FICCI

GLOBAL AVIATION SUMMIT 2019

15 – 16 January 2019 | The Grand Hyatt, Mumbai



Vision 2040

for the

Civil Aviation Industry in India

Knowledge Partner

KPMG

FICCI

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सत्यमेव जयते

प्रधान मंत्री
Prime Minister



MESSAGE

It is a pleasure to learn that Ministry of Civil Aviation, Airports Authority of India and FICCI are organising the Global Aviation Summit on 15-16 January at Mumbai. The theme – "Flying for All" is highly relevant and appropriately timed.

The 21st century is an era of connectivity, where physical distances have ceased to exist. With technological innovations and fast-paced communication, the concept of global village has today become a reality. The global citizens travel over long distances, providing a boost to travel and tourism. Aviation industry is one of the most critical sectors, as it generates employment and fuels economic growth.

Our Government has launched 'UDAN' (Ude Desh ka Aam Nagrik) Yojana to ensure that air travel becomes increasingly affordable for the common people. We have also implemented a regional connectivity scheme to link smaller airports to India's aviation circuit.

The Summit is an ideal platform to discuss various challenges in connecting the world through 'Flying for All'. Technology driven innovations will further reduce travel time and distances. It will also enable national and international experts to share their experiences, as well as showcase the latest technology that will usher in a revolution in the aviation industry.

I am sure that the deliberations at the summit will come up with practical suggestions to embrace latest technology, improve infrastructure and make air travel increasingly faster and safer.

Best wishes for fruitful deliberations and all-round success of Global Aviation Summit 2019.

(Narendra Modi)

New Delhi
11 January, 2019

सुरेश प्रभु
SURESH PRABHU

मंत्री
वाणिज्य एवं उद्योग;
एवं
नागर विमानन मंत्रालय
भारत सरकार, नई दिल्ली
MINISTER
COMMERCE & INDUSTRY;
and
CIVIL AVIATION
GOVERNMENT OF INDIA, NEW DELHI



MESSAGE

Air travel has seen massive growth around the world with hundreds of millions of people joining the global middle class. India, in particular, has seen an extraordinary growth in its aviation sector. As flying is becoming more affordable in India and smaller towns are being included on the aviation map, it is a suitable time to take forward **the vision of Shri Narendra Modi, Hon'ble Prime Minister of India of making the common citizen fly through the flagship Regional Connectivity Scheme - UDAN.**

2. The platform provided by Global Aviation Summit, the 1st ever comprehensive aviation event, would enable eminent dignitaries from different corners of the world to speak about various aviation policies and plans. With a shared ambition of enabling flying for all, the dignitaries would be able to discuss more effectively on how to connect the world through air transport.

3. I am hopeful that this event will be immensely fruitful for policy making in India as well as in other emerging countries within the aviation sector.

4. I wish the event all the success.

(Suresh Prabhu)

Ministry of Commerce & Industry: Udyog Bhawan, Rafi Marg, New Delhi-110011.
Tel. 91-11-23062223, 23061492, 23061008, Fax: 91-11-23062947, E-mail : cimoffice@nic.in
Ministry of Civil Aviation: Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi-110003.
Tel: 91-1124610351, 24632991, Fax : 91-11-24610354, E-mail : hm.moca@nic.in

जयंत सिन्हा
Jayant Sinha

सत्यमेव जयते

नागर विमानन राज्य मंत्री
भारत सरकार
नई दिल्ली-110003
MINISTER OF STATE FOR CIVIL AVIATION
GOVERNMENT OF INDIA
NEW DELHI-110003



MESSAGE

India is currently the third largest domestic civil aviation market in the world: it is forecast to soon become the third largest overall aviation market. With around 200 million passenger trips annually now, we foresee Indian aviation market to grow more than five times to a billion trips in the next decade or two. Indeed, we are building our infrastructure with such a vision.

Our airlines, airports and other stakeholders in the aviation community have worked hard to offer world-beating and yet low-cost services to the consumer. This has led the Aviation sector in India to emerge as one of the fastest growing sectors during the last five years. It is a matter of pride that even as passenger traffic, number of planes and number of airports have increased dramatically, our safety, quality and customer service scores have improved substantially.

India is open for business. India has amongst the most liberal Foreign Direct Investment (FDI) policies in the aviation sector across the world. We allow 100% FDI in airports and many other associated businesses and a significant minority position in airlines. We are liberal in our Open-Sky-Policy and have allowed many ports of call within the country. We incentivize Make in India for anyone wanting to set up their manufacturing base here in India.

There are global challenges in aviation: safety and security, tackling climate change, and the new, nascent and emerging technology of drones. These challenges will require international coordination in setting standards and deploying effective counter-measures without hampering customer convenience or growth.

I am confident that this global event will give the participants an idea of opportunities in inherent in Indian aviation and offer a platform to discuss on global challenges. I expect the deliberations and networking will be immensely useful for the participants.

I wish the event all success.

(Jayant Sinha)

January 7, 2019

360, राजीव गांधी भवन, सफदरजंग एयरपोर्ट, नई दिल्ली-110003 दूरभाष : 011-24627231, 24626001, फैक्स : 011-24652113
360, Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi-110 003 Tel. : 011-24627231, 24626001 Telefax 011-24652113
E-mail : mos-aviation@gov.in

आर. एन. चौबे, भा. प्र. से.
R. N. Choubey, I. A. S.

सत्यमेव जयते

सचिव
भारत सरकार
नागर विमानन् मंत्रालय
नई दिल्ली-110 003
SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF CIVIL AVIATION
NEW DELHI-110 003

January 8, 2019.



MESSAGE

Aviation is one of the most "global" industries: connecting people, cultures and businesses across continents. To maximize the benefits of air transport, it is necessary for all stakeholders and partners to work together and support the sustainable growth of aviation by connecting more people and more places, more often.

2. The Global Aviation Summit is taking place at an opportune time. As the Indian aviation sector has demonstrated a growth trend which sets an example for other emerging aviation countries, India is the most appropriate location for such an event, which aims to bring together members of the aviation fraternity from across the globe.

3. I am happy that Ministry of Civil Aviation, Airports Authority of India and FICCI are jointly organising the Global Aviation Summit and I wish this endeavour all the success.

(R.N. Choubey)

RAJIV GANDHI BHAWAN, SAFDARJUNG AIRPORT, NEW DELHI-110 003
TEL. : 011-24610358, FAX : 011-24602397 E-mail : secy.moca@nic.in

Sandip Somany
President

Federation of Indian Chambers of Commerce and Industry
Federation House
Tansen Marg
New Delhi 110001
T +91 11 2335 7364
F +91 11 2332 9369
E president@ficci.com,
www.ficci.in
CIN: U99999DL1956NPL002635
ISO 9001 : 2015 Certified



MESSAGE

I compliment the Ministry of Civil Aviation, Government of India for taking this important initiative of organising the Global Aviation Summit on 15th-16th January 2019 in Mumbai with the overarching theme "Flying for All"

The Indian aviation sector is on a high growth path which is currently among the top seven global aviation markets. It is expected to become the third largest market in the world by 2022. India now handles the third largest domestic traffic after USA and China. It is likely that growth of this sector will be further boosted.

However, the unprecedented growth being witnessed in the Indian aviation sector is still significantly lower than its untapped potential. This opens opportunities for investment in new growth areas in the domain of civil aviation. As this programme will bring all key stakeholders of the global aviation sector on one platform, I am confident that the deliberations in the Global Aviation Summit will further facilitate growth of this important segment of our national economy.

I wish the Summit all the success.

I wish the Summit all the success.

10 January 2019

Sandip Somany

Foreword



Amber Dubey
Partner and Head - Aerospace and Defence
KPMG in India
adubey@kpmg.com



Manoj Mehta
Head - Civil Aviation
FICCI
manoj.mehta@ficci.com

India's civil aviation industry is the pride of the nation. It is playing a key role in connecting Indians to the remotest corners of the country and to the world. It is bringing people from the across the world to discover the huge business and tourism opportunities in India.

In December 2018, Indian aviation completed 52 consecutive months of double digit growth. With a growing economy, rising incomes, supportive policy environment and intense competition among airlines, the growth story is likely to continue. The rapid expansion in India's airport and air navigation infrastructure will fuel it further.

With just 187 million passengers (to, from and within India) in FY 2017-18, many believe this is just the tip of the iceberg. The best of Indian aviation is yet to come.

This Vision 2040 document highlights the growth potential in different sub-sectors of Indian aviation and the key action steps required thereof. We hope that this document leads to further deliberations and fine-tuning of the path to 2040.

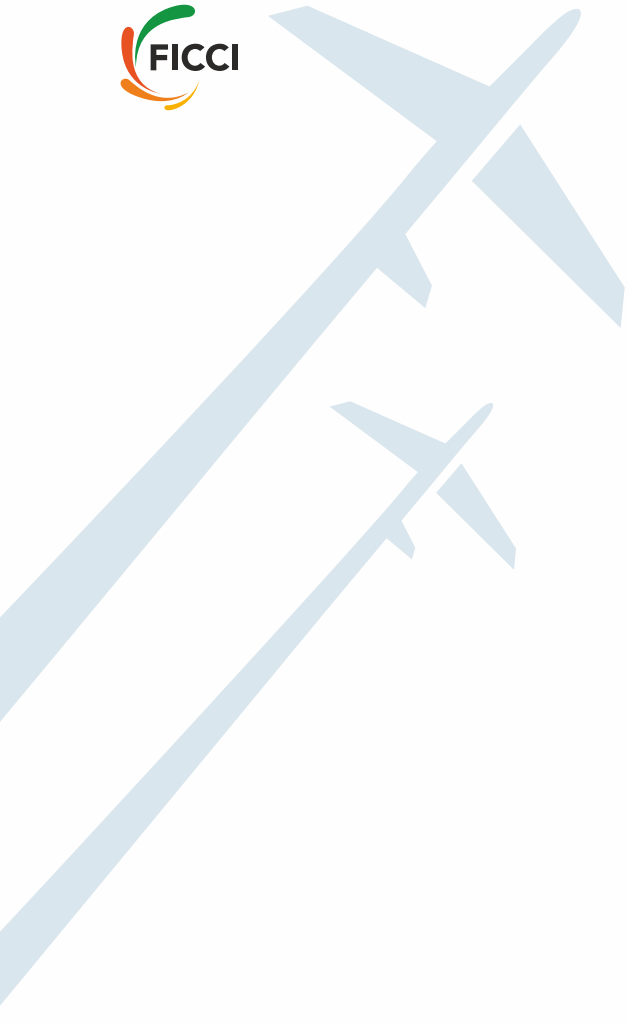
A vision is only as good as its execution. With growing collaboration between the policymakers, industry and academia, we believe that India can surprise the world by not just meeting but exceeding the Vision 2040 targets.

KPMG thanks FICCI for the opportunity collaborate on this important initiative. We look forward to your kind insights and feedback at manoj.mehta@ficci.com and adubey@kpmg.com.



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Executive Summary



Executive Summary

India is the seventh-largest country by area and the second-most populous with over 1.35 billion people. It is one of the fastest growing economies of the world and is likely to become the fifth largest in 2019.

The Indian aviation market is on a high growth path. Total passenger traffic to, from and within India, during Apr-Nov 2018 grew by around 15% year on year as compared to around 6% globally. India is now the seventh largest aviation market with 187 million passengers (to, from and within India) in FY 2017-18. It is expected to become the third largest by 2022.

This growth is being driven by a growing economy, rising incomes, intense competition among airlines and a supportive policy environment. The National Civil Aviation Policy (NCAP 2016) signaled the government's intent to radically alter the sector's growth trajectory. NCAP's flagship program - Regional Connectivity Scheme (RCS or UDAN) is taking flying to the masses by offering subsidised fares as low as USD 35 for a one hour flight. The government decided to privatise its national carrier Air India and helicopter company Pawan Hans, something unthinkable in the past.

Initiatives like Nabh Nirman (for airport capacity augmentation), Digi Yatra (for paperless travel) and AirSewa (for online passenger grievance redressal) etc. are bringing in radical changes. The tax structure for Aviation Turbine Fuel (ATF), Maintenance, Repair and Overhaul (MRO) and aircraft leasing may be gradually aligned with leading global jurisdictions.

If the trend continues, India would become one of the top aviation hubs by 2040. The passenger traffic is expected to grow six-fold to around 1.1 billion. India has one of the largest aircraft order books currently with pending deliveries of over 1000 aircraft. Its commercial airline fleet is likely to grow from 622 in March 2018 to around 2359 in March 2040.

India may have around 190-200 operational airports in 2040. Its top 31 cities may have two airports and the cities of Delhi and Mumbai three each. The incremental land requirement is expected to be around 150,000 acres and the capital investment (not including cost of acquiring land) is expected to be around USD 40-50 billion.

The government may consider establishing a Nabh Nirman Fund (NNF) with a starting corpus of around USD 2 billion to support low traffic airports in their initial phases. The concept of land pooling may be used to keep land acquisition costs low and to provide landowners with high value developed plots in the vicinity of the airports.

Air cargo throughput is projected to quadruple to 17 million tons in FY 2040. Cargo processing will be completely paperless and dwell times reduced to just 1-2 hours. India's freighter fleet is likely to expand multifold with the growth in e-commerce. India will gradually become a trans-shipment hub for entire South Asia.

With conducive policies and a large fleet of over commercial and military aircraft, India will build

its indigenous aircraft manufacturing industry in collaboration with global OEMs. By 2040, India will assemble nearly 70% of its commercial aircraft demand and also export to other countries.

India will establish its own aircraft leasing industry which may handle almost 90% of aircraft being ordered in India by 2040. India's tax structure and repossession processes will be equally or more attractive than those in leading global jurisdictions.

A significant course correction in policies, taxation and customs procedures will enable growth of India as a global MRO hub by 2040, handling nearly 90% of the MRO requirements of large Indian carriers.

General aviation (GA) will become an integral part of India's aviation eco-system, driven by remote area connectivity, tourism and disaster management programs. The elitist tag and high tax incidence on GA may gradually go away.

By 2040, India will witness a boom in usage of drones and helicopters, especially in urban commuting and medical evacuation. With a supportive policy regime, India could become a global leader in research, design and manufacturing of drones and anti-drone systems. There could be over 200 amphibious aircraft located across India's coastline and waterbodies.

Over the next 5-8 years, all Indian aircraft will be flying on the satellite-based GAGAN system developed by AAI and ISRO. This will lead to better airspace utilisation and safer operations despite reduced aircraft separation. GAGAN signals will also be used by other sectors like shipping, highways, railways and agriculture etc.

Ground handling and airport operations will be highly automated and driven by electric ground support equipment. Check-in, bag drop, immigration clearance, retail shopping etc. will be automated, with minimal human intervention. Indian airports will invest heavily in cloud computing capabilities, which will enable integration of different safety and security data sets such as security camera feeds, facial recognition, luggage scans, security incident reports etc.

India will witness a massive upgrade of its aviation education and skilling infrastructure. Its affordable and high-quality aviation education system will attract students from across the globe.

DGCA may be converted into a fully-independent Civil Aviation Authority, with its own sources of funding and freedom to recruit professionals at market-linked salaries. Most transactions with DGCA will be automated with minimal human interface.

Vision 2040 is only as good as its execution. Implementation of Vision 2040 will require a robust monitoring mechanism under the leadership of the Hon'ble Minister of Civil Aviation. A duly empowered Vision 2040 Program Management Unit (VPMU) will need to be established. It will be supported by Vision 2040 Task Forces (VTF) for separate sub-sectors. VTF's monthly report should be shared with the public.

Indian aviation's Vision 2040 targets are lofty and aspirational. The road to 2040 will not be easy. The Indian government, industry and academia will need to work closely together. India will also need to collaborate with aviation leaders across the globe for knowledge and advice.

With the right policies and a relentless focus on execution, India can surprise the world by not just meeting but exceeding the Vision 2040 targets. We'll get there.

01 Introduction



01 Introduction

1.1 India at a glance

India is the seventh-largest country by area and the second-most populous with a population of over 1.35 billion. India is one of the fastest growing economies of the world and is likely to become the fifth largest in 2019.

The history of the Indian subcontinent dates back 5000 years to the Indus Valley civilization which gives it its name. It is a melting pot of all major religions of the world - Hinduism, Islam, Sikhism, Christianity, Buddhism, Jainism, Judaism and Zoroastrianism. It has a rich bio-diversity with Himalayas in the North, the Thar Desert in north-west, Bay of Bengal to its east and Arabian Sea to its west; with various rivers and forests across the country.

A nuclear weapon state, India shares its land border with two other nations with nuclear capability - China and Pakistan - and countries like Nepal, Bhutan, Bangladesh and Myanmar. It has the third largest standing army in the world and the fifth largest defence budget. It has a robust space program with the capability to launch its own satellites. Its leading industries include IT, pharmaceuticals, automotive and telecom.

India is parliamentary democracy with and independent judiciary and free media. It has 29 states and 7 union territories with a huge diversity in terms of language, cuisine and culture.

1.2 Indian aviation industry

The Indian aviation market is on high growth path. Despite global headwinds on crude oil and currency, domestic passenger traffic in the period Jan-Nov 2018 grew by 19.2% year on year. Total passenger traffic to, from and within India, during Apr-Nov 2018 grew by around 15% year on year.

As per IATA, the number of global departures during calendar year 2018 is projected at around 4.3 billion, a growth of 6% over the previous year. In contrast, in December 2018, India completed 52 consecutive months of double digit growth. Yet, many feel, India is just scratching the surface.

This stupendous growth has catapulted India to among the top seven aviation markets with 187 million passengers (to, from and within India) in FY 2017-18. India today handles the third largest domestic traffic after USA and China. It is expected to become the third largest market (domestic plus international) by 2022 and gradually reduce the gap with the top two nations over the next decade.

1.3 The growth drivers

The civil aviation industry is vulnerable to several intrinsic and extraneous risks. These include economic boom and bust cycles, volatility in oil price and exchange rates, natural disasters, epidemics, infrastructure challenges, protectionism, wars and political upheavals etc.

The Indian civil aviation industry has managed to exhibit significant resilience against these risks over the last two decades. Some of the key reasons behind the rapid growth of the Indian aviation sector include:

a) Steady growth in the Indian economy, which is now poised to become the fifth largest after US, China, Japan and Germany.

b) Domestic open-skies, which allows new airlines to freely enter the market subject to stipulated norms

c) Partial open skies in international routes wherein India's neighbouring countries and those outside a 5000 km radius from the capital New Delhi can have unlimited flights to designated international airports in India

d) Growth of highly competitive Low Cost Carriers (LCC) in India

e) Development and operation of leading airports at Delhi, Mumbai, Hyderabad, Bengaluru, Hyderabad and Cochin through the Public Private Partnership (PPP). Many more are on the anvil.

f) Formulation of the industry-friendly National Civil Aviation Policy 2016 (NCAP 2016) that covers almost all aspects of Indian aviation.

g) Opening up of regional airports in India's hinterland through the landmark Regional Connectivity Scheme (RCS) popularly known as UDAN ('Ude Desh ka Aam Nagrik').

h) Removal of FDI limits for almost all sub-sectors like airports, air cargo, ground handling, general aviation and Maintenance, Repair and Overhaul (MRO) etc.

i) Liberalization of global flying rights with all Indian carriers having a fleet of 20 aircraft free to fly abroad.

j) Clear intent of the government to leverage the strengths of the private sector by way of privatisation of the national carrier Air India, helicopter company Pawan Hans and operation of large government-owned airports through PPP.

1.4 India's untapped potential

The unprecedented growth being witnessed in the Indian aviation market, though impressive, is significantly lower than its untapped potential.

A nation of nearly 1.35 billion people, with a middle class of over 350 million (and growing) should be flying, at conservative estimates, over 700 million passengers per annum. The FY 2018 figure of 187 million passengers is a small fraction of that.

The key reasons behind low air penetration in the past were manifold:

a) Treatment of air travel as an 'exotic luxury product'

b) Short-term approach to planning,

c) High oil prices

d) High taxes

e) Sub-optimal infrastructure and

f) Shortage of skilled professionals etc.

All this is now changing, with successive governments at the federal, state and district level realising the catalytic effect of the aviation sector on the local economy, infrastructure, tourism and employment creation. Each of these are critical for a nation with over half its population below the age of 25, yearning for satisfying jobs and high quality of life.

In February 2018, India's Finance Minister announced India's plans for a five-fold increase in its airport capacity to handle over a billion trips a year under a new initiative called 'NABH Nirman' (NABH - NexGen Airports for Bharat; Nirman - Development).

