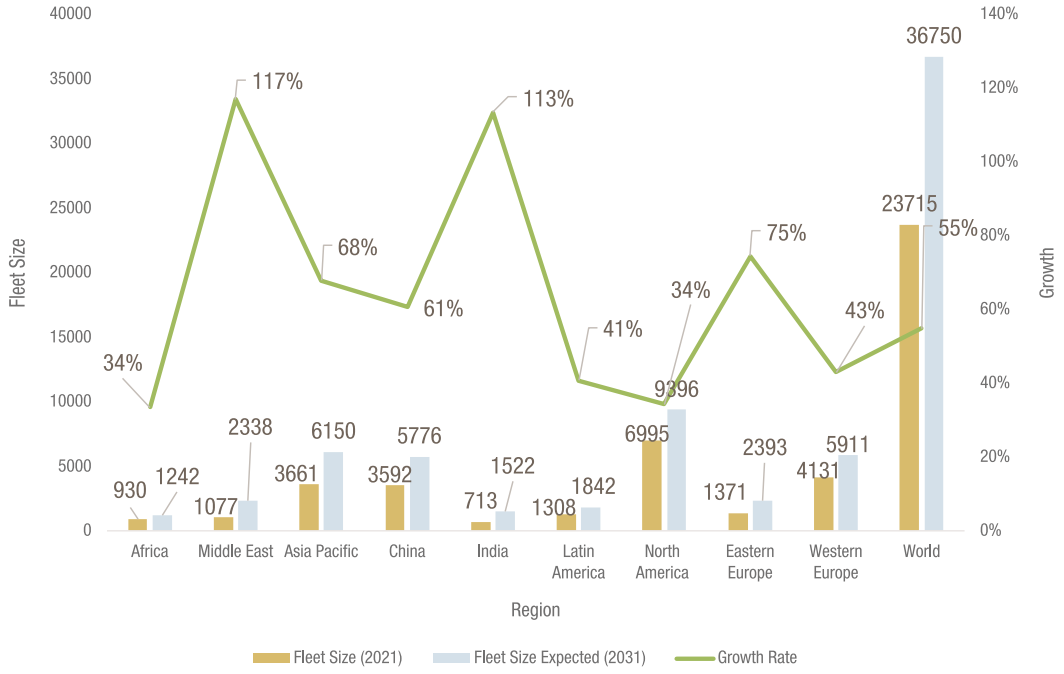
2 *Oliver Wyman*

3 *https://www.iata.org/en/pressroom/2022-releases/2022-03-01-01/#:~:text=In%202021%2C%20overall%20traveler%20numbers,2024%20and%20101%25%20in%202025.*

4 *https://www.researchandmarkets.com/reports/4762307/air-cargo-market-forecast-to-2028-covid-19#:~:text=According%20to%20the%20new%20research,8.0%25%20from%202021%20to%202028.*

also increase the demand for MRO services, as well as components and parts. Out of all the regions under consideration, the highest rate of increase in fleet size is predicted for India, with a growth rate of 113% i.e. from a current fleet size of about 713 to 1522 aircrafts by 2031 as shown in Figure 2.

Figure 2 – Fleet Size Distribution by Region



Source: Oliver Wyman

3.

Maintenance, Repair & Overhaul: An overview

3. Maintenance, Repair & Overhaul: An Overview

The Maintenance, Repair and Overhaul (MRO) ecosystem comprises OEMs, airline operators, service providers, vendors and manufacturers of parts/spares. The MRO industry is highly regulated and comprises routine checks, repair and scheduled replacement of components, and maintenance during redelivery of an aircraft with the primary purpose of maintaining 'airworthiness' of the aircraft. These procedures are mandated by national regulatory authorities, which in turn are coordinated under international standards established by the International Civil Aviation Organization (ICAO) [5]. Some of the key global players in the MRO market include BAE systems, Boeing, Airbus, General Dynamics, Lockheed Martin, Huntington Ingalls, Northrop Grunman, Raytheon, Rockwell Collins, Saab, URS Corporation and Elbit Systems.

3.1. MRO Segments

MRO services are categorized into four major segments – a) Line, b) Components, c) Engines and d) Airframes. Of these four segments, Engine and APU maintenance constitute almost 60% of the total MRO outlay, whereas component, line and base maintenance form around 22%, 8% and 10% respectively.[6] Engine and APU maintenance is majorly done in the USA, as airlines find it more competitive there as compared to other destinations.[7] Figure 3 provides a brief overview of the four major segments of the MRO industry.

5 International Civil Aviation Organization is a specialized agency of the United Nations which acts as a global forum for discussions on safe and sustainable civil aviation system.

6 ASI Report. 2021

7 Based on stakeholder discussions

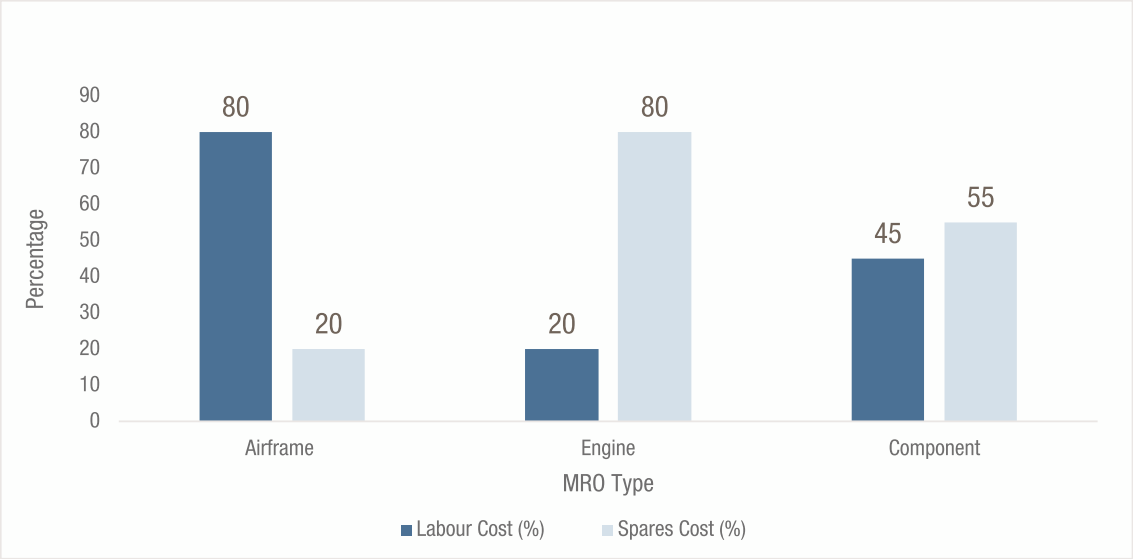
Figure 3 – Types of MRO Segments

Line Maintenance	Component Maintenance	Airframe Heavy Maintenance and Modification	Engine maintenance
• Periodicity: Carried out during turnarounds, while the aircraft is still in its operating environment • Relatively straightforward tasks which mostly involve routine-in-service inspections, check actions, trouble-shooting and rectifications • Does not require additional infrastructure such as hangars, but limited by the availability of the ground support equipment	• Periodicity- around 3 months/500-600 hours depending on the type of aircraft • Aircraft components such as avionics units, engine and landing gear are inspected in detail in a specialist shop, after being removed during various checks • A Component Maintenance Manual (CMM) is referred to understand the tasks that are required for a particular component in order to restore it back to serviceable state	• Periodicity: As mandated, depending on aircraft type; involves removal of an aircraft from service, for a period ranging up to 30 days • Occurs in a hangar with specialised tools, involving time consuming tasks such as 'C' and 'D' checks • Generally includes structural work, corrosion prevention, interior refurbishment and replacement of major components	• Periodicity- Around 12-18 months/5000 hours, depending on the type of aircraft • Involves repair, service and inspection of the aircraft engines to maintain airworthiness and meet international standards

Source: SKYbrary, Primary Information

Out of the above-mentioned segments, airframe maintenance is labour-intensive in nature, with labour cost occupying upto 80% of the total cost incurred during an aircraft's maintenance. On the other hand, engine maintenance is extremely capital-intensive, with a major portion (~80%) of the overall cost being occupied by the cost of spares. In component MRO services, labour cost and cost of spares occupy 45% and 55% of the overall cost respectively. The approximate share of labour and spares cost of major MRO segments has been depicted in Figure 4.

Figure 4 – Labour and Spares Cost Distribution of MRO Components



Source: FICCI

3.2. MRO Maintenance Checks

3.2.1. Nature of Aircraft Maintenance Checks

A key aspect of aircraft maintenance is the nature and periodicity of various checks that an aircraft go through. Although different aircrafts may require maintenance checks at different intervals depending on OEM guidance and domestic regulations, an overall understanding of the various checks is imperative. Table 1 provides a general overview of the maintenance checks required.

Table 1 – Description of Scheduled and Unscheduled Maintenance Checks

Type	Periodicity	Completion Time	Description
Unscheduled Maintenance checks			
Pre-flight check	Precedes every flight	15 to 60 minutes depending on the aircraft type	It involves an inspection of the aircraft by the cockpit crew and mechanics.
Ramp check	Carried out on a daily basis	35 man-hours	Mechanics check the aircraft's individual functions, inspect the tyres and brakes, and refuel the oil and hydraulic fluids. The aircraft is also subjected to a visual check, both outside and inside the cabin.
Service check	Carried out on weekly basis	55 man-hours	The ramp inspection is combined with chores like topping up the water, air and oil, as well as a full cleaning of the cabin.
Scheduled Maintenance Checks			
A-level check	350-750 flight hours	Between 45 to 260 man-hours	It is labour intensive and involves a visual examination of the airframe, powerplant, avionics and accessories to ensure general conditions of the aircraft.
B- level check	around 750 flight hours	About 200 man-hours	Includes A check plus operational check, fluid servicing and lubrication as well as open inspection of panels and cowlings.
C-level check	Happens every 18 months to 2 years depending on the type of aircraft	Between 1,500- 2000 man-hours	Detailed maintenance work is carried out, that entails thorough inspections inside and outside, along with meticulous examination of structures (load-bearing components on the fuselage and wings) and functions.
Engine repair	Performed in aircrafts which have had 12,000 hours in the air and flown a distance of almost 10 million kilometres	Aircraft engines are put under a lot of strain. Thus, every engine in a four-engine wide-body jet like the Airbus A380 may provide up to 34 tonnes of thrust. When such massive forces are at work, continuous inspection and maintenance are required to ensure the required level of reliability.	
Landing gear	Carried out within 8 to 10 years	3 to 5 days	To ensure that the jolt of a very bad landing can be reliably withstood without any problems, maintenance of landing gears is highly essential.
Intermediate Layover (IL)	Performed every 3 to 5 years	About 2 to 4 weeks	A number of large assemblies, such as the high-lift devices, are disassembled to allow easier access to the fuselage and wing structure for inspection. Several pieces of equipment and systems are tested and fixed at the same time. Cabin components such as seats, galleys and toilets are also overhauled, and the aircraft may be repainted if necessary.
D-level check	Performed every 6 to 10 years	About 30000 to 50000 man-hours	The entire plane is practically dismantled and reassembled. Everything in the cabin is disassembled (seats, toilets, galleys, overhead bins) so engineers may examine the aircraft's metal skin from the inside out. All of the aircraft's systems are removed, inspected, repaired or replaced, and then reinstalled. Each D check is worth several millions of dollars.

