

**Deloitte.**



# MRO in India – Poised to take off

November 2021

# Contents

<b>Executive summary</b>	02
<b>Introduction</b>	05
<b>Global MRO landscape and current ecosystem</b>	08
Recent developments in the MRO ecosystem	10
Global trends in the market	11
Key performance indicators for the global industry	13
Technology as an enabler and differentiator	14
<b>Opportunities and challenges for MRO service providers in India</b>	17
Potential of the MRO sector	18
Challenges facing the sector	18
Key initiatives to develop the sector	19
Sidebar - 1: Collaboration with the French aerospace industry	21
Sidebar - 2: Singapore case study	22
<b>Conclusions</b>	24



# Executive summary

The Maintenance, Repair, and Overhaul (MRO) sector, which ensures the availability and airworthiness of aircrafts, is of critical importance to global aerospace & defense industry. Industry reports identify India as the seventh-largest civil aviation market in the world. It is set to become the world's third largest by 2026, representing a significant expansion scope for MRO facilities in India. About 90 percent MRO requirements in India are currently met through imports. India's indigenous MRO sector is in a nascent stage but carries a significant growth potential. The sector's growth will mainly be fueled by a growing aviation industry (expected to generate nearly 90,000 jobs and save about US\$ 2 billion in foreign exchange). Dependence on foreign MROs is likely to continue until the domestic MRO industry catches up with its foreign counterparts in terms of size and certified breadth of services.

The Indian MRO industry size is expected to increase from US\$ 1.7 billion in 2021 to US\$ 4.0 billion by 2031, at a compound annual growth rate (CAGR) of 8.9 percent against the expected global CAGR of 5.6 percent. With more than 1,000 aircraft currently on order, the country is likely to become the third-largest buyer of commercial passenger planes in the world, only after the US and China. This translates into demand for 200–300 major maintenance checks annually. Replacing ageing aircraft in the fleets of several airlines also creates scope for MRO to meet redelivery contracts. India is also poised to become a large defence aircraft market, propelling demand for military MRO capabilities as well.

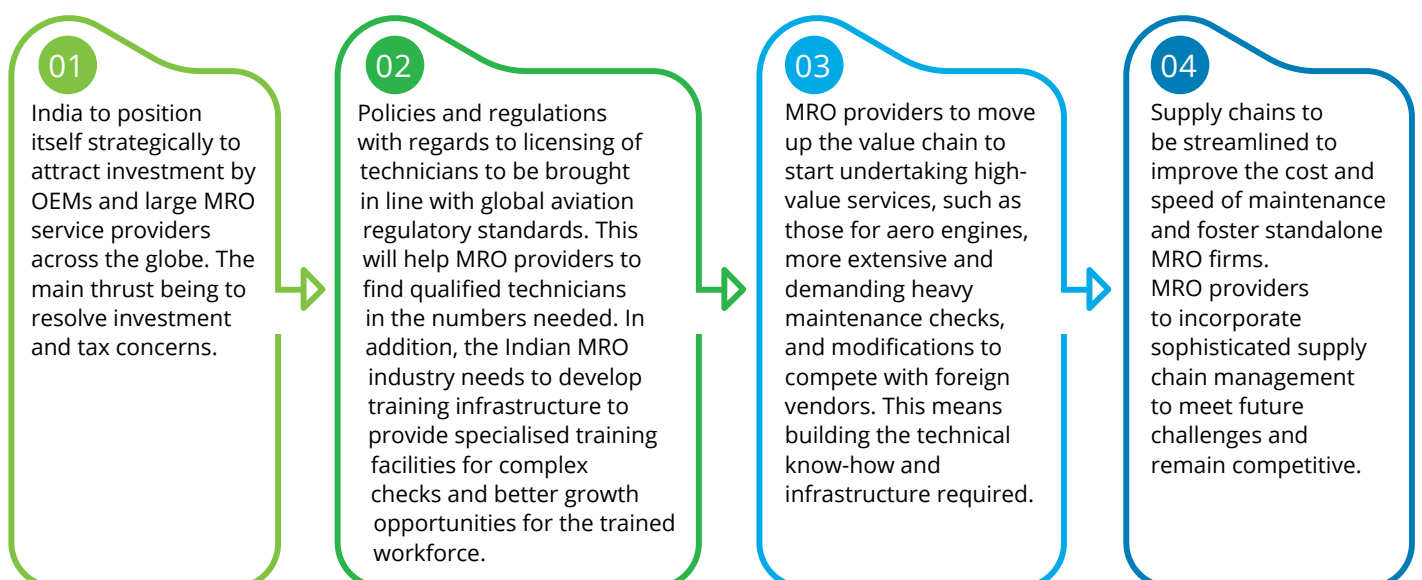
Clearly, these statistics drive a compelling case for India to steadily emerge as one of the largest MRO hubs in the region and potentially a global one. The sheer intensity of demand for new

aircrafts and consequent MRO requirements over the next decade and even beyond makes a strong case for strategic investors, Original Equipment Manufacturers (OEMs), and leading MRO players across the globe to evaluate investment opportunities in the Indian MRO space.

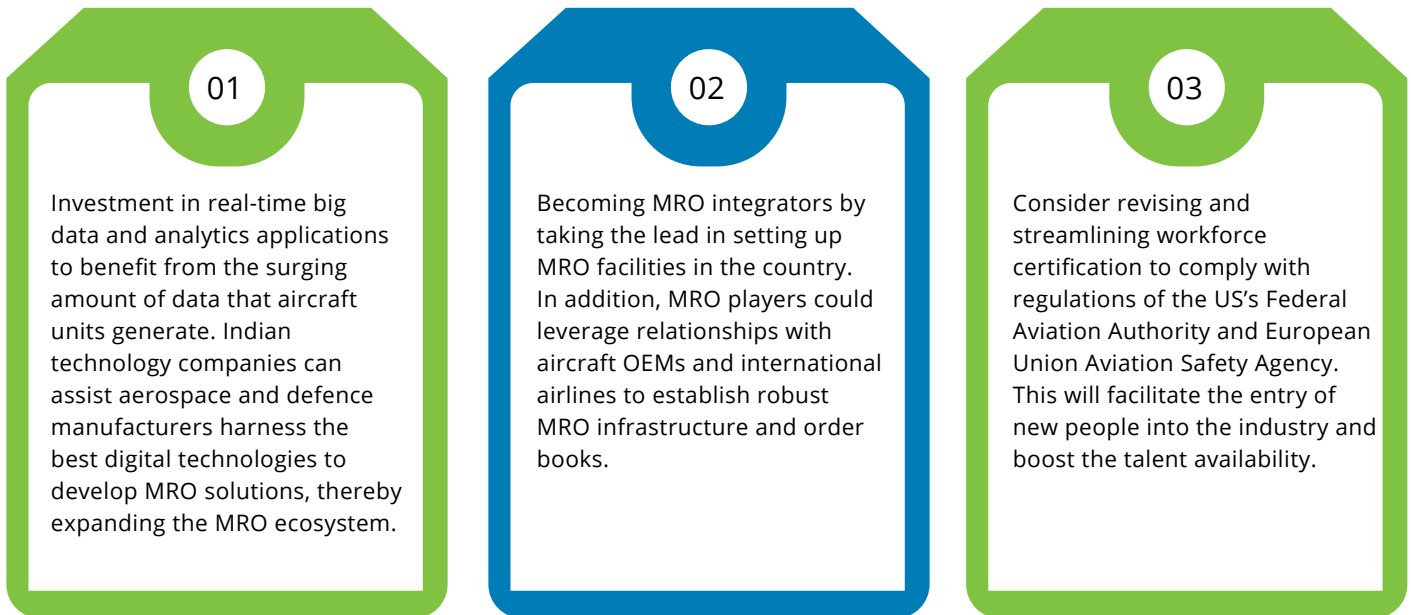
From the policy standpoint, the government has stated its intent to foster the development of India as a global MRO hub. A set of policy initiatives by the central and state governments has positioned India well to build high-quality infrastructure facilities, wider and deeper precision manufacturing capability, spare-parts supply chain, and generate employment opportunities for skilled people. These initiatives include a new MRO policy, liberalised land rentals, changes in land allotment policy, and tax concessions.

Moreover, India can boast of significant leverage in terms of highly skilled talent and relative cost advantages vis-à-vis global counterparts. These advantages easily sets India apart as one of the most competitive destinations for setting up large MRO facilities catering to both indigenous and export demand of MRO services in the region and globally. The country has a large pool of engineering talent. India's MRO workforce costs can be about 50 to 60 percent lower than those in Western Europe or the US. The capabilities in India are rising steadily, with companies such as Boeing, Airbus, Hindustan Aeronautics Limited (HAL), Pratt & Whitney, and Safran setting up repair facilities in India.

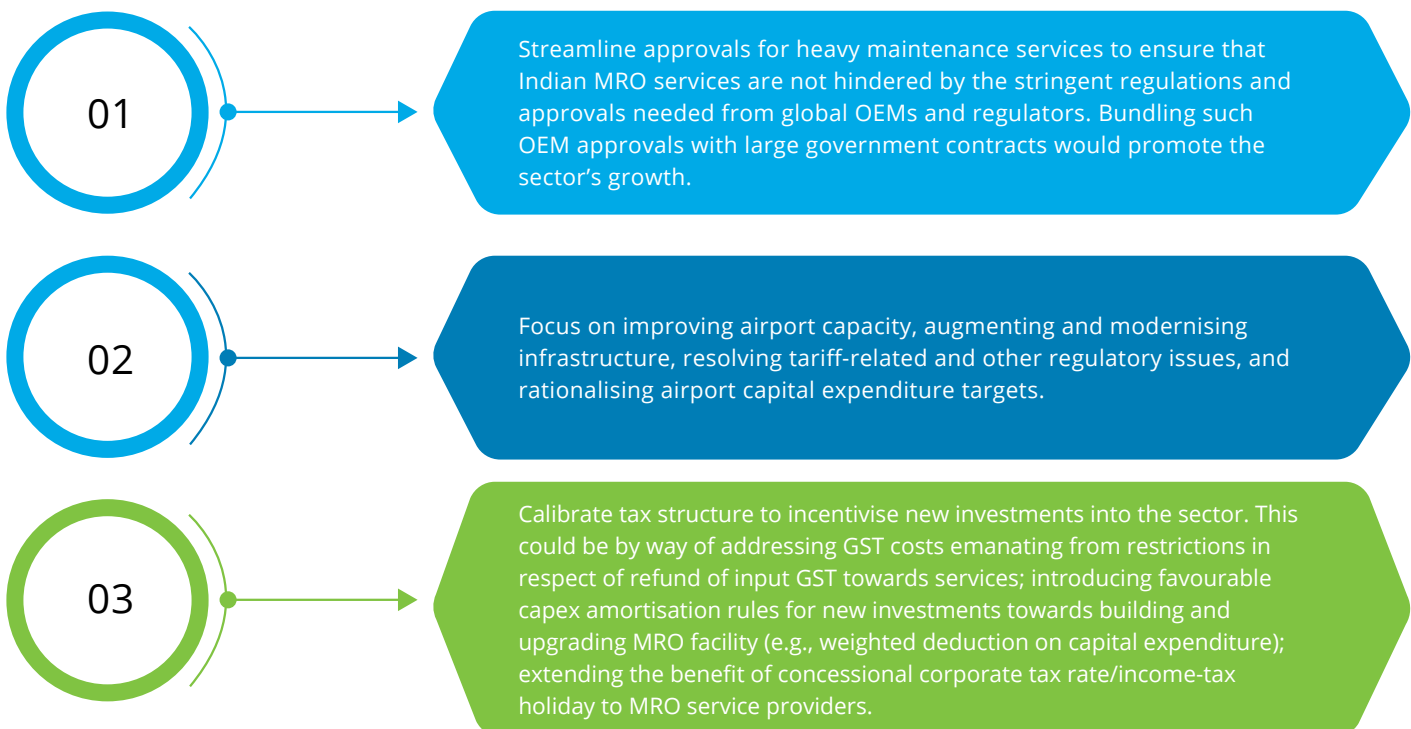
At the same time, whether or not India can fully realise its potential in this sector will hinge to a great extent on how well and quickly some of the key challenges facing MRO players in India are collaboratively addressed. A few of these can be recounted as below:



From the lens of the aviation industry, three main initiatives would contribute immensely to drive sustainable growth of the MRO sector:



On the other hand, the Government can further build on its policy initiatives by pushing through the following measures:



India will reap many benefits from a competitive MRO sector. The immediate benefits of saving on fuel and logistic costs, conserving foreign exchange, and supporting the country's efforts to develop aircraft financing and leasing, will be accompanied by the long-term benefits of economic growth, job creation, and the growth in the aviation sector in India. Given the wings to fly, the MRO sector will soar.