1.5 Why Vision 2040

Aviation is a long term play. Aircraft procurement, airport development, air navigation system changes, skill development etc., can't be planned for the short term. The infrastructure shortage that Indian aviation is grappling with, is perhaps due to the fact that there was no 10 or 20 year plan other than the incremental 5-year plans prepared by the erstwhile Planning Commission of India.

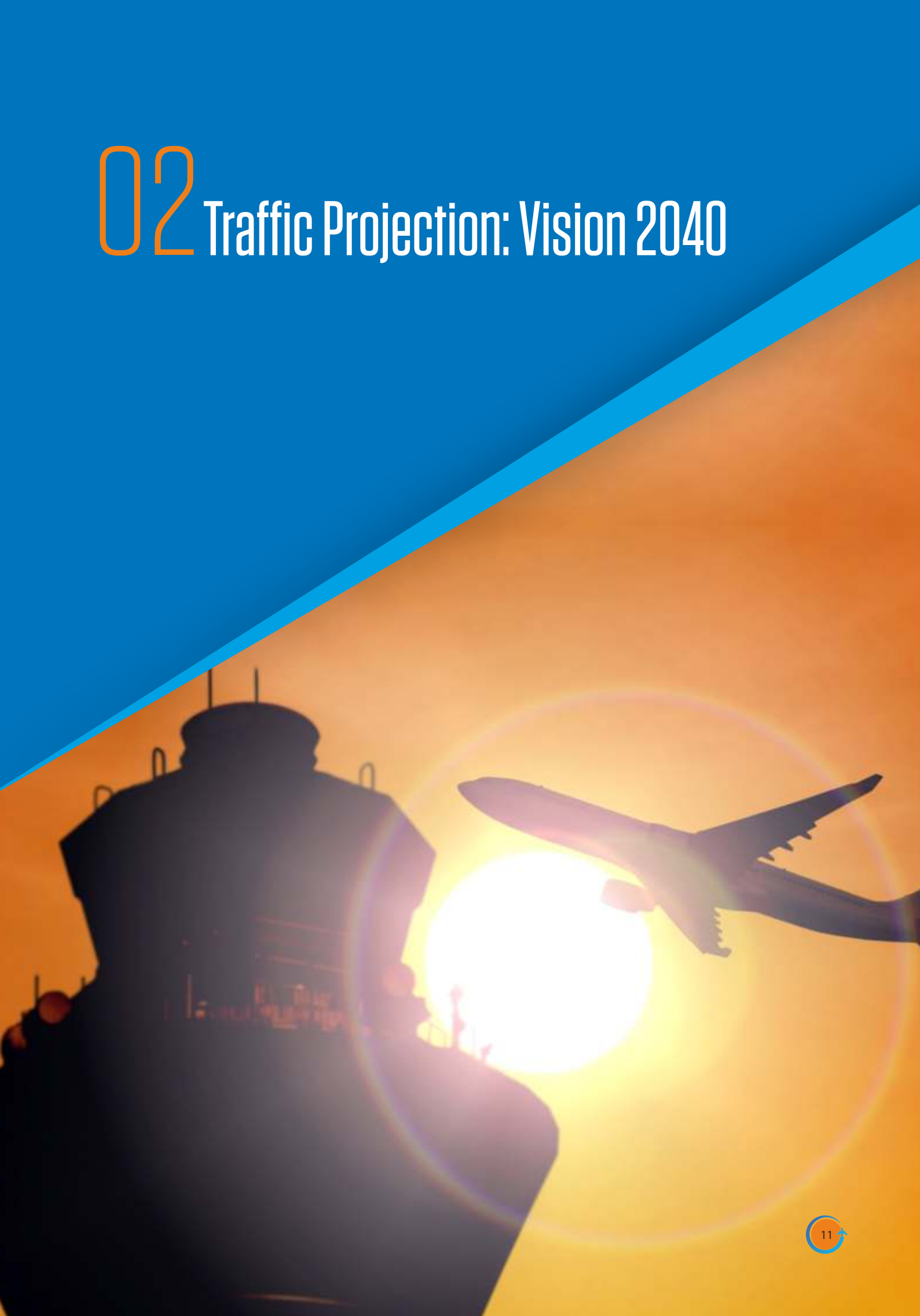
It is therefore important for India to have a robust 20 year plan that lays out the targets and the path to get there along with timelines and clear accountability. This document is an attempt in that direction.

Technology developments like artificial intelligence, machine learning, blockchain, biometrics, composites, super-alloys, bio-fuels etc. are changing the face of aviation. It is humanly impossible to predict the oil price or the exchange rate a month down the line, much less the impact of technology ten years hence.

The Vision 2040 document is therefore a live document. It needs to be debated, refined and improved upon as we go forth.



02 Traffic Projection: Vision 2040



02 Traffic Projection: Vision 2040

2.1 Methodology

Forecasting techniques typically recognize the causal relationship of relevant quantifiable historical variables with the forecasted variable to estimate its future values. The broad categories of statistical techniques used for air-traffic forecasts are:

a) Market share model

b) Time series model

c) Econometric model

d) Simulation approach

The Econometric Model has been used for these projections. Based on the dynamics of the Indian aviation market and quality of data available, the Panel Data Model (a type of Econometric Model) was adopted as the appropriate approach.

2.2 Panel data model

Panel data model is typically used where both cross-sectional and time-series data are available for analysis. The key advantages of Panel Data Model, making it a more dependable approach for Indian aviation context, are as follows:

a) It allows control of variables across individual airports that are not quantifiable (that may be airport-invariant or time-invariant) but may effect passenger traffic

b) Provides more variability, less collinearity among the variables, more degrees of freedom, and greater efficiency

c) Allows better ability to study the dynamics of adjustment over time of a unit

d) Allows fewer restrictions on a particular airport on a distributed lag model than in a purely time series model

e) Micro panel data which is gathered for a particular small panel, like an airport, may be more precisely calculated due to removal of biases that occur due to accretion over all individuals.

2.3 Risks associated with the methodology

Like every statistical model, Panel Data Model have certain risks and constraints. These include the following:

a) Forecasts are dependent on past trends. Any future disruptions such as shutting down of airlines, state-wide or country-wide emergencies etc. are difficult to predict.

b) Forecasts are highly dependent on GDP and oil prices. Future recessions and abnormal volatility in oil prices are difficult to predict and model.

c) The projections consider an unconstrained scenario, that is, it is assumed that India's airport, airline and air navigation capacity will be continuously augmented to support future demand growth.

2.4 Independent variables

The list of independent variables were shortlisted after statistical analysis of various variables vis-à-vis historical traffic data. The final list is as follows:

a) Gross State Domestic Product

b) District Population

c) State Urbanization Rate

d) Consumer Price Index

e) Fuel Prices

f) Lagged value of passenger demand

For forecasting international traffic, global GDP growth was added as an independent variable. Each of the variables considered for the model showed high correlation factor with historical traffic data.

Variables that captured events like the global financial crises and collapse of airlines like Kingfisher Airlines etc., were included to increase the accuracy of the model.

2.5 Cluster wise projections

India's top 53 airports that account for 99% of the domestic traffic in FY 2018 were divided into five clusters to analyse micro-impact of each independent variable on domestic traffic. These clusters are as follows:

S No	Cluster	Cities
1	Metros	Delhi, Mumbai, Chennai, Kolkata, Hyderabad, Bangalore
2	State capitals and industrial hubs	Vizag, Pune, Ahmedabad, Bhopal, Bhubaneswar, Chandigarh, Cochin, Coimbatore, Guwahati, Indore, Lucknow, Nagpur, Patna, Port Blair, Raipur, Ranchi, Trivandrum
3	Tourist destinations	Goa, Jaipur, Udaipur, Varanasi
4	Airports in North-East India	Agartala, Lengpui, Dibrugarh, Dimpaur, Imphal, Jorhat, Silchar
5	Airports impacted by externalities	Dehradun, Jammu, Leh, Srinagar
6	Others	Remaining airports

For projecting international traffic, India's top 24 airports accounting for 99% of international traffic were clustered as follows:

S No	Cluster	Cities
1	Metros	Delhi, Mumbai, Chennai, Kolkata, Hyderabad, Bangalore
2	State capitals and industrial hubs	Pune, Ahmedabad, Coimbatore, Lucknow, Guwahati, Bhubaneswar, Vizag, Patna, Chandigarh
3	Tourist destinations	Goa, Jaipur, Varansi
4	Airports with over indexed international traffic	Calicut, Cochin, Trichy, Trivandrum
5	Others	Remaining airports

An illustrative equation used in the forecasting model can be written as:

$$y_{it} = factor(airport) + factor(structuralchange) + \beta_1 y_{it-1} + \beta_2 factor(airport) : factor(structuralchange) : logGSDP_{it} + \beta_3 CPI_{it} : Fuel\ Price_{it} + \beta_4 ditrictwise\ Pop_{it} + \beta_5 urbanization_{it} + u_i + \varepsilon_{it}$$

Where i = 1, 2, 3,…, n (airports in the cluster) and

t =FY-01, FY-02……FY-17

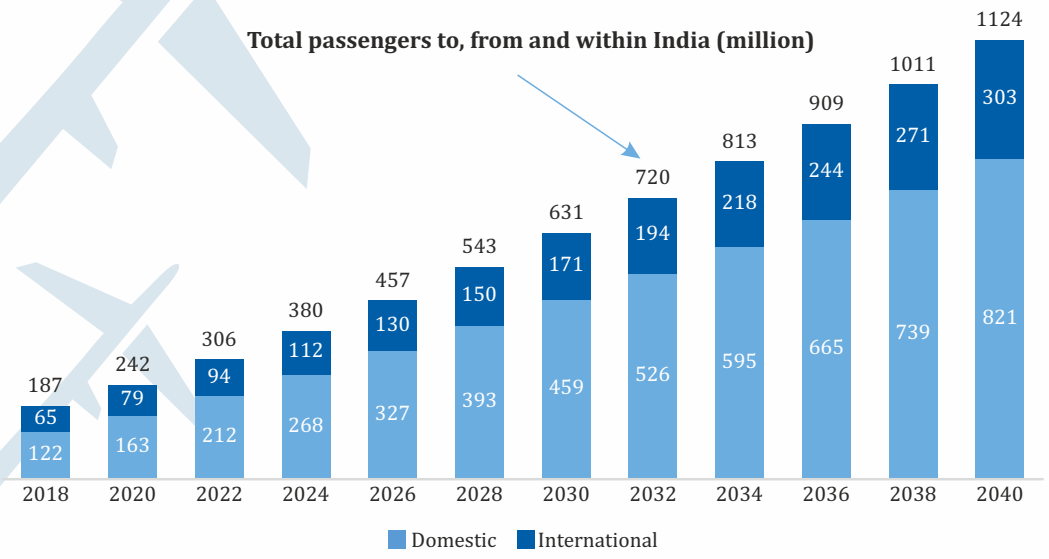
The above equation is for domestic metro airports. Similar equations were used for other airport clusters depending on the variables which have a statistically significant impact. The traffic forecasts were further adjusted based on non-quantifiable factors for specific airports.

2.6 Traffic projection

Based on the Panel Data Model for each cluster, the total passenger traffic (to, from and within India) in India is expected to rise nearly six-fold from 187 million in FY 2018 to around 1124 million in FY 2040. This includes around 821 million domestic passengers and around 303 million international passengers (to and from India).

The overall CAGR across the five clusters works out to around 9% in domestic and 7% in international traffic during FY 2018-2040.

The traffic projections are as follows:



2.7 Vision 2040 at a glance

S No	Parameter	Year ended Mar 2018	Year ended Mar 2040	CAGR (%)
1	Total passengers (million)	187	1124	8.5%
2	Global ranking	7	3	
3	Scheduled airline fleet	622	2,360	6.2%
4	General aviation fleet	750	6,100	10%
5	Industry revenue (USD billion at FY 2018 prices)	11.4	28.6	4.3%
6	Number of operational airports	99	160-180	3%
7	Number of cities with two or more airports (does not include general aviation or military airports)	0	33	
8	Number of airports with over 10 million passenger throughput	7	47	9%
9	Cargo throughput (million tons)	3.4	17	7.7%
10	Revenue of Indian MRO industry (USD million)[3]	50	540	11%

The Vision 2040 for different sub-sectors of Indian aviation will be presented in the subsequent chapters, along with key action steps required to achieve the same.

2.8 Comparison with other projections

The traffic projections for the Indian aviation by different entities is as follows:

S No	Entity	Total passengers in 2040 (million)	CAGR (%)
1	Airbus	677	6.0%
2	IATA	1169 (with policy stimulus)	8.7%
		621 (constant policy)	5.6%
		485 (with protectionism)	4.4%
3	ACI	736	6.8%
4	FICCI-KPMG	1124	8.5%

Source: United Nations Population Forecast, The Global Market Outlook Airbus app, 2018 (data provided up to 2037, extrapolated up to 2040 using annual traffic growth rate of FY37), ACI WATF 2018-2040 forecast (growth rate of 6.8% applied till 2040), IATA's India Air Transport Sector (data provided up to 2037, extrapolated up to FY40 using (i) 9.1% CAGR for policy stimulus & market liberalization scenario, (ii) 6.1% CAGR for baseline – constant policy scenario and (iii) 4.9% CAGR for pick-up in protectionism scenario, assumed domestic trips to constitute 65% of total traffic (as per FY18 data) up to 2040.

The FICCI-KPMG projection is higher than the projections made by leading organizations. Given the untapped potential of the Indian aviation market and the significant reforms being driven by the federal and state governments, we feel that the above projections are eminently achievable. These are of course predicated on the assumption that volatility in oil prices and exchange rate will be within a reasonable range and the constraints in terms of policies, taxation, infrastructure and ease of doing business shall be addressed on priority.


एअर इंडिया
AIR INDIA

03 Airports


Rajesh Sud
CEO & MD
Max New York
Life Insurance Co. Ltd.
Vodafone Business Solutions

03 Airports

3.1 Current status

Overview

There are over 450 airports and airfields in India out of which 101 are operational as in December 2018. The government-owned Airports Authority of India (AAI) owns 125 airports. It is one of the largest airports companies of the world.

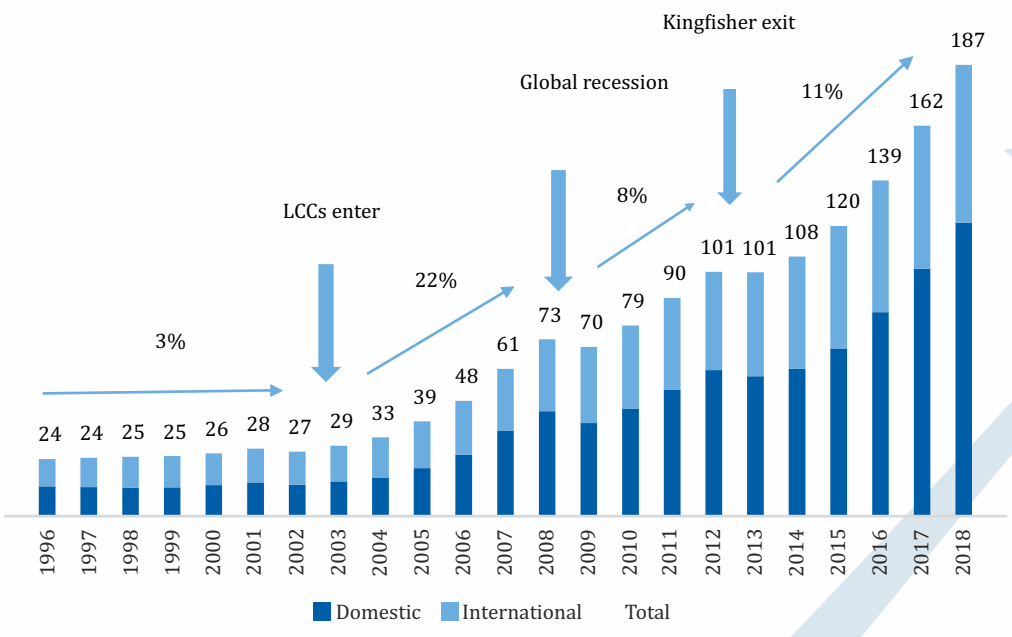
AAI is also responsible for providing Air Navigation Services (ANS) over the India airspace and the Indian Ocean region covering around 9.6 million sq. km., nearly thrice of India's land area of 3.3 million sq. km.

There are six airports being operated under the Public Private Partnership (PPP) model namely Delhi, Mumbai, Bengaluru, Hyderabad, Cochin and Nagpur. Six more airports at Ahmedabad, Jaipur, Lucknow, Guwahati, Thiruvanathapuram and Mangaluru are proposed to be handed over to private operators under the PPP model. This will free AAI's administrative and financial bandwidth to focus on smaller airports in the hinterland where no private capital is likely to come in the initial phase.

Traffic trends

While Indian aviation market has witnessed consistent growth over the last decade, air passenger traffic registered a decline during 2009 and 2013. This was mainly on account of the global recession during 2009 and exit of Kingfisher Airlines in 2013.

Historical trend in passenger traffic (million)



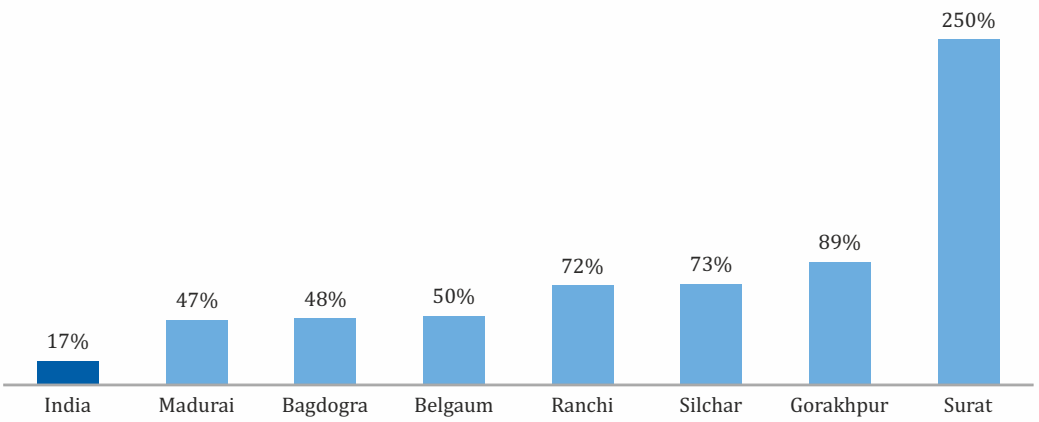
As per DGCA, the growth in demand, measured by Revenue Passenger Kilometres (RPK), has consistently outpaced the growth in supply, measured by Available Seat Kilometres (ASK). This has resulted in an increasing domestic passenger load factor in India. As per IATA, in March 2018, India registered the highest domestic load factor of 87.8% among top seven aviation markets in the world.

Hinterland opportunity

Air-traffic in India is still concentrated in top 15 airports. In FY 2018, top 15 airports in India contributed to around 83% of total throughput in the country. The concentration of traffic in top 15 airports is significantly higher than comparable markets such as USA and China. As per Federal Aviation Administration (FAA), USA and Civil Aviation Administration of China (CAAC) data, the top 15 airports in USA and China contributed to around 54% and 57% of total throughput in 2017.

As Indian economy matures, economic growth is expected to spill over to its interiors. The future growth in Indian aviation market is therefore expected to be driven by non-metro cities. The picture below tells the story, though some of this will taper off with the base effect kicking in.