Source: A metaheuristic approach for solving the airline maintenance routing with aircraft on ground problem (2014)[8]

8 A Metaheuristic Approach for Solving the Airline Maintenance Routing with Aircraft On Ground Problem (https://www.researchgate.net/publication/271466255)

Cost Estimates for Various Maintenance Checks#

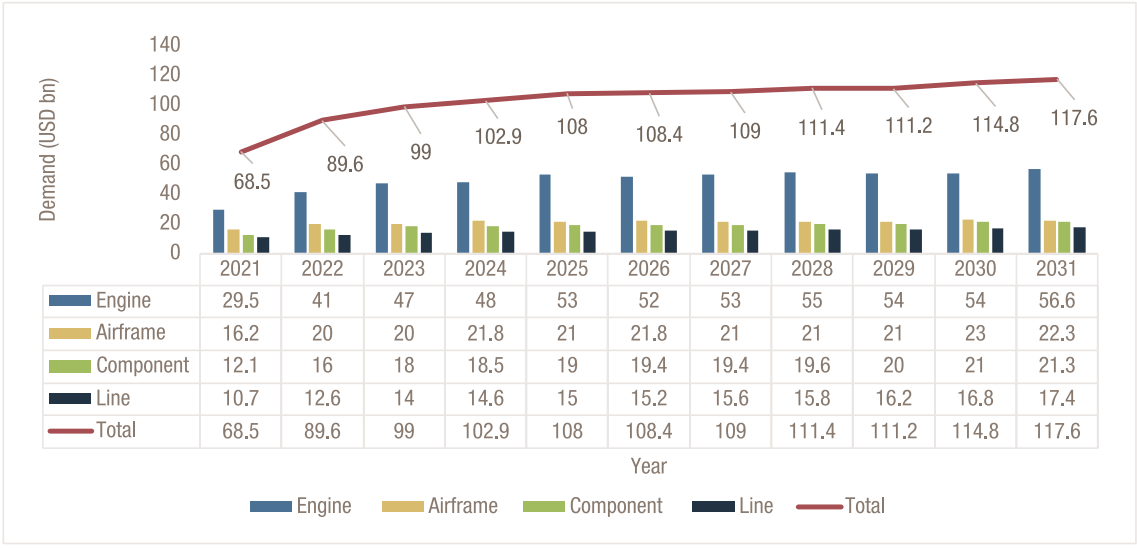
Unscheduled Checks
Pre-flight Check : In-house Tariff of Airlines
Ramp Check : In-house Tariff of Airlines
Service Check : In-house Tariff of Airlines
Scheduled Checks
A-level Check : USD 50,000
B-level Check : USD 75,000-100,000
C-level Check : >USD 350,000
Engine Repair : >USD 1 Million
Landing Gear : USD 375,000
Intermediate Layover : USD 300-600
D-level Check : >USD 1 Million

#As per stakeholder interactions

3.2.2. Demand Projections for Various MRO Segments

The MRO industry is expected to achieve robust growth in the near future, owing to augmented demand. Global MRO demand is positively correlated with fleet size. Therefore, with consistently increasing fleet size, a surge in MRO demand is foreseeable in the near future. Figure 5 depicts the predicted segment-wise MRO demand till 2031. The global MRO demand is expected to reach USD 117 billion by 2031 – an increase of 70% – from USD 68.5 billion in 2021. Out of the four segments, engine MRO is predicted to display the highest growth of about 93%[9], and therefore, becomes a focus area for both established and emerging MRO markets.

Figure 5 - Global Annual MRO Demand Prediction by Segment



	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Engine	29.5	41	47	48	53	52	53	55	54	54	56.6
Airframe	16.2	20	20	21.8	21	21.8	21	21	21	23	22.3
Component	12.1	16	18	18.5	19	19.4	19.4	19.6	20	21	21.3
Line	10.7	12.6	14	14.6	15	15.2	15.6	15.8	16.2	16.8	17.4
Total	68.5	89.6	99	102.9	108	108.4	109	111.4	111.2	114.8	117.6

Source: Oliver Wyman, 2021

9 Oliver Wyman, 2021, BRIEF Analysis

#As per stakeholder interactions

4.

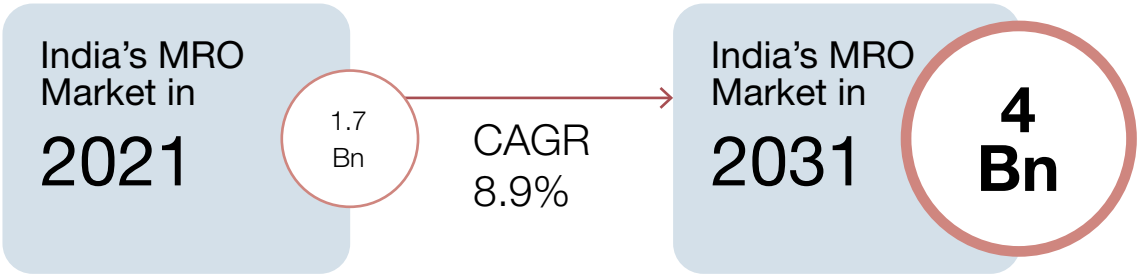
The Indian MRO Industry

4. The Indian MRO Industry

4.1. Overview

India's civil aviation industry, with a market size of USD 900 million[10], has become one of the country's fastest expanding industries with a high growth curve. The principal drivers of this growth have been an expanding fleet size and favorable policy interventions. India is the world's third largest domestic aviation market – with a domestic traffic of 275 million[11] – and is expected to surpass The United Kingdom (UK) to become the third largest air passenger market – including both international and domestic passengers – by 2024.[12] The combined air passenger traffic stood at around 341 million (5th largest in the world) in FY 2020, with an annual passenger growth of 15% (pre-COVID). The Indian civil aviation industry has been the centerpiece of the development of MRO Industry in the Asia Pacific region and is projected to depict a substantial growth of 9.1% by 2031. India currently has a fleet size of 713 commercial aircrafts and is poised to become the 3rd largest buyer in the world with an order book of more than 1000 commercial aircrafts according to a report by Centre for Asia Pacific Aviation (CAPA), an independent think tank.[13]

In India, airlines spend around 12 to 15% of their overall revenues on maintenance, which becomes the second most expensive item after fuel (45% of operating expenses). In general, airline operators in India perform on-tarmac inspections (A and B checks) in-house and outsource engine, heavy maintenance (C and D checks) and modification work to third-party MROs. Engine and component repairs account for over 60%-70% of MRO costs, and the remaining 30-40% is spent on airframe maintenance. Of the two, Indian MROs are competent in performing airframe maintenance whereas engine and component MRO services are procured from abroad. Further, there is no major helicopter MRO facility in India except for Pawan Hans and Hindustan Aeronautics Limited (HAL). Helicopter MRO services is therefore a significant business opportunity with considerable potential for the future.[14]



10 *https://pib.gov.in/PressReleasePage.aspx?PRID=1638887ed*

11 *https://timesofindia.indiatimes.com/blogs/voices/india-flying-high/*

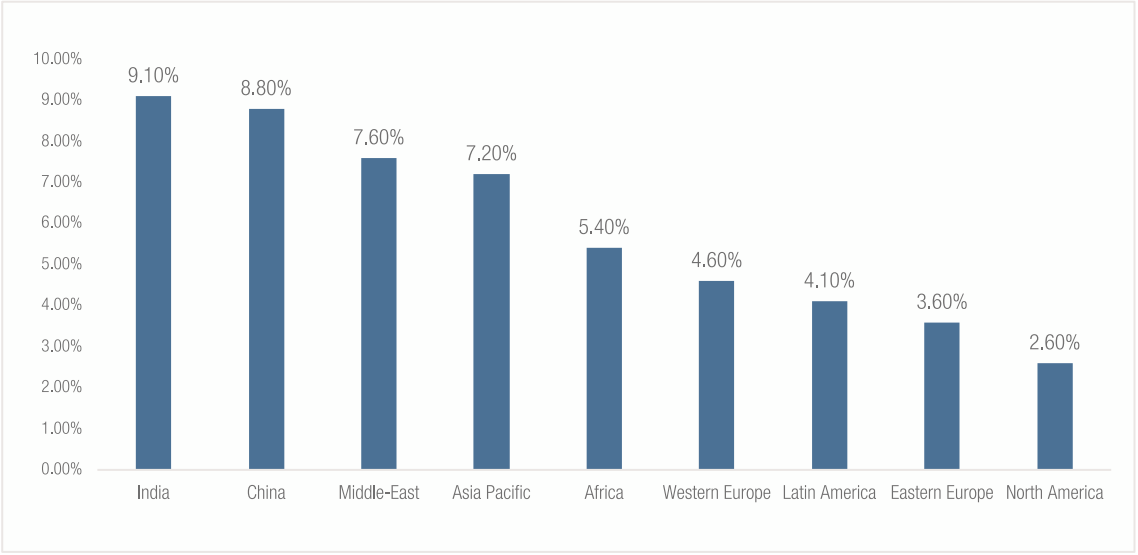
12 *IBEF, Aviation Industry Overview*

13 *https://timesofindia.indiatimes.com/business/india-business/india-set-to-become-third-largest-buyer-of-passenger-planes/articleshow/58937405.cms*

14 *https://www.spsairbuz.com/story/?id=691&h=MRO-Progress-in-India*

The market size of the MRO sector in India stood at USD 1.7 billion in 2021, which is expected to reach USD 4.0 billion by 2031[15], registering a CAGR of 8.9% as compared to the global average of 5.9%. The import of MRO services (2019-20) by airlines in India stood at USD 1.26 billion[16], sourced mainly from countries like France, Sri Lanka, Germany, Jordan, Malaysia, Singapore, Turkey, United Arab Emirates and the USA. The MRO market size is estimated to reach to around USD 2.8 billion in the next five years, with a considerable share being procured from domestic MROs[17]. Figure 6 provides a comparative analysis of the annual growth rate of the MRO sector in India vis-à-vis other key countries/regions.