# Introduction

In the pre-COVID-19 world, the size of the global commercial MRO market was expected to increase from US\$ 80 billion in 2019 to US\$ 110 billion by 2029. APAC was likely to outpace the global MRO demand. India's commercial MRO sector was about US\$ 0.9 billion in 2019 (nearly 1 percent of the global MRO market) and expected to grow at a CAGR of 7.7 percent in the pre-COVID environment<sup>1</sup>.

The pandemic has led to a substantial reduction in passenger traffic, significantly lowering the demand for new aircraft and utilisation rates of the existing fleet. These trends had a drastic impact on aircraft orders and deliveries, and consequently affected the revenues of commercial aerospace OEMs and the extended supply chain. Further, lower utilisation rates resulted in weak demand for MRO services as airlines delayed non-compulsory maintenance and upgrades. According to Aviation Week Fleet Discovery data, of the 22,287 civil aircraft globally, 2,188 are in parked/reserved status, 3,400 are in parked status, and 6,000 are stored.<sup>2</sup>

The Indian civil aviation industry, the mainstay of MRO services, is on a high-growth curve, albeit with minor hiccups. According to Airbus and Boeing forecasts, India will be amongst high-growth markets for the aviation industry. Its current fleet of 600–700 aircraft is expected to reach more than 2,000 over the next 20 years.<sup>3</sup>

According to the International Air Transport Association (IATA) reports, India is expected to become the third-largest aviation market by 2026.<sup>4</sup> This also represents a huge expansion scope for MRO facilities in India. The sector can capitalise on the significant increase in the number of air passengers, rapid expansion of commercial fleets, entry of low-cost carriers, growth of charter services, quest for efficiency, and government initiatives to boost MRO growth to transform India into a global hub for these services. India is also poised to become a large defence aircraft market. With a rise in military expenditure, the need for military MRO capabilities will also increase.

A capable, indigenous MRO industry is imperative to support the Indian aviation industry's growth, both civilian and defence.

Despite a higher domestic demand and healthy growth of the global MRO market (both for commercial and defence MRO), India has lagged behind its Asian peers. However, the country may get a competitive edge by ameliorating certain crucial parameters, such as fiscal incentives, operational aspects driving ease of doing business and facilitating investment in the sector, and aligning various policies.

MRO Association of India (MAOI), a non-profit association representing its members' interest, is working towards making the country a global hub. MAOI voices issues to various government bodies and regulatory authorities; and works towards the development of MRO as an industrial sector in India.

The Indian government treated the pandemic as an opportunity to assess the aerospace and defence sectors and initiate policy measures to reset the sector's growth. It is the turn of industry to reciprocate and take advantage of the emerging playing field in the aerospace and defence sectors in India.

Further, initiatives are underway for the convergence of civil and military works concerning MRO. Converging defence and civil MRO will create economies of scale and generate large-scale employment. The ultimate goal is to reduce import dependency in a staggered manner, and in the process, enable the development of a robust and sustainable indigenous aerospace and defence manufacturing supply chain that can serve both domestic demand and also emerge as a fast-growing export segment serving the global supply chain.

## Roles and responsibilities of MRO service providers

The MRO ecosystem includes large OEMs, airlines, pure-play MRO service providers, parts vendors, and manufacturers of aerospace parts and spares. In terms of services, the MRO industry comprises four segments: line maintenance, components, engines, and airframe.

**Line maintenance:** This ensures that the aircraft is perfectly fit for the flight before take-off. The aircraft is visually inspected, and its aircraft logbook is checked for different entries relating to system problems, failures, or any other maintenance need. Line maintenance also includes troubleshooting, defect rectification, and component replacement.

**Components:** This involves the maintenance, repair, and overhaul of composite and mechanical airframe components. This type of MRO involves servicing inlet and fan cowlings, cargo, exhaust assemblies, plugs, entry doors, thrust reversers, mechanical actuation, flight control surfaces, interior components, and other components.

**Engines:** Engine MRO provides total aero-engine support, including testing of commercial and military engines.

**Airframes:** Airframes MRO includes heavy maintenance, avionics upgrade, structural and accessory repair for aircraft, and fleet transitions and integration.

As airframe OEMs mainly focus on development and production, most airlines have to outsource (partially or fully) repair and maintenance. As a result, MRO organisations have become vital to the functioning of airlines. Many large OEMs who have not focused on the MRO offerings in the past seem to realise the value they can generate and are trying to expand their service offerings in the after-sales market. They are increasingly turning their focus on MRO services, not only as a means to enhance customer satisfaction but also as a revenue-generating opportunity. Hence, this industry is expected to see more M&A and consolidation in the near future.

At present, India outsources 90 percent MRO services to countries such as Singapore, the UAE, and Sri Lanka.<sup>5</sup> According to the 2019–20 Economic Survey, annual MRO services import by Indian carriers amounted to INR 9,700 crore (over US\$ 1.3 billion) in that year.<sup>6</sup> An MRO ecosystem in the country is needed to cater to the rising number of civil and defence aircraft

and optimise turnaround time. Moreover, with many aircraft parts especially safety-related equipment falling under the Dangerous Goods (DG) category, the need to keep such product maintenance within India boosts demand for MRO services in the country.

India will reap many benefits from a competitive MRO sector. Airlines will be able to save on fuel and logistic costs, and conserve foreign exchange. Indian lessors will be able to offer competitive prices on wet leases, supporting the country's efforts to develop aircraft financing and leasing. India is trying to develop this sector by notifying aircraft leasing and aircraft financing in the International Financial Services Centre (IFSC) at GIFT City.<sup>7</sup>

Finally, creating an MRO ecosystem will benefit the economy by creating job opportunities. In India, for example, the Aerospace and Aviation Sector Skill Council (AAASC), a body that manages skill development for the country's aerospace and aviation sector under the National Skills Development Corporation trained more than 16,000 people and placed 75 percent of them in various MRO-related jobs, as of April 2021<sup>8</sup>.



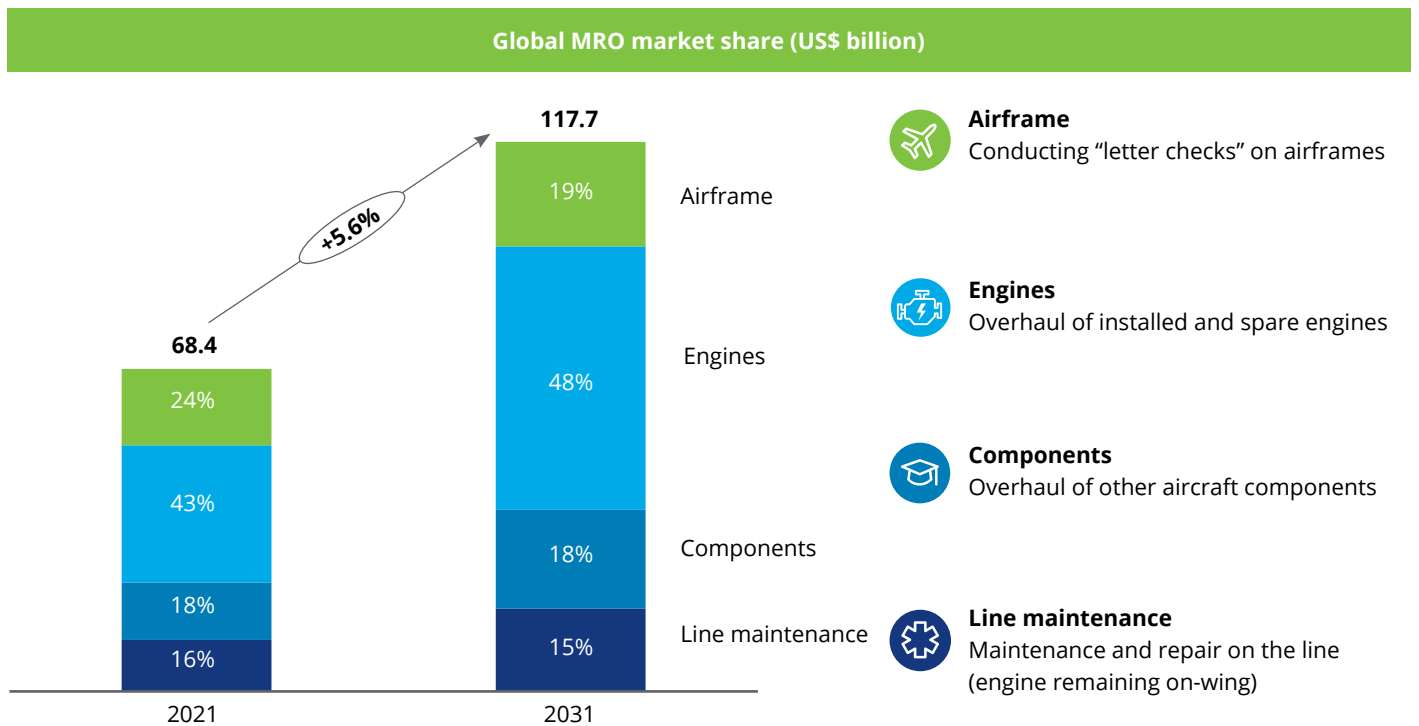


# Global MRO landscape and current ecosystem

Globally, the MRO industry's size is expected to reach US\$ 117.7 billion by 2031, from US\$ 68.4 billion in 2021, growing at a CAGR of 5.6 percent.<sup>9</sup>

The MRO industry comprises four segments: line maintenance, components, engines, and airframe. Of these, engine maintenance is likely to be the most lucrative segment—engines and airframes constitute 65–70 percent of the work by value.