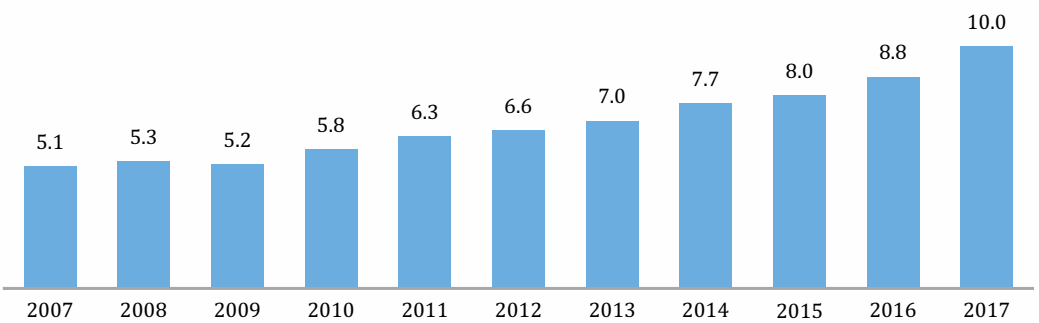
Traffic growth in airports above 100,000 passenger throughput (FY 2018)



Tourism potential

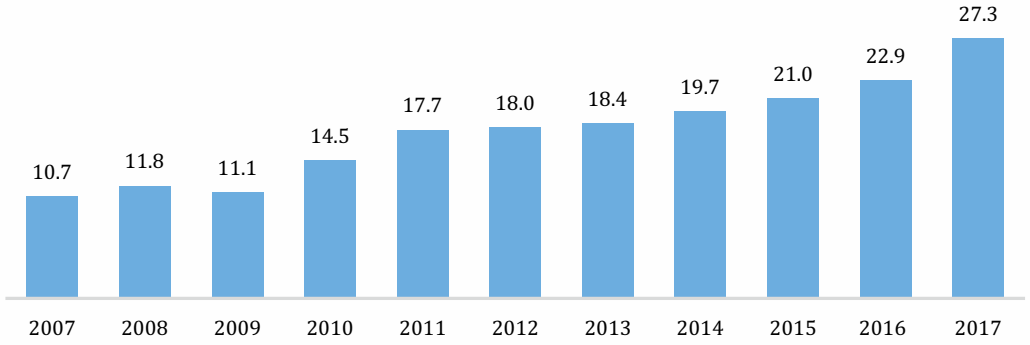
India is gifted with huge opportunities in terms of religious, cultural, historical and nature tourism. This reflects in the steady growth in foreign tourist arrivals and the forex earnings thereof. Tourism brings in significant investments, infrastructure and employment opportunities especially for the semi-skilled.

Foreign tourist arrivals (Million)



Source: Bureau of Immigration, Government of India

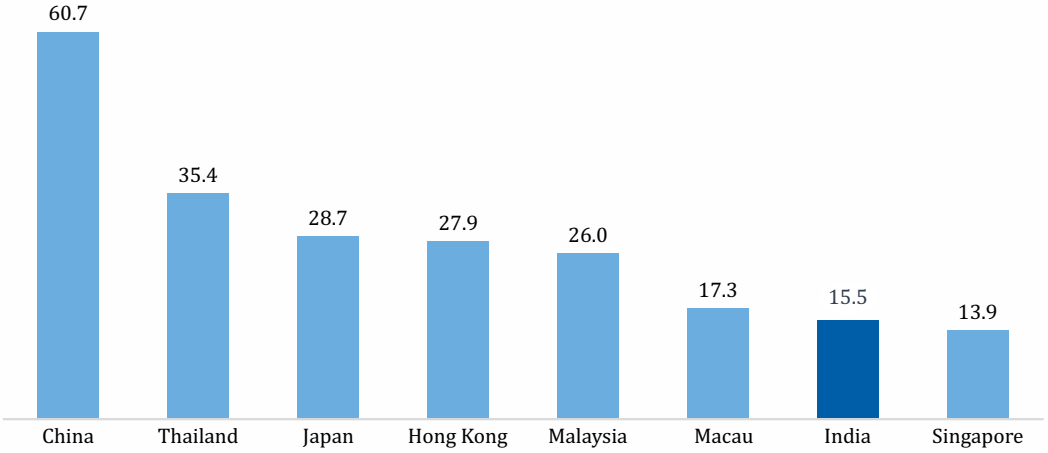
Forex earning from tourism (USD billion)



Source: Reserve Bank of India, Ministry of Tourism, Government of India

Though the foreign tourist arrivals and forex earnings shows a steady growth, the numbers pale in comparison with other Asian countries as shown below:

Foreign tourist arrivals in 2017 (Million)



Source: United Nations World Tourism Organization (UNWTO) and Bureau of Immigration, Government of India.
Note: The number for India also includes Non-Resident Indians

According to UNWTO, in 2017, India accounted for just around 1.2% of the 1.32 billion foreign tourist arrivals globally. Many global tourists prefer Asian hotspots like Bali, Phuket, Langkawi and Angkor Vat etc. primarily because of India's sub-optimal global connectivity, inadequate hotel facilities especially in non-metros, insufficient last-mile road connectivity and limited maintenance of monuments etc. Isolated incidents of mistreatment of tourists have hurt India's image. These shortcomings are being addressed, but much more remains to be done.

National Civil Aviation Policy, 2016

In June 2016, India released its first ever National Civil Aviation Policy (NCAP 2016). The industry-friendly policy aims to take flying to the masses by enhancing affordability and connectivity. It promotes ease of doing business, deregulation, simplified procedures and e-governance.

The comprehensive policy document covers over 22 areas of the Indian aviation industry. NCAP 2016 has given a big boost to industry growth, transparency and investor sentiments.

Regional Connectivity Scheme (RCS or UDAN)

The cornerstone of NCAP 2016 is the Regional Connectivity Scheme (RCS), also known as UDAN ('Ude Desh ka Aam Naagrik'). This scheme plans to enhance connectivity to India's unserved and under-served airports.

UDAN has received significant interest from leading domestic carriers and startup airlines due to the various fiscal and monetary incentives therein and the three-year exclusive right to operate on the allotted RCS routes.

The selection of the RCS operator on a particular route is through a transparent electronic bidding process. Under RCS-1 in April 2017, five airlines won the licenses to operate on 128 routes connecting over 31 new and 12 under-served airports under the regional connectivity scheme.

The second round of RCS bidding saw significant improvement over the first one, including doubling of the number of RCS flights for priority routes (Northeast, J&K and Andaman and Lakshadweep areas) and participation by market leader IndiGo and helicopter companies. Under RCS-2 in January 2018, the aviation ministry awarded 325 routes to 15 airlines and helicopter operators. These routes included 25 new airports and 31 new helipads.

There are challenges related to non-performance by some small operators; limited slots for UDAN flights in congested airports like Delhi, Mumbai etc.; and restricted leasing options for small fleet owners. These are teething troubles that are likely to get addressed as the UDAN scheme matures.

On the other hand, large airlines have reported high load factors and good yields on many UDAN routes. The fact that leading players like IndiGo and SpiceJet have placed large orders for turboprops is a testimony to the potential that exists.

International UDAN

In August 2018, MoCA released the draft International Air Connectivity (IAC) scheme, or 'International UDAN' scheme. The scheme seeks to promote international connectivity from non-metro cities that are covered under India's open skies policy with other Asian countries.

State governments will be offering a pre-decided amount per seat as subsidy on routes covered under this scheme, and airlines will be required to bid on the percentage of flight capacity for which subsidy is required. The subsidy will be provided for a period of three years, along with exclusivity to the selected airline on that route for the same period.

The government has identified eight potential routes so far for the implementation of International UDAN. Six of these routes are to provide connectivity from Guwahati to Dhaka, Kathmandu, Yangon, Kuala Lumpur, Singapore and Bangkok, while two routes are from Vijayawada to Dubai and Singapore. In October 2018, AAI invited bids for the six proposed routes from Assam, and is currently in the process of evaluating the same.

Global recognition

Indian airports are now getting global recognition with many of them bagging top positions in different traffic categories in the annual ACI ASQ ratings. The ACI rankings in 2017 is as follows:

S No	Traffic category (mppa)	Airport	Global ranking (2017)
1	Above 40	Delhi, Mumbai	1 (Joint)
2	15-25	Bangalore Chennai	2 3
3	5-15	Hyderabad Cochin, Kolkata, Pune	1 3 (joint)
4	2-5	Lucknow	1
5	Under 2	Indore	1
6	Most improved airport	Ahmedabad	1

Capacity enhancement

India has embarked on a massive capacity expansion of its airport infrastructure.

The national capital - Delhi - with 66 million passengers in FY 2018 is now the seventh largest airport in Asia. It will see significant growth when its fourth runway and fourth terminal get commissioned in 3-4 years.

The second airport for the National Capital Region is planned at Jewar in the state of Uttar Pradesh. It is about 72 km from the Delhi airport and is likely to be provided mass rapid connectivity through metro rail and expressways.

Second airports are being planned for Mumbai, Goa, Vizag and Pune. Work on the upcoming Navi Mumbai and Mopa airports (in Goa) is on. The Bhogapuram airport (near Vizag) is under the bidding stage and is likely to commence construction in 2019. The bidding process for Pune's second airport at Purandar is expected soon. A new international airport at Kannur in North Kerala was commissioned in December 2018.

Earlier in September 2018, India's 100th operational airport was commissioned at Pakyong in the Himalayan state of Sikkim. This is expected to benefit the state's connectivity and tourism industry. Earlier, tourist arrivals in Sikkim were through the Bagdogra airport and Siliguri railway station located several hours away.

All major airports in India are augmenting their airside and terminal capacity to address the demand that is showing no signs of abating.

Private investments

PPP in airports has shown the world that 'India can, and will'. It helped bring in investments of over USD 5 billion, created world-class facilities to Indian and foreign travelers, helped the government unlock value especially in commercial revenue, generated lakhs of jobs and contributed to the economy through a positive impact on tourism, hospitality, manufacturing and global trade.

Surprisingly, PPPs are still being seen as a "means of financing" in India. The real benefits of PPP have less to do with financing and more to do with innovation in design and engineering, asset quality, risk management and operational efficiency. Well-structured PPP projects with adequate

government support not only help in limiting the extent of government funding or subsidies but instead generate large cash inflow for the government, as has been seen in the case of Delhi and Mumbai airports.

Private investments in Indian airports has been limited in terms of wider participation, especially from global airport companies. Most of the PPP concessions were won by two large group - GMR and GVK.

While the PPP experiment created world class airports in India, it also led to severe challenges in terms of high airport tariffs, legal disputes between concessionaires and the tariff regulator AERA; and limited profitability of the Concessionaires. In the PPP bids for large airports like Navi Mumbai and Mopa, the interest from both Indian and global bidders was extremely lukewarm.

National Civil Aviation Policy (NCAP 2016) brought in the hybrid till approach for tariff determination. This has brought back private sector interest in the airports sector though there is still a long way to go.

NABH Nirman

The major challenges faced by investors in the Indian airport sector include:

a) Lumpiness of investments,

b) Tariff uncertainty,

c) Insufficient interest by foreign and domestic investors,

d) Lengthy legal disputes with the Regulator

e) Long-drawn bidding process,

f) Challenges in fund-raising,

g) Revenue leakage risk in PPP airports and

h) Sub-optimal exploitation of real estate.

To address the challenges, the Government of India has proposed a new transaction structure for future greenfield airports under the NABH Nirman initiative. Some of the key features of the new transaction structure are:

a) The guiding principles are affordability, sustainability and predictability.

b) The long drawn tariff fixation exercise every five years will be replaced by a system of pre-determined aeronautical yields which shall be pegged to inflation. This shall save time and disputes. It will also prevent the allegations of 'gold-plating' since concessionaires will get no tariff advantage by over-spending.

c) The proposed bid parameter is Concession Fee in INR per passenger instead of 'revenue share'. Concession Fee is a simple and transparent bid parameter which has near-zero risk of revenue leakage. The determination of the term 'annual revenue' and the allegations of 'loss of revenue share' has led to many disputes.

d) Concessionaires shall be free to exploit the full potential of the non-aeronautical businesses subject to local zoning and height restrictions.

e) The regulator's mandate will be to determine key performance indicators (KPI) for the Concessionaires and to monitor quality of infrastructure and service.

f) In August 2018, the draft transaction structure for greenfield airports was released for stakeholder feedback. The Draft Model Concession Agreement (MCA) is under development and is expected to be released for stakeholder feedback soon.

g) The AERA Act (Amendment) Bill, 2018 is awaiting approval by the Parliament.

Use of technology

In October 2018, MoCA announced the draft Digi Yatra Biometric Boarding System which will enhance passenger movement at airports through facial recognition. The Digi Yatra platform is expected to be operational from early 2019.

Digi Yatra aims to provide air travelers in India with a 'seamless experience' of passing through airports by using facial recognition for passenger verification. A centralized registration system will be created to store passenger details, with each individual passenger being assigned a unique Digi Yatra ID. The enhanced passenger experience may lead to higher consumer spends at the airport resulting in more jobs, lower airport tariffs and higher tax revenues for the government.

Pilot implementation will be carried out at Bangalore and Hyderabad Airports by the end of February 2019, and the programme will subsequently be rolled out at Kolkata, Varanasi, Pune and Vijayawada by April, 2019. It is planned that airports will be able to provide innovative services through Digi Yatra, such as immersive shopping experiences and targeted advertisements.

In November 2018, Bangalore Airport for the first time in India has deployed automated baggage drop machines to make check-in process faster. This is likely to be introduced across major Indian airports soon.

Air Vistara has introduced a robot using Artificial Intelligence (AI) technology at the Delhi airport. Named RADA, it can scan boarding passes and further provide information on the terminal, departure gates, weather conditions of destination city and real-time flight status etc.

In August 2018, robots were also introduced on trial basis at Chennai Airport. These can navigate on their own, identify and greet passengers and respond to queries.

Deployment of smart cameras and re-positioning of security apparatus at airports enabled the end of the anachronistic practice of stamping hand baggage tags during security check. As of July 2018, 42 airports in India are now under the hand baggage tag-free security regime.

India is likely to witness a boom in autonomous aerial vehicles or 'drones'. These have been covered in detail in a subsequent chapter.

AirSewa

In 2016, MoCA launched the AirSewa app to provide an efficient grievance redressal mechanism for passengers. The app allows passengers to upload voice and video complaints regarding all aspects of their travel experience, along with a detailed description. As of November 2018, around 12,000 complaints have been addressed through AirSewa.

An upgraded version - AirSewa 2.0 has been introduced in November 2018, allowing passengers to register complaints through social media using the hashtag 'AirSewa'. The portal also features

an interactive chatbot to handle customer queries, real-time flight and airport information, and a link with BHIM e-payment app. The next update may include a ranking of airlines based on customer feedback, among other features.

Green airports

Cochin Airport has been awarded Champion of Earth Prize, UN's highest environmental honour, for meeting its energy demands solely from the electricity generated by solar panels installed on the airport site. It also sells additional electricity to the state grid.

Many airports have taken a cue from Cochin and are undertaking investments in solar power generation. Many of the airports operated by AAI and private operators have been accredited LEED gold certification for their environment-friendly airport terminal buildings.

3.2 Vision 2040

The projected passenger traffic (to, from and within India) for FY 2040 is 1124 million. This comprises around 821 million domestic passengers and around 303 million international passengers (to and from India). This is over six times the 187 million traffic recorded in FY 2018.

Handling this traffic will require a dramatic increase in airport infrastructure. Most of the large Indian airports are expected to be saturated over the next 10-15 years. In leading regions like Delhi and Mumbai even the second airports are likely to be saturated by 2040 and will require a third airport. Overall, India may require around 190-200 airports in 2040. The incremental land requirement is expected to be around 150,000 acres.

The total capital expenditure for brownfield and greenfield capacity expansion in India till 2040 is conservatively expected to be in the range of USD 40-50 billion. It is expected that with advancements in technology and the push for greater affordability, the capital and operating expenditure per airport will gradually reduce with time.

The Vision 2040 for the Indian airport sector is summarised below:

S No	Parameter	Year ended Mar 2018	Year ended Mar 2040	CAGR (%)
1	Total passengers (million)	187	1124	8.5%
2	Number of operational airports	99	190-200	3.0%
	Number of international airports	34	70	3.3%
3	Number of cities/ regions with three airports	0	2	NA
4	Number of cities with two airports (within a 50 km radius)	0	31	NA
5	Number of airports with over 10 million passenger throughput	7	47	9.0%
6	Number of airports with over 1 million passenger throughput	37	84	3.8%
7	Land area under airports (acres)	90,000	2,40,000	4.6%
8	Cumulative cost of land acquisition and multimodal connectivity (USD billion)	NA	30-50	NA
9	Cumulative capex for airport (USD billion)	NA	40-50	NA
10	Total capex - land plus airport development (USD billion)	NA	70-100	NA
11	Direct employment at airports - airport, retail, security ('000)	46	80	3.6%

3.3 Action steps to achieve Vision 2040

a) Detailed roadmap and monitoring

Achieving a six-fold increase in air traffic may require focused and relentless effort from Government of India and all stakeholders. The government should consider setting up a task force for airports at MoCA headed by a Joint Secretary. The task force should come up with a detailed roadmap for achieving Vision 2040 in consultation with state governments, airlines, airports, travel trade, hospitality industry, funding institutions and other stakeholders.

The roadmap should be widely shared so that state governments and industry can plan their investments, staffing and business activities well in advance. The Task Force should track and report progress to the aviation minister on a quarterly basis.

b) Efficient capex and opex

The future traveler in India will be extremely price conscious. Experiences across the world show that passengers value efficiency over grandeur. They are aware that every non-essential dollar spent on the airport will ultimately be recovered from them. The concept of pre-determined tariffs will help mitigate the need for 'gold-plating' of capex and opex to obtain higher tariffs from the regulator. This concept should be introduced at the earliest possible. The role of the regulator under pre-determined tariff approach will shift more towards ensuring service quality since some airport operators may try to cut corners on capex and opex.

c) Aerotropolis approach

Important hubs around the world such as Beijing, Guangzhou, Hong Kong and Atlanta obtain a significant part of their revenues from the towns and cities situated in their catchment areas. Being large airports, they are complemented by world-class multi-modal transport infrastructure with tremendous ease of access for passengers and cargo from their catchment areas. This has traditionally not happened in the past. New airports need to be developed as part of a holistically-planned aerotropolis than a mere plot of land where aircraft land and take off.

d) Land acquisition

There is an urgent need to build consensus and amend India's LARR Act 2013 especially for growth drivers like aviation and tourism. Finding 3000-5000 acre land parcels for new airports in metros and large cities will be extremely difficult. Setting up greenfield airports 50 km or beyond from the city centres will increase cost and travel time for passengers. The concept of land pooling wherein displaced land-owners get cash compensation and a developed plot closer to the airport has been adopted by some states with encouraging results.

e) Hub development

Hub airports like Atlanta, LA and Chicago in US; London, Paris, Frankfurt in EU; Beijing, Dubai, HK, Singapore etc. are driven by their hinterland economy, hub carriers, efficient processes and relatively 'open skies'. India faces challenges on all counts - the national carrier is in financial distress, the hinterland economy around leading airports is

relatively small, the tourist arrivals are not significant, the processes - visa, immigration, customs and airport transfers - need improvement; and its only under NCAP 2016 that India allowed partial 'open skies' to its neighbours and to countries beyond 5000 km from India.

India needs to develop a comprehensive hub policy that promotes long haul connectivity by its top airlines through fiscal and monetary incentives, use of technology to ensure faster passenger movement through customs, immigration and security; easier visa regime; and a massive push for inbound tourism.

f) Mindset changes

For improving passenger flow at airports, a change in mind-set is critical. Domestic to international terminal transfers in many metro airports are still done through buses moving through city traffic. This increases the connecting time and makes passengers uncomfortable. In most leading airports like JFK, Heathrow, Paris, Singapore and Hong Kong, passenger transfers are done through in-airport shuttle trains.

It's important to routinely carry out Minimum Connect Time (MCT) analysis to ensure faster movement of passengers, luggage and cargo between connecting flights. Air-side terminal transfers, dynamic gate management, dedicated bag screening for ramp to ramp transfers, dedicated immigration counters for specific airlines at a fee, inexpensive dorm rooms for transfer passengers etc. are some of the options.

Central authorities like Customs, Immigration and CISF need to enter into service level agreements with airport operators. This will help monitor and reduce passenger handling times without compromising on safety and security.

The Government of India has done well by doing away with the archaic immigration forms. Intelligence agencies have access to data on all passengers in advance and can run data analytics tools to identify suspicious passengers. Immigration should shift to automatic e-gates like in most of the developed countries.

g) Privatisation of Air India

The purchase of Air India by a strong investor group is critical for India to achieve global hub status. This is discussed in detail in the subsequent chapter.

h) Air side operational efficiency

Airports are developing rapid exit taxiways to enable lower runway occupancy time and hence higher number of flight movements per hour. These need to be done on a high priority basis.

i) Wide bodies on domestic routes

Airlines are introducing wide body aircraft in the domestic sector to address rising demand and constrained slots. This requires significant changes in the air-side infrastructure. Airports undertaking expansion programs need to take cognizance of this trend and incorporate the same in their master-plan.