Figure 6 – Annual MRO Growth (in %) by Region for 2021-2031



Source: Oliver Wyman, 2021

4.2. Potential of MRO in India

Some of the factors which are expected to provide necessary fillip to the Indian MRO industry have been described in detail below:

- **Rising demand as a result of growing fleet size –** MRO demand in India is anticipated to grow at a much faster rate than the rest of the world, thereby entailing attractive investment opportunities for domestic as well as foreign investors, OEMs and leading MROs across the world. Various domestic and foreign investors could also consider investing in the MRO sector in India by way of alliance and collaboration. To cite a few examples, the MoU between Air India Engineering Services Ltd. (AIESL) with Pratt & Whitney – to launch a joint engine MRO facility in Mumbai – and the venture between Wadia group and SIA Engineering Company have been key developments in the sector. Such developments make way for a competitive MRO sector, which promises to provide India a strong operational ecosystem for both domestic and international players.

15 https://www2.deloitte.com/content/dam/Deloitte/in/Documents/finance/in-fa-MRO-in-India-Poised-to-take-off-noexp.pdf

16 https://www.civilaviation.gov.in/sites/default/files/annual-report-2019-2020.pdf

17 Ibid.

- **Availability of low cost, English speaking diverse pool of engineers –** India is globally recognized for its strong engineering curriculum. This holds true for the MRO industry as well, wherein the scope of benefitting from a strong and competent workforce is considerable. One of the most significant benefits that India provides to the rest of the world is the availability of highly qualified engineers with the capability of being trained for an array of technical MRO activities. Another important reason that puts India on the map for MRO activity is its cost advantage. Labour cost – which forms a considerable share of overall cost in airframe and component maintenance – is comparatively lower in India, thereby ensuring higher labour arbitrage as compared to global counterparts.
- **Prevalent sale and lease – back model providing a large scope for redelivery maintenance services –** Redelivery maintenance is an important aspect of an airline and lessor's MRO requirements, especially in India, where the sale-and-lease-back model is common. This is a big opportunity for component repair as well as heavy maintenance. Due to several legal and technical restraints, this is currently done largely outside India.

Figure 7 – Primary and Secondary Advantages of a Flourishing MRO Market in India

Primary Advantages	Secondary Advantages
• Addressing MRO demand of the increasingly growing Indian fleet • Economic benefits such as lower costs, reduced turnaround time, less inventories, etc.	• Addressing MRO demand of global fleet and competing with the MRO players in the Asia-Pacific (Middle East, South Asia and South-East Asia) • Reduction in foreign exchange outflow • Employment generation • Incresed revenue and investments

The Indian MRO sector can potentially ensure several primary and secondary benefits for the aviation industry. The primary advantage of a flourishing Indian MRO sector will be to address the increasing MRO demand of the Indian fleet as a consequence of the growing size. Post establishing foothold in the Indian aviation industry, Indian MRO players can potentially switch to global markets and compete with the established players in South and South-East Asia as well as other international MRO hubs. A well-established MRO industry in India will not just have the aforementioned advantages, but would also create win-win situations for all the stakeholders involved. Apart from reduction in foreign exchange outflow, and other benefits such as employment generation, manufacturing of components and spares within the country would be bolstered. Increase in indigenous capacities would subsequently ensure overall economic growth and faster turnaround time while creating a sustainable end-to-end eco-system for commercial, general and military aviation.

4.3. Major Markets and Players

Figure 8 – Key Players in the Indian MRO Market

The MRO market in India can be primarily categorized into five regions i.e. Delhi, Mumbai, Bangalore, Chennai and Kolkata. The segments these markets majorly cater to and the role of leading players in these regions have been summarised in Table 2.

Table 2 – MRO Infrastructure and Region-wise Expertise of Key Players in the Industry

Region	Competencies (MRO Segments)	Expertise of Key Players
Bengaluru	• Airframe • Component	• Air Works India's facility in Hosur, which specializes in airframe repair of Airbus 320s, Boeing 737s and ATR42/72 turboprops • Air India Engineering Services Ltd. (AIESL) facility in Thiruvananthapuram specializes in airframe checks, wheel and brake overhauls and maintenance of Boeing 737s
Chennai	• Airframe • Component	• GMR Aero Technic and SpiceJet Technic caters to the airframe segment of Boeing 737s, Airbus A320s, ATR42/72s and Bombardier Q400s • Turbo Jet Engines Private Limited (Telangana) and SpiceJet Technic provides component MRO services for Airbus A320s, Boeing 737s and ATR42/72s
Kolkata	• Component (with emphasis on propeller overhaul and repair)	• Arrow Aviation Services Private Limited (New Delhi), NSCB Aviation Private Limited (Kolkata), and the Aerospace Research and Development Center in Guwahati are some players specializing in component MRO • AIESL provides services in airframe inspections for A319 and A320, component overhaul for auxiliary power units for A320 series, high-flow pneumatic components, and provides fuel accessories
Mumbai	• Airframe • Component • Engine	• Air Works (for A320, Boeing 737, and ATR42/72 fleet types) and AIESL (for Airbus A330 and Boeing 737/777/747/787) specialize in airframe MRO • AIESL provides component overhaul for Boeing 777, 787, 747 and 737 fleets. • AIESL also provides engine overhaul for PW4056/4152, CF6680C2, CFM56-7B and GE90
Delhi	• Airframe • Component • Engine	• Bird Execujet Airport Services Private Limited and AIESL dominate the airframe and engine MRO categories • Interglobe Aviation Private Limited and Indamer Aviation are two major participants in component MRO activities • AIESL provides maintenance and repair services for Airbus A330 and Boeing 737 aircrafts; it also conducts engine overhaul for the IAE V2500, JT8D and CFM56-5B engine versions

Source: Primary research, company websites

Apart from the above mentioned key industry players, DGCA[18] has also approved 40 overseas entities to conduct MRO on Indian-registered aircrafts.

18 The Directorate General of Civil Aviation is a statutory body of Government of India to regulate civil aviation in India.

4.4. Regulatory Environment

With the vision to make India a global MRO hub, the Government of India has introduced several policies and regulations to bring India's MRO sector at par with the global markets. The government has taken several steps to encourage companies to set up MROs in India, including lowering the Goods and Services Tax (GST) on domestic MRO services from 18% to 5% with full Input Tax Credit from 1st April 2020, treating transactions sub-contracted by foreign OEMs and MRO companies to domestic MROs as exports with zero-rated GST, waiving custom duty on tools, toolkits and spares imported by MROs, and permitting 100% Foreign Direct Investment (FDI) through the automatic route, among others.

To attract more investments, the Ministry of Civil Aviation announced a new MRO Policy in 2021 which includes key reform measures such as land leasing through open tenders and the abolition of the AAI's royalty. Additionally, instead of the existing short-term period of 3-5 years, land allotment for establishment of MRO facilities is expected to be for 30 years.[19] Some of the policies and regulations that have been framed to facilitate systemic and strategic developments to make India a global MRO hub have been discussed in Figure 9.

Figure 9 – Key Policy Interventions for MRO Industry in India

National Civil Aviation Policy (2016)

- To enable 300 million domestic ticketing by 2022 and 500 million by 2027 along with international ticketing to the tune of 200 million by 2027
- MRO service companies to be exempt from airport royalty and extra costs for five years
- MROs no longer expected to provide proof of their client's demand for parts or orders
- Extension of duty-free component imports for MRO from one to three years
- Provision for airlines to claim a set-off on the 5% GST of MRO performed outside India
- Permission for foreign aircrafts to visit India for MRO for a six-month term instead of the erstwhile 15-day time period

Vision 2040 Document (Ministry of Civil Aviation, 2019)

- To make India a global MRO hub servicing 90% of the Indian carriers' MRO requirements
- To mandate at least 20% of the Indian MRO industry's income from foreign-registered aircrafts
- To ensure that nearly 90% of re-delivery maintenance take place in India

Defense Acquisition Procedure (DAP), 2020 for Defense MRO industry

- At the Request for Information (RFI) stage, potential foreign vendors to be asked if they are willing to progressively start manufacturing and build a local ecosystem at the spares/sub-component level
- Introduction of a new Buy (Global – Manufacture in India) category to conduct outright purchase of equipment from foreign vendors, followed by indigenous manufacturing of the entire/part of the equipment, as well as spares/assemblies/sub-assemblies/maintenance, repair and overhaul (MRO) facility for an equipment, through subsidiaries in India, joint ventures, Indian Production Agencies, etc.
- Advocacy of co-production through Inter-Governmental Agreements (IGA) as a way to decrease life cycle cost through import substitution i.e. production of equipment, spares, sub-assemblies, etc. in India

19 The MRO policy document has not been released yet for public access by the Ministry of Civil Aviation.

4.5. Barriers to Entry

Despite persistent efforts by the government, there are pertinent problems that a new entrant might face in the MRO industry, some of which have been elaborated in the Figure 10.

Figure 10 – Barriers to Entry for New Entrants in the MRO Market

Economic and Infrastructural Barriers	Licensing and Compliance Issues	Labour Issues
• Competing against already established international players in terms of scale • Large initial capital expenditure for facilities, personnel training, components, marketing, etc. • Apprehension amongst MRO customers towards incurring switching costs • Information asymmetry as a consequence of control of information, data and manuals by OEMs/ manufacturers	• Getting FAA/EASA licences as DGCA licenses and regulations have limited recognition in the global markets • Intense FAA/EASA audits of MRO provider's documents, processes, stores, AME licensing, stock referring and parts issued or fitted in the aircrafts, etc., which are lengthy and logistically cumbersome processes	• Brain drain - Fewer availability of jobs within the country compulses skilled personnel to seek jobs outside the country • Lack of training infrastructure for human capital devlopment

4.5.1. Economic and Infrastructural Barriers

Economies of scale – Economies of scale refer to the cost advantage derived due to reduction in fixed cost per unit of output, as output increases. The economy of scale advantage discourages entry of new MRO suppliers, requiring new entrants to choose between entering on a large scale and risking a strong reaction from established enterprises, or entering in small capacity and accepting a cost disadvantage, both of which are undesirable options.