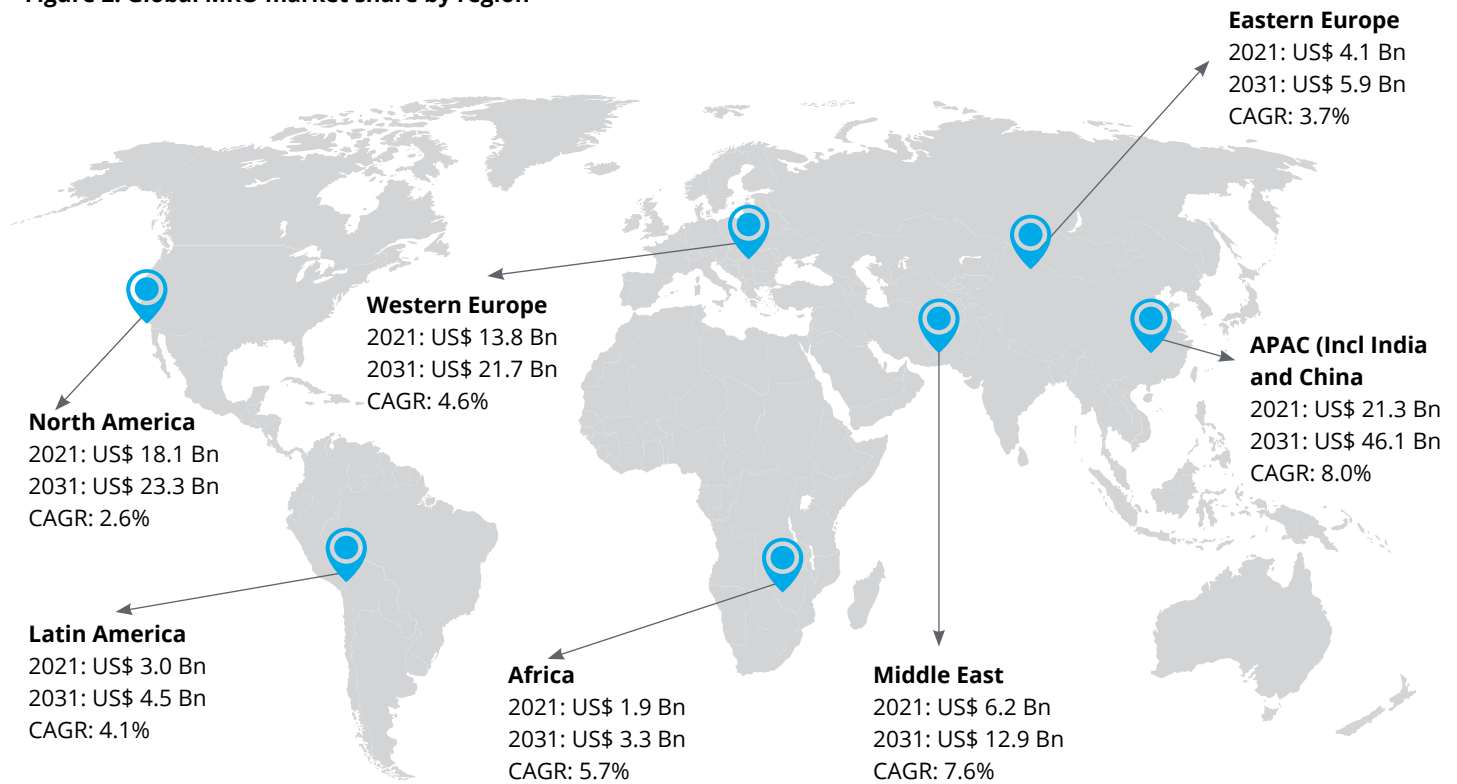
**Figure 1: Global MRO market share (US\$ billion)**



Source: Oliver Wyman, 2021



The maintenance, repair, and overhaul of engines as a segment is worth more than US\$ 29 billion in 2021 and has the highest share of the overall MRO market.

**Figure 2: Global MRO market share by region**

Source: Oliver Wyman, 2021



The APAC region is expected to grow at a CAGR of ~8% over 2021-2031 with the highest market share, primarily due to high-growth rates in India and China.

In terms of geography, APAC is expected to grow the fastest in the MRO segment. It is considered a major manufacturing hub for spare parts supplied to different countries. Emerging APAC economies are focusing on expanding MRO services to commercial and military aircraft companies. The increasing aircraft fleet size, a rich pool of engineering expertise, economic growth, expanding aviation infrastructure, and lower labour cost across APAC are amongst the factors driving the aircraft MRO market's growth.

For instance, Singapore dominates the APAC market due to its established MRO hubs and the presence of major industry players, such as GE Aviation, Airbus, and Rolls-Royce. According to Wisconsin Economic Development Corporation (WEDC), Singapore houses 120 aerospace companies that represent close to one-quarter of the total MRO market players in the region.<sup>10</sup>

Players from countries such as Indonesia, Malaysia, and Thailand are looking to replicate the success of Singaporean

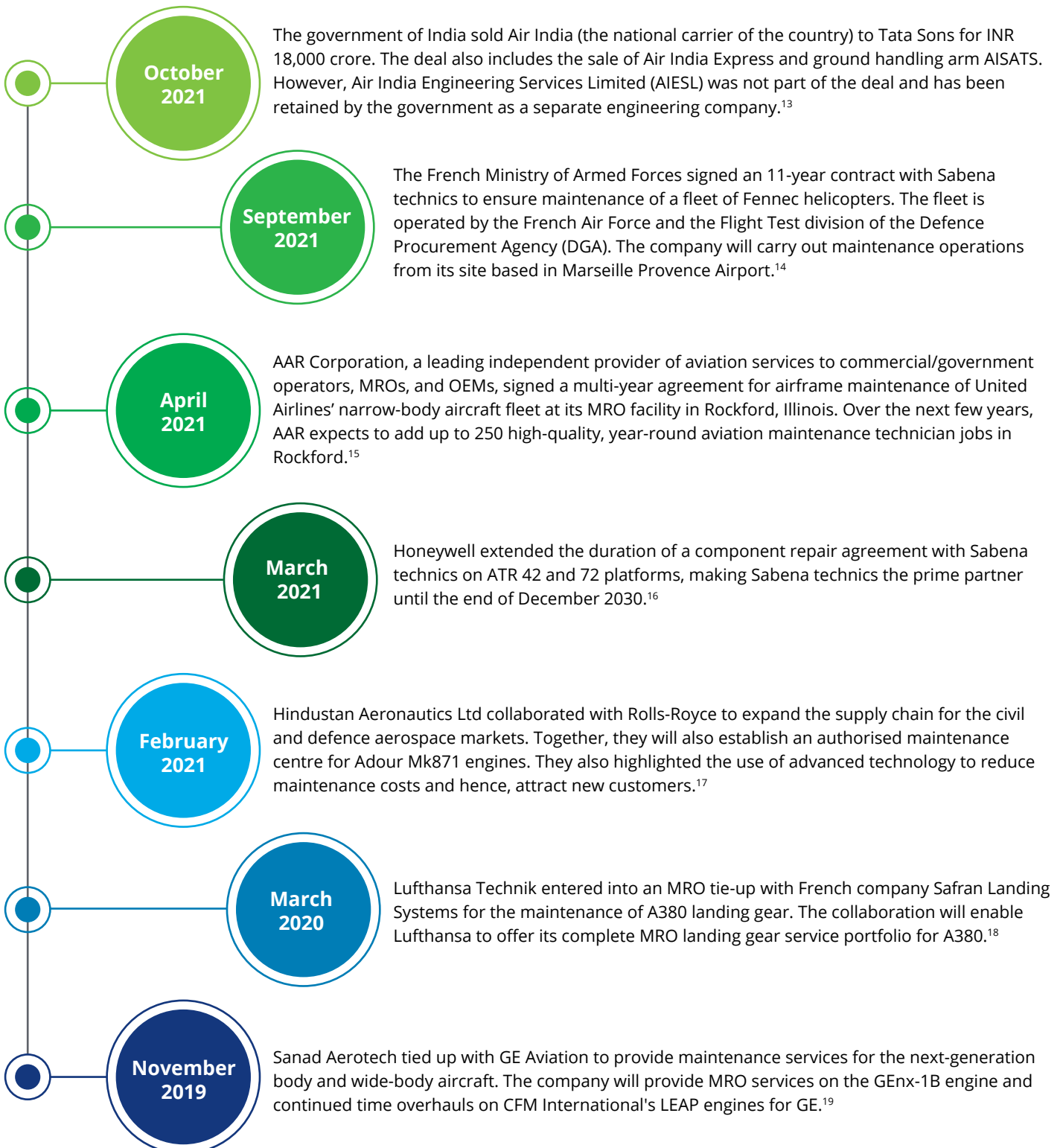
players and developing their MRO capabilities, placing APAC as an important global hub for aircraft MRO.

Amongst the key regional MRO hubs, Sri Lanka announced its plan to invest in MRO facilities at Mattala Rajapaksa International Airport (MRIA) in November 2020.<sup>11</sup> With that, the country expects to become a key foreign exchange earner and create several employment opportunities. Further, Sri Lankan Engineering has more than 30 years of experience in maintaining the country's fleet plans to open three more MRO stations in South Asia. It has also started servicing the aircraft of Qatar Airways since July 2021.<sup>12</sup>

Further, the growth in air traffic in the region over the years has put pressure on airline operators to keep their fleet in operational condition. As APAC overshadows other regions in terms of new aircraft deliveries, MRO operators in the region are ramping up their capabilities to cater to an increasing aircraft fleet.

### Recent developments in the MRO ecosystem

The MRO ecosystem is at an inflection point owing to the changing dynamics in the aviation business, digitisation and technology advancements, and pressure to reduce costs. MRO service providers are taking several initiatives to deal with such disruptions for sustainable growth. For instance, to meet the needs of tier-1 suppliers and create a cutting-edge industry ecosystem, manufacturers from around the world are already collaborating with global suppliers, and small and medium enterprises, including those in India. With the active participation of global players, the industry is expected to develop exponentially.





### Global trends in the market

#### The increasing importance of aircraft maintenance

With new aircraft orders likely to be deferred, an impact of COVID-19, maintenance of the existing fleet will become far more important in the near term. Travel restrictions have caused a massive decrease in the number of flyers, and many aircraft moved to extended storage. As a result, when aircraft units have resumed operations, the number of reported problems has gone up considerably.

#### The increasing digitalisation of MRO to increase efficiency and reduce aircraft downtime

MRO services are largely characterised by unpredictable process time and material requirements. These issues are often offset by large buffers in terms of time, people, and parts inventory, and lead to higher service cost. MRO service providers are increasingly using data analytics, and AI and ML tools to draw insights from a massive amount of information and data captured from ERP systems, maintenance records, flight systems, and sensors installed in newer aircraft.

Furthermore, installing more sensors in newer aircraft enables the creation of powerful predictive maintenance algorithms. MROs that grab this opportunity have high chances to gaining a competitive edge.

#### More partnerships or consolidations are expected in the MRO ecosystem

The MRO ecosystem is undergoing dramatic changes with evolving customer expectations, acceleration of technological innovation, and shifts in competitive advantage. For many years, OEMs were content with manufacturing and supplying products to MRO service providers. However, with changes in aviation business models, product sales, and tightening budgets, OEMs are expanding their presence in the aftermarket. In light of heavy competition from OEMs with deep pockets, more partnerships and collaborations are expected in the MRO ecosystem.

#### MROs struggling to maintain SKUs

The outbreak of COVID-19 has severely affected the industry. MRO vendors are struggling to maintain Stock-Keeping Units (SKUs) due to the increasing disruptions in the global supply chain. Consequently, they are observing the rising need for a framework that can guide them in making strategic investments in supply chain capabilities; identifying risks and opportunities; establishing communication channels; evolving a distribution strategy; and enabling cross-functional, decision-making.

#### OEMs entering the aircraft aftermarket

OEMs are expanding into the MRO space to improve their revenue share from aftermarket services. For instance, OEMs and big airframers, such as Airbus and Boeing, are entering into the MRO space.<sup>20</sup> The move enables airlines to access service packages across activities such as maintenance, technician training, e-solutions, and system upgrades, along with material management services (such as spares and tooling). OEMs participating in the after-sales MRO space will be formidable competition for smaller MRO providers and parts suppliers without the vast resources and technologies that larger OEM service providers can provide.

#### Changing MRO business model

As major OEMs aggressively expand into the MRO domain, stakeholders across the ecosystem are reevaluating their business strategies and value proposition.