04 Airlines



04 Airlines

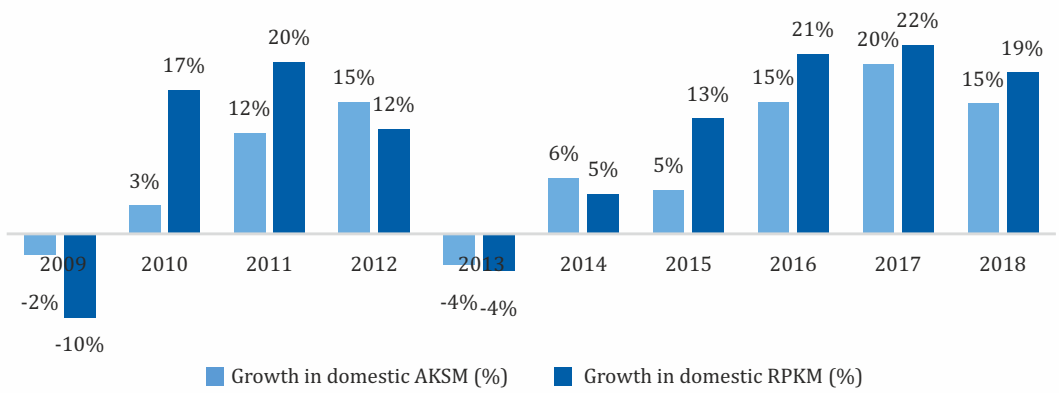
4.1 Current status

The airline landscape in India has transformed radically over the past 15 years. In 2003, there were just five leading carriers - Air India, Indian Airlines, Jet Airways, Air Sahara and Air Deccan, all operating full service models except the last. By 2018, the scenario has changed completely with Low Cost Carriers like IndiGo, SpiceJet, GoAir, AirAsia, JetLite and TruJet controlling nearly 72% of the passenger market share.

The previous chapter has highlighted the high growth being witnessed in the Indian aviation market. This is on the back of low airfares driven by the fall in global crude oil prices in 2015 and cut-throat competition among Indian carriers.

The growth in domestic traffic has outpaced capacity growth in seven out of the last ten years. This has encouraged all major Indian carriers to place large aircraft orders.

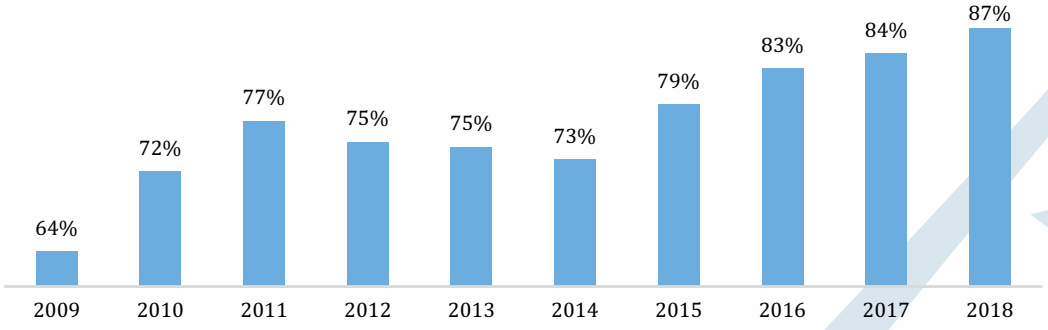
Domestic demand outpacing capacity growth



Source: DGCA

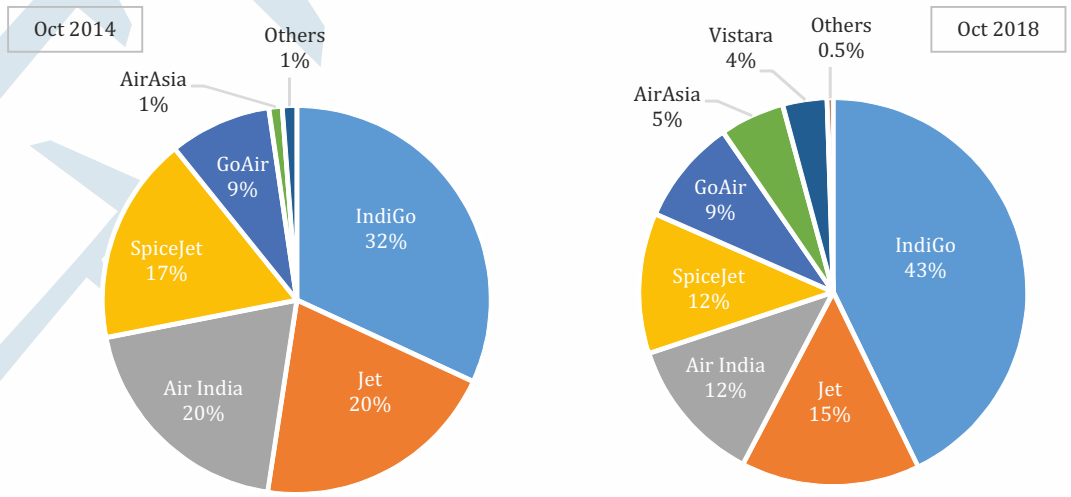
The growing demand is also reflected in load factors which have risen sharply in the last four years as shown below:

Domestic passenger load factor (%)



Source: DGCA

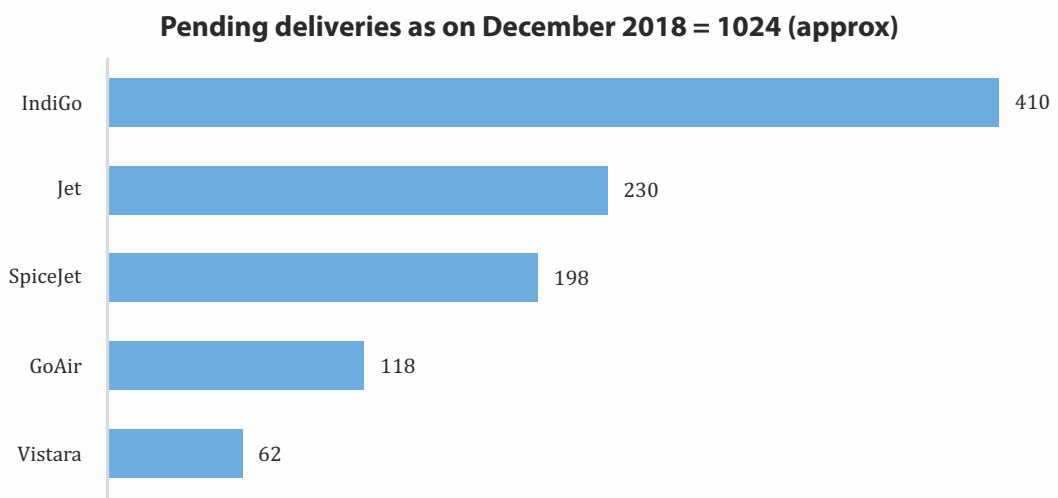
IndiGo is the leading carrier with its passenger market share steadily rising to over 43%. It is followed by Jet, Air India and SpiceJet with double-digit market shares.



Source: DGCA

Large orders

The growing demand has encouraged Indian carriers to place large orders as shown below. In December 2018, Indian carrier had a fleet of around 670 aircraft with pending deliveries of around 1024 aircraft as shown below:

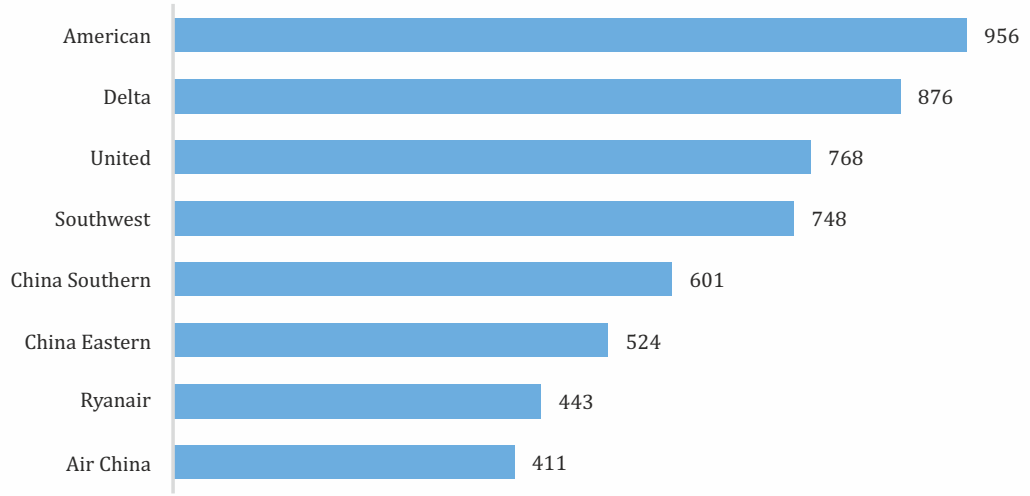


Source: Media reports

Global fleet

India's fleet of 670 aircraft pales in comparison with the fleet of world's largest carriers in US and China as shown below. A significant portion of their fleet comprises wide-bodies, something that Indian carriers will have to catch up on as they expand their presence in the long haul market.

Largest airlines by fleet size (Dec 2018)

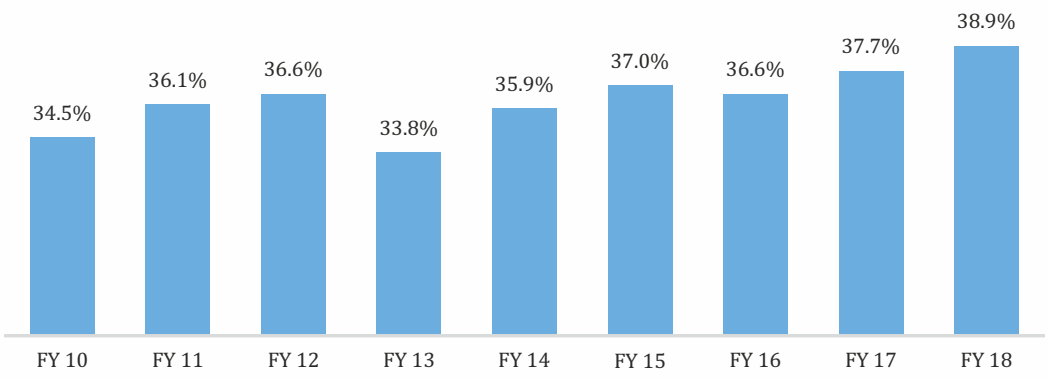


Source: Media reports

Growing share of Indian carriers on international routes

With increasing fleet and policy support, the share of Indian carrier on international traffic to and from Indian is growing. There are likely to be a temporary dip due to financial problems at two large Indian carriers, but it is likely to be compensated by fund infusions into them; and by other Indian LCCs likely to introduce wide-body aircraft on international routes.

Share of Indian carriers in international traffic to and from India (%)



Source: DGCA

As highlighted earlier, under NCAP 2016, the Government of India has allowed open skies for scheduled carriers of countries beyond 5000 km from New Delhi. The bilateral seat quotas of many countries lying within the 5000 km radius, however, have not being enhanced. This is to allow Indian carriers the chance to recover lost ground, especially on the long haul traffic to USA and EU.

Affordability is key

India's biggest strength is its population and not per capita income. Transportation is a volume game, with low margins. Price sensitivity among Indian flyers is extremely high. The success of Indigo and the dramatic revival of Spice Jet from near-death in December 2014 proves this

hypothesis. At times full-service domestic carriers are forced to price their tickets equal or even lower than that of LCCs, severely hurting their bottom-line.

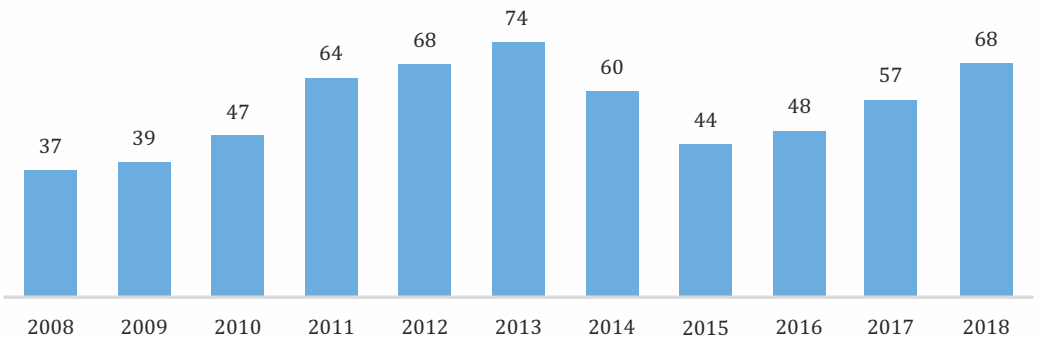
With the gradual rise in per capita incomes, perceived value of 'time', propensity for leisure and tourism and government initiatives, more and more Indians are likely to fly. According to a statement by the government in the Parliament, the number of air passengers has overtaken the number of passengers travelling in air-conditioned railway coaches. This was unthinkable a decade back.

With massive capacity addition by Indian carriers, the competition is only likely to intensify and airfares likely to stay in the affordable range. This is already causing significant pressure on airport infrastructure, the multimodal connectivity to the airports and the air navigation system.

ATF taxes

The current phase of high demand in domestic sector was triggered off in early 2015 with the fall in crude oil prices. A part of it was passed to the aviation sector in terms of lower ATF prices. The graph below shows the trend in ATF prices as on 1 December across the last decade.

ATF price as on 1 December for domestic flights (INR per litre)



Source: Indian Oil Corporation

A sudden spike in Brent crude oil price in early October 2018 to above USD 85 per barrel and the consequent devaluation of the rupee to around INR 75 per USD caused significant concern. It subsequently cooled down to reasonable levels.

Brent crude price (USD per barrel)



Source: www.macrotrends.net

With increasing push for electrification of vehicles and clean energy sources like wind and solar, there is a possibility that crude oil prices in general may follow a range-bound movement, except for occasional volatility caused by geo-political events and supply disruptions.

The growth in domestic aviation in India is despite the fact that the landed price of ATF for domestic flights in India is one of the costliest in the world. ATF accounts for nearly 30-40% of an airline's operating expenses. In many states, the local taxes on ATF are in the range of 25-30 percent. This is on addition to federal taxes.

Since airlines do not have the flexibility of raising fares at will, the taxes add pressure on the airline's bottom line. One can imagine the surge in demand if the government decides to bring ATF under Goods and Service Tax (GST) and provides input credit on the taxes paid thereon.

Since international ATF prices are significantly lower than domestic, at times an all-expense paid trip flight to Thailand or Malaysia turns out cheaper than flying within India. India's ATF pricing therefore has a negative impact on the Indian tourism.

Just like India's revolution in the early 2000s, a drastic reduction in the airfares will help take flying to the masses and expand the national air grid. It would give a fillip to economic growth, tourism and job creation. The follow on taxes from the economic activity generated will be far in excess of the small tax foregone on the raw material (ATF).

Many states like Andhra Pradesh, Odisha, Jharkhand, Madhya Pradesh, Chhattisgarh and West Bengal etc. have reduced taxes on ATF to 0-5 percent at many or all of their airports. Larger states like Delhi, Maharashtra, Tamil Nadu, Karnataka etc. continue to charge high rates of 24-30 percent. It is expected that once fueling starts shifting to other states due to the tax differential, ATF taxes across the country will come down gradually.

The impact of social media

With greater access to internet, especially through mobile phones, more and more people find it easier to compare and book travel packages on their own. This is particularly so for young Indians that display a greater propensity to spend than save, as compared to their previous generations.

The presence of online apps in vernacular language and with voice assistance helps. With the boom in social media apps, competitive posturing for 'coolness quotient' and hashtags like #yolo ('you only live once') and #fomo ('fear of missing out'), there is a growing competitive demand pull for people to travel and share experiences.

With around 1.2 billion mobile phone connections, over 500 million internet users, and a young aspirational population, there's a huge demand segment opening up for reasonably-priced air travel and accommodation.

Passenger Convenience

In May 2018, MoCA proposed new rules for flight delay compensation, aimed at increasing the efficiency of airlines and improving passenger convenience. Airlines at fault for flight delays or cancellation would have to compensate passengers up to INR 20,000, offer a refund, or provide free hotel accommodation, depending on the nature of the problem.

As per the new rules, passengers will be able to cancel or amend their tickets free of charge up to 24 hours after booking, and the cancellation charges levied by airlines post this 24 hour period have been capped.

Airline profitability

The Indian airline industry, despite strong traction on growth, is facing challenging times. As discussed earlier, these include oil price and exchange rate volatility, high capacity growth, airport infrastructure deficit and talent shortage. Coupled with pressure on yields, this has aggravated the turbulence in the industry.

The Indian airline industry is expected to report an aggregate loss of about USD 1-1.5 billion in FY2019. Some of the airlines have large fleet expansion plans, which may be delayed a bit till the situation improves.

Air India privatisation

Despite the government's significant efforts, the much-delayed privatization of Air India has been missed. Losses for the national carrier in FY 2019 are likely to mount. This may require further fund infusion from the exchequer. With no fleet expansion, Air India may see further fall in its domestic and international market share.

Air India's international LCC subsidiary Air India Express has achieved a significant improvement in financial and operational performance over the last couple of years, but may become less valuable over time as private Indian LCCs expand their regional and international footprints.

Air India's ground handling subsidiaries AIATSL and AISATS are likely to be challenged with AAI's plans to award new ground services concessions at over 90 airports.

Innovations in the airline industry

Disruptions in digital innovation forms a key element in the high volume-low margin airline industry. Disruptive technologies are significantly influencing the business models of the airlines by helping them achieve short term efficiency goals as well as attain long term targets of improving customer experience and increasing operational efficiency. Key developments include the following:

a) **Biometrics:** As highlighted in the previous chapter, use of biometrics is key for faster movement of airlines passengers through check-in, baggage self-drop, security and immigration etc. This will be especially important for transit passengers who may be time challenged due to delays in incoming flights.

b) **Augmented and Virtual Reality:** These technologies are being utilized to further enhance passenger experience, promote offers and improve training for employees. KLM has integrated augmented reality on their app, which enables hand baggage check by indicating the visual representation of bag dimensions permitted on-board. Japan Airlines is training their maintenance staff using augmented reality; creating an environment that they are actually working on an engine or aircraft part.

c) **Cloud Computing:** Cloud computing enables airlines to store and share a vast amount

of programs and data at lower costs. Popular application of cloud computing includes the resource management system.

d) **Artificial Intelligence:** In 2017, Jet Blue launched a venture capital subsidiary. JetBlue Technology Ventures, dedicated to investing in travel technology start-ups to foster innovation in the airline. Jet Blue partnered with Utrip, a Seattle based startup which uses artificial intelligence to plan travel itineraries.

e) **Block chain:** This technology has gained popularity and is being used in passenger management, baggage tracking and aircraft safety. Its potential is yet to be entirely leveraged.

f) **Drones:** Drones have the potential to drastically reduce the commercial aircraft inspection time while also lowering costs and boosting accuracy. EasyJet has implemented the use of drones for fuselage inspection. Developments are being made to automate aircraft inspections by using visual processing algorithms coupled with enterprise IT systems to send work orders to the maintenance crew as identified.

g) **Remote Air Navigation Services and GAGAN:** This will help airlines access remote and low traffic airports without incurring the high cost of ANS infrastructure and manpower. The satellite based ANS system - GAGAN - will help airlines mount more flights on the same route with reduced separation, greater accuracy and higher safety standards.

Entry of e-commerce giants

Amazon Air, e-Commerce giant Amazon's cargo airline has around 40 Boeing 767 freighters. In December 208, it announced a fleet expansion by another 10 Boeing 767s. It plans to build a fleet of 100 wide body freighters.

Online taxi aggregator Uber plans to make aviation on-demand by using a network of vertical take-off and landing (VTOL) aircrafts. Uber has entered into partnerships with aircraft manufactures, real estate and technology companies and government agencies like NASA to create aircrafts, infrastructure and other procedures for the project.

The company plans to fly VTOL on short distances of around 100 km, with a speed of 150-300 mph, at an altitude of 1000-2000 feet on a single charge. Uber plans to launch flight demonstrations for this project by 2020, with commercial flights starting by 2023. Uber has shortlisted Dallas and Los Angeles as its first two launch cities. Uber announced that five countries - Japan, France, Brazil, Australia and India are being considered for the third spot.

These are just two examples. There is a high probability of more e-commerce giants, well-funded that they are, entering into the airline, cargo and short-haul commuter business.