Capital Requirements – Capital requirements are major hurdles which entail significant upfront expenditure in facilities, personnel, initial advertising, R&D and equipment for new MRO facilities.

Switching Costs – Switching costs are the costs incurred by MRO customers as a result of switching suppliers. These costs include retraining staff in the new firm's procedures, additional location expenditures and the rebuilding of business relationships. Because of the complexity and variety of specialized airframes and components, switching to new suppliers can result in hefty expenditures for the customers.

4.5.2. Labour Issues

Brain Drain – The non-availability of experienced engineering, design and technical manpower in India is frequently emphasized. Because there are fewer jobs and industries available, there is a massive brain drain of skilled personnel out of the country. However, there have been increased efforts by the government lately, to improve the aerospace industry as a whole. The overall growth of the Indian MRO sector will create job possibilities in India and may encourage reverse migration.

4.5.3. Licensing and Compliance Issues

Non-recognition of DGCA standards by European authorities has been a challenge for new entrants in the Indian MRO industry. Indian MROs must obtain EASA approval for European Union registered aircrafts, even if they have DGCA and FAA approvals. Moreover, the EASA approval becomes expensive for Indian MROs owing to associated inspection costs.

5.

International Best Practices

5. International Best Practices

Global hubs such as Singapore, Malaysia, UAE (Dubai), Turkey, etc. have established themselves as consistent and reliable players in MRO services. This has been achieved due to various factors such as persistent government efforts to create viable business ecosystems, availability of cost-efficient and skilled labour, favourable taxation policies, geographical location and competitive pricing to name a few. Therefore, at this juncture, it is imperative to understand the key factors that catalysed the growth of MRO in these regions. Table 3 highlights country-specific policies and challenges to provide necessary clarity on the measures which led to the remarkable growth in MRO activities in key hubs in the Asia-Pacific region.

Table 3 – Key Characteristics and Interventions by Global MRO Hubs

Country	Key Characteristics and Conducive Policies	Tax Incentives	Challenges
UAE 	• State of the art infrastructure facilities for MRO services • Geographical advantage • Technology transfer and training by established OEMs to MRO players • Presence of global MRO players and OEMs leading to increased competition	• Establishment of free trade zones • 5-15 years of tax holidays • Exemption from import duties on goods brought into free trade zone	• Shortage of indigenous skilled labour
Singapore 	• Home to the largest MRO base in Asia • High concentration of aerospace industry • Presence of big industry players such as Rolls Royce and Airbus • SIA Engineering Company and ST Engineering (the world's largest MRO supplier) are local heavyweights • Provision for complete nose-to-tail services, catering to engines, components and avionics • Low custom duty and logistic cost • Co-investment program to invest with global companies along with local enterprises in joint ventures and strategic projects • Usage advanced technologies like drones for aircraft inspections and data analytics	• 5 -15 years corporate tax exemption • Additional corporate tax deduction of not less than 5% up to 10 years	• Limited space for new MRO facilities
Malaysia 	• Second largest MRO market in South-East Asia • Lower cost of labour compared to Singapore • More space for MRO facilities • Public Private Partnerships • Investment in niche technological capabilities throughout the value chain • Grant support to Malaysian owned businesses for technology acquisition, R&D and conformity with international standards • Aggressive advertising operations abroad	• 10 years corporate tax exemption • 100% Investment Tax Allowance (ITA)	• Still developing supply chain for aircraft parts • Higher labour cost as compared to countries such as Thailand
Thailand 	• Lower cost of labour compared to Singapore and Malaysia • Strategic location for MRO facilities • Strong automotive parts and petrochemical supply chain that can develop into aircraft parts industry • Growth in logistics and tourism industries	• 12 years corporate tax exemption • 17% personal income tax for foreign experts (lowest rate in the ASEAN region)	• Relatively low level of R&D • Limited supply chain for aircraft parts

Philippines 	• Philippines' Investment Priority Plan includes manufacturing of industrial goods, machinery and equipment, including parts, components and other MRO-related services within the country • To boost skill development, Philippines has also established a Technical Education and Skills Development Authority	• Import of production equipment and machinery, spare parts and other components are tax- and duty-free	• Infrastructure at Manila airport is limited • Regional competition from established markets

5.1. Case Study: Singapore – The Future Aerospace City

10% of the Global MRO market share	25% of Asia's MRO market	MRO occupies 90% of the country's aerospace sector

Overview – Singapore, Asia's largest market, has established itself as one of the world's leading MRO centers, and it is already known as the "Future Aerospace City." Rolls Royce and Airbus, for instance, have a long-standing and considerable presence in Singapore. SIA Engineering Company and ST Engineering (the world's largest MRO supplier) are among the local heavyweights that are continuing to grow their activities. Singapore has a broad and diversified aerospace ecosystem that caters to engines, components and avionics for complete nose-to-tail services, with over 130 aerospace businesses active in the country.

Singapore's market supremacy has recently been challenged by emerging destinations such as Thailand, Malaysia and the Philippines. However, they compete mostly on the basis of cheap labour costs. Singapore has a highly efficient workforce that generates high-quality work, which helps to counterbalance the premium on labour costs.

Due to a strong ecosystem marked by efficient customs, great connectivity and state-of-the-art infrastructure, the overall MRO cost in Singapore is highly competitive. Because of the significant concentration of varied companies in the aerospace industry, the domestic market is heavily stacked with essential support sectors which have the capability to absorb a wide range of subcontracting work.

Policy Support – The MRO sector in Singapore is built on a solid foundation of forward-thinking legislative support, cutting-edge research and innovation and a home-grown talent pool — attributes that are rare in other competing nations. In January 2018, the government unveiled the Aerospace Industry Transformation Map (ITM), which intends to grow the aerospace industry by focusing on operational excellence, emerging technology innovation and talent development. The results of these important reform measures can be seen in the progressive advancements achieved in MRO operations in the recent times.

Infrastructural Support – The Singapore government, Rolls-Royce and SIA Engineering have spent up to USD 60 million in a collaborative laboratory to work on advanced manufacturing technologies such as 3D printing and robotics. ST Aerospace is using data analytics to provide innovative solutions to their clients, such as predictive maintenance and inventory management. Drones are also being used by the corporation for improved

aerial aircraft inspection and developing spare parts using additive manufacturing processes to save time and resources. To equip Singaporeans with necessary skills in the aerospace sector, the government has implemented initiatives such as the Skills Framework for Aerospace and the Skills Future Enhanced Internship Initiatives.

Achievements – The longstanding presence of global MROs, efficient workforce, adequate infrastructure, technological innovations and supportive legislation have created a broad and diverse ecosystem in Singapore to provide nose-to-tail services, thus placing it amongst the leading MRO service providers across the globe.

5.2. Case Study: Malaysia – From Small Domestic Market to Leaping Beyond Borders

Overview – The Malaysian aerospace industry had a small base and catered mostly to the domestic market. In the last two decades, it has grown to become the second-largest market in South-east Asia.[20] Faced with intense competition from established regional competitors such as Singapore, Vietnam and Thailand, Malaysia has constructed an innovative industry environment to drive competitiveness. At the outset, the national policy initiatives, centered on investment, trade, workforce development, infrastructure development and the creation of public-private platforms (which identified upgrading opportunities in the aerospace GVC and spearheaded coordinated responses involving industry, government and educational institutions). The aerospace industry of Malaysia took off with the launching of the National Aerospace Blueprint in 1997, which charted a comprehensive development plan to transform the country into a dynamic international aerospace player by 2015.[21] Subsequently, an array of systemic reforms have been undertaken to fuel the growth of the aerospace industry through the creation of defining competitive advantages in the areas of governance, taxation, R&D, etc. among others.

Policy Support – Following the National Aerospace Blueprint of 1997, the Malaysia Aerospace Industry Blueprint 2030 was launched in 2015 during the Langkawi International Maritime & Aerospace Exhibition 2015 (LIMA '15). The Blueprint has set a vision for Malaysia to become the leading aerospace nation in South-east Asia – and an integral part of the global market by the year 2030 – with an annual revenue of RM 55.2 billion and more than 32,000 high-income jobs.[22] By 2030, the industry is projected to churn out RM 20.4 billion from MRO operations, RM 21.2 billion from aero-manufacturing, and RM 13.6 billion from engineering and design services.[23]

Malaysia is targeting to capture 50% of the South-east Asian MRO business and 5% of the global market by 2030. It aims to achieve the same by developing an Industry 4.0 Technology Roadmap, expanding MRO activities for business jet, attracting investments from new Fixed Based Operators (FBO) and developing a leading regional helicopter MRO business. This will position the country as South-east Asia's top aerospace hub.

Trade and Investment Incentives – Malaysia has granted the aerospace industry a comprehensive trade and investment incentive package since 2003. The incentives are aimed at the entire value chain, including design, production and assembly, operator

20 https://www.mida.gov.my/wp-content/uploads/2021/07/Aerospace-High-Ress-Final-2021.pdf

21 https://www.miti.gov.my/miti/resources/8._Aerospace_Industry_.pdf

22 Ibid

23 https://www.mida.gov.my/mida-news/mida-welcomes-more-oems-tier-1-firms-to-aerospace-sector-2/

groups as well as maintenance and repair services. Allowing 100% foreign ownership, the incentive package includes a 100% income tax exemption for a period of 5-15 years, a 60% investment tax credit and a double deduction on training expenses made by employers.

In addition, raw materials, components, machinery and equipment, spares and consumables are exempt from import duty and sales tax for aircraft enterprises engaged in MRO activities. Further, to complement these incentives, the Malaysian Investment Development Authority (MIDA) has conducted aggressive advertising operations abroad.

Nudging the domestic firms – Grant support for local firms was included in the investment incentives, which were exclusively targeted at Malaysian-owned businesses. The Domestic Investment Strategic Fund was created for this purpose in 2012.

Further, matching (1:1) grants have been provided to Malaysian-owned businesses for technology acquisition, R&D and conformity with international standards. In general, the initiative has aimed to improve the capabilities of local firms, so that they can take advantage of the upgrading opportunities offered by the outsourcing MNCs.