MRO customers are moving to performance-based service offerings, with OEMs providing pay-per-use and subscription-based services.

Manufacturers of complex components are offering long-term service contracts to customers to expand their presence in MRO.

**Airlines collaborating with engine MRO service providers**

To reduce overseas maintenance costs, several airlines have partnered with engine MRO service providers to develop in-house capabilities. In January 2021, MTU Maintenance Hannover GmbH, the MRO division of MTU Aero Engines, signed a five-year contract with AirSial, a Pakistani airline, for MRO services related to Airbus A320 aircraft. The contract includes the provision of engine trend monitoring, on-site services, and lease engine support, along with technical training for airline employees.<sup>21</sup>

**Low-cost carriers are dominating the skies**

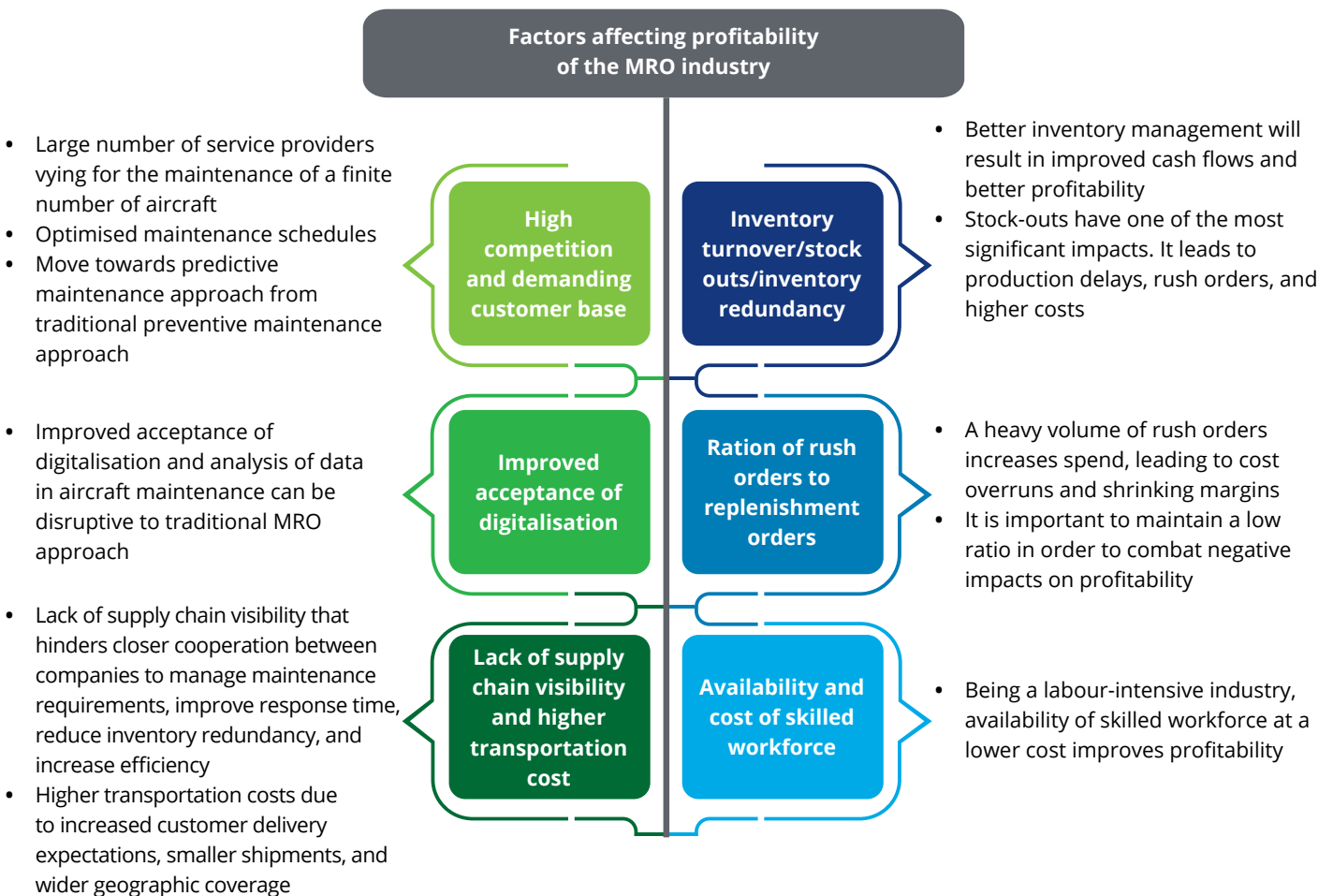
The low-cost model has had a transformative impact on the aviation supply chain, putting cost pressure on every small

or big carrier. Globally, low-cost carriers dominate the skies, leading to a surge in demand for fuel-efficient and more viable, narrow-body aircraft. MROs will require to re-design their business models with this in mind and focus on cost-effective, pay-per-use services.

**Surging demand for Used Serviceable Materials (USM)**

USM—salvaged parts of old aircraft—are an acceptable, lower-cost alternative to new parts. Its demand is expected to be strong especially considering the number of commercial aircraft and turboprop aircraft retired in 2020 is almost the same as the number retired in 2019 i.e., about 680 aircraft. The USM market gives airlines various cost-effective options for parts and competitive advantage to smaller MROs.

**Key factors affecting the global MRO industry's profitability**



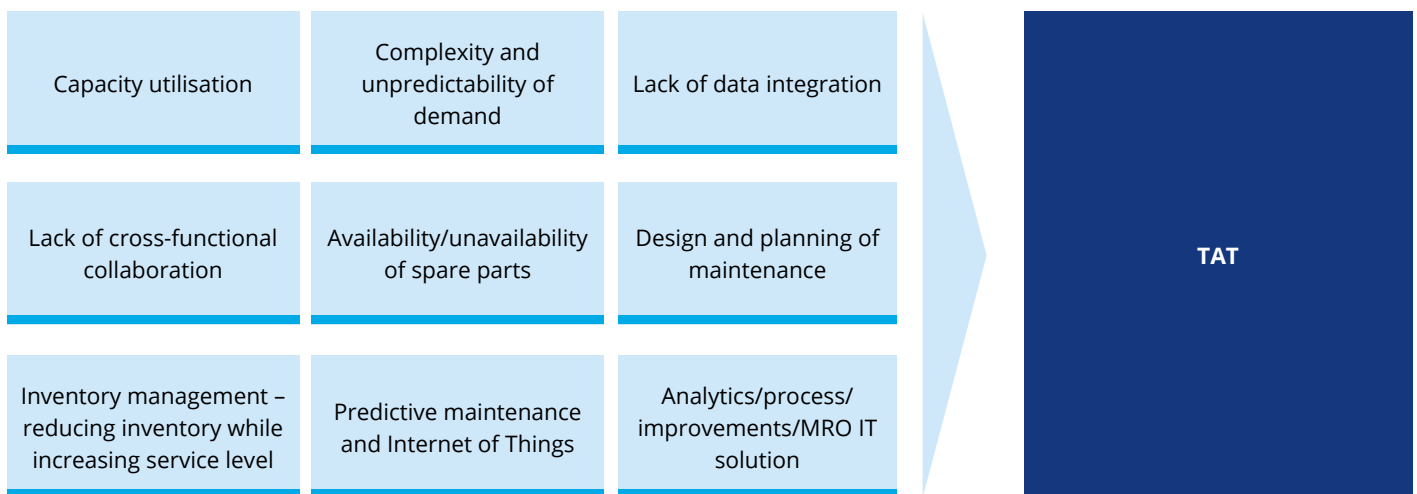
Source: Deloitte Research

### Key performance indicators for the global industry

MRO is a complex process that needs to fulfil specific industry standards to provide timely quality services to airlines operators, ensuring that the highest level of safety is maintained. Some of the more critical metrics used to track the performance of MROs including cost efficiencies as well as safety management systems are:

**Turnaround Time (TAT):** This is the most critical Key Performing Indicators (KPI) for MRO providers as it directly reflects the Aircraft On Ground (AOG) metric tracked by airlines, and is based on the time an MRO takes to complete services, while maintaining quality and safety standards. Although there are a number of factors influencing TAT, the aim of the MRO service provider is to keep the TAT low and within the contractual obligations while maintaining cost efficiencies and providing value-added services to airlines.

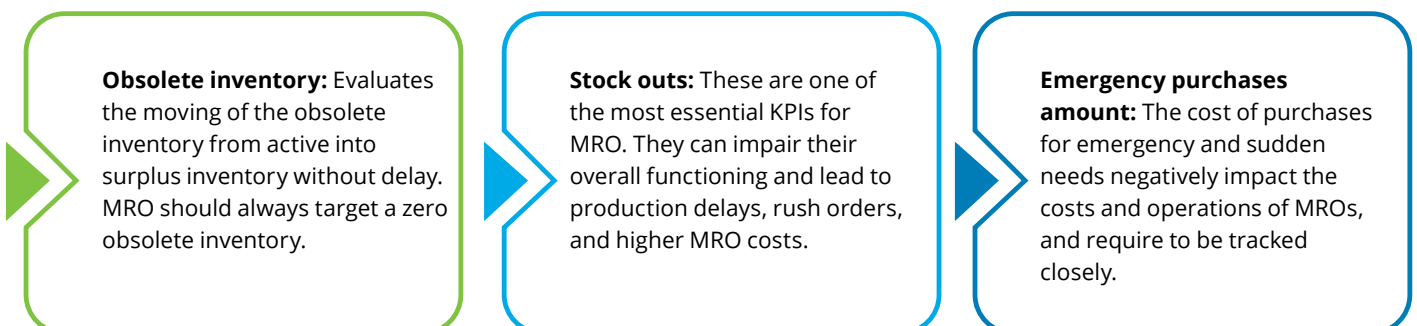
### Key factors affecting Turn Around Time (TAT)



Source: Deloitte Research

**Order fulfilment cycle time:** This KPI measures the time taken from order receipt until the acceptance of service by a customer. It represents the percentage of orders delivered on or before customer commit date in the required condition with right certifications at the right place.

### Inventory management:





**Supply chain cost and asset management:** It includes both direct and indirect costs incurring in planning, sourcing, and delivering of materials. Additionally, labour, facility usage, and warranty/returns costs also come under this KPI. Supply chain assets management involves the capacity utilisation of working and fixed assets (such as hangar, engine and component shops, and inventory turns).

MRO players are leveraging digital technologies, including data analytics, Artificial Intelligence (AI), Virtual Reality (VR) and Machine Learning (ML) not only to maintain service standards and meet defined safety requirements, but also to bring in cost efficiencies and value-added services to airlines.

**Technology as an enabler and differentiator**

While COVID-19 has significantly eroded short-term demand, digital technologies could be the differentiator for immediate and sustainable success for MROs. Many OEMs and engine manufacturers are entering the MRO domain leveraging digital technologies to offer capabilities such as proactive and predictive maintenance. In a recent Deloitte study, about 65 percent industry executives expressed high confidence in the potential of digital technologies and stated that the effective use of these technologies would drive revenues of MRO service providers.

To enhance efficiencies and differentiate their services, some OEMs and engine manufacturers have started harmonising internal processes with the help of digital technologies.