4.2 Vision 2040

a) **Third largest market**

India will be the third largest aviation market international air travel market, inching closer to USA, projected number two. A dramatic fall in crude oil prices, removal of all

taxes on aviation, massive buildup in India's airport infrastructure and local manufacturing of aircraft may even allow it to overtake USA, something unthinkable in the past.

b) Consolidation

With greater automation, standardization in terms of pricing and service quality; and reducing profit margins, there will be very little to choose from airlines in terms of differentiation. This may lead to consolidation of airlines within countries and then globally.

c) Open skies

Pressure from passengers may force countries to drop restrictive practices around bilateral quotas. Many leading countries have gone for partial or completely open skies and have their economies have benefitted from growth in tourism and jobs.

d) Foreign ownership of airlines

Aviation is one of the last bastions of nationalist policies. As more sensitive sectors like mobile telephony, IT, banking and defence manufacturing opens up to foreign ownership across the world, ownership restrictions in airlines may gradually vanish. This may also allow large Indian carriers to look for airline acquisitions in the global market.

e) Low operating costs

Airline non-fuel operating costs will drastically reduce with the use of technology disruptions such as artificial intelligence, machine language, automation, biometrics, 3D printing and robotics. These will help reduce human errors from repetitive activities, revenue leakages and operating costs. Airports will have minimal human interface in terms of check-in counter, bag-drops, security and immigration. Interactions between airlines and passengers will be mostly through machines with minimal human interface.

f) Airline as a platform

Airlines are transforming their business models by providing lower ticket prices and then selling add-on services and also partnering with other retailers or airports or to sell their services. With the share of ancillary revenues increasing, there lies a possibility that fares would be negligible or even zero and airlines would earn their revenue through ancillary revenue. Additionally, airlines can leverage the passenger data to provide more customized services and targeted advertising, activating further revenue generation channels.

g) Entry of e-commerce giants

As highlighted earlier, there is a high probability of -funded e-commerce giants getting into the airline business through the alliance or acquisition route.

The Vision 2040 for the Indian airline sector is summarised below:

The Vision 2040 for the Indian airline sector is summarised below:

S No	Parameter	Year ended Mar 2018	Year ended Mar 2040	CAGR (%)
1	Total passengers (million)	187	1124	8.5%
2	Share of India in international traffic to and from India (%)	39%	45-50%	
3	Passengers handled by Indian carriers (million)	147	972	9%
4	Number of aircraft	622	2359	6.2%
5	• Narrow body aircraft	503	1817	6%
6	• Wide body aircraft	66	306	7.2%
7	• Turboprops	53	236	7%
8	Value of aircraft fleet (USD billion)	32	126	6.4%
9	Airline revenue (USD billion)	13	63	7.4%
10	Airline employees (thousand)	67	212	5.4%

4.3 Action steps to achieve Vision 2040

a) ATF under GST

ATF needs to be brought under the ambit of GST at the earliest. The benefits in terms of growth in travel, tourism, infrastructure and jobs; and the long term taxes therefrom will more than compensate for the small amount of GST foregone in the short-term. The government may consider raising the GST rate on economy class tickets from 5 to 12 percent to reduce the GST loss in the short term.

b) Privatisation of Air India

Air India needs to be privatized at the earliest. For India to achieve global leadership, it needs 2-3 large Indian carriers with wide global footprint. Air India has huge untapped value in terms of high value slots at international and domestic airports; a wide body fleet and highly-trained crew. These can be better leveraged by a well-funded private investor.

Some of the clauses - like debt, employees and government shareholding in Air India etc. - that investors found challenging, need to be addressed appropriately when the privatisation process re-commences.

c) Policy support for global connectivity

Launching international flights is an extremely risky proposition. The breakeven periods are long and the risk of severe backlash from incumbent airlines is extremely high. International flights are akin to export of services and import substitution. They bring in precious foreign exchange and tourists and create additional jobs in India.

The government should come up with a hub development policy (akin to the highly successful Regional Connectivity Scheme 2016) that provide fiscal, monetary and procedural benefits to all Indian carriers that venture into international routes. A ten-year tax holiday on profits earned on international flights can be a great starting point.

d) Investment in technology

Airlines need to continuously invest in technology to enhance operational efficiency, safety, security, speed of passenger processing; and reduction in operating costs.

e) Aero-manufacturing

Given the size of their aviation markets, USA and China have managed to create a robust aerospace industry with leading aircraft manufacturers setting up their assembly plans therein. India, with a projected fleet of over 2300 commercial aircraft by 2040 and large orders of military aircraft, provides ample justification for global OEMs to consider India as an aircraft manufacturing base.

The 20-30 percent cost advantage in India versus USA allows OEMs to use India as a base for global exports too. NCAP 2016 allows OEMs to claim defence offset credits in lieu of investments in commercial aerospace manufacturing. It also speaks of providing a viability gap funding in case the cost of made-in-India aircraft and components work out to be higher than those supplied from their original sources.

The government needs to engage with the Indian airline industry and global OEMs to facilitate establishment of a robust, globally-competitive aerospace manufacturing hub in India by the year 2040 than being a mere component supplier.

f) Domestic leasing and MRO

Leasing and MRO lead to a massive outflow of foreign exchange from Indian carriers. These sub-sectors need a massive policy support. These will be discussed in subsequent chapters.

g) Exclusive airline terminals

As Indian carriers grow in size and scale, they may be allowed to build and operate exclusive airport terminals through a transparent PPP policy. An exclusive terminal helps the lead airline is achieving operational synergies and better passenger experience. The large amounts of data collected by the airline could be leveraged in designing customized airport service offerings and choice of retail outlets.

The airline may be charged a reasonable premium for the strategic benefits it gets from the exclusive terminal. This premium can be utilised partly to cross-subsidise smaller airlines that need to provide a competitive alternative to passengers.

h) Integrated travel offerings

Airlines and their partners should be encouraged to provide an integrated travel offering comprising heli-taxis, air-taxis, sea-planes in addition to standard airline services. These alternatives could be used for enhancing tourism within states or for regular commute between the airport and the city centre. Owing to increasing traffic congestion in major cities, such integrated offerings can create additional sources of revenue, tourism and jobs.

i) Masala bonds

Given that a large fraction of airline costs are dollar-denominated and interest rates are relatively higher in India, Indian carriers with stable balance sheets should explore the rupee-denominated Masala Bonds in the global market.

j) Joint marketing

State governments should plan and execute joint marketing programs in India abroad with leading Indian carriers to promote their tourist destinations.

k) Oil-pipelines to airports

Airports are perhaps the biggest single-point consumers of petro-fuels in any city. For most leading airports oil is transported through oil tankers into tank farms located at the airports. As volumes grow and Indian cities get more congested, this may not be a safe and financially viable option. The government needs to create a task force comprising senior officials from relevant ministries like petroleum, aviation, transport, finance, home and defence etc. to plan underground pipeline access to the top 30 airports in India. For greenfield airports, connectivity to the oil pipeline grid should be made a mandatory requirement.

l) Biofuels

Biofuel has the ability to reduce airline carbon footprint significantly. In August 2018, SpiceJet did a successful 40-minute demonstration flight between Delhi and Dehradun with a 25% biofuel-blended ATF. The biofuel was from Jathropha crop, developed by CSIR and Indian Institute of Petroleum. India consumes around 8 million tons of ATF in India. A 25% blend would require around 2 million tons of biofuel or around 5-6 million tons of Jatropha seeds per annum. The government should come up with an aviation-grade biodiesel policy to promote cultivation and manufacturing of this wonder-fuel.



05 Air Cargo



05 Air Cargo

5.1 Current status

Air cargo accounts for less than 1% of the global cargo movement by tonnage, but over 35% by value. It is critical for industries such as e-commerce, pharmaceuticals, electronics, marine exports, floriculture, fashion garments, etc. where shipments are highly time-sensitive.

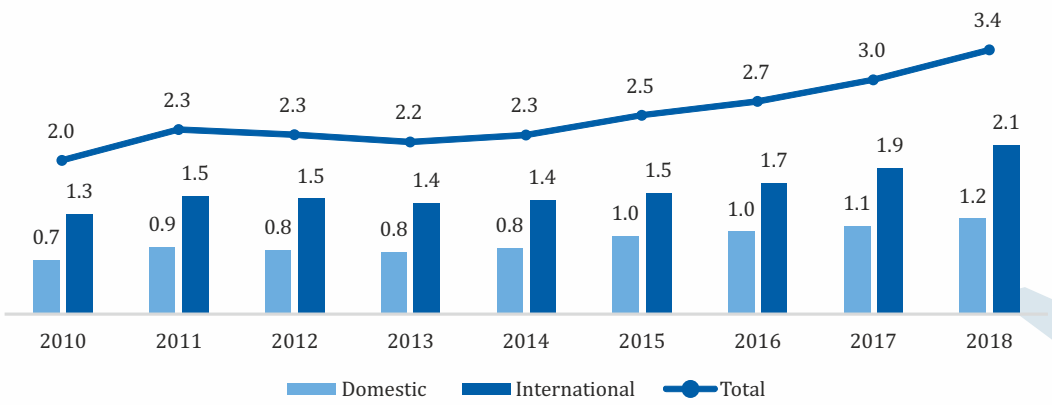
Revenue from cargo is generally higher on a per kilogram basis as compared to passengers. It also involves far lesser infrastructure, attention and care. Growth in air cargo therefore is critical for the financial sustainability of airlines.

As per IATA, air cargo is expected to rise to 62.5 million MT in calendar year 2018 from 59.9 million MT in 2017.

High growth potential

Air cargo throughput in India increased by 12.7% to 3.35 million MT in FY17-18. International cargo contributes to 60% of total air cargo volumes in India and grew at 15.6% over FY 16-17. In comparison, domestic cargo grew by only 8% due to stiff competition from the trucking industry and various infrastructure challenges at Indian airports.

Air cargo throughput (in million MT)



Source: AAI

Key growth drivers for air cargo include the growth in economy, fleet enhancement by Indian carriers, boom in e-commerce and express deliveries, several pro-industry policy initiatives by the government and investments in infrastructure.

Key challenges

Despite the healthy growth, the volume of air cargo handled in India is significantly lower as compared to top airports in the world. As per Airports Council International (ACI), combined

cargo handled by ALL Indian airports is less than that handled by Hong Kong, Memphis and Shanghai airports individually in the year 2017.

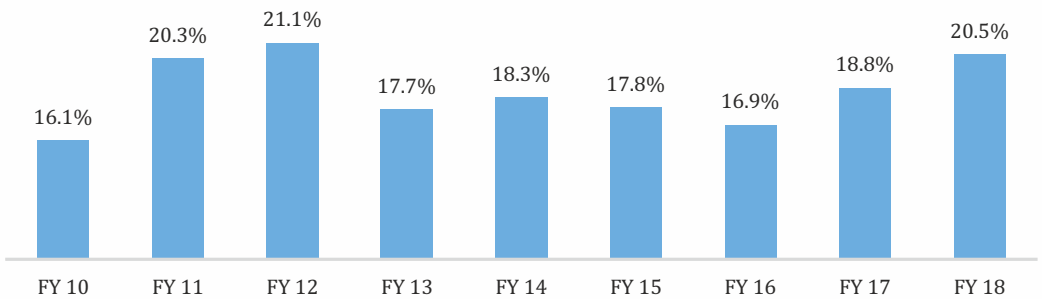
Logistics costs in India comprise about 13-14% of GDP as compared to 7-8% in developed countries which has also hampered the growth of air cargo logistics industry.

The Indian air cargo industry in the country faces a multitude of challenges. These include high dwell times, congested cargo terminals, sub-optimal use of belly cargo capacity, missing/ damaged/ non-traceable cargo, manual processing etc. Key reasons include insufficient enabling infrastructure, complicated procedures, limited use of technology and challenges on the human resource front.

Share of Indian carriers

The share of Indian carriers in international cargo to and from India has risen since FY 15-16 with the increase in capacity deployment. However, due to low presence of wide-bodies and freighter aircraft in the Indian fleet, the share of Indian carriers is still around the 20% mark as shown below. This is likely to move upwards in future with the likely introduction of wide-bodies by Indian carriers.

Share of Indian carriers in international cargo traffic to and from India (%)



Source: DGCA

Indo-Gulf corridor is key

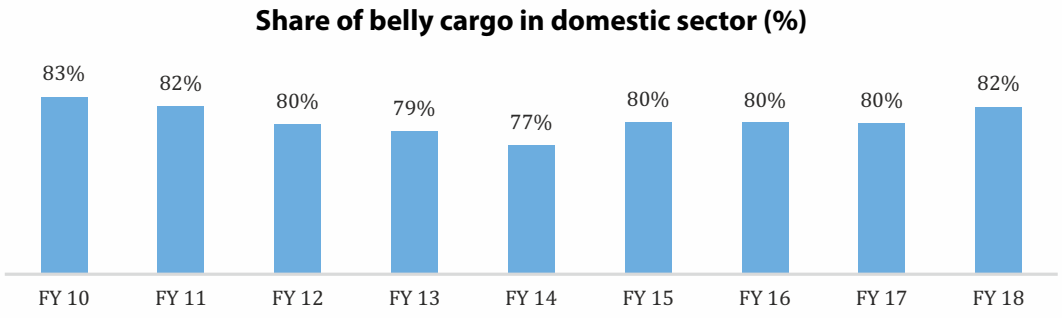
The top 10 destinations account for 78% of the total cargo tonnage flow from India in 2017. The Gulf region is the prime contributor with UAE accounting for 30% and Qatar 11% to the cargo flow from India. Ethiopia at number three highlights the untapped potential of the Indo-Africa freight corridor. There is a need to explore more such under-leveraged corridors.

S No	Country	Tonnage ('000 MT)	Annual growth
1.	UAE	293	4.7%
2.	Qatar	114	18.2%
3.	Ethiopia	78	114.4%
4.	United Kingdom	66	16.0%
5.	Hong Kong	62	-0.3%
6.	Singapore	58	5.4%
7.	Saudi Arabia	52	25.6%
8.	Germany	47	6.3%
9.	Thailand	33	34.2%
10.	Kuwait	25	30.2%

Source: IATA

Belly cargo dominates

In domestic sector, belly cargo comprises almost 80% of the total cargo handled. This is likely to increase as more capacity gets introduced on the passenger side.



Source: DGCA

High dwell time

In a study commissioned by MoCA, reasons for high dwell time at six leading airports were assessed and corrective actions were identified. In 2017, the free period for air cargo was reduced from 72 hours to 48 hours. As per a recent assessment, dwell time for import and export cargo has been reduced by over 25% at seven airports in India over the last three years. This needs to be brought down to low single digits by use of paperless processing, infrastructure improvements at the cargo terminals and use of off-airport cargo processing.

Infrastructure bottlenecks

According to ICRA, air cargo traffic in India is expected to grow by 60% in the next five years, but infrastructure and procedural bottlenecks continue to be major constraints. Airports in India currently have a capacity to handle 4.63 million MT of air cargo per annum. Cargo handling capacity needs to increase by at least 2 million MT in the next five years.

Air cargo traffic is concentrated at the major airports, with 6 airports accounting for 87% of the total cargo volume which is leading to terminal congestion at these airports.

S No	Country	Cargo in FY 17-18 ('000 MT)	% share
1.	Delhi	963	28.7%
2.	Mumbai	906	26.9%
3.	Chennai	418	12.4%
4.	Bangalore	348	10.4%
5.	Kolkata	163	4.8%
6.	Hyderabad	134	3.9%
	All India	3,357	

Source: AAI

For instance, terminal capacity in courier terminals at Delhi and Mumbai is lacking compared to the demand which leads to high dwell times and embargo on incoming cargo.

There is a shortage of skilled manpower in the ground operations and security functions. Insufficient supporting infrastructure like truck docking bays, special facilities for temperature

controlled goods, express freight, hazardous goods etc. and seamless rail-road connectivity to the hinterland continue to hurt.

Trans-shipment - a low hanging fruit

Trans-shipment cargo constitutes as high as 60-70% of total volumes handled by some of the leading global airports. It is negligible in India. India has a significant potential to become a trans-shipment hub, given its geographic location, global flight connections and improved relation with its neighbouring countries.

5.2 Vision 2040

a) Air cargo throughput may reach 17 mmtpa in FY 2040 from 3.35 mmtpa in FY 2018

b) Dwell time may be reduced to 1-2 hours for exports and 2-3 hours for imports

c) Cargo processing may be completely paperless

d) Three Indian airports may be among top 20 airports in the world in terms of air cargo handled

e) India to become a trans-shipment hub, with trans-shipment accounting for at least 30% of India's total international cargo throughput.

f) India to be among the top 10 countries in World Bank's Logistics Performance Index (LPI). It is currently ranked 44th.

5.3 Action steps to achieve Vision 2040

a) Strengthen the ACLPB

The Air Cargo Logistics Promotion Board (ACLPB) is facilitating close coordination between different government ministries and industry stakeholders; and enabling time-bound implementation of growth-oriented cargo policies. ACLPB needs to be strengthened further with additional staff that can undertake multiple initiatives. It should release quarterly updates on the key actions taken and the outcomes thereof.

b) Trans-shipment

As highlighted earlier, cumbersome customs, safety and security procedures for trans-shipment cargo have prevented full exploitation of this low-hanging fruit. India's neighbours find it faster and cheaper to send goods via ships to hubs in the Middle East and thence by air to markets in USA and EU. Clause 20(g) of NCAP 2016 states that ACLPB shall propose specific action steps for trans-shipment including establishment of free trade warehousing zones inside the airports. This needs to be addressed on priority. Seamless ramp to ramp transfers of trans-shipment cargo with due safeguards needs to be implemented on a priority basis; followed by greater engagement with logistics companies in neighbouring countries.

c) Performance monitoring

The ACLPB should formulate key performance indicators (KPI) for various government and industry stakeholders like - airlines, airports, terminal operators, Customs House Agents (CHA), freight forwarders; and government agencies like Customs, CISF, quarantine officers etc.

Emerging technologies like artificial intelligence and blockchain etc. should be leveraged for real time monitoring with minimal human intervention. Mechanism for rating the Cargo Terminal Service Quality (CTSQ) along the lines of ACI's Airport Service Quality (ASQ) rating of passenger terminals should be introduced

d) Air Freight Stations (AFS)

AFS need to be promoted on priority. These are critical for faster cargo processing at space-constrained airports.

e) RMS for exports

Risk Management System (RMS) has shown excellent results on the imports side. Customs authorities should consider introducing RMS for exports at the earliest possible, to minimize congestion on the apron and the resultant damage and/or pilferage.

f) Paperless processing

Simplify customs processes and documentation through full adoption of EDI (Electronic Data Interchange). Customs should go for full EDI adoption for import and export registration, clearance, drawback and e-payment of duty. This shall release several Customs officers, who can contribute in part for 24x7 operations. Implementation of Customs Single Window System should take place only after the readiness of the other ancillary regulatory authorities & full up-gradation of Customs EDI system.

g) Digital innovations

The industry should speedily adopt innovations like big data, block chain, biometrics and artificial intelligence to improve transparency and reliability of operations.

h) IATA's e-freight initiative

A major thrust towards migrating to paperless environment can come from the proposed e-freight initiative of IATA being adopted in other countries. E-freight aims to take paperwork out of air cargo supply chain and replace it with cheaper, more accurate and reliable electronic messaging. Facilitated by IATA, the project is an industry-wide initiative involving carriers, freight forwarders, ground handlers, shippers and customs authorities. The government and industry should work together to ensure its rollout in India at the earliest.

i) 'Infrastructure' status for off-airport facilities

NCAP 2016 states that cargo facilities co-located at an airport are covered under the Harmonised List of Infrastructure and will get the benefit of 'infrastructure sector'. The

same needs to be extended to air cargo facilities located outside the airport with due checks and balances.

j) Cargo Village

Facilitate the development of Cargo Villages at all major airports. This would help consolidate all government agencies, regulators and service providers within the airport's cargo facility and help decongest the cargo terminals.

k) Low frills cargo airports

Dedicated low-frills cargo airports need to be promoted close to industrial and logistics centres. These airports would allow peak operation during night hours, have good connectivity with transport infrastructure and would help decongest hub airports.

l) Tier 2/3 airports

The government should incentivize development of cargo handling and processing infrastructure in Tier 2/3 city airports to decentralize cargo operations at metro airports

m) Freighters

Freighters play a vital role in increasing the cargo throughput of the country. With the growth of e-commerce, there is a possibility of freighters being introduced on the domestic sector in large numbers. There is no policy for allotment of dedicated facilities at any of the airports for freighters and express cargo operators. Restriction on night operations and high lease rentals has made setting freighter operations a costly proposition. ACLPB needs to develop a policy framework for promotion of freighters.

06 Maintenance, Repair and Overhaul



06 Maintenance, Repair and Overhaul

6.1 Current status

With its growing aircraft fleet size, strategic geographic location, rich pool of engineering expertise and low labor cost, India has a huge potential to be the global Maintenance, Repair and Overhaul (MRO) hub given a long-time perspective.