Sector Strategy and Institutional Building – The Malaysia Industry-Government Group for High Technology (MIGHT) was founded in the mid-1990s as an industry-driven non-profit organisation tasked with bringing industry stakeholders, government and the academia together. Although this group succeeded in establishing a stakeholder platform, the achievement of upgrading objectives was dependent on top-level decision-making. In 2001, the Malaysian Aerospace Council was established to ensure the latter. This council, which was chaired by the Prime Minister – and included representatives from the six relevant ministries, the aerospace industry and MIGHT as the secretariat – served as a national level steering body that systematically charted policy priorities and implementation strategies to upgrade the MRO industry in Malaysia.

Human Capital Development – MIGHT's industry connections aided in the development of education and training programmes that aligned with industry improvement strategies. A consortium of 11 Malaysian public institutions was formed in 2002 to address the human resource needs of the aerospace and other high-tech industries. This nationwide programme laid the groundwork for more focused and targeted relationships with businesses to fill talent gaps in niche areas.

Achievements – Cohesive policies and continuous government support has aided the evolution of Malaysia as one of the leading MRO service providers in Asia, despite facing intense competition from already established MRO destinations in the Asian region such as Singapore.

Figure 11: Key Practices in Select MRO Destinations and Key Takeaways for India

Key Practices in Select MRO Destinations

Established Markets

UAE (Dubai)

- Development of facilities to function as a workstation for major players
- Partnerships with major MROs
- Technology transfer and training
- Creation of jobs

Singapore

- Longstanding presence of global MROs
- Home of leading MRO suppliers
- Broad and diversified ecosystem covering nose-to-tail services
- Efficient workforce (homegrown talent pool) generating high quality work
- Adequate infrastructure and connectivity
- Support sectors for sub-contracting
- Forward thinking legislative support
- Efficient R&D/technological innovation
- Investments in innovative solutions including data analytics, drones for aircraft inspection, etc.
- Government initiatives for skill development

Emerging Markets

Malaysia

- Blueprint for development
- Nodal agency under government
- Cooperation between government and local players
- Incentives for R&D
- Participation of local companies in government procurement
- Clustering based on strengths
- Data repository for demand-supply monitoring

Thailand

- Tax exemptions
- Low personal income tax for foreign experts
- Low labour cost
- Growth in logistics

Philippines

- Tax exemptions
- Prioritized investments in MRO services
- Thrust on skill development

Key Takeaways for India

Develop necessary ecosystem (infrastructure, regulatory support, etc.) to attract global players

Establish a nodal agency under government to ensure coordination with local MROs

Prioritise investments in the MRO sector

Initiate longstanding partnerships with major international MROs

Diversify MRO services and provide end-to-end solutions

Optimise tax exemptions on parts and components

Facilitate R&D, technological innovation as well as technology transfer

Strengthen skill development initiatives as well as create jobs for local talent pool

Create a robust work environment for the indigenous workforce as well as foreign experts

Facilitate growth in the supply chain including MRO suppliers/clusters, support sectors, etc.

Create a digitized data repository and develop advanced data analytics

6.

Challenges Faced by the MRO Industry in India

6. Challenges Faced by the MRO Industry in India

Despite inherent advantages such as growing passenger traffic and considerable fleet size, Indian MRO sector has not seen a corresponding growth, owing to certain key bottlenecks. This section highlights the infrastructure related, operational and regulatory issues faced by the sector currently.

Post-pandemic Demand-Supply Mismatch	OEM/Manufacturer's Aftermarket Monopoly	Duty, Tax and Royalty Issues
Licensing and Certification Issues	Infrastructural Issues	Lack of Access to Credit

Increased OEM/manufacturer aftermarket presence: The increased presence of OEMs in the aftermarket has been a regular occurrence in the MRO business for several years. The OEMs' ability to quickly capture market share in the aftermarket is largely due to their control over Intellectual Property (IP) related to training manuals, data design, etc. This adversely affects engine and component manufacturers and poses a serious challenge to the vision of an indigenous MRO industry in India.

Secondly, OEMs charge exorbitant consultancy fees that restricts MRO players to diversify and expand their services.[24] Further, there has been a sharp increase in the price of parts, which MRO players mostly attribute to annual OEM material price increase and the restrictions OEMs have placed on the direct sale of OEM designed parts because of their IP ownership. A close study of these aspects indicate that this pattern is likely to continue. According to an Oliver Wyman survey, most executives believe that OEMs will continue to expand by putting more usage restrictions on current IP and licensing[25].

Some OEM practices which create entry barriers for independent MRO players include:

1. Independent MRO operators cannot compete without reasonable access to necessary data.
2. Unavailability of maintenance manuals/ instructions for independent MRO operators severely affects operational viability.
3. Charging below list prices for components for OEM's MRO affiliates but higher list prices for independent MRO operators impacts competitiveness. Moreover, OEMs get into long-term (greater than 5-year) contracts – with built-in, below-list pricing for parts and caps on price increase despite surge in inflation – in order to entice operators. This makes it practically impossible for independent MROs and distributors to gain market share.
4. With the assistance of an aftermarket confederate, OEMs purchase all spares (those in overhauled, repaired or repairable condition) in the aftermarket, and then withdraw them totally from the aftermarket. If an operator requires a spare, it must purchase a new part from the OEM. Meanwhile, OEMs provide exclusive access to the procured spares to their MRO affiliates, thus eroding the competitiveness of independent MROs and aftermarket distributors.

Issues at contractual stage and offset clauses while purchasing/leasing the aircraft: Besides reluctance in information sharing, airlines and engine OEMs provide contractual conditionalities in exchange for discounts on the price of the aircraft engines and components.[26] These conditionalities usually mandate airline operators to provide after-market services or are characterized by Power by the Hour (PBH) contracts at their designated MRO shops. Most of the shops are situated outside India, thus taking a considerable share of the actual contract spend to overseas destinations.

Further, the offset clauses in the defense and the civil aviation sector that are decided at the time of purchase of the aircraft often do not get implemented and are therefore washed away without any substantial outcome.[27] As a result, training and technological capacity of the MRO players in India remain restricted, thus limiting their operations and expansion.

24 Based on stakeholder consultations

25 https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2018/april/MRO-Survey-2018-web.pdf

26 Based on stakeholder interactions

27 Ibid.

Countries such as China mandate the aircraft, engine and component OEMs to establish their supply chain, manufacturing units and MRO establishments within the country at the contractual stage, to ensure long term strategic creation of a holistic eco-system for domestic sustainability.[28]

- **Infrastructural issues:** To cut down logistics cost and streamline aircraft operations, MRO services are usually preferred within/near the airport premises. To fulfil this requirement, countries such as Singapore have provisions to reserve lands for MRO hangars during the developmental stages of airports. Major airports in India, however, have little or no provisioning of land for establishing MRO hangars within/near the airport. This has left MRO operators with limited choice to position themselves in proximity to the airports, compelling them to incur augmented logistics and operations costs. MRO operators thus also face stockholding issues which restrict their scope to provide end-to-end services.[29] Another infrastructural bottleneck of the Indian MRO sector is the lack of training infrastructure. To cite an example, at least 20-30 institutes do not have an aircraft for training.[30]
- **Lack of access to credit:** MRO is a capital-intensive sector and therefore requires large capital expenditure for establishment and expansion. The impact of the COVID-19 pandemic has significantly reduced the business of airlines and MROs with marginal reduction in costs. The resultant decline in profitability has led to reduced availability of funds for players in the aerospace industry. As a result, access to credit has either been very limited for MRO operators or have been accompanied by exorbitant collateral demands.[31]
- **Issues in licensing and certification framework:** In order to cut down on cost while leasing the aircraft, airline operators often involve FAA or EASA approved MRO centers. Also, MRO operators have to get accreditation from FAA/EASA in order to provide services to foreign airlines. This drives away majority of the MRO business outside India.

  Additionally, even though DGCA guidelines, with regards to MRO, are harmonized with EASA regulations and guidelines under the EU-India Aviation Agreement, yet European authorities or countries following EASA, often do not recognize DGCA certifications and approvals at par with certifications or approvals issued by the EASA states. EASA certification permits Indian MROs to maintain and release aircraft registered in the European Union as well as install components on them. An Indian MRO is unable to perform services to aircrafts registered in the European Union if its EASA approval is absent or revoked. MROs must obtain EASA clearance for European Union registered aircrafts, even if they have DGCA and FAA approvals.

In the last few decades, the following key harmonization were undertaken between DGCA and EASA requirements –

a. In January 2005, Civil Aviation Requirements order (CAR 145) introduced

28 https://www.trade.gov/market-intelligence/china-aircraft-maintenance-repair-and-overhaul-market#:~:text=China%20is%20expected%20to%20become,10.5%25%20annual%20compound%20growth%20rate.

29 Based on stakeholder interaction

30 https://centreforaviation.com/analysis/reports/overcoming-the-skills-crisis-in-india-aviation-25633

31 Based on stakeholder interactions

to harmonize Indian requirements for granting the approval of Aircraft Maintenance organizations in line with international standards of EASA.

b. In November 2011, Civil Aviation Requirements order (CAR 66) in line with EASA regulations related to issuance of an Aircraft Maintenance Engineer's (AME) licence, conditions of its validity and privilege to certify aircraft were issued.

c. In December 2017, Civil Aviation Requirements CAR 147 (Basic) in line with EASA regulations relating to grant of approval to Aircraft Maintenance Training Organization imparting ab-initio training introduced

d. In August 2021, Working Arrangement agreed between European Aviation Safety Agency (EASA) and DGCA, to achieve common safety and environmental protection standards, promoting understanding of each other's regulatory systems for aviation safety and environmental protection and facilitating exchange of aeronautical products, services and personnel.

In spite of an almost synchronized regulatory system in place by DGCA, any certificate issued by DGCA is not considered by EASA, while on the contrary, EASA has full market access in India as DGCA accepts EASA certifications and approvals. Because of the prevalent stringent practices with respect to EASA clearance, European aircraft lessors and owners are skeptical of Indian MRO standards. Thus, despite of FAA and DGCA approvals in place, the European Lessors' aircrafts are maintained in Europe, which affects the Indian market.

As a precedent, EASA and the Civil Aviation Authority of Singapore entered into a working arrangement to recognize each other's certifications in July 2017 to reduce regulatory duplications. This development must be looked in the context that Singapore is one of the largest MRO hub in Asia, and caters to bulk of MRO requirement from India's Airlines operating in EU airspace.