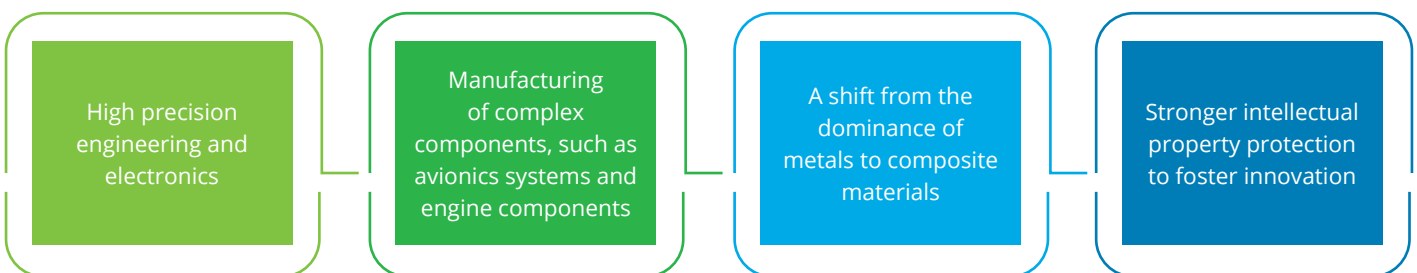
Digital technologies	Value proposition	Use cases
<b>Industrial Internet of Things (IIoT)</b>	<ul style="list-style-type: none"> <li>Enhance purchasing experience</li> <li>Promote transparency</li> <li>Reduce unplanned downtime</li> </ul>	GE Aviation uses IoT technology to schedule preventive maintenance plans. It collaborated with GE Digital to implement its asset performance management solution on its LEAP engine production line. The collaboration allowed GE to model machine data with a maintenance history from about 400 connected machines. The technology enables the company to analyse health conditions and provide predictive maintenance recommendations. <sup>22</sup>
<b>AI ML</b>	<ul style="list-style-type: none"> <li>Virtually monitor maintenance and repair needs</li> <li>Reduce unplanned downtime for customers</li> </ul>	Delta Airlines uses AI for better customer experience and predictive aircraft maintenance. <sup>23</sup>



Digital technologies	Value proposition	Use cases
<b>3D printing</b>	<ul style="list-style-type: none"> <li>Manufacture small spare parts in-house</li> </ul>	GE Aviation, along with its sister technology company GE Additive, has begun 3D printing to avoid long lead times on spare parts. For now, the company is 3D printing four new gas turbine engine parts. <sup>24</sup>
<b>Cloud-based data analytics solutions</b>	<ul style="list-style-type: none"> <li>Proactively monitor customers' maintenance needs</li> <li>Advance customer engagement</li> </ul>	Airbus uses 'Skywise', an open data platform, to enable its customers to seek the support of 20,000 Airbus engineers throughout the lifespan of an aircraft unit. The platform provides fleet analysis, efficiency monitoring, and predictive maintenance, along with data analytics tools, to minimise fuel consumption. <sup>25</sup>
<b>Augmented Reality (AR) and Virtual Reality (VR)</b>	<ul style="list-style-type: none"> <li>Improve field service efficiency</li> <li>Enhance customer service experience</li> </ul>	A leading jet manufacturer uses AR/VR to make field service more efficient and cost-effective, with fewer technicians on-site as quality checks can be done virtually by off-site technicians. Further, Air France uses AR training for 787 aircraft, publicising it as "ultra-modern training for an ultra-modern aircraft." <sup>26</sup>

For smoother digital transformation, MRO service providers mainly focus on two areas. First, they use connected enterprise systems and data analytics to surface insights that improve visibility in the supply chain. Second, they prefer using and monetising insights generated from data that can help develop better solutions and, at the same time, build a competitive advantage.

Further, from a longer-term standpoint, the MRO industry across the globe will also need technical support related to:





# Opportunities and challenges for MRO service providers in India

According to IATA India is expected to become the third-largest aviation market by 2026. Accelerated vaccination drive, along with a higher rate of economic activity, soared India's domestic air passenger traffic in July 2021 on a year-on-year basis.

In July 2021, India's domestic air passenger volume by Revenue Passenger Kilometres (RPK), was one of the highest amongst major aviation markets, such as Australia, Brazil, China, Japan, Russia, and the US. The RPK growth in the country increased by 123 percent in July 2021 compared with that in July 2020. Demand for aircraft repair services and maintenance will also go up.

In the Economic Survey 2019-20, the size of domestic and imported Indian airline MRO was projected to increase annually to INR 21,600 crore (about US\$ 2.9 billion) in the next five years.<sup>27</sup>

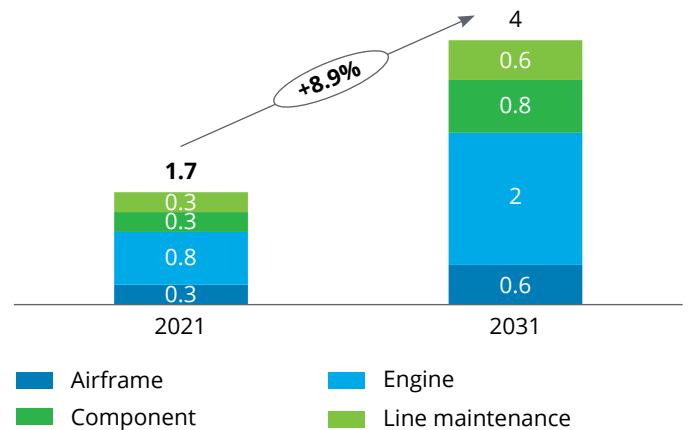
India's MRO industry is estimated at US\$ 1.7 billion in size in 2021. It is expected to reach US\$ 4.0 billion by 2031 at a CAGR of 8.9 percent.<sup>28</sup>

However, the Comptroller and Auditor General of India reported that, at present, the country's MRO ecosystem is not yet ready to meet the frequent maintenance needs of aircraft. The success of government initiatives to boost the sector will hinge on efforts to bolster the ecosystem. An assessment of the potential for MRO in

India, current initiatives to boost its growth, and the challenges that need to be overcome show that this can be achieved.

Engine maintenance is the most lucrative of the four MRO industry segments (airframe, engine, component, and line) and engines and airframes constitute 50–55 percent of the work by value.

**Figure 3: Indian MRO market size (US\$ billion)**



Source: Oliver Wyman

## Different MRO activities by Indian carriers



## Potential of the MRO sector

With more than 1,000 aircraft currently on order, India is set to become the third-largest buyer of commercial passenger planes in the world, after the US and China. This translates into demand for 200–300 major maintenance checks (A to D checks) annually, representing a massive opportunity for MRO service providers in India.

In June 2020, IndiGo announced its plans to replace its aging A320neos with more fuel-efficient A320neos by end-2022 or early 2023.<sup>29</sup> SpiceJet has more than 200 B737 MAX aircraft on order,<sup>30</sup> while GoAir has over 100 A320neos,<sup>31</sup> which are yet to be delivered. Almost every aircraft needs MRO services before leaving the fleet to meet the redelivery conditions laid out in the leasing contract.

In India, airlines operate aircraft built by global players, such as Boeing, Airbus, ATR, Embraer, and Dornier.<sup>32</sup> Moreover, most aircraft are sent abroad for major MRO services, highlighting the long-pending demand for an MRO industry in India.

In a first for an Indian private firm, in February 2021, Tata Group acquired the intellectual property rights for a German-origin platform to make an indigenous military aircraft. Such an increase in aircraft manufacturing capabilities holds immense potential for MRO service providers in the country; these providers can expect a bigger addressable market and improved synergies in their operations.<sup>33</sup>

The Indian Air Force (IAF) has signed a contract to purchase 24 phased-out Mirage 2000 fighter aircraft valued at US\$ 31.6 million.<sup>34</sup> The acquisition of these phased-out aircraft would provide the spares and airframes needed to improve the serviceability of Mirage-2000s in the Indian fleet. Further, these spares can be cost-effective and beneficial in case of supply chain issues. The spares and airframe obtained from the phase-out aircraft may make the difference between a swift return to active service or an extended MRO.

Further, India has cost and talent advantages over its global counterparts. In India, the cost of MRO workforce ranges between US\$ 30-35 per hour, almost 60 percent lower than that in Western Europe or the US (although comparable with wage rates in China or Indonesia). India also has a large pool of engineering talent, particularly useful in the labour-intensive MRO industry with its high skill requirements. Developed countries face a dwindling availability of high-quality engineering talent, apart from an aging workforce. This provides a highly lucrative opportunity for Indian engineering talent to migrate to the West – a factor to consider in keeping or attracting talent to the MRO industry in India.

Multiple players, including Boeing, Airbus, Hindustan Aeronautics Limited (HAL), and Pratt & Whitney,<sup>35</sup> plan to set

up repair facilities in India. For instance, Boeing India has collaborated with Air Works to make India a repair development and sustainment hub.<sup>36</sup> Airbus has signed a Memorandum of Understanding (MoU) with GMR Group to explore collaboration opportunities across aviation services, technologies, and innovation.<sup>37</sup> HAL has signed an MoU with Air India Engineering Services Limited (AIESL) to provide MRO services.<sup>38</sup>

## Challenges facing the sector

### Support for attracting investment

India needs to position itself strategically to attract investment from OEMs and large MRO service providers across the globe. Countries such as Singapore and Malaysia were quick in creating attractive investment policies and offering significant tax credits to OEMs. For instance, these countries offered tax credits on reinvestment, which effectively meant that an OEM already generating revenues in Singapore or Malaysia could re-invest in these countries and enjoy significant tax credits on 50–60 percent of these investments. This policy has been the primary reason for OEMs to invest in a close cluster of countries.

India can consider the following steps to provide a fillip to the MRO industry and attract private investment into the sector:

- Introduction of weighted deduction for capital expenditure incurred by MRO service providers in relation to set-up/ operations of a facility in India
- Extension of a concessional corporate tax rate of 15 percent, recently introduced for new manufacturing companies, to MRO businesses as well; the extension to place India as a competitive investment destination amongst its Asian peers for global MRO players
- Introduction of an income-tax holiday for a specified period for MRO business, similar to the tax break recently provided to aircraft leasing business operating in the International Financial Services Centre (IFSC).

### Resolution of issues in the tax structure

To boost domestic MRO in India, the government has been trying to liberalise its tax and regulatory policies. Rationalising the GST rate on MRO services to 5 percent has been a welcome measure. However, the following uncertainties in tax structures still need attention:

- For supply of MRO services to domestic customers, refund of GST on inputs (goods) would be available given the inverted duty structure (i.e., a higher rate of GST on input than the output). However, refund of GST on input services is not available under the inverted duty structure scenario. Accordingly, accumulation of credit on this account would continue to be an area of concern.
- Refund of GST for MRO services (on account of export to offshore customers and inverted duty structure in a domestic scenario) involves a notable time and effort cost. This makes an adverse impact on working capital requirements.

- Concerns consistently raised by customs authorities with respect to the HSN classification and determination of applicable rates of customs duties on aircraft parts, could create tax uncertainties for MRO players in India.

### Regulation on maintenance technicians

Bringing policies and regulatory provisions in line with global aviation regulatory standards will foster growth and ensure quality. Aviation regulators decide the qualifications and certification criteria for technicians in the industry. Factory workers employed by the Indian MRO industry must pass a test conducted by the Director-General of Civil Aviation (DGCA) to be eligible for providing MRO services. In contrast, aviation factory workers in Europe and the US do not have to pass any examination.

DGCA licence holders are limited in number. Moreover, employing highly qualified people in place of highly skilled workers for relatively low-end jobs adversely affects the economics of MRO operators.

### Key initiatives to develop the sector

To tap the immense potential offered by the MRO sector, the central government has taken various initiatives. State governments have followed its lead. These initiatives focus on building high-quality infrastructure facilities, wider and deeper precision manufacturing capability, and a spare-part supply chain, alongside creating employment opportunities for skilled expertise.