The current market size of the MRO industry in India is assessed at about $700-800 million which is expected to reach $1.2 billion by 2020. India has the potential to become the third largest aviation market by 2022. India has long been viewed with interest from MROs globally seeking a valuable gateway between the Middle East and Asia-Pacific.

According to Aviation Week Fleet and MRO Forecast, the MRO market in India is expected to grow at 7.7% annually over the next decade, which is more than three times the global rate.

This demand is being driven by a fleet growing at 9.9% annually, from around 620 in FY 2018 to a projected fleet of over 2,300 in FY 2040. With over 1000 aircraft currently on order, India is likely to become the third largest buyer of commercial passenger planes in the world, only behind the US and China.

The growth is being boosted by the expansion and development of new airports, fast expanding LCCs, a liberal FDI policy, rising adoption of new technology and focus on regional connectivity etc.

Key challenges

Despite a rising fleet, Maintenance, Repair and Overhaul (MRO) industry continues to struggle for relevance. The biggest challenge is the severe tax anomaly with foreign jurisdictions. This is despite the widespread appreciation of the fact that, with a fast expanding fleet, India needs to build a robust domestic MRO eco-system. More so, given the government's avowed commitment to push for 'Make in India'.

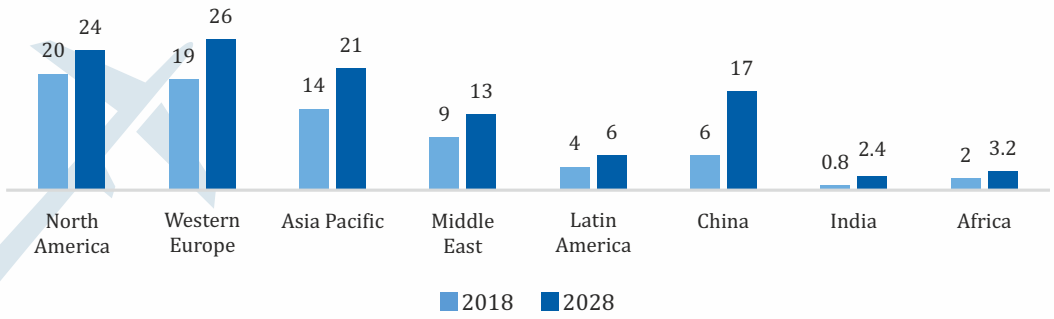
Due to a limited MRO eco-system and a sub-optimal tax structure, most Indian carriers carry out MRO in Sri Lanka, South East Asia, Middle East or Europe. This entails additional cost of empty ferry flights, additional logistics costs and payment in foreign exchange. That it still works out cheaper and better than doing MRO in India does not show India in a great light.

There are about 40 overseas entities approved by DGCA to conduct MRO on India-registered aircraft. These account for over 90% of the MRO spend of Indian carriers.

Currently GST on aviation MRO is levied at 18%. In Singapore and Malaysia, tax is levied at 7% whereas in Sri Lanka there is none.

The graphs below shows the total MRO spend by region in 2018 and 2028 (Billion USD). India may continue to remain an insignificant player unless drastic policy interventions are undertaken in line with the provisions of NCAP 2016.

MRO spend by region



Source: Consultancy.UK, KPMG Analysis

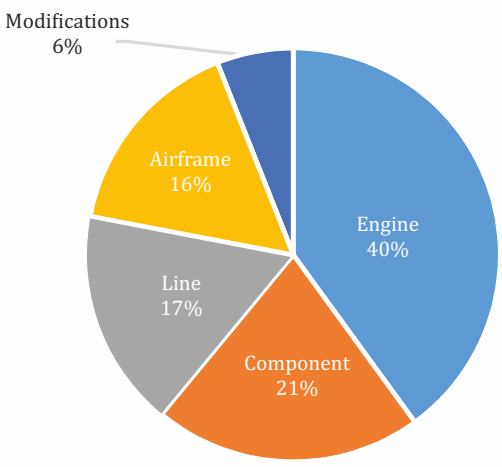
In January 2017, low cost carrier SpiceJet confirmed a deal worth USD 22 billion to buy 205 aircraft from Boeing. The airline has tied up with Air India Engineering Services Ltd (AIESL) for using their MRO facility at Nagpur. Other OEMs and airlines need to be persuaded to strongly consider setting up their MRO facilities in India on their own or through third parties.

It is not easy to wean away Indian carriers from their well-established MRO service providers outside India. It has to be a 3-5 year mission, involving continuous dialogue between central and interested state governments, DGCA, airlines, OEMs and the MRO industry.

Airlines in India typically spend about 12-15 per cent of their revenues towards maintenance, which is the second highest cost item after fuel. Generally, airlines carry on-tarmac inspections (A and B checks) in-house and work with third-party MROs for engine, heavy maintenance (C and D checks) and modifications.

Nearly 60% of the MRO spend is on engine and component repairs. This is where India has to focus on.

Revenue split by nature of MRO



Source: KPMG Analysis

Procedural reforms under NCAP 2016

The landmark NCAP 2016 removed many procedural hurdles faced by the MRO industry and have been duly welcomed by them.

The duty free period for component imports was increased from one to three years. Foreign aircraft were allowed to come to India for MRO for a period of 6 months (instead of 15 days earlier) without any permission.

MROs were required to provide proof of their requirements of parts, or orders from their client airlines. This has been done away with. Foreign pilots and MRO experts will be provided visas and Temporary Landing Permits promptly. Airport royalty and additional charges will not be levied on MRO service providers for a period of five years.

To facilitate repairs of damaged sub-assemblies like engines and landing gears of foreign carriers, the notification has been revised to enable advance export of serviceable parts.

Taxation anomaly

The benefits of NCAP 2016 have been completely undone by the tax regime applicable to MROs. GST on MRO providers in India is 18% for most items as compared to 0-7 percent tax in competing nations in Middle East and SE Asia.

The government of India does impose a GST of 5% on the invoice value of the MRO done abroad, but airlines can take a setoff against the same. The significant tax differential between Indian and global MRO providers renders MRO in India a non-starter.

Some argue that since airlines get an input tax credit for GST paid on MRO, there's no problem at all. The reality is that LCC's pay only 5% GST on economy class tickets whereas many of their inputs services incur GST of 5-28 percent. At times, LCCs do not have adequate GST credits to offset the 18% GST paid to Indian MROs. The 18% GST then becomes an additional cost that airlines, operating on thin profit margins cannot absorb.

There is also a cash-flow issue. Most Indian carriers are facing a cash crunch. They do not want to pay 18% GST today and then claim a setoff later. It's much simpler to fly the aircraft abroad and work with established global MRO providers.

The tax anomaly is worse for Indian MROs importing tools, test benches and consumables. An Indian MRO importing tools and test-benches is subject to 18% GST as against 5% charged on aircraft components.

MROs importing consumables like adhesives, paints and varnishes are perhaps the worst off. Consumable are slapped with a 10% import duty and then a GST of 18%. Note the anomaly - the same paint applied in Singapore and Dubai on an Indian aircraft will suffer a 5% GST, but if an Indian MRO imports the paint, the airline will pay a 10% import duty, compounded by 28% GST. There's almost zero probability of an Indian airline getting its aircraft painted in India.

Some feel that if a zero rate of GST is applied on aviation MRO, every repair shop for autos, cars, trucks and trains may demand the same. This is an incorrect analogy. One cannot take one's car or truck physically to Singapore or Dubai for MRO. In case of aviation, the vehicle flies. It can fly to any country that provides reliable MRO services at a lower cost. This is the simple reason why most progressive countries apply a 0-7 percent rate of tax on their MRO sector.

Giving rebate in GST for car or truck repair shops may lead to reduction in GST revenue and no major gains in jobs. In contrast, as highlighted earlier, nearly 90% of the MRO expense of Indian carriers is incurred abroad. Applying a zero rate of GST on aviation MRO will bring back the revenue forgone and help establish the industry. It will also create incremental GDP, employment and government taxes (corporate tax, income tax, GST on consumption by employees etc.).

Interestingly, by zero-rating GST on MROs, the government will suffer no loss of GST revenue since MRO is a B2B business. E.g., if an MRO doesn't charge GST to an airline, the said airline will not get any input tax credit on the same - the government loses nothing. The so-called revenue loss is notional and non-existent.

Airlines will need a complete MRO eco-system in India in order to switch from their current service providers. The MRO ecosystem includes repair shops for airframe, engine and components; component suppliers, warehouses and training facilities. The entire MRO zone should be notified as an SEZ and subject to zero taxation on all MRO activities.

The MRO industry globally has been developed on the back of foreign investments and players, Singapore and Dubai embarked on this journey in the early 1980s. Foreign OEMs and MROs see India's long term potential and are keen to invest here.

Investments from foreign OEMs and MROs are subject to dividend tax. These entities have already invested in MRO facilities in India's neighbourhood. An investment in India will cannibalise their own investments and hurt the volume commitments that they may have made to their business partners. OEMs and foreign MROs need to be incentivised to balance out these constraints.

Airport royalties

Airports in India charge royalties on the invoice value of MROs, over and above the space rentals that MROs pay to the airport companies. This is a violation of Clause 18B (f) of NCAP 2016 that stipulates removal of all such royalties and add-on costs for a five year period. The said Clause needs to be enforced with immediate effect.

Redelivery maintenance

With the prevalence of sale-and-lease-back model among Indian carriers, redelivery maintenance forms a major part of an airline's and lessor's MRO requirements. This presents a large opportunity for both component repair and heavy maintenance. Currently this is done mostly outside India, due to various legal and technical reasons.

Cost advantage in India

If there is a continued push for tax and procedural reforms, aircraft servicing in India can be 20-25 percent cheaper than its competing nations. It will help transform the moribund Indian MRO industry from mere line or base maintenance providers to value providers.

New business models

There is a possibility that aircraft OEMs and lessors may provide aircraft as a service, selling seat-hours instead of aircraft. MROs will then shift into being asset management platforms instead of

simply fixing defects and performing planned checks. This may require a radical change in mindsets, capabilities and financial strength of Indian MROs.

Revival of Air India's MRO facility

The AIESL facility at Nagpur is a national asset. Unconfirmed reports reveal that it is utilised only to the extent of 20 per cent. AIESL's losses in FY 2016 and FY 2017 were INR 559 cr and INR 505 cr respectively. It is now trying to offer its services beyond the parent Air India.

In 2016, AIESL signed a contract with Jet Airways to carry out C checks on their Boeing 777s at Nagpur AIESL now also services Jet's aircraft at Mumbai.

AIESL has signed an agreement with SpiceJet. Talks are underway with another Indian LCC. Under an agreement with Boeing, AIESL can undertake MRO work on most aircraft types. In 2017, the Nagpur facility has been approved by DGCA to carry out maintenance of Airbus A319, A320 and A321 aircraft, which opens up a huge window of opportunity.

AIESL has started tests and minor repairs on GE's engines that power Boeing 777s. There is a possibility that AIESL may get the approval for complete overhaul of engines in the near future. This engine overhaul facility, the first of its kind in India, can undertake repairs of all GE engines.

AIESL is willing to let a reputed private player take over the Nagpur facility on a 30-year lease under a revenue-sharing agreement. This option needs to be pushed hard with leading airlines and global MRO providers. There may be some liberal terms that may need to be built in in the lease agreement to attract reputed operators form India and abroad.

Other facilities

Some upcoming MRO facilities are as follows:

S No	Entity	City	Status
1	Jet Airways and BIAL	Bangalore	Signed agreement to set up MRO at Bengaluru airport.
2	Lufthansa-Technic and GMR	Hyderabad	Signed agreement to set up MRO at Hyderabad airport.
3	Boeing and Air India	Nagpur	Boeing plans to establish a $100 million facility at Mihan SEZ
4	Thales International	Gurgaon	An avionics maintenance centre is being planned.
5	TAAL and Airworks	Mumbai	Plans to lease up to five hangers to develop a private airfield as an MRO and aviation park
6	Sabena Technic and TAAL	Hosur	Plans to develop an MRO at TAAL's airfield in Hosur
7	Airbus	Nashik	Tie-up with Hindustan Aeronautics (HAL), for setting up a US$ 100 million MRO facility. Also signed MOUs with Maharashtra Airport Development Company.
8	HAL and Pratt and Whitney, Canada	Bangalore	Engine Overhaul and maintenance services. This MRO would have yearly capacity of 150 aircraft.

Source: Industry sources, media reports (Note: Some information could be erroneous)

6.2 Vision 2040

The Vision 2040 for MRO industry is as follows:

a) India shall be a global MRO hub, handling nearly 90% of the MRO requirements of Indian carriers.

b) At least 20% of the Indian MRO industry's revenue shall come from foreign-registered aircraft.

c) Nearly 90% of redelivery maintenance shall be done within India.

6.3 Key steps to achieve Vision 2040

a) MRO task force

A high-power task force for promotion of MRO needs to be formed under the leadership of a Joint Secretary of MoCA. The task force may have members from relevant ministries and regulators. It should also have five representatives from the airlines, OEMs and MRO providers. The task force may analyse the various options and action steps required to make India a global MRO hub; develop a clear roadmap; and report actions and outcomes to the aviation minister.

b) Tax disparity

MROs and component warehouses need to be declared as free trade zones with zero-rate of GST and a ten-year holiday on corporate tax, capital gains tax and dividend distribution tax. There is no loss of indirect tax revenue since the GST will be recovered from the end consumer - the airlines. There will be no loss of direct tax revenue since the MRO industry is almost non-existent today.

Disrupting existing relationships between Indian carriers and foreign MROs is not easy. The MRO task force may consider additional incentives like capital subsidy and interest subsidies to attract investments.

In order to build an MRO ecosystem in high-tech systems like engines and avionics, there could be additional incentives provided for MROs investing in these categories.

c) Import restriction

The government may consider restricting airlines from taking Indian aircraft abroad for repairs, except in cases where the infrastructure and technical knowhow is not available in India. Such a restriction may be applied five years after the tax anomalies are removed, giving ample time to develop the MRO eco-system in India.

d) Alternate locations

MRO eco-system needs to be established near large airports. Many busy airports like Mumbai are already congested. This creates an opportunity for progressive state governments to create an incentive package over and above the central package and attract large OEMs or MRO providers to their state.

e) Airport royalties

In line with Clause 18B (f) of NCAP 2016, MoCA may issue a notification abolishing, with immediate effect, all royalties and charges (other than reasonable lease rentals) levied by airport operators on MROs for a period of five years.

f) Illustrated Parts Catalogues

Components, tools, test benches and consumables related to MRO should be subject to immediate clearance by Customs without any harassment and delays. The Illustrated Parts Catalogues (IPC) issued by OEMs should be treated as adequate proof of the genuineness of the aircraft component. Any violation by an MRO may invite cancellation of license and appropriate penalties to serve as a deterrent.

g) Skill-building

The MRO facilities will require ancillary industries and services. These include repair and testing facilities for avionics, electrical equipment, hydro-mechanical and pneumatic components, composite structures and aircraft interiors etc. There will a large requirement for super-specialised training facilities. This shall need to be captured in the incentive package in close coordination with the Aerospace and Aviation Sector Skill Council (AASSC).


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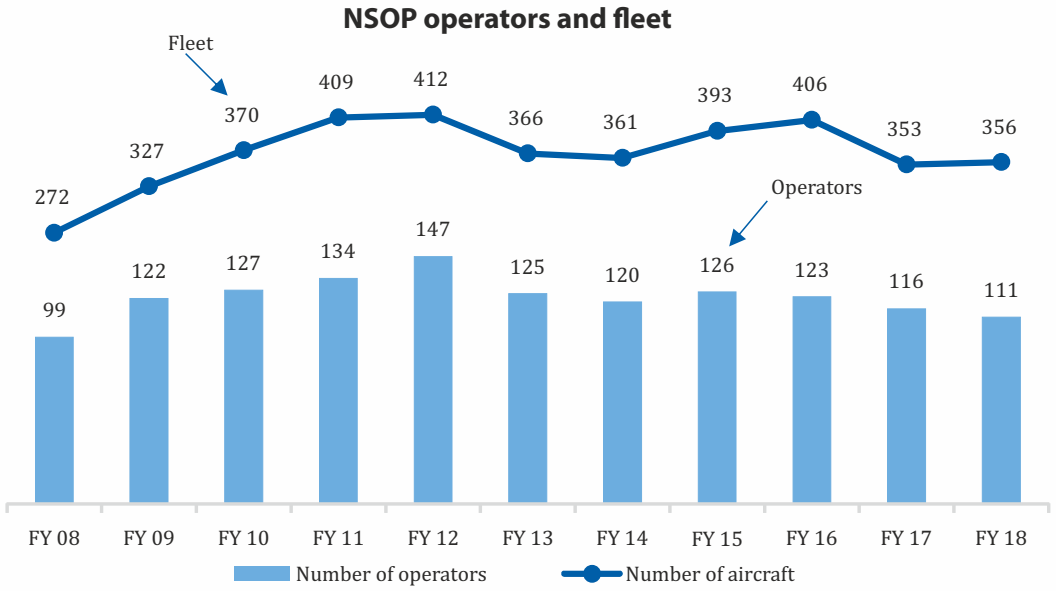
07 General Aviation



07 General Aviation

7.1 Current status

While scheduled airlines are facing significant demand growth, the General Aviation (GA) industry has not been very successful. As per DGCA, the number of operators with the Non-Scheduled Operator's Permit (NSOP) reached a peak of 147 in FY 2012 which has since reduced to 111 in FY 2018. The present ownership pattern indicates a fragmented sector with most of the operators owning 1-3 aircraft. Such small fleet result in higher cost of operations and compliance.



Source: DGCA

The NSOP fleet in India comprises around 356 aircraft, including helicopters. This is down from a peak of 412 aircraft in FY 2012. Of the total 35 non-scheduled international operators, the top 15 operators accounted for more than 80% of the total number of international flights operated in FY 2018. Of the total 76 NSOP domestic operators, the top 15 operators accounted for more than 60% of domestic flights operated in the year FY 2018.

In addition to the NSOP fleet, there are 134 fixed wing and 48 helicopters registered with DGCA as private aircraft as of July 2018.

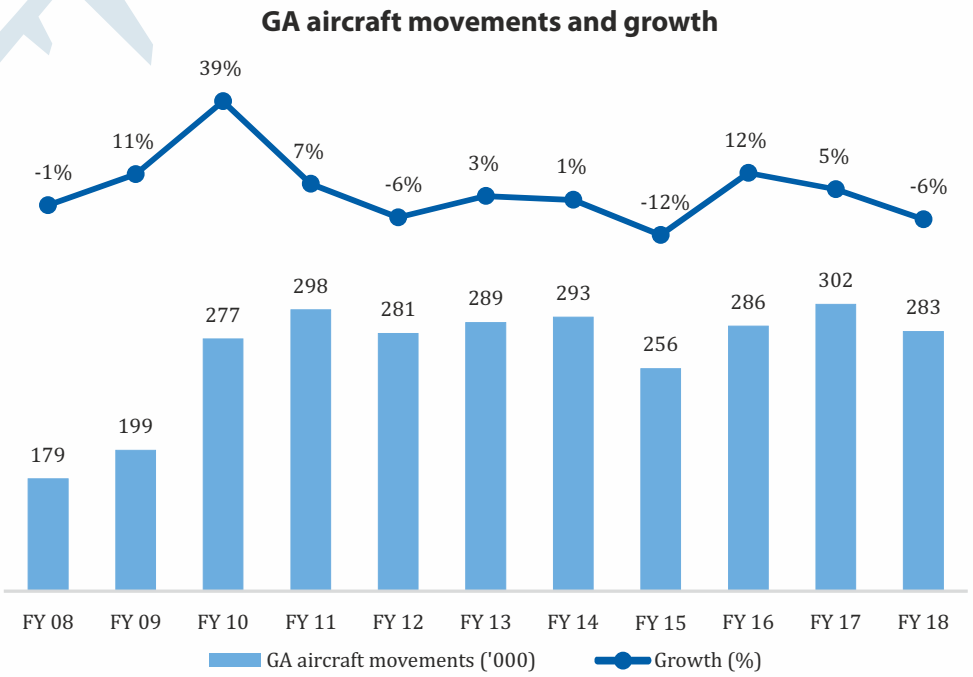
In contrast, UK has over 20,000 GA aircraft using over 1800 aerodromes. US has several times the UK fleet, flying to over 5200 aerodromes.

The biggest challenge faced by the GA industry is the infrastructure deficit especially at major airports such as at Delhi and Mumbai. This is where a majority of owners and clients of GA live and work. Since preference is given to scheduled airlines in the morning and evening peak hours, the

curfew hours imposed on GA renders them ineffective. The planning and roadmap for aviation infrastructure so far has not taken note of GA requirements.