- **Demand-Supply mismatch as a result of the COVID: 19 pandemic –** As a result of the pandemic, there has been excess supply of MRO services, which has acted as a deterrent to the development of the Indian MRO sector, which was expected to see significant growth after the tax reforms of 2021. This mismatch has further been compounded due supply chain bottlenecks. Further, development of an MRO ecosystem is capital intensive and requires long lead time. All these factors combined together have significantly impacted the business operations of MRO players in India.[32]

- **Duty, Tax and Royalty Issues**

  - **Goods and Service Tax –** The effective GST levied for MRO services have been brought down from an erstwhile rate of 18% to 5% in 2021 with an intent to push the MRO sector at par with the global MRO hubs. However, as per stakeholders, for acquisition of spares, the effective GST still often ranges from 15% to 28%. Further, an order released in April 2020 for HSN Code Chapter 84 says that some engine parts

32 Based on stakeholder interactions

are charged 18-28 percent GST.[33] The price of spares and components occupies a considerably larger share as compared to other cost components such as labour. Thus, minimal GST benefits on spares and components has been a concern for MRO operators. No airline will be willing to pay 20% higher tax as compared to destinations such as Dubai and Singapore, which offer zero tax structures and tax holidays for 10 years respectively, to encourage aircraft maintenance activities.[34]

- **Custom interpretation of tax notifications –** Ambiguities over classification of raw materials – such as paints, aircraft parts, components, etc. – often lead to augmented duties/taxes. Raw materials such as specialty steel, nickel based alloys, aerospace grade aluminium, etc. are taxed as non-aircraft parts, thereby affecting the competitiveness of civil manufacture as well as MRO services. Often customs officials face ambiguity over the nomenclature of aircraft components and start identifying the same with other generic HSN codes having similar nomenclature or the "others" category under a certain HS code, and impose duty as per the prescribed slab (percentage). Components such as paint, microwaves, LCD screens, etc., that are specifically built for aircraft installation, are not interpreted as such by the customs department, and therefore, considerable duties are charged while importing.[35] Further, due to the prevalent inverted duty structure, there is no incentive to manufacture components locally. Import of finished components is cheaper, owing to duty exemptions on finished goods.
- **Royalty charged by airports –** As per stakeholders, the Airport Authority of India (AAI) continues to levy airport royalty on the Gross Turn Over (GTO) – under several categories such as ground handling, revenue sharing, demurrage, and so on – which ranges from 11% to 20%. Such charges, paid for utilizing airport services, negatively impact competitiveness of MRO service providers.

33 Ibid.

34 Ibid.

35 Ibid.

7.

Recommendations

7. Recommendations

Table 4 – Recommendations: Short-Term and Long-Term Measures

Short–Term Measures

Recommendations for Government Stakeholders

Establishing/assigning a nodal agency to identify and streamline the roles and responsibilities of all the stakeholders involved through inter-ministerial/ departmental coordination, identification of technology priority areas, promoting home-grown technology and self-sufficiency, expanding global outreach, human capital development, etc.

Negotiating with Internationally established MROs/Manufacturers for collaborations through joint ventures and greater flexibility in information sharing

Co-recognising DGCA regulations through bilateral talks and treaties

Developing a capital investment incentive policy through PLIs for components and spares, tax waivers, priority sector lending etc.

Resolving issues related to customs duty, tax, royalty, etc.

Resolving custom and tax issues such as royalty tax, GST issues etc.

Relaxation in land -lease rentals; inclusion of relevant reform measures in the MRO Policy

Inclusion of ***MRO in the Harmonised Master List of Infrastructure Sub-sectors***

Recommendations for Private Players

Focusing on areas with lesser IP control as entry points through joint ventures with OEMs/globally significant MROs and bilateral negotiations

Long–Term Measures

Recommendations for Government Stakeholders

Identification and subsequent incentivization to manufacture the components and spares where India can have a comparative advantage

Developing a public-private partnership model for civil and defence public sector MROs

Civil-defence MRO convergence for capacity enhancement and collaborative efforts to bolster the industry

Human capital development through combined and sincere efforts of industry, academia and the government

Recommendations for Private Players

Developing infrastructure and fostering collaborations with OEMs/manufacturers to gradually achieve self-sufficiency in manufacturing of spares and components

Capturing the higher end of the component supply chain having greater IP control through bilateral negotiations and improved capacity

In order to bolster the MRO sector in India and place Indian MROs at par with the global MRO players, the challenges and bottlenecks elaborated in the preceding section need to be addressed. Further, in order to attract investments into Indian MRO services, the sector has to display strong economics. For this, defining steps need to be taken in terms of attracting volumes, cost-saving, better quality and ease of doing business. Apart from a significant fleet size, servicing a larger geographical market is also imperative to attain envisaged growth in areas such as engine and aircraft maintenance.[36] The following recommendations have been formulated after gathering feedback on important areas from key stakeholders in the MRO industry:

Establishing/assigning a nodal agency: In order to streamline and coordinate the interests of all the stakeholders involved, establishing a regulatory body/nodal agency is recommended. A regulatory body that looks into matters pertaining to management, administration, interpretation of regulation and implementation of MRO policies on ground should be established. This regulatory agency should ensure that relevant reforms are implemented in the sector – such as ensuring that provisions of the offset clause are strictly mandated – through effective interventions on the ground. The roles and responsibilities of the regulatory authority can be broadly delineated into –

1. **Inter-ministerial/departmental coordination –** The nodal agency can ensure effective coordination and communication between the present aviation bodies and line ministries such as Ministry of Civil Aviation (MoCA), Directorate General of Civil Aviation (DGCA), Airport Authority of India (AAI) and others to ensure holistic development of the MRO industry in India as envisioned.
2. **Identification and development of technology priority areas –** The nodal agency shall identify key technological intervention areas in the MRO sector such as drones, predictive analytics, artificial intelligence, etc. to impart competitive edge and bring the Indian MRO industry at par with the global standards and best practices.
3. **Nurturing and absorbing home-grown technology through R&D –** The nodal agency shall explore opportunities of self-sufficiency through promoting and incentivising research and development in the MRO industry, reflecting its commitment to the government's vision of 'Aatmanirbhar Bharat'.
4. **Offset management –** Offset deals can provide necessary push to the Indian MRO industry in terms of technology acquisition, capacity development and infrastructure development if properly implemented. The nodal agency can develop guidelines and regulations to ensure that the offset clauses are implemented in letter and spirit.
5. **Expanding global outreach of the Indian MRO market –** The agency should highlight and market the scope and prospects of the Indian MRO industry in order to attract foreign investments and provide required impetus to the industry.
6. **Fostering strategic partnerships –** The nodal agency can help foster strategic partnerships between leading OEMs and Indian MROs to facilitate access to newer technology, components, spares, designs, manuals, etc. Such collaborations will aid the development of a broader of MRO operations in the country. The nodal agency may also explore opportunities of collaborations within the country i.e. PPP initiatives, civil-defence convergence, etc.
7. **Ensuring acceptability of DGCA regulations –** One of the most important areas of intervention for the nodal agency

36 Based on stakeholder interactions

would be to conduct regular negotiations with relevant stakeholders on DGCA regulations. It needs to ensure greater acceptability of DGCA regulations which are, to a considerable extent, harmonised with regulations such as EASA.

8. **Human capital development –** Persistent efforts are required by the agency in order to bring the industry and the academia together to develop an efficient and cost-effective human resource pool in the country. The agency may also facilitate exchange programmes with other countries to ensure that the Indian labour force gets necessary exposure and facilities.

The Malaysia Industry-Government Group for High Technology (MIGHT) was established in mid-1990s as an industry-driven non-profit organisation tasked with bringing industry stakeholders, government and academia together along with the Malaysian Aerospace Council established in 2001. MIGHT is chaired by the Prime Minister and includes representatives from six relevant ministries. It serves as a national level steering body that systematically charts policy priorities and implementation strategies to upgrade the MRO industry in Malaysia.

Focusing on areas with lesser IP control as entry points- As a starting point, Indian MROs may explore opportunities in categories with low IP control. There is considerable scope in activities such as line maintenance, structural repair, electrical and electronics, avionics, hangar maintenance, etc. which can potentially be outsourced to India. India can focus on gradually capturing the aforementioned space through negotiations with Tier-I MROs in the short term. With the development of substantial capacity and foothold in these areas, it can gradually move up the value chain by venturing into areas such as engine maintenance, landing gears, etc., which have greater IP control.

Global players need to be approached for potential collaborations with Indian MROs, wherein such players can benefit from the potential scale of operations in India and Indian MROs can gradually ensure capacity enhancements in the MRO space.

Developing infrastructure and fostering collaborations with OEMs/manufacturers to gradually achieve self-sufficiency in manufacturing of spares and components – Beyond a conducive regulatory and policy ecosystem, MRO industry requires physical space and a robust infrastructure in place to function efficiently. Developments in infrastructure would include regular maintenance of facilities, production and transport equipment, etc., along with efficient inventory management of spares, components and tools such as personal protective equipment, hand equipment, etc.

Moreover, with the disruption of supply chains in the post-pandemic world, development of a self-sufficient MRO industry becomes even more important. Cost of spares form 55% of overall outlay for component MRO and 80% for engine MRO. Therefore, India needs to gradually increase foothold in the component/ spare manufacturing space, to ensure lesser dependence, cost reductions and enhanced competitiveness.

The expanding manufacturing sector in India and conducive government policies can provide an ideal environment for the production of spares and components within the country. The government may initiate tie-ups/joint ventures of Indian MROs with leading OEMs

and manufacturers. It may also consider extending the benefits of various schemes such Production Linked Incentives (PLI) to provide necessary fillip to domestic manufacturing of components/spares. As per stakeholder feedback, it is feasible for FAA/EASA certified MROs to augment local production in the near future, which may therefore be considered for PLI. In the longer term, DGCA certified parts/components may be promoted through necessary negotiations.

In the MRO sector, imports are consistently increasing, leading to cost pressure and affected margins. For instance, as per stakeholders, engine spend for civil aviation is estimated to be around INR 6,000-7,000 crores, which poses considerable challenges. Therefore, local capacities need to be tapped in the long run.

As reported by certain MROs, capabilities have been developed over the years to conduct maintenance services – which were outsourced abroad in the past – in India. To carry out such services, only piece parts are imported and the maintenance work is conducted in India, thereby increasing overall profitability. This leads to such MROs moving up the value chain, which needs to be encouraged.