These initiatives will also help the Indian MRO industry to overcome certain challenges, which have historically impeded the sector's growth. These include high set-up costs, multiple levels of certification, skill building, service quality and breadth of services, and a complex tax regime.

The government has made its intentions quite clear with initiatives announced to ensure the sector's sustainability and growth. The central government has taken the following initiatives to boost the sector's growth:

- Liberalised land rentals:** A scarcity of space is one of the biggest impediments to the growth of the Indian MRO market. Ideally, MRO facilities need to be located at an airport with cargo services as most parts are sourced overseas, and as high-value components are transported by air. Further, hangars are vital for the aviation industry as they are used to protect an aircraft from the elements during MRO processes. At present, India has only 19 conventional hangars, insufficient to provide the temporary protective storage for aircraft and meet the increasing demand for MRO services in the country.

In September 2021, under the Aatmanirbhar Bharat Abhiyan, the Airports Authority of India (AAI) has introduced an MRO policy with highly liberalised land rentals and abolished<sup>39</sup> royalties (revenue share payments to AAI). This may lead to

enhanced business for Indian MROs and help reverse the outflow of business, employment, and foreign exchange.

- Changes in land allotment policies:** Entities setting up MRO facilities will be allotted land for 30 years instead of the current three-to-five years. Under the new policy, the lease rental rate would be decided through bidding instead of the current pre-determined rates set by AAI. Land will be allotted through open tenders, not through allotment based on an entity's request. There will also be changes in the renewal of contracts of existing leaseholders.

On the expiry of existing contracts, land provided to MROs would be allotted through a bidding process. The existing MRO would have the right of first refusal if its bid is within 15 percent of that by the highest bidder, and it agrees to match the rates quoted by the highest bidder.

- New MRO policy to attract investment:** The government has identified eight airports for investment in MRO facilities: Begumpet (Telangana), Bhopal (Madhya Pradesh), Chennai (Tamil Nadu), Chandigarh, Delhi, Juhu (Maharashtra), Kolkata (West Bengal), and Tirupati (Andhra Pradesh).

To augment airport infrastructure, the government aims to develop 100 airports by 2024 (under the UDAN scheme) and invest US\$ 1.83 billion by 2026.

- Development of manufacturing ecosystem:** Under the Aatmanirbhar Bharat scheme, the central government focuses on developing defence and aerospace manufacturing ecosystem in the country. In a bid to support the scheme, some state governments, including Tamil Nādu, Karnataka, and Uttar Pradesh have introduced manufacturing corridors with one of the focuses being aeroparts in support of the ecosystem.
- Concessional GST on MRO services:** In April 2020, the central government lowered the GST rate from 18 percent to 5 percent on MRO services in respect of aircraft, aircraft engines, and other aircraft components/parts. Reducing GST rate on MRO services was a significant move in providing a level playing field to domestic service providers. Further, lower GST incidence is also aimed towards rationalising overall tax structure for the airlines especially given the uncertainty around full utilisation of input GST (GST input tax credit is not available to airlines on account of several factors, such as the exempt output international cargo services and exempt sectors).
- Export status available in respect of MRO services provided to recipients outside India:** Earlier MRO services provided outside India by foreign MRO service providers to airlines in India/outside India were not subject to GST unlike MRO services performed in India. To fix this disparity, the central government amended GST laws in April 2020 and

linked the taxability of such services to the service recipient's location. This amendment essentially resulted in an equitable tax position for both foreign and domestic MRO players such that MRO services for domestic service recipients are subject to GST, whether procured locally or from outside India. This has also helped offshore OEMs provide MRO services through sub-contractors in India in a tax efficient manner.

- **Income-tax measures:** The central government has undertaken a slew of measures on the income tax front to boost corporate investment (including foreign investment) and ease of doing business, which should attract MRO players to set up facilities in India:
  - **Reduction in corporate tax rates:** The government overhauled the corporate tax rate regime with effect from April 2019 and introduced reduced base tax rate of 22 percent for domestic companies<sup>i</sup> and 15 percent for new manufacturing companies<sup>ii</sup>, placing India as a competitive investment destination amongst its Asian and BRICS peers. Further, domestic companies opting for concessional tax rates have been exempted from Minimum Alternate Tax (MAT). For companies not opting for the concessional tax regime, the MAT base rate has been reduced to 15 percent (from 18.5 percent).
  - **Change in tax regime for dividends:** Under erstwhile provisions, a domestic company faced 20.56 percent Dividend Distribution Tax (DDT) on dividends declared/distributed/paid. Such dividend was consequently exempt for shareholders. To rationalise effective tax rates for Indian companies and promote foreign investments, DDT has been abolished and dividend is now taxed in the hands of the recipient i.e., shareholders with effect from April 2020. The change in dividend taxation policy entails significant benefits for non-resident investors as (a) most Indian tax treaties limit source taxation on dividends at 5/10 percent (in some cases, 15 percent), compared with DDT of 20.56 percent, and (b) tax on dividend paid in the source country is available as tax credit in the resident country, unlike DDT that was non-creditable.
  - **Other measures:** The government has taken other measures to boost ease of doing business and strengthen investor sentiment, such as (a) withdrawal of 'retrospective' effect of tax amendment introduced in 2012 relating to capital gains tax on indirect transfer of shares of an Indian company; (b) simplification of tax compliance and reduction of compliance burden on foreign taxpayers; non-residents earning income only in the nature of interest, dividend, royalty, and fee for technical services have been exempted from filing of tax returns in India, subject to adequate deduction of taxes at source; (c) introduction of dispute resolution scheme (Vivad se Vishwas) to reduce tax litigation; and

(d) ease in tax administration with introduction of faceless e-assessment and appeals.

- **Supporting infrastructure:** To encourage multinational companies to invest in India and source their maintenance services in India, the government has permitted 100 percent foreign direct investment in MRO via the automatic route. It has also liberalised the policy for borrowing and lending in foreign currency and rupees on competitive terms for MRO service providers. Additionally, the government has extended the stay of foreign aircraft in India for the entire duration of MRO work or six months, whichever is shorter.

Further, India changed its FDI regulations to allow investments of up to 74 percent in the defence manufacturing sector under the automatic route, as opposed to the previous 49 percent. This is an important decision for a sector that is looking to attract investment.

- **Aircraft financing/leasing support:** The government is making concerted efforts to attract new business into India through aircraft leasing, financing, and MRO operations. In the next 20 years, India will need 1,750–2,100 aircraft valued at more than US\$ 290 billion, with an estimated 100 deliveries each year, valued at about US\$ 5 billion of financing each year, according to predictions of Airbus and Boeing.

To drive development of Indian financial hubs, in October 2020, the Ministry of Finance designated an "aircraft lease" as a "financial product". Further, in the 2021-2022 Union Budget, the government announced that further tax incentives would be provided to promote aircraft leasing in GIFT City. These incentives include a tax holiday on capital gains of aircraft leasing companies and tax exemptions for aircraft lease rentals paid to a foreign lessor.

State governments have also taken the following steps to boost MRO:

- **June 2021:** The Haryana government announced an investment of INR 7,000 crore (about US\$ 938 million) in the aviation sector for the next five years. Additionally, the government will frame a Haryana Aerospace and Defence Policy to attract new MRO players to India.
- **September 2020:** The Rajasthan government signed an MoU with Shri Vallabh Pittie (SVP) International Group to develop facilities related to aviation, defence, and textiles.<sup>40</sup> The government has planned an investment of INR 4,000 crore (about US\$ 536 million) and the company has proposed developing a project for defence and aerospace, including an MRO facility.

<sup>i</sup> Subject to non-availing of specified exemptions/incentives

<sup>ii</sup> Companies incorporated on or after 1 October 2019, and commencing operations before 1 April 2023

- **August 2020:** The Uttar Pradesh government conceived the idea of creating Asia's biggest civil airport at Jewar. Covering 6,000 hectares, the airport will have an in-house MRO facility to attract foreign investment in the sector.
- **December 2019:** The Punjab Cabinet approved the leasing of four sites of 5,000 square feet each for the development of an MRO facility at Patiala Aviation Complex. This initiative could make Punjab a hub for the aviation and defence industries in the next few years.
- **August 2018:** The Karnataka government allowed Boeing to make aerospace components and set up an MRO at its aerospace special economic zone near the Devanahalli airport.<sup>41</sup>
- **State industrial policies:** Several states, including Maharashtra, Gujarat, Andhra Pradesh, and Chhattisgarh, increased incentives to encourage investment in MRO facilities.
- **April 2021:** Indian low-cost carrier IndiGo has extended a component support contract with European MRO Air France Industries KLM Engineering and Maintenance (AFI KLM E&M) for its Airbus A320 family aircraft, covering 350 aircraft. The services to be delivered include component repairs, dedicated pool access, provision of a main base kit at the hub of IndiGo's airline operations in Delhi, and logistics support.<sup>43</sup>
- **February 2021:** Boeing has signed a strategic collaboration with aviation services provider Air Works for the MRO of two key Boeing defence platforms in India – P-8I operated by the Indian Navy (IN) and the VIP transport fleet operated by the IAF. This is a significant step since the recently launched initiative for convergence between civilian and defence MRO. The Boeing India Repair Development and Sustainment (BIRDS) hub, aims to help develop a competitive MRO ecosystem in India.<sup>44</sup>

Recent developments involving Indian aviation (both civil and defence) also indicate the sector's growth:

- **September 2021:** The Ministry of Defence (MoD) has signed a contract with Airbus to acquire 56 C-295MW transport aircraft worth INR 20,000 crore (US\$ 2.7 billion) for the Indian Air Force. Of them, 16 aircraft will be delivered in a flyaway condition from Spain within 48 months of contract signing. The remaining 40 aircraft will be manufactured in India by the TATA consortium within 10 years of signing the contract.<sup>42</sup>
- **January 2021:** French aerospace provider Safran Group is seeking local partnerships in India for the long run. Safran has been a long-standing partner in India's aviation and defence journey for more than 65 years. It undertakes an assortment of activities ranging from design and production to services and is building and expanding its footprint in India.<sup>45</sup>
- **March 2020:** Air India Engineering Services Limited (AIESL) has been selected by Pratt & Whitney (a United Technologies company) to maintain its geared turbofan engines in India. AIESL will provide MRO services for PW1100G-JM engines at its Mumbai facility.<sup>46</sup>

Before completing deliveries, a 'D' level MRO servicing facility for the C-295 aircraft will be set up in India. This facility will act as a regional MRO hub for various variants of C-295 aircraft.