Add to these, high ATF taxes and airport charges, shortage of hangars and parking slots etc. and one can understand why GA in India never really took off.

As seen in the graph below, annual GA aircraft movements have remained nearly static over the last nine years, below the 300,000 movements per annum mark. This is in sharp contrast to the traffic growth being witnessed in commercial aviation.



The high taxes and charges imposed on GA are primarily due to its branding as a 'luxury' item. This is very similar to how commercial aviation was looked at, less than two decades back.

The current users of GA are the primarily the rich and powerful - politicians, industrialists, corporate executives and celebrities. Given its elitist tag, any support to GA is perhaps considered politically risky. It therefore continues to remain a high cost luxury; out of reach for most middle class Indians. The elitist tag remains a self-fulfilling fallacy.

GA aircraft are the biggest catalyst of regional connectivity. They are the first to land at small airfields in small towns that have significance due to a manufacturing plant, mine, port or tourist location. It is only after the small town achieves prominence that regular airlines venture there.

For 'Make in India' to succeed, GA needs to be promoted in big way so than investors, bankers and executives can travel between the headquarters and the production and logistics centres seamlessly without wasting hours on the road, some of which may pass through unsafe and unsecured territory.

Once the value of GA is realised, appropriate steps need to be undertaken to make it affordable and reliable. There are GA booking portals that are aggregating demand and managing the fleet of small GA operators. This, along with fractional ownership of aircraft is likely to give a boost to the GA industry in India.

Import of private jets incurs basic customs duty and a GST of 28%, while a non-scheduled operator (NSOP) has to pay basic customs duty plus 18%. Leading aviation powers like US, UK, Australia, and Japan etc. impose zero import duty on GA aircraft.

No wonder we have fleet of less than 150 private jets, despite a huge need and purchasing power that exists in India. With almost zero imports, the government in turn gets almost nothing by way of tax, making it look like a self-goal.

The tax differential between private and NSOP aircraft ensures that most private buyers import an aircraft under the NSOP category. A large number of NSOPs have single aircraft fleet, which creates a huge pressure on DGCA in terms of monitoring and oversight.

According to media reports, the MoCA is considering allowing different owner and operator for private jets. This would allow a private entity to purchase an aircraft and hand it over to an aircraft management company to maintain and operate it on mutually agreed terms.

Helicopters

Given their versatility, helicopters have a far wider range of applications than fixed wing aircraft. These include - intra and inter-city commuting, cargo, air ambulance, law enforcement, search and rescue, tourism, firefighting, agriculture, media and entertainment etc. Most of these have tremendous potential in India.

Ironically, the whole of India has just around 319 helicopters. They are distributed among NSOPs (229), private entities (48) and government entities (42). In comparison, just one city in Brazil - Sau Paulo -has over 700 registered helicopters and over 500 helipads. USA is far ahead with over 14,000 helicopters.

According to industry sources, over 70% of the flying hours of the Indian helicopter fleet is accounted for by just around 40 helicopters deployed in the offshore oil-rigs. According to DGCA, out of 52 non-scheduled helicopter operators, the top three - Global Vectra, Pawan Hans and Himalayan Heli-services accounted for more than 70% of the total number of flights operated in FY 2018, indicating that other operators are severely under-utilised.

Religious tourism in India draws millions of people across different income strata. Since many of the religious destinations involve a strenuous trek over difficult terrain, heli-taxis have a huge potential, especially for senior citizens, children and the differently abled. The success of heli-taxis at the Vaishno Devi shrine is an eye-opener. It needs to be replicated all across the country.

Amphibious aircraft

With a coastline of over 7516 km and 246 islands, India has tremendous potential for coastal tourism. Plus it have vast lakes and rivers. Countries with far less have done much better in terms of tourism revenue and jobs. One reason has been a near absence of amphibious aircraft in India.

Many of the high potential coastal spots are located far off from the nearest airport, highway or railway station due to terrain issues or shortfalls in planning. Amphibious planes help us leapfrog from coast to coast or airport to coast and back. Given the small weight, amphibious aircraft can operate from very small regional airfields with minimal infrastructure. NCAP 2016 has rightly highlighted amphibious aircraft as an opportunity area and provided policy support.

7.2 Vision 2040

The expected scenario for GA in 2040 is as follows:

a) GA will become an integral part of India's aviation eco-system, driven by remote area connectivity, tourism and disaster management programs.

b) The elitist tag attached to GA will go.

c) The tax differential between GA and commercial aircraft will be zero or minimal.

d) The price differential between GA and business class tickets on scheduled carriers may be reduced to a very small number.

e) GA terminal and facilities will be an integral part of the design of new airports.

f) India's top ten cities may have separate airfields for GA that may operate on a 24x7 basis with customs and immigration facilities.

g) Total GA fleet may increase drastically by over 7-10 times its current fleet.

h) There could be over 200 amphibious aircraft located across India's coastline and waterbodies.

7.3 Key action steps to achieve Vision 2040

a) GA Task Force

A task force should be formed under a Joint Secretary of MoCA to address the long pending growth challenges of the GA industry. The task force should have representatives from DGCA, AERA, MoF, MHA, MoD, airport operators and the GA industry. The task force should lay out the roadmap for establishment of a robust GA industry in 60 days and thereafter report actions and outcomes to the aviation ministers on a monthly basis.

b) Equitable treatment

GA aircraft face a curfew during peak hours at leading airports. It is akin to private cars being banned on the roads during peak hours in favour of buses and taxis during peak hours. Such an approach defeats the very purpose of general aviation. A clear policy needs to be developed regarding slot allocation to GA at congested airports. Till then five slots per hour could be allocated to GA during peak hours.

c) Development of heliports

Development of heliports is important to support the growth of GA in India, especially in areas that cannot have runways due to financial constraints or terrain-related challenges. MoCA may consider developing a PPP policy for development of heliports. NCAP 2016 has proposed a series of reforms to support the helicopter industry. The same should be implemented in letter and spirit, especially for use in intra-city travel and medical evacuation.

d) Support infrastructure

It is important to develop the supporting infrastructure at airports in Tier 2/3 cities including night-landing facilities, enhancement of passenger amenities and state support in statutory services, like security, to boost the GA industry. GA facilities at metro airports need an upgrade in terms of dedicated terminal, entry point, apron and parking space, etc.

e) Upgrading of non-operational air-strips

Non-operational airstrips need to be upgraded in places of economic significance such as ports, mines, industrial clusters and tourist locations. These need to be done at the lowest possible cost without compromising on safety. The airstrip may attract a small number of GA flights initially and if it has a strong business case, it may ultimately lead to full scale operations in future, with significant boost to the local economy and jobs.

f) Airfield information

GA aircrafts and helicopters at times use airports and helipads that are not in regular use. It is important for MoCA to create a reliable and regularly updated database of all airports and airstrips in the country. It is also important to improve coordination with IAF airfields and introduce basic low-cost navigational aids in these small airfields, where applicable.

g) Heli-taxies

Heli-taxis are a low hanging fruit on India's highly congested metros. MoCA, DGCA, AAI and GA industry should work together to develop heli-taxi routes in Mumbai and Delhi to begin with. These should cover 8-10 high demand areas of the city with a flight taking off every 20 minutes during peak hours and thereafter every 60 minutes depending on the demand.

h) Defence clearance

NCAP 2016 allows helicopters to fly without prior ATC clearance as long as it stays below 5000 feet and does not enter restricted areas. However the defence ministry still insists on an Air Defence Clearance, which defeats the utility and quick response time of the helicopter. The Air Defence Clearance for non-restricted areas should be done away with. For the rest it should be available expeditiously through a phone-based app.

i) Cashless medical evacuation

MoCA should work with ministries of railways and highways; insurance companies, helicopter operators and hospitals to evolve a cashless system for medical evacuation.

j) Helipads

Rooftop helipads need to be built over metros stations, railway stations, stadia, key buildings and near highways for rapid evacuation in case of an emergency.

k) Monitoring and oversight

Monitoring over a hundred-plus GA operators is a mammoth responsibility for DGCA. The numbers are expected to increase in future. Removing the tax differential between NSOP and private aircraft may help reduce the number of NSOPs. The option of a separate monitoring and facilitation agency for GA may be evaluated by MoCA.

l) GA airfields

All major India cities will need separate airfields for GA. Examples include Teterboro in New York, Le Bourget in Paris and Seletar in Singapore. This allows unhindered movement of commercial and general aviation without interfering with each other.

m) Helicopters on active runways

At airports, helicopters are made to land on active runway. This creates a huge bottleneck and delays regular flights. The ANS procedures should be designed in such a way that the helicopters land at dedicated helipads in or around the airports.

n) Amphibious aircraft

Amphibious aircraft should be brought under UDAN, the regional connectivity scheme. UDAN currently doesn't allow single engine aircraft. This may need to be amended since most seaplanes operate with a single engine. Since amphibious aircraft operate from jetties, the same shall need to be added to the list of eligible airfields under UDAN.

o) Airport charges

GA operators complain of maltreatment and high charges at metro airports since these are not regulated by the tariff regulator, AERA. NCAP 2016 stipulated that airport charges for helicopter operations will be suitably rationalized. The same needs to be implemented on priority.

p) GA cell at DGCA

Clause 16 (g) of NCAP 2016 states that a helicopter cell will be created in DGCA. This is a great idea. MoCA should consider making the cell look after entire GA and not just helicopters. DGCA should co-develop GA regulations with the industry, like the practice adopted by developed nations.

According to industry sources, in some cases, DGCA regulations are far more onerous and restrictive than FAA and EASA. These need to be liberalised, with due checks and balances.

Routine approvals at DGCA should be made online at the earliest, to prevent needless delays and harassment.

08 Aeronautical Manufacturing



08 Aeronautical Manufacturing

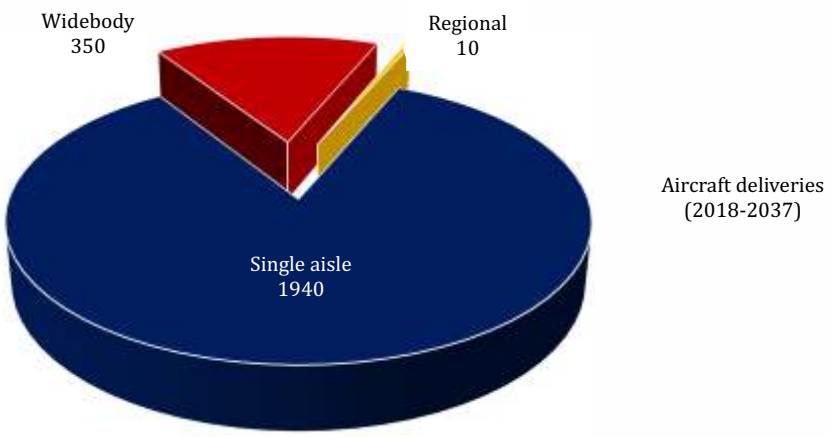
8.1 Current status

Over the next two decades, the global commercial aircraft fleet size is expected to grow at a CAGR of around 4%. Around 45,000 new aircraft are likely to be delivered globally between 2018 and 2040.

The growth will be driven by socioeconomic changes in emerging economies, especially in India, China, South East Asia and the Middle East. These factors, as discussed earlier, include rising incomes and aspirations, lower oil prices, fierce competition between airlines and increasing value of 'time'.

For India, Boeing raised its long-term forecast for commercial airplanes to 2,300 new jets - valued at $320 billion - over the next 20 years. Nearly 84% of those are expected to be narrow bodies.

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Source: Boeing

According to Boeing, with more than five percent of the world's fleet expected to operate in India by 2037, commercial services such as flight training, engineering and maintenance and digital analytics etc. will be the key drivers of growth. In the South Asian market, including India, Boeing forecasts a commercial services market valued at USD 430 billion over the next 20 years.

Sourcing from India

With India's high demand for aircraft, strategic geographic location, rich pool of engineering expertise and competitive labor cost, India has started to become an important part of the global footprint of leading OEMs like Airbus, Boeing, Lockheed Martin, Bombardier, etc.

Boeing has partnered with over 160 suppliers from India, with its annual sourcing from India standing at around USD 1 billion. Airbus has a total of 46 suppliers in India. Its sourcing from India

in 2017 totaled over USD 550 million. Airbus plans to source products worth USD 2 billion annually from India by 2020.

Global OEMs are also looking at developing a strong MSME base within India, so as to cater to the needs of their Tier-1 suppliers and set up an aircraft manufacturing ecosystem within the country.

Support from NCAP 2016

NCAP 2016 lays special emphasis on promoting aero-manufacturing. It state that aero-manufacturing locations may be notified as SEZ. The government will provide fiscal and monetary incentives and fast-track clearances. MoCA and MoD will work together to ensure that commercial aero-manufacturing is covered under defence offsets requirements.

NCAP 2016 also states that in case the cost of made-in-India aircraft and components work out to be higher than those supplied from their original sources, the government will consider an incentive package to nullify the cost differential. This provides a big support to potential investors.

Made in India aircraft

The Indian government has set up a task force led by the aviation minister to formulate a plan for the development of indigenous civilian aircraft, helicopters and associated aviation equipment under the National Civil Aircraft Development (NCAD) programme. The programme aims at promoting India as global hub for the manufacture, design and innovation in aeronautical manufacturing under the 'Make in India' initiative.

The task force consists of over a hundred experts from HAL, NAL, ADF and DRDO. A special purpose vehicle (SPV) will soon be set up for the project, with an initial investment of USD 1.4 billion.

The government is strongly engaging with all leading OEMs to establish manufacturing and assembly lines for production of aircraft in India like in USA, EU and China.

The leading suppliers and their products are listed below in the table:

S No	Supplier	Product	OEM
1	Aequs	Machining material	Premium Aerotech (an Airbus subsidiary)
2	Dynamatic Technologies	Flap-track beams for A320 and A330	Airbus
3	Tata Advanced Systems	Helicopter fuselage and wire harness for Sikorsky S-92	Lockheed Martin
4	Tata Advanced Materials	Composites for A320, A380 and A350	Airbus
5	TAL	Advanced composite floor beam for B787	Boeing
6	Bharat Forge	Titanium flap-track forgings for B737 MAX	Boeing
7	Mahindra Aerospace	Hard metal components for A320 NEO and A350XWB	Airbus

Source: Media reports; Note: The list is not exhaustive

Need for India sourcing

Currently, global aerospace OEMs and Tier-1 suppliers source more than 70% of their systems from suppliers in US and EU. Many new aircraft models are either entering the manufacturing

stage or undergoing a production ramp-up resulting in increased strain on the existing suppliers. For mitigating their supply chain risk, almost all leading OEMs and Tier 1 suppliers are adopting a multiple sourcing strategy and expanding their supplier base to include different geographical regions.

This opens up opportunities for China and India, which are closer to regions where the maximum demand for aircraft fleet expansion is being generated. Global majors such as UTC, Rolls Royce, Moog etc. have set up manufacturing facilities in India and are developing the supply chain here for global requirements.

Learning from automotive sector

The Indian aerospace supply chain is undergoing gradual transformation. Its current status is similar to that of the Indian auto sector 20 years back. The auto sector then had just a handful of players that were operating in India without a domestic manufacturing ecosystem eco-system and relying primarily on imports for major raw materials and components.

The government of India undertook a series of reforms by opening the sector for global players, with fiscal and monetary incentives and enhancing the 'ease of doing business'. The arrival of big players like Suzuki, Hyundai, Ford, GM and Toyota etc. has completely changed the game now, with India a major exporter of passenger cars. The Indian aero-manufacturing sector needs the same level of support from government and global collaboration.

8.2 Key challenges

a) Until recently, due to several challenges and strategic priorities aerospace OEMs and large suppliers did not have a focused sourcing strategy for India. This has resulted in very few aerospace components and systems being sourced out of India, primarily to meet defence offset requirements and for positive visibility. India is struggling to attract large scale investments from OEMs and Tier 1 manufacturers.

b) There are a handful of Indian players that are supplying to OEMs. Indian companies hence fail to attract a substantial volume of work at Tier 1 and 2 systems level resulting in securing mostly low value-added component manufacturing jobs, which involve high labour component.

c) India does not have a flourishing civil aircraft manufacturing program that can help the Indian players in building their capabilities. The aerospace sector in China and Brazil are success stories because of their push for an indigenous aircraft. India's Regional Transport Aircraft (RTA) program has faced many challenges.

d) The global aerospace supply chain is dominated by players from established economies. Clusters in Europe and North America contribute to 90% of the global sourcing volume. Indian suppliers are increasingly facing stiff competition for component level sourcing from low cost destinations such as China, South Korea, Thailand and the Middle East.

e) Stringent quality standards, mandatory certifications and long gestation period are major challenges in the aerospace manufacturing sector. The payback period is long

and production volumes are low initially. Indian suppliers are therefore struggling to establish themselves.

f) Non-availability of aerospace grade materials in India and heavy dependence on imports is eroding the cost competitiveness of Indian suppliers.

g) Shortage of skilled manpower is another major challenge in India. Most of the skill-development is done in-house by Indian manufacturers adding to their cost base.

8.3 Vision 2040

a) India will have a robust commercial aircraft manufacturing ecosystem in India with global collaboration. It will meet at least 70% of the country's commercial aircraft demand and also export to other countries.

b) At least two global OEMs will assemble aircraft in India.

c) India will co-develop an aircraft engine in India for domestic and global sales.

d) India will develop an ecosystem that will manufacture up to 90% of the components required for a commercial aircraft.

8.4 Key action steps

a) Develop aero-clusters

The task force created under the NCAD programme may identify the top five aeronautical technologies that India should achieve global leadership in, over the next 20 years. This is similar to what India did with its space program in the late 1990s. The focus technologies could be related to aero-structures, avionics, engine, composites, special-alloys, landing gears, cabin interiors, etc.

The government then needs to develop 3-4 focused aero-clusters for the identified technologies. These could be around large existing aero-manufacturing establishments in the private and public sector.

b) SEZ and deemed exports

Aero-clusters need to be given SEZ status. Aeronautical R&D and manufacturing should be given 'deemed' exports status for at least twenty years, extendable in future based on outcomes.

c) Anchor investors

MoCA and state governments should work with leading OEMs and Tier 1 companies to facilitate their entry as anchor investors. At the moment most global investors come in for project-specific and component-specific joint ventures. This has to become more holistic.

d) 100% FDI in defence aeronautics

The government should consider allowing 100% FDI through automatic route for investments by OEMs and Tier 1 manufacturers in defence aeronautical manufacturing. Aero-manufacturing technologies are highly classified and insisting on an Indian partner creates several challenges due to exports control restrictions in the parent countries. This may enable global players to set up manufacturing plants in India for the global market. The Indian market may not be big enough to justify a full-fledge manufacturing plant here.

e) Defence offsets

Defence offsets should be used strategically as an enabler to promote civil aerospace manufacturing in the country. Higher offset multiplier should be provided for sourcing complex commercial aerospace components from Indian players and MSMEs. Else some OEMs do end up ordering low-end metal fabrication work from Indian players that doesn't really help the latter and India move up the value chain.

f) Common infrastructure

Due to the capital intensive nature of the sector, Indian MSME and component manufacturers are not able to invest in the required infrastructure to compete globally. MoCA should take the lead in creating common infrastructure that can be shared by the component manufacturers. This may include special process and testing facilities, warehouse for inventory storage, training centres etc. These could be part of the proposed aero-clusters or existing ones based on a thorough feasibility analysis.

g) Skill development

MoCA, academia and industry need to jointly set-up an integrated aerospace skill development centres offering certification courses covering various aspects of aircraft manufacturing. These include R&D, prototyping, machining, wiring, surface treatments, composites, tooling, welding, assembly etc. These centres could be located in or close to the aero-clusters.



09 Remotely Piloted Aircraft



09 Remotely Piloted Aircraft

9.1 Current status

Remotely piloted aircraft (RPA), commonly known as drones are the next big revolution in aviation. A new era will dawn when they get regulatory approvals to carry human beings aerially.

While India is one of the fastest growing aviation markets in the world, RPA usage in India have been restricted to scattered operations and aerial photography due to legitimate concerns around privacy, safety and national security.

The government acknowledges the huge potential of drones and plans to develop India as a drone hub of the world. It has set up a 13-member task force comprising government officials, academia and private sector CEOs to help it prepare a road map for the sector. The task force will focus on areas like research and development, acquisition and commercialization, application and adoption in specific sectors, regulatory framework as well as preference for Make in India.