These measures will not only boost the MRO industry in the long term but will also create the necessary ripple effects through job creation and the growth of regional economies. Finally, necessary planning, capacity building and negotiations with OEMs/airlines with respect to future aircraft models would go a long way in ensuring sustainable growth in the Indian MRO sector.

Singapore has the maximum number of JVs in MROs. This makes it evident that labour costs has limited influence in the engine and component MRO, labour cost in Singapore being comparatively on the higher side. Around 90% of the value is driven by maintenance of parts as well as logistics and supply chain availability. Additionally, distance also doesn't influence the selection of MROs. For instance, aircrafts are taken to countries such as the UK for MRO services.

Deliberating and overcoming OEM monopoly – Global players such as manufacturers and OEMs, especially component manufacturers are reluctant to share relevant information pertaining to aircraft design, manuals, spares, components, training data, etc. that poses a major hurdle for the MRO players to operate. This has created serious bottlenecks for the MRO industry, especially the component industry to grow within India. Moreover, in order to attain a discounted price while purchasing/leasing aircrafts, airline operators are required to conduct their aftermarket MRO services at

locations designated by OEMs/manufacturers. The Government can encourage OEMs and airline operators to help establish complete nose-to-tail MRO support infrastructure as well as manufacturing capacities for parts and spares within the country, either as standalone entities or through joint ventures with key industry players.

Given the outsized advantages that OEMs possess with design, data and manuals, MROs can consider partnering with the OEMs rather than competing with them. Through such strategic partnerships MROs can gain access to newer technology, components, spares, etc. and leverage respective expertise to jointly deliver a wider and deeper range of services to their customers. For OEMs, joint ventures would ensure greater flexibility both in terms of packages they can offer to customers as well as network flexibility without investing in their own capacities, thus ensuring a win-win situation for all.

To create a range of MRO capabilities, Singapore-based SIA Engineering Company (SIAEC) has established a total of 23 subsidiaries and joint ventures in seven countries with OEMs and strategic partners such as Rolls-Royce, Pratt & Whitney, GE, Safran, Collins and Jamco.[37]

Besides, MROs and operators have also developed potential alternatives[38] to new OEM parts such as-

1. **Surplus Parts –** This category can include Used Serviceable Materials (USM), new materials (excess inventory) and used unserviceable materials
2. **Designated Engineering Representatives (DER) Repairs –** FAA approved engineers who can approve technical data for repairs and modifications outside the Computerized Maintenance Management System (CMM)
3. **Design Organization Approval (DOA) –** Necessary approvals for an MRO to develop internal repairs
4. **Parts Manufacture Approval (PMA): Licensed as well as Competitive –** FAA approval granted to non-OEM manufacturers of aircraft parts

The above-mentioned options can be viable alternatives to manoeuvre through the strict monopoly regime of the OEMs and manufacturers.

Acceptance of DGCA Regulations at par with Global Standards – The DGCA regulations at present are considerably harmonised with EASA regulations. Despite the harmonisation, OEMs and manufacturers do not accept DGCA regulations and mandate FAA/EASA certification for heavy maintenance, lease return checks, etc. These multiple approvals and certifications result in loss of business opportunities for the Indian MRO players. It is desirable that the Government of India engage in bilateral talks with the EU, the USA, Canada, UK, Australia and other countries to harmonize and standardize DGCA certifications/approvals to be accepted at par with EASA/FAA/Transport Canada/UK CAA/ Australian CASA standards. This will assist in getting global recognition for Indian MRO players.

37 https://www.aviationbusinessnews.com/mro/mros-and-oems-a-changing-dynamic/

38 https://www.naveo.com/insights/aerospace-mro-part-choices-new-usm-der-or-pma/

There is an ardent need for bilateral reciprocity to achieve envisaged export potential in the MRO sector. As per stakeholders, reported cases of crashes, faults, etc. are minimal in the Indian aviation sector and therefore there is no viable reason for non-acceptance of DGCA standards globally. Hence, complete reciprocity may be sought by the policy establishment in terms DGCA approvals in the same way as EASA/ FAA approvals are accepted in India to boost MRO exports.

The reform measures should incorporate renegotiations on the EU-India Aviation Agreement and Bilateral Aviation Safety Agreement with the European Union and the United States respectively to acknowledge cross-validation and certification in aerospace manufacturing and modifications or repairs done on aircraft and aircraft components.

Developing a capital investment incentive policy – India has a captive and growing domestic aviation market, unlike other MRO hubs such as Singapore, Malaysia, Sri Lanka, etc. which are export oriented and rely on the Indian fleet size to operate their businesses. However, as a consequence of inadequate MRO infrastructure and regulatory bottlenecks, the domestic aviation sector is compelled to switch to international markets.

To attract foreign OEMs/manufacturers and MROs, a capital investment incentive policy, encompassing component MRO, landing gears, engines and APU, with combined contributions from the centre and the states is desirable. The incentives should be tied to technology and capital expenditures. The incentives should be directly correlated with the degree of technology investments and capital expenditures. (Tax credits should be calculated using a percentage of capital expenditure investments spread over 5-8 years.)

Other incentives might include Production Linked Incentives (PLIs) for the manufacture of components and spares, Remission of Duties and Taxes on export products (RoDTEP) scheme on Indian manufactured parts and components, state level incentives and discount on electricity and other amenities, priority sector lending and improved soft infrastructure such as use of artificial intelligence and analytics, single window clearances, etc. to provide necessary push to the Indian MRO industry.

Public-Private Partnership Model – Establishing a MRO facility is highly capital intensive, involving a longer break-even period. This has been one of the major reasons for MRO players and OEMs to avoid establishing newer MROs in India. Moreover, the infrastructure and capacity utilisation of key public sector MRO players such as AIESL and HAL have not been optimal. At times, due to lack of spares or infrastructure, aircrafts remain unserviceable beyond desired time periods. This is where the government can reap the benefits of a PPP model, such as the private sector's efficiency, access to cutting-edge technical know-how as well as private funding. The necessity for a conventional repair system or one based on PPP would be determined to a large extent by the equipment's deployment region, operational criticality and technological content. As a result, the viability of implementing PPP would have to be determined depending on the deployment of equipment in a particular sector; and hence, a "one-size-fits-all" solution is unlikely to succeed. It may be necessary to construct it uniquely and differently for each sector, taking

into account the equipment profile of that sub-sector.

Out of the numerous investment models, it is suggested that the government can incorporate the 'Government Owned, Privately Operated' model to collaborate with key private players and OEMs in the industry.

> Malaysia has efficiently leveraged the Public-Private Partnership model by attracting OEMs as strategic partners in developing its MRO industry.

Civil-defence MRO convergence – The capacity of defence MRO players such as HAL is yet to be utilised completely. Moreover, civil aviation MRO in India is still at a nascent stage and encountering challenges as discussed in the preceding section. The training capacities, spares and components required in civil and defence sectors are similar. To induce holistic growth in the MRO industry, defence MRO and related infrastructure is crucial and cannot be ignored. It is therefore recommended to have a Civil-Defence MRO convergence for effective and efficient utilization of available infrastructure and capacity in both the sectors. Further, in terms of manpower, erstwhile defence personnel may be absorbed into the civil MRO industry to meet human resource requirements in the long run as well as ensure high quality output. The certification process of such personnel may also be relaxed owing to the considerable experience they possess in handling complex defence aircrafts.

Civil-defence convergence will aid the stakeholders to jointly develop a plan on what civil and defence players could do together to enhance their capacities and identify the additional capabilities that can add value to this convergence.

Resolving issues related to customs duty, tax, royalty, etc. – To attract operators to conduct MRO services in India, the effective GST and customs duty – to the tune of 5-28% – levied on the purchase of components and spares needs to be brought down considerably, in line with countries such as Malaysia and Singapore.[39] Further, Notification No. 55/2021-Customs dated 29th December 2021 has entailed duty exemptions for aircrafts only, and has excluded aircraft parts. Therefore, aircraft parts continue to attract full duty as per their respective chapters – thereby making their procurement by MROs expensive – whereas airlines remain exempt from the same. There is a need for relevant revisions to address this issue. Also, to maintain coherence in the interpretation of aircraft parts during custom checks and clearances, Illustrated Parts Catalogue (IPC) or any other appropriate document such as Aircraft Maintenance Manual (AMM), Component Maintenance Manual (CMM), provided by aircraft/engine/component OEMs should be taken as substantive evidence by the customs department to enlist the parts and spares as aircraft parts and subsequently, all imports intended for use on aircrafts – across various chapters – may be brought under a uniform GST of 5%. Alternately, the inclusion of all aviation parts, spares, materials, etc. into Chapter 8803 (Schedule I, IGST Notification No. 1/2017) – which outlines 5% GST on aviation parts – may be deliberated upon to ensure uniformity. Finally, abolition of customs duty on parts used in maintenance work of re-delivery aircrafts may also be encouraged to stem foreign exchange outflows and boost employment opportunities.

The Airport Authority of India may exercise relaxations with respect to the royalty levied on MROs, to make the business environment more competitive and viable.

Another recommendation to attract the foreign investments in the MRO sector is the removal of dividend distribution tax and capital gain tax on foreign OEMs and MROs, which shall possibly attract large scale collaborations and investments.

> Like Japan and Singapore, there can be registered importers in India in order to minimise the confusion and suspicion pertaining to misinterpretation of custom laws. There will be one more layer of checking and payments, but the associated expenses will still be less than the tax paid.

Relaxation in land rentals – The Airports Authority of India (AAI), a statutory body under the Ministry of Civil Aviation, is responsible for creating, upgrading, maintaining and managing civil aviation infrastructure in India. It presently manages 136 airports out of which there are 24 international airports, 81 domestic airports, 21 Civil Enclaves at Defence Airfields and 10 Custom Airports.[40] The land lease rentals charged by Airport Authority of India (AAI) to MRO players is exorbitantly high and further adds on to the operating expense of MROs.

39 Based on stakeholder discussions

40 AAI Annual Report, 2021

However, it has been identified that land lease rentals do not occupy a major share in the net revenue of the Airport Authority of India (AAI).[41] Rent and services formed 7.8% of the overall revenue of AAI in the FY 2019-20, which increased to 17.8% in FY 2020-21 primarily as a result of decreased total revenue.[42]

The central government can provide discounts on land lease rentals (below the minimum threshold discount on ready reckoner/circle land rates) in order to incentivize the MRO players. It is desirable that such reform measures form a part of the MRO Policy of the Ministry of Civil Aviation.