#### Sidebar - 1: Collaboration with the French aerospace industry

India has historically relied on aircraft manufactured in France and the country is India's oldest strategic partner for defence and aerospace equipment. The IAF uses Mirage and Rafale jets from Dassault. Airbus (headquartered in France) dominates the Indian civilian aircraft market and is the preferred choice of Indian airlines. Most of these aircraft are narrow-body and dominated by the Airbus 320 series.<sup>47</sup>

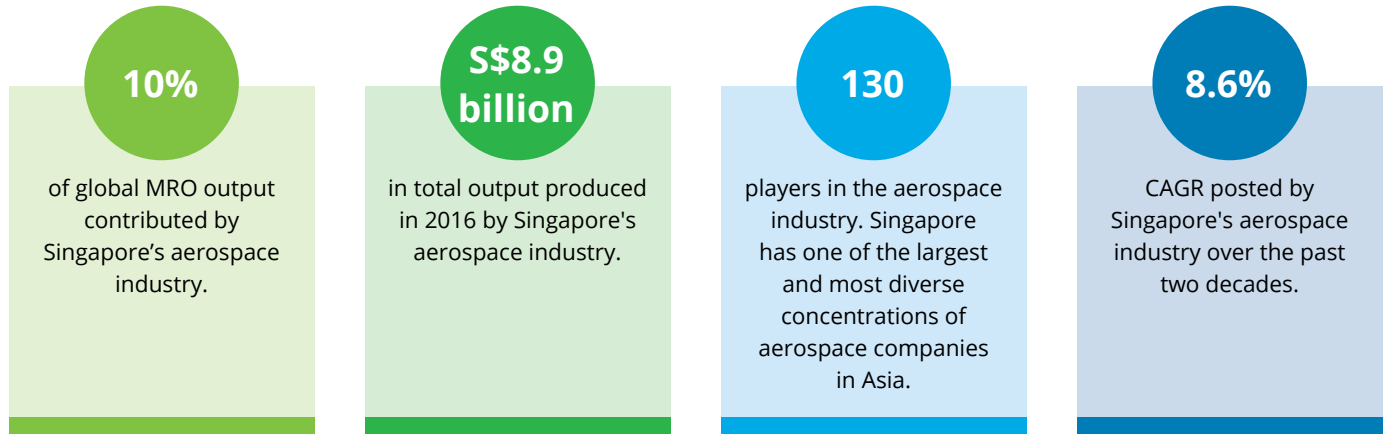
To support the Indian government's 'Make in India' initiative, Safran is expanding its supply chain in the country through Indian suppliers that have been qualified and integrated into its global supply chain. It is also working to establish production centres, such as the HAL/Safran joint venture based in Bangalore and Hyderabad. The company also plans to build an Indian supply chain for leading-edge aviation propulsion engines; it has already secured about EUR 200 million (about US\$ 231 million) under its offset obligation.<sup>48</sup>

Under the Shakti engine cooperation with HAL, Safran has set up a helicopter engine MRO joint venture and provided more than 70 percent technology for manufacturing. Once operational, the MRO centre will work to improve the repair and overhaul turn-time of military helicopter engines.<sup>49</sup>

The company is also looking to collaborate with the Defence Research and Development Organisation (DRDO) to develop a military engine for India's fighter programmes, including technology transfer.

**Sidebar - 2: Singapore case study**

**Singapore MRO: Key stats**



Singapore is a leading one-stop solutions provider for aircraft MRO. It contributes 10 percent to global MRO output. Major global aerospace leaders, such as Rolls-Royce and Airbus, have a long-term and significant footprint in Singapore.<sup>50</sup>

The Singaporean government has created an environment that attracts the global aerospace industry. The country is also a hub for the design and manufacturing of products used in MRO, which helps it cater to the largest share of the global MRO market. These include engine casings and gears, valves, avionics computers, engine fan blades, seat actuators, and electrical power systems.

The Singaporean aerospace and satellite industry has about 21,000 highly skilled and trained workers. They have a hands-on learning environment with access to real aircraft and support equipment, such as flight simulators at the Republic Polytechnic's 1,500 sqm aerospace hub (The ARCH).

The government of Singapore has also introduced programmes such as skills framework for aerospace, which help their citizens gain relevant skills in the aerospace industry. Additionally, the Economic Development Board of Singapore is capitalising on the specific skills in the country's MRO sector to establish more complex manufacturing activities in country.

**Singapore MRO: Key players<sup>51</sup>**

**AFI KLM E&M and Sabena technics**

Singapore Component Solutions, a joint venture of AFI KLM E&M and Sabena technics, supports A320 and ATR component repairs in Singapore.

**Bombardier**

Bombardier's Singapore service centre provides maintenance, refurbishment, and modification services to customers, and is introducing an aircraft painting facility, and will more than double the size of its integrated parts depot.

**Collins Aerospace**

Collins' Singapore facilities provide MRO services for actuation systems, interiors, composite nacelle systems, engine control, electrical power systems, sensors and integrated systems, engine components and other aerostructures.





EMERGENCY EXIT

# Conclusions

In a bid to encourage air service operators to take on aircraft maintenance within the country, the Indian government is changing policy and taking other steps, such as fiscal incentives, focus on operational aspects to drive ease of doing business in India, and initiatives to facilitate investment in the MRO sector. Trends in India continue to augur its emergence as one of the fastest-growing aviation markets in the post-COVID world.

Indian technology companies and solution providers (i.e., real-time big data, IA, VR, ML, and analytics) can help aerospace and defence manufacturers and MRO service providers to optimise existing capacity and execute maintenance effectively. It can help the industry leverage the vast volume of generated data using real-time big data and analytics applications.

Indian conglomerates can take the lead in setting up MRO facilities in the country. They can also leverage their relationship with aircraft OEMs and international airlines; some of which already offer high-quality MRO services in their home country, to establish robust MRO capabilities and infrastructure in India. This can be done on a sub-contract basis as well.

The aerospace industry faces a constant skill shortage. At present, the licensing of aircraft maintenance engineers as governed by CAR-66 procedures is relatively complex in the country. Workforce certification needs to be revised and streamlined while complying with regulations of the US Federal Aviation Authority (FAA) and European Union Aviation Safety Agency (EASA). This will ease the process for new players entering the market and boost the availability of talent in the country.

In addition, action is needed to facilitate investing and operating in MRO in India, as described below.

## Upgrading the ecosystem

Indian MRO service providers need to move up the value chain. They need to offer high-value services, such as the more extensive and demanding heavy maintenance ("C" and "D" checks) and modifications for aero engines, to compete with foreign vendors. Specialised agencies perform these tasks and involve approvals from global OEMs and regulators. Moreover, these services require technical know-how and investment in the required infrastructure in India.

The Indian MRO industry also needs to develop training infrastructure to close the gap with global counterparts in terms of specialised training facilities for complex checks and better growth opportunities for trained workforce.

## Streamlining supply chains

The MRO industry must continually look for ways to minimise operating costs, maximise fleet availability, and assure compliance with regulatory requirements.

In addition, supply chains must be streamlined to improve the cost and speed of maintenance. To run the process smoothly, MRO service providers are expected to interact with airlines and suppliers simultaneously. To offer regulator-approved services, meet future challenges, and remain competitive, they need sophisticated supply chain management.

Further, the government could consider the following measures to promote aircraft manufacturers to set up an MRO base in India and make the import of MRO services in the country less lucrative:

- Incentivise large international MRO players to start offering services domestically, by themselves or with Indian MRO partners.
- Streamline the approval process for heavy maintenance services so that Indian MROs are not deterred by stringent regulations and approvals that must be obtained from global OEMs and regulators. Such OEM approvals bundled with large government contracts can promote growth in the sector.
- Focus on airport capacity enhancement, infrastructure augmentation and modernisation, tariff-related and other regulatory issues, and airport capital expenditure targets.
- Calibrate tax structure to incentivise new investments into the sector. This could be by way of addressing GST costs emanating from restrictions in respect of refund of input GST towards services; introducing favourable capex amortisation rules for new investments towards building and upgrading MRO facility (e.g., weighted deduction on capital expenditure); extending the benefit of concessional corporate tax rate/ income-tax holiday to MRO service providers.

To be globally competitive MRO players must have the volume and scale of services, technical expertise, suitable access to the supply chain, and digitised infrastructure capability

to offer substantial value to their end customers while withstanding competition.

As the aviation market in India grows to the third largest market globally and matures, India is positioning itself to provide the required ecosystem to support such growth. One such focus area is aircraft MRO activities. Currently, most of the MRO work is outsourced to foreign players due to the lack of local MRO propositions. The Indian MRO industry has always had huge potential due to high-growth projections in air traffic, strategic location, and lower labour costs; however, profitability has remained elusive. On the domestic front, complex tax regulations and lack of infrastructure have hindered financial returns, and on the international side, overseas MROs have been more successful due to their ability

to fulfil domestic as well overseas demand, and an ability to offer competitive prices.

The government of India has demonstrated its commitment to driving the aviation ecosystem with positive changes in the tax policy and other regulatory framework aimed at driving both ease of doing business in India and improving the commercial outlook for the MRO sector. It is now expected that the MRO industry will take the initiative to position the sector in India for long-term sustainable success.

The MRO runway in India is set for takeoff; the time is now.

# Endnotes

- 1 Navigating COVID-19 and beyond: Policy impetus for the Aerospace and Defence sector, Deloitte, June 2020, <https://www2.deloitte.com/content/dam/Deloitte/in/Documents/about-deloitte/in-manufacturing-covid-ad-noexp.pdf>
- 2 Lee Ann Shay, Lindsay Bjerregaard, Sean Broderick, Michael Bruno, James Pozzi, MRO Market Changes And Trends To Expect In Pandemic Recovery, Aviation Week Network, April 2021, <https://aviationweek.com/mro/mro-market-changes-trends-expect-pandemic-recovery>
- 3 D Anand Bhaskar, A lift for MRO, The Hindu – Businessline, June 2021, <https://www.thehindubusinessline.com/specials/flight-plan/a-lift-for-mro/article34998721.ece>
- 4 India Brand Equity Foundation (IBEF), “Aviation”, March 2021, <https://www.ibef.org/download/Aviation-March-2021.pdf>
- 5 Aero-engine mro: market outlook in india, SP Guide Publications, January 2019, <https://www.spsairbuz.com/story/?id=863&h=Aero-Engine-MRO-Market-Outlook-in-India>
- 6 Management discussion & analysis report (2019-20), Air India Engineering Services Limited (AIESL), <https://www.airindia.in/images/pdf/AIESL-English.pdf>
- 7 Gujarat Infrastructure Development Board, “Aviation MRO opportunities”, October 2021, <https://www.gidb.org/aviation-mro-opportunities>
- 8 Mini Tejaswi, MRO growth to help create jobs: skill council, The Hindu, April 2021, <https://www.thehindu.com/business/Industry/mro-growth-to-help-create-jobs-skill-council/article34275162.ece>
- 9 Tom Cooper, Ian Reagan, Chad Porter, Carlo Fanzoni, “Global fleet and MRO market forecast, 2021-2031, Oliver Wyman, January 2021, <https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2021/MRO%202021%20Master%20file.pdf>
- 10 Aircraft MRO Market Overview with Detailed Analysis, Competitive landscape and Forecast to 2027, EIN Presswire, January 2020, [https://www.einnews.com/pr\\_news/507043032/aircraft-mro-market-overview-with-detailed-analysis-competitive-landscape-andforecast-to-2027](https://www.einnews.com/pr_news/507043032/aircraft-mro-market-overview-with-detailed-analysis-competitive-landscape-andforecast-to-2027)
- 11 Sri Lanka to invest in MRO facilities at Mattala Rajapaksa Airport, Airport Technology, November 2020, <https://www.airport-technology.com/news/sri-lanka-mattala-rajapaksa-international-airport/>
- 12 SriLankan Engineering, e-brochure, <https://www.srilankan.com/mro/>
- 13 Govt. signs share purchase agreement with Tata Sons for ₹18,000 crore Air India deal, The Hindu, October 2021. <https://www.thehindu.com/business/Industry/govt-signs-share-purchase-agreement-with-tata-sons-for-18000-crore-air-india-deal/article37162689.ece>
- 14 The French Ministry of Armed Forces entrusts the maintenance of its Fennec helicopters to Sabena technics, Sabena technics Newsroom, September 2021, <https://www.sabenatechnics.com/newsroom/the-french-ministry-of-armed-forces-entrusts-the-maintenance-of-its-fennec-helicopters-to-sabena-technics>
- 15 AAR announces multi-year agreement with United Airlines for heavy maintenance services in Rockford, IL and significantly grows local workforce, AAR News Article, April 2021, <https://www.aarcorp.com/aar-announces-multi-year-agreement-with-united-airlines-for-heavy-maintenance-services-in-rockford-il-and-significantly-grows-local-workforce/>
- 16 Sabena technics expands its partnership with Honeywell, Sabena technics Newsroom, March 2021, <https://www.sabenatechnics.com/newsroom/sabena-technics-expands-its-partnership-with-honeywell>