In August 2018, the government released Drone Regulations 1.0 which became effective from 1 December 2018. The regulations are intended to enable visual line-of-sight daytime-only and a maximum of 400 ft. altitude operations. The Digital Sky Platform will register pilots, devices, service providers; and implement the "no permission, no takeoff" (NPNT) regime.

For every flight (exempted for the nano category), users are required to ask for permission to fly on a mobile app and an automated process permits or denies the request instantly. To prevent unauthorized flights and to ensure public safety, any drone without a digital permit to fly will simply not be able to takeoff.

With drone regulations 2.0, expected in late 2019, may enable beyond visual line of sight (BVLOS) operations, delivery of payloads and automation of the air traffic management to the extent possible. One pilot may be allowed to operate any number of RPAs.

Under drone regulations 3.0, human transportation by RPAs may be allowed. Given the speed of innovations, this may happen faster than one can imagine.

9.2 Vision 2040

a) RPAs will be ubiquitous, like cellphones today. They would seamlessly transport humans and cargo from door to door. They would do everything that a helicopter can do plus a lot more.

b) Sensors, communication, encryption-decryption, cyber-security, physical safety,

privacy control; drone detection and neutralisation etc. will be the key focus areas for research and development.

c) By 2040, the noise-abatement, battery capability, avionics and materials will be several generations ahead of today.

d) Specific navigational corridors may need to be designed to minimise public safety risks, national security risks, invasion of privacy and cluttering of the skies.

e) Security agencies, airports and airlines will need to develop advanced techniques to detect and neutralize rogue RPAs that may threaten human lives and property.

f) Given the vast and varied geographical landscape of the country, RPAs will replace helicopters for disaster prediction and relief operations.

g) Indian would have near 100% internet coverage through a network of linked satellites and RPAs.

h) In defence, RPAs may completely eliminate the need for manned fighter jets and attack helicopters.

i) India will leapfrog from its current weakness in terms of commercial aircraft manufacturing and become a global leader in research, design and manufacturing of RPAs.

9.3 Key action steps to achieve Vision 2040

a) Drone roadmap

MoCA's drone task force should come up with clear roadmap on how to leverage India's traditional strengths in innovation, software development and entrepreneurships to develop a world-class RPA manufacturing industry in India. This will require the government, academia, financial institutions and industry to collaborate closely in a mission mode. The roadmap should be shared in the public domain so as to aid prudent investment decisions by the industry and startups.

b) Nano category

Nano category would be most appealing for hobbyists and draft CAR mandates minimal hurdles for the same with no requirement of Unique Identification Number (UIN) or Unmanned Aircraft Operator Permit (UAOP). However, the Maximum Take-off Weight (MTOW) for RPAs falling under the Nano category has been kept as 250 grams. Most of the recreational RPAs / drones weigh more than 250 grams. The batteries alone weigh close to 200 grams. Even the smallest of drone models of the largest retail drone manufacturers weight more than 250 grams. The MTOW for nano-drones should be enhanced to at least 500 grams to cater to the base models of commercially available drones.

c) AGL limit

The maximum Above Ground Level (AGL) height allowed has been fixed at 200 feet for RPAs in Micro and above categories and only 50 feet for RPAs falling under Nano category (without UAOP). To put into perspective, 50 feet would mean a height of a 4-5 floors building and 200 feet would mean a building with close to 20 floors. These AGL height limits are way below international standards.

Australia, China and United Kingdom etc., have AGL height limits of about 400 feet for the lightest category of drones. The government should consider enhancing the AGL limit to 500 feet, with provision for higher limits on a case by case basis.

d) Single window

The requirements of UIN and UAOP are welcome moves to regulate both the supply side and operation of RPAs. The time-bound application process (2 days in case of UIN) is a very positive indication of DGCA to provide an inviting ecosystem for RPA operators. However, registration of UIN and UAOP is apparently dependent upon approvals from other authorities and so far seems to be offline. DGCA should establish a single window clearance system enabling online filing of applications for both UIN and UAOP.

e) Deemed approval

There should be time limits for other concerned authorities and the concept of 'deemed' approval, like in the case of passport application process. This will help minimise deliberate delays, harassment and rent-seeking behaviour.

f) Approval of freqencies

Issuance of UIN also requires permission for frequencies used in RPA operations from Department of Telecommunications (Wireless Planning and Coordination Wing). This should not be required in for UIN but for UAOP only as most of the recreational RPAs especially falling under Micro category are operated on home Wi-Fi channels and Bluetooth.

g) Sim cards

The requirement of GSM sim card slot for Nano and Micro category of drones may be waived off as the necessity of tracking the RPAs is largely taken care by GPS. Also, large RPA manufactures have developed or are fast developing in house advanced technologies to identify and track RPAs.

h) Training

Even a 500 gram RPA falling from a height of 200 feet can cause severe damage to life and property. Training of pilots is a positive initiative in the CAR. MoCA should facilitate establishment of a large network of pilot training schools to make such training more accessible, affordable and effective. The basic curriculum and requirements for RPA operations should be well defined and communicated to the

training institutes. DGCA should regularly update the list of training providers and enforce regular quality checks.

i) Make in India

The rising demand for RPAs in India may motivate international RPA manufacturers to start manufacturing in India. DGCA should work closely with DIPP and the industry to make it easy and attractive for global players to 'Make in India'.

j) Foreign RPAs

The influx of foreign RPAs in India shall require due regulations to ensure safety, individual privacy and national security. DGCA should permit sale of RPAs in the country only through authorized resellers of registered RPA manufacturers.

k) Training of security forces

DGCA should conduct regular courses for authorities like Customs, police and paramilitary forces so that RPAs are not intercepted, confiscated, neutralized or damaged without due reason.

l) Video footage

The RPA operator is liable to ensure that privacy of citizens and their property is not compromised in any manner. The operator should be required to maintain copies of the footage for a reasonable period, say 6-12 months, which shall be open to scrutiny by government authorities.

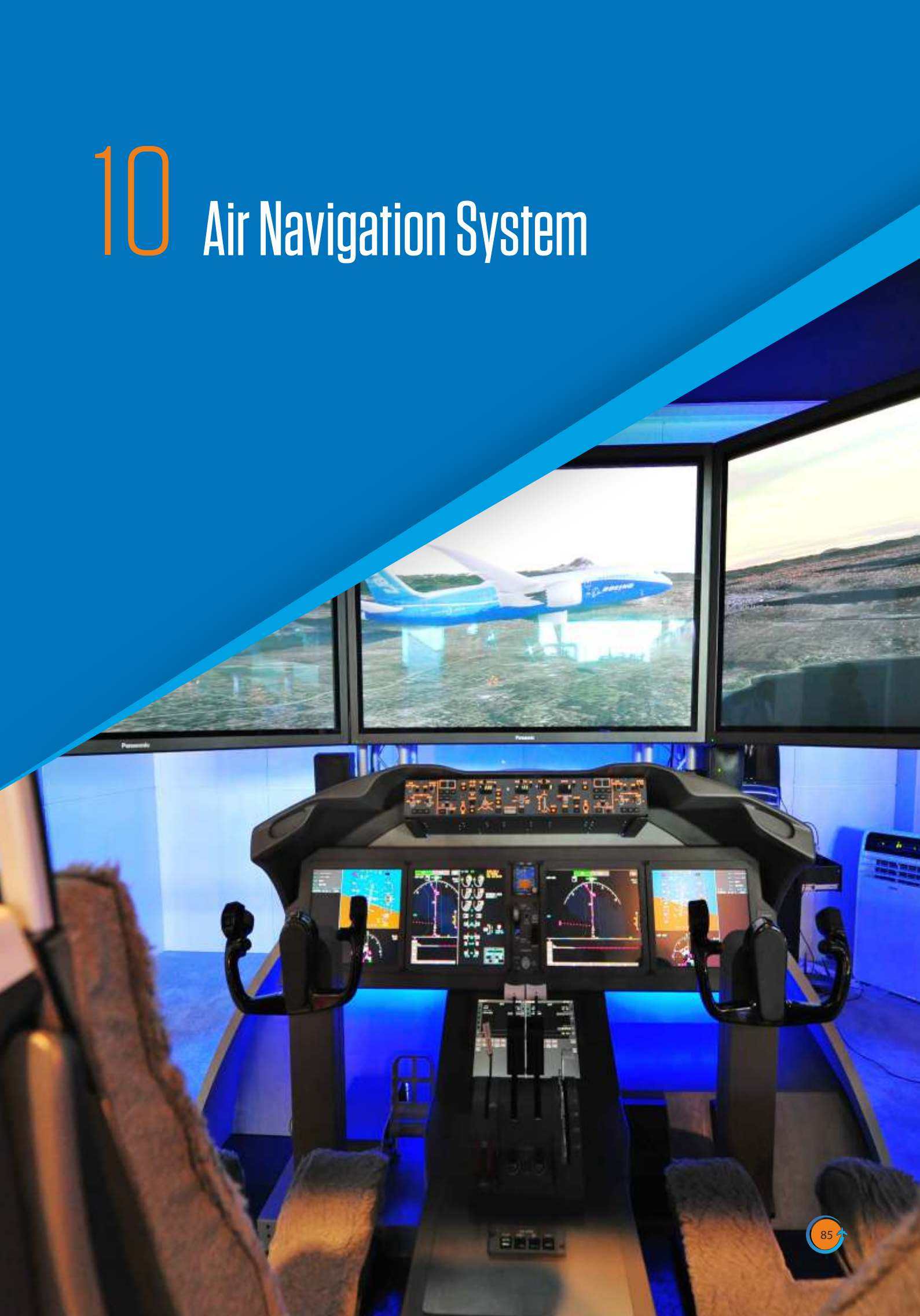
m) Semi-autonomous RPAs

While Regulations 1.0 disallows operation of autonomous RPAs, it is unclear with respect to operations of semi-autonomous RPAs. Such RPAs are currently deployed in large industries like oil and gas for inspection of their equipment and facilities. Semi-autonomous RPAs should be allowed with due safeguards.

n) R&D

Any entity intending to use a test site for research and development of RPAs, needs to obtain an industrial license from DIPP in addition to UIN and UAOP. This process needs to be simple and time-bound.

10 Air Navigation System



10 Air Navigation System

10.1 Current status

As highlighted earlier, AAI is responsible for providing Air Navigation Services (ANS) over the India airspace and the Indian Ocean region covering around 9.6 million sq. km, nearly thrice of India's land area of 3.3 million sq. km.

AAI's coverage includes all civilian airports in India including joint venture airports (e.g., Delhi, Mumbai, Nagpur), public airports, greenfield airports (e.g., Bengaluru, Shamshabad, Cochin, etc.), state government airports (e.g., Lengpui), and private airports (e.g., Mundra, Durgapur etc.).

The function of navigation systems is to support en-route, terminal, approach, landing operations and surface movements. The current navigation infrastructure in India comprises primarily of ground-based navigation aids such as Non Directional Beacon (NDB), Very High Frequency Omni Directional Range (VOR), Distance Measuring Equipment (DME) and Instrument Landing System (ILS) radio aids, which are standard International Civil Aviation Organization (ICAO) based navigational and precision landing aids.

AAI has undertaken several steps for upgrading its Communication Navigation Surveillance (CNS) and Air Traffic Management (ATM) infrastructure. The implementation of Performance-based navigation (PBN) in India commenced in 2007 to achieve enhancements in air capacity, efficiency and safety. PBN-based RNAV-1 standard instrument departures (SID) and standard terminal arrivals (STAR) procedures are being implemented at all operational airports in a phased manner.

The Upper Airspace Harmonization (UAH) undertaken by AAI enables safe and more efficient use of air space besides providing straighter routes. The UAH has been enabled by deployment of advance technology in form of overlapping surveillance cover through RADAR/ ADS-B/ Multilateration combined with seamless air-to-ground communication and automation systems. This has resulted in seamless connectivity throughout Indian airspace. Results observed on airlines getting their preferred route, flight levels and carbon emission control after the deployment of new systems are very positive.

In January 2017, AAI launched the ambitious C-ATFM (Central Air Traffic Flow Management) System and formally dedicated the Central Command Centre at the New Air Traffic Services Complex, thereby becoming the 7th country in the world to implement the Air Traffic Flow Control Measures across the country.

The C-ATFM system is primarily meant to address the balancing of capacity against the demand to achieve optimum utilisation of the major resources, viz., airport capacity, airspace and aircraft at every Indian airport facing a capacity constraint. The introduction of C-ATFM has enhanced safety, fuel saving and on-time performance of airlines.

To make Regional Connectivity Scheme cost effective and sustainable, AAI has brought in eight mobile ATC towers. The airports connected in the first phase include Bilaspur, Ambikapur, Jagdalpur, Jeypore, Utkela, Vellore, Bokaro and Mithapur.

Another major transformation towards implementing and operationalising Future Air Navigation System (FANS) such as Ground Based Augmentation System (GBAS) and Satellite Based Augmentation System (SBAS) in India are underway that will lead to better traffic flow management, shorter flights and lower fuel consumption.

GAGAN - a new beginning

India's GPS-Aided Geo-Augmented Navigation (GAGAN) system - a joint project of AAI and ISRO - is tipped to be the pride of India. It makes India as one of only four regions to have an operational satellite-based augmentation system (SBAS). The other three SBAS have been implemented in USA (WAAS), Europe (EGNOS) and Japan (MSAS). Russia, China, Korea, Australia, Africa and Middle East are in the process of implementing such systems.

GAGAN was developed by AAI and ISRO to provide enhanced navigation capabilities including RNP 0.1 and APV 1 services for en-route, terminal area, and Non-Precision Approach (NPA) operations. GAGAN is the first system developed in Equatorial Region making India the leader in Asia Pacific Region and is operational since May 2015.

GAGAN is currently operated through a constellation of three geo-stationary satellites: GSAT-8, GSAT-10 and GSAT-15 with fifteen Indian reference stations, two Indian master control centres, three Indian uplink stations and four chains of networks.

GAGAN covers a very large areas airspace hitherto unserved by conventional technology. Its operationalisation in the Indian Flight Information Region (FIR) is expected to:

a) Enhance the standards of aviation safety in India

b) Ensure efficient utilization of existing airspace capacity through reduced aircraft separation

c) Promote regional connectivity

d) Provide more direct routes between two locations

e) Make flights possible in unfavourable weather and low visibility conditions;

f) Provide shorter approach paths to the runways

g) Reduce noise pollution and carbon emissions;

h) Enhance surveillance standards across the Indian FIR and oceanic routes; and

i) Reduces the need for expensive ground based nav-aids (such as ILS).

According to AAI, GAGAN is expected to minimize the occurrence of flight delays, diversions, and cancellations, and reduce the controlled flight into terrain incidents by almost 75 percent.

The government has mandated GAGAN-compliant equipment on all new aircraft to be registered in India after 30 June 2020.

10.2 Vision 2040

The vision of Air Navigation Services in India is to provide a technologically advanced air navigation system that has the highest integrity, reliability, accuracy and safety. Some of the major initiatives include the following:

a) Integration of GAGAN signals with IRNSS

Indian Regional Navigation Satellite System (IRNSS) or NAVIC is an independent regional navigation satellite system developed by ISRO. IRNSS provides Standard Positioning Services (SPS) which are meant for general navigation purposes and Restricted Service (RS), which is an encrypted service provided to authorised agencies.

IRNSS with its seven satellites provides a wide global coverage comprising the Indian subcontinent, Southeast Asia, Middle East and parts of Far East Asia and Australasia. Unlike GAGAN that is inter-operable, IRNSS is a self-reliant satellite based navigation over Indian region. Integrating GAGAN signals with IRNSS will provide the greater coverage and accuracy with lesser number of satellites.

b) Use of block-chain

The conventional Air Traffic Management (ATM) system is largely centralized and may not be able to support the increasing air traffic volume. Adopting block-chain technology will result in organizing India's ATM data in an encrypted form in a block chain network instead of a centralized system.

DGCA will need to develop oversight and audit mechanisms for these distributed services and their providers. This decentralized and layered design of the automated and block-chain system will make adoption of new technology easier eliminating the need of upgrading the core architecture and the basic system design.

c) Unmanned Traffic Management

Unmanned Traffic Management (UTM) works as the existing Air Traffic Management system that handles movement in airspace but will support self-piloting aircraft. The current Indian air traffic system focused primarily on flights between airports, and have procedures in place to guide fixed-wing pilots in making control decisions.

Under UTM, drone flights in India would use free routing, fixed routes, corridors, or other constructs to avoid conflicts, obstacles or areas too dense for safe operation. UTM will also provide alerts, geo-fencing, registration, and vehicle location services.

d) Airspace Corridors

Airspace corridors are defined volumes in space that manages airspace during peak time or manage separation and traffic flow. These corridors has a control service to govern and coordinate its usage. These corridors are specifically designed to accommodate unmanned systems or drones. Any unmanned system would require a clearance from the corridor's control service to enter. These corridors can take any shape such as cylinders, tubes or cones. Unmanned aircrafts are usually guided inside these airspace corridors using predetermined routes analogous to approach procedures.

e) **ANS training**

Given the pace of innovation in air navigation systems, training of ANS staff in latest technologies will assume critical importance. By 2040, AAI's ANS training centre (CATC Allahabad) should become one of the top five ANS academies of the world, with at least 30% of its trainees coming from outside India.

10.3 Key action steps to achieve Vision 2040

a) **GAGAN Taskforce and PMU**

AAI should set up a GAGAN Task Force comprising representatives from AAI, MoCA, DGCA, airlines, airports, NSOPs, OEMs, component manufacturers and software providers etc.

AAI should establish a GAGAN Program Management Unit (PMU) as a single point of contact for coordinating with various stakeholders and undertaking necessary implementation activities.

b) **LPV Approaches**

AAI should expedite its efforts for developing GAGAN based Localizer Performance with vertical guidance (LPV) approaches at Indian airports. Consideration should be given to focus on Tier-2 airports and regional airports, where air connectivity is a challenge. DGCA should certify these approaches in a timely manner.

c) **RNFC waiver**

AAI has proposed a Route Navigation Facility Charge (RNFC) waiver of 5 percent to stimulate the retrofitting of aircraft owned by the scheduled operators with the GAGAN receivers. There need to be a facilitating agency to manage and monitor this incentive scheme. Procedural delays in issuing the waivers may create problems.

d) **Non-aviation applications**

Conduct a pilot project to quantify real time benefits of GAGAN. GAGAN provides wide opportunities for precision Position, Navigation and Timing (PNT) in numerous industries and organizations. While many users in India have been utilizing GAGAN services for the purposes of various studies, it needs to be commercially leveraged by non-aviation sectors. The GAGAN PMU can act as a receiver certification agency and provide technical support for short-term pilot projects and 'proof of concept' (PoC) for use of GAGAN in non-aviation sectors.

e) **Global benchmarking**

The GAGAN PMU can incorporate and disseminate lessons from similar initiatives carried out by countries like USA, EU and Japan. These countries are mandating SBAS through implementation of Automatic Dependent Surveillance - Broadcast (ADS - B). For instance, the United States Federal Aviation Administration (FAA) has mandated the use of ADS - B in all the aircraft flying in most US airspace categories above 10,000

ft. from 1 January 2020. In India, the similar focus on mandating ADS - B could improve the functioning of Air Traffic Controllers and help to optimize the use of ever-busier Indian airspace. ADS-B would be a particular advantage as RCS routes develop and India's hub airports get busier.

f) Revenue from exports

GAGAN's geostationary satellites GSAT-8, GSAT-10 and GSAT-15 have a wide footprint extending from Africa to Australia. The GAGAN system can support 45 ground stations, leaving room for 30 new ground stations in neighbouring countries within the GAGAN footprint. AAI can utilize its expertise to develop, certify and manage GAGAN system in ASEAN, SAARC and Gulf countries. AAI can setup a consulting arm on the lines of the Delhi Metro which is providing consulting to many metro projects in India and abroad (eg. Jakarta Metro).

g) DGCA regulations

GAGAN PMU should coordinate closely with DGCA and the industry to ensure that requisite amendments are made in the DGCA regulations and manuals to certify any new navigation technology and equipment adopted by Indian aircraft carriers. These amendments should be made on an urgent basis so as to avoid delays in getting new and/or retrofitted aircraft certified.

h) Old nav-aids

GAGAN PMU should implement the concept of 'Minimum Operational Network', which will gradually phase out the conventional nav-aids over time to reduce their operations and maintenance costs. It can pick up insights from FAA's experience for a similar initiative undertaken in USA.

I) PinS

As per DGCA, almost 95% of helicopter operations in India are carried out under Visual Flight Rules (VFR), making it difficult for operations during night and at extreme weather conditions. Globally, GNSS based Point in Space (PinS) approaches use instrumentation as well as visual maneuvering that enables helicopters to