Human capital development – The aviation sector is a strategic and sensitive industry that requires attention to detail and there is no scope of human error. It therefore requires highly skilled manpower that is trained in the technical nuances of the aircraft models. To produce such skilled labour, a rigorous theory and practical curriculum is required. The existing training institutes should sincerely work towards upgrading their capabilities and imparting the right knowledge to the available human resources. The Government of India should invite MRO players/OEMs/ manufacturers and aviation universities to collaborate, coordinate and develop an efficient education and training curriculum to impart necessary training to the engineers and support staff engaged in the MRO industry. To incentivize aviation maintenance, repair and overhaul as a viable career option for the Indian labour force, the Government of India can partly finance scholarships and other benefits such as student-exchange programmes, which will aid desirable human capital development for the MRO industry.

MIGHT's industry connections in Malaysia aided the development of education and training programmes that aligned with industry improvement strategies. A consortium of 11 Malaysian public institutions was formed in 2002 to address the human resource needs of the aerospace and other high-tech industries. This nationwide programme laid the groundwork for more focused, targeted relationships with businesses to fill talent gaps in niche areas.

Inclusion of MRO in the Harmonised Master List of Infrastructure Sub-sectors – MRO services can be included in the Master List of Infrastructure Sub-sectors under the 'Transport' category, given the immense potential it holds in terms of contributing to the economy of the country – buoyed by increased demand in the near future – as well as to the development of its workforce. This development may go a long way in providing necessary relief to the MRO sector in terms of reduced costs (through tax exemptions on components, spares, etc. among others) and augmented investments (including foreign capital, low interest rate loans, investments from the private sector, etc.).

41 Based on stakeholder discussions

42 AAI Annual Report, 2021

Table 5

Key Stakeholder Perspective to Bolster the MRO Industry in India

Airline manufacturer/OEM's opinion to bolster the MRO industry in India

Factors such as reduced turnaround time, better quality of services offered and ease of doing business are more important as compared to cost-efficient labour in the case of component and engine MRO. India needs to develop its business case accordingly.

Getting into joint venture with international MROs having IP rights, joint ventures and expertise can be an entry point for the Indian MROs to crack into the already established global supply chain. With this, there needs to be a reduction in GST along with other bottlenecks.

Offering tax holidays/ waivers and other incentives that will also have tertiary advantages such as increased Foreign Direct Investments and employment generation.

The importers of aircraft parts/components could be registered with customs in order to have duty exemptions for the products imported under MRO. It would reduce the confusion and suspicion pertaining to misinterpretation of custom notifications.

MRO also needs an ecosystem including warehousing, preservation works, trained manpower, etc.

The development of an MRO ecosystem not only requires conducive government policies but also requires manufacturing of new airplanes. Moreover, the supply chain of aircraft manufacturing, from its announcement to delivery takes 5 to 7 years which is a long-term process.

The MRO provider can enter the market directly with OEMs when the supply chain is planned and designed for a new airplane, which isn't manufactured without the introduction of a new engine. A new engine has not been announced since 2013-14.

Introduction of MRO into the supply chain system starts at planning stage. The launch of the aircraft may happen in a few years' time after that. It is important to keep engaging with the manufacturers/OEMs.

If a nodal agency is set up by the Government of India, it would have a significant impact only if it is empowered and has the authority to take decisions like in Singapore (Civil Aviation Authority of Singapore) and Hong Kong (Hong Kong Civil Aviation Department).

For roller crafts, more than volume the focus should be on manufacturing complete helicopters in India. DGCA may consider getting into bilateral agreements in order to certify the helicopters manufactured in India

Helicopters which are currently manufactured in India do not have international footprint as they do not have the international acceptability and selling power. There can be a partnership opportunity here also.

Local MRO player's opinion to bolster the MRO industry in India

Developing a resilient supply chain infrastructure for the manufacture of airline components and spares.

Capturing the lower end of the component value chain having lesser IP control through joint ventures with OEMs/globally significant MROs and bilateral negotiations and gradually shifting to higher end of the supply chain.

Relaxation in GST and land lease rentals, removing the issue of custom interpretation through standardization of Integrated parts Catalogue (IPC), manuals, etc.

Establishing/assigning a nodal agency to identify and streamline the roles and responsibilities of all the stakeholders involved through inter-ministerial/ departmental coordination, identification of technology priority areas, promoting home-grown technology and self-sufficiency, expanding global outreach, human capital development, etc.

Developing a capital investment incentive policy through tax waivers and holidays, PLI on aircraft parts and spares, etc.

Negotiating with OEMs and manufacturers for joint ventures and greater flexibility in information sharing.

Universalization of DGCA standards at par with FAA/ EASA regulations.

Human capital development through combined efforts of industry, government and the academia.

Leveraging advanced technologies such as drones, artificial intelligence and data analytics to further enhance the capacity of Indian MRO players

Synergy between civil and defence MRO for effective and efficient utilization of available infrastructure and build a strong business case to attract foreign investments.

8.

Conclusion

8. Conclusion

The prevailing trends in the aviation industry makes it evident that India is emerging as the fastest growing market in the post-COVID world. This will be further augmented through conducive government policies catalysing infrastructure development such as the National Civil Aviation Policy (2016), Regional Connectivity scheme (RCS), etc. To achieve the same, there needs to be an ecosystem – as envisaged by the policy establishment – that promotes ease of doing business in India and facilitate investments in the MRO industry.

Structurally, there is potential for advancements by way of systemic improvements, diversification of services, digitisation and human resource development among others. To access required capital for capacity enhancement, the Indian MRO service providers could consider joint ventures with aircraft OEMs and international airlines. This can be done on sub-contract basis as well. Such collaborations will aid in enhancing capacity and align their standards in line with the global best practices adhered to by the big players. MRO service providers in India would have to gradually move up the value chain, by progressively foraying into high-value services such as 'C' and 'D' checks as well as engines MRO services, in order to compete with foreign vendors. India's diverse and efficient pool of human resources, which includes engineers, data analysts, AI & ML experts, etc., can provide the necessary labour arbitrage that can be effectively utilised to optimize the present MRO capacity of the country. Usage of real-time big data and analytics tools can aid leveraging of the huge volume of data that is generated to facilitate overall growth. Infrastructure upgradation and creation of state-of-the-art training institutes – which provide access to cutting edge technologies and meet global standards – for the existing/ potential workforce is also recommended.

Further, steps can be taken to iron out various challenges Information access and technology transfers from the OEMs can be negotiated at the contractual stage itself. Standardisation/ acceptability of DGCA regulations can be ensured through negotiations with OEMs/ manufacturers and bilateral talks between the respective governments. Short-term measures can also include addressing anomalies with respect to Goods and Service Tax (GST) on spares/parts/components, standardising the interpretation of tax notifications by customs officials through the usage of Illustrated Parts Catalogue (IPC) or any other relevant document, etc. among others. Royalties payable by MROs to airport authorities – on Gross Turnover (GTO) – may also be brought down in line with government policies to ensure greater competitiveness.

In addition, there is scope for facilitation of credit accessibility and introduction of incentives for investments in the Indian MRO sector. The Government of India can consider providing necessary tax rebates, waivers and other incentives through a Capital Investment Incentive Policy to attract foreign investments, which can include Production Linked Incentive (PLI) Scheme for investments in capacity enhancement of the MRO industry, Remission of Duties and Taxes on Export products (RoDTEP) for aircraft components and spares manufactured in India, concession in land lease rentals, etc. Countries like Singapore and Malaysia have introduced similar waivers and concessions in order to attract investments in the aerospace sector. Further, for public enterprises (both civil and defence) such as AIESL and HAL, there is a scope for public-private partnerships and civil-defence convergence for efficient and effective utilization of infrastructure and resources.

To ensure streamlined development in the sector, it is recommended to establish a nodal agency to facilitate overall development by streamlining the roles and responsibilities of all stakeholders involved. Such an agency would go a long way in fostering holistic

growth through inter-ministerial/departmental coordination, identification of technology priority areas, promotion of home-grown technology and self-sufficiency, expansion of global outreach, human capital development, etc.

Owing to consistent augmentation in air traffic, strategic location and lower labour costs, the Indian MRO sector presents considerable growth potential. The government has initiated various reforms in the aviation ecosystem – by addressing tax policies and other regulatory aspects to promote ease of doing business and improving the commercial outlook of the MRO sector – to enhance overall scalability and profitability of key services. Through structured improvements and concerted efforts by major stakeholders, it is expected that the MRO sector will play a strategic role in boosting the aviation sector, and therefore promoting economic growth in the long-term in addition to establishing India as a key aerospace destination in the world.

Annexure I

List of Stakeholders

Annexure I - List of Stakeholders

Stakeholder	Organization
Mr. Anoop Kumar	Dy. GM (Engg.) and Executive Assistant to CEO, Air India Engineering Services Ltd.
Mr. Anubhav Kumar	Head of Strategy, Boeing India
Ms. Ashmita Sethi	President and Country Head, Pratt and Whitney
Mr. Ashok Gopinath	CEO, GMR Aero Technic
Mr. Bharat Malkani	CMD, Max Aerospace and Aviation; President MRO Association of India
Mr. Dinesh Kumar	Deputy Director, Ministry of Civil Aviation
Mr. Jose Mathew	CEO, Air India Engineering Services Ltd.
Ms. Mini M. Rojy	Dy. General Manager, Air India Engineering Services Ltd.
Mr. Om Prakash Sharma	Deputy Secretary, Ministry of Civil Aviation
Mr. Parag Sehgal	Director (India), Lockheed Martin
Mr. Piyush Shrivastava	Senior Economic Advisor, Ministry of Civil Aviation
Mr. Rajeev Gupta	CEO, Indamer Aviation
Mr. Rajeev Kumar Rastogi	Head of Marketing, Air India Engineering Services Ltd.
Mr. Salil Gupte	President, Boeing India
Mr. Sandeep Bahl	US India Aviation Cooperation Program
Mr. Sanjay Sharma	Sr. Assistant General Manager (Jet Engine Overhaul), Air India Engineering Services Ltd.
Mr. Sharad Agarwal	Executive Director, Air India Engineering Services Ltd.
Mr. Subhabrata Roy	CEO, Taj Air Limited
Mr. Sunil Kumar	Sr. Assistant General Manager (Engg.), Air India Engineering Services Ltd.

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