- 17 Hindustan Aeronautics and Rolls Royce expand partnership, Business Standard, February 2021, [https://www.business-standard.com/article/news-cm/hindustan-aeronautics-and-rolls-royce-expand-partnership-121020501651\\_1.html](https://www.business-standard.com/article/news-cm/hindustan-aeronautics-and-rolls-royce-expand-partnership-121020501651_1.html)
- 18 Safran and Lufthansa Technik sign MRO partnership agreement for A380 landing gear, Safran Pressroom, March 2020, <https://www.safran-group.com/pressroom/safran-and-lufthansa-technik-sign-mro-partnership-agreement-a380-landing-gear-2020-03-04>
- 19 Sanad Aerotech Becomes Maintenance Center for LEAP Engines, GE Aviation, Press Release, November 2019, <https://www.geaviation.com/press-release/genx-engine-family/sanad-aerotech-becomes-maintenance-center-leap-engines>
- 20 New tech of inflatable hangars poised to take off in Indian aircraft maintenance industry, Hindustan Times, June 2021, <https://www.hindustantimes.com/cities/mumbai-news/new-tech-of-inflatable-hangars-poised-to-take-off-in-indian-aircraft-maintenance-industry-101622915304922.html>
- 21 MTU Maintenance Signs Exclusive Contract with New Airline Air Sial, Aviation Pros Press Release, January 2021, <https://www.aviationpros.com/aircraft/maintenance-providers/mro/press-release/21205566/mtu-maintenance-hannover-gmbh-mtu-maintenance-signs-exclusive-contract-with-new-airline-air-sial>
- 22 Help reduce operational disruptions and unplanned maintenance with data driven insights, Maintenance Insight, November 2019, [https://www.ge.com/digital/sites/default/files/download\\_assets/flight-analytics-maintenance-insight.pdf](https://www.ge.com/digital/sites/default/files/download_assets/flight-analytics-maintenance-insight.pdf)
- 23 7 Ways Airlines Use Artificial Intelligence and Data Science to Improve Operations, altexsoft, July 2018, <https://www.altexsoft.com/blog/datascience/7-ways-how-airlines-use-artificial-intelligence-and-data-science-to-improve-their-operations/>
- 24 GE cuts costs by 35% in move from casting to 3D printing technology, 3D Printing Industry News, May 2021, <https://3dprintingindustry.com/news/ge-cuts-costs-by-35-in-move-from-casting-to-3d-printing-technology-189798/>
- 25 Unlock the full potential of aviation data. Skywise emphasises smart, insightful, AI-driven analytics, Airbus, <https://aircraft.airbus.com/en/services/enhance/skywise/digital-solutions>
- 26 Aftermarket services: Transforming manufacturing in the wake of the COVID-19 pandemic, Deloitte Insights, May 2020, <https://www2.deloitte.com/us/en/insights/industry/manufacturing/aftermarket-services-digital-differentiator-beyond-COVID-19.html>
- 27 Management discussion & analysis report (2019-20), Air India Engineering Services Limited (AIESL), <https://www.airindia.in/images/pdf/AIESL-English.pdf>
- 28 Tom Cooper, Ian Reagan, Chad Porter, Carlo Fanzoni, “Global fleet and MRO market forecast, 2021-2031, Oliver Wyman, January 2021, <https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2021/MRO%202021%20Master%20file.pdf>
- 29 IndiGo Takes New Aircraft But Fleet Size Unchanged: Here's Why, Simple Flying, July 2021, <https://simpleflying.com/indigo-deliveries-a320-retirement/>
- 30 SpiceJet to resume Boeing 737 MAX flights from October 5, Economic Times, September 2021, <https://economictimes.indiatimes.com/industry/transportation/airlines/-aviation/spicejet-to-resume-boeing-737-max-flights-from-october-5/articleshow/86544961.cms?from=mdr>
- 31 GoAir places order for 144 P&W engines to power its A320Neo planes, Livemint, November 2019, <https://www.livemint.com/companies/news/goair-places-order-for-144-p-w-engines-to-power-its-a320neo-planes-11574261418582.html>
- 32 Civil aircraft manufacturing in India, SP's airbus, Issue: 4 / 2018, <https://www.spsairbus.com/story/?id=711&h=Civil-Aircraft-Manufacturing-in-India>
- 33 India's Tata gets IP rights for German platform to build military aircraft, Airforce Technology, February 2021, <https://www.airforce-technology.com/news/indias-tata-gets-ip-rights-for-german-platform-to-build-military-aircraft/>
- 34 IAF signs deal with French Air Force to purchase phased out Mirage aircraft, Business Standard, September 2021, [https://www.business-standard.com/article/current-affairs/iaf-signs-deal-with-french-air-force-to-purchase-phased-out-mirage-aircraft-121091800401\\_1.html](https://www.business-standard.com/article/current-affairs/iaf-signs-deal-with-french-air-force-to-purchase-phased-out-mirage-aircraft-121091800401_1.html)

- 35 Pratt & Whitney maintenance facility to be set up in Mumbai see slow progress due to GST issue?, Hindustan Times, Dec 2020, <https://www.hindustantimes.com/mumbai-news/pratt-whitney-maintenance-facility-to-be-set-up-in-mumbai-see-slow-progress-due-to-gst-issue/story-7MoLVKMFUN87jhuGR43oM.html>
- 36 Boeing and Air Works Announce Strategic Collaboration for Maintenance Support of Key Defence Platforms, Boeing News Releases, February 2021, <https://www.boeing.co.in/news-and-media-room/news-releases/2021/february/boeing-and-air-works-announce-strategic-collaboration-for-maintenance-support-of-key-defence-platforms.page>
- 37 Airbus signs MoU with GMR Group to collaborate on aviation services in India, Airbus Press Releases, February 2021, <https://aircraft.airbus.com/en/newsroom/press-releases/2021-02-airbus-signs-mou-with-gmr-group-to-collaborate-on-aviation-services-in-india>
- 38 Airport Authority Offers Land At Eight Airports To Set Up Maintenance, Repair & Overhaul Facility; Invites Bids, Swarajya, March 2021, <https://swarajyamag.com/news-brief/airport-authority-offers-land-at-eight-airports-to-set-up-maintenance-repair-overhaul-facility-invites-bids>
- 39 Government announces new MRO policy for civil aviation space; seeks to attract investments, Economic Times, September 2021, <https://economictimes.indiatimes.com/industry/transportation/airlines-/aviation/government-announces-new-mro-policy/articleshow/86064968.cms?from=mdr>
- 40 SVP Group inks MoU with Rajasthan govt to invest Rs 4,000 crore in aviation, textile sectors, Moneycontrol, September 2020, <https://www.moneycontrol.com/news/world/svp-group-inks-mou-with-rajasthan-govt-to-invest-rs-4000-crore-in-aviation-textile-sectors-5791281.html>
- 41 Pb Cabinet gives nod to setting up of MRO facility at Patiala Aviation Complex,, Business Standard, December 2019, [https://www.business-standard.com/article/pti-stories/pb-cabinet-gives-nod-to-setting-up-of-mro-facility-at-patiala-aviation-complex-119121901326\\_1.html](https://www.business-standard.com/article/pti-stories/pb-cabinet-gives-nod-to-setting-up-of-mro-facility-at-patiala-aviation-complex-119121901326_1.html)
- 42 MoD signs contract with Airbus Defence & Space, Spain for acquisition of 56 C-295MW transport aircraft for IAF, Press Information, Bureau, September 2021, <https://pib.gov.in/PressReleasePage.aspx?PRID=1757634>
- 43 IndiGo reconfirms its trust in Air France Industries KLM Engineering & Maintenance for its Airbus A320 Fleet component support, AirFrance Industries Press Releases, April 2021, <https://www.afiklmem.com/en/press-release/14042021-indigo-a320-component-support>
- 44 Boeing in strategic tie up with Air Works for MRO of P-8I, VIP transport fleet, BusinessLine, February 2021, <https://www.thehindubusinessline.com/news/national/boeing-in-strategic-tie-up-with-air-works-for-mro-of-p-8i-vip-transport-fleet/article33752728.ece>
- 45 Aero-India: We are in India for a long run and seeking more local partnerships, says Safran Executive Vice President, International and Public Affairs, Financial Express, February 2021, <https://www.financialexpress.com/defence/aero-india-we-are-in-india-for-a-long-run-and-seeking-more-local-partnerships-says-safran-executive-vice-president-international-and-public-affairs/2186725/>
- 46 AIESL to provide Pratt & Whitney GTF engines' MRO in India, Aerospace Technology, March 2020, <https://www.aerospace-technology.com/news/aiesl-to-provide-pratt-whitney-gtf-engines-mro-in-india/>
- 47 IAF signs deal with France to purchase phased out Mirage-2000 fighter aircraft, ThePrint, September 2021, <https://theprint.in/defence/iaf-signs-deal-with-france-to-purchase-phased-out-mirage-2000-fighter-aircraft/735904/>
- 48 Aero-India: We are in India for a long run and seeking more local partnerships, says Safran Executive Vice President, International and Public Affairs, Financial Express, February 2021, <https://www.financialexpress.com/defence/aero-india-we-are-in-india-for-a-long-run-and-seeking-more-local-partnerships-says-safran-executive-vice-president-international-and-public-affairs/2186725/>
- 49 HAL, French firm Safran ink MoU for strategic cooperation on high-thrust aero-engines, The New Indian Express, <https://www.newindianexpress.com/nation/2021/feb/05/hal-french-firm-safran-ink-mou-for-strategic-cooperation-on-high-thrust-aero-engines-2260028.html>
- 50 Frederic Gomer, Giving wings to Aviation MRO in Singapore, Singapore Business Review, 2019, <https://sbr.com.sg/aviation/commentary/giving-wings-aviation-mro-in-singapore>
- 51 EDB Singapore, Singapore's Aerospace Industry: Key Facts & Figures, February 2020, <https://www.edb.gov.sg/content/dam/edb-en/our-industries/aerospace/EDB-Aerospace-Industry-Brochure.pdf>

# Connect with us

[industryprogin@deloitte.com](mailto:industryprogin@deloitte.com)



Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee (“DTTL”), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as “Deloitte Global”) does not provide services to clients. Please see [www.deloitte.com/about](http://www.deloitte.com/about) for a more detailed description of DTTL and its member firms.

This material is prepared by Deloitte Touche Tohmatsu India LLP (DTTILLP). This material (including any information contained in it) is intended to provide general information on a particular subject(s) and is not an exhaustive treatment of such subject(s) or a substitute to obtaining professional services or advice. This material may contain information sourced from publicly available information or other third party sources. DTTILLP does not independently verify any such sources and is not responsible for any loss whatsoever caused due to reliance placed on information sourced from such sources. None of DTTILLP, Deloitte Touche Tohmatsu Limited, its member firms, or their related entities (collectively, the “Deloitte Network”) is, by means of this material, rendering any kind of investment, legal or other professional advice or services. You should seek specific advice of the relevant professional(s) for these kind of services. This material or information is not intended to be relied upon as the sole basis for any decision which may affect you or your business. Before making any decision or taking any action that might affect your personal finances or business, you should consult a qualified professional adviser.

No entity in the Deloitte Network shall be responsible for any loss whatsoever sustained by any person or entity by reason of access to, use of or reliance on, this material. By using this material or any information contained in it, the user accepts this entire notice and terms of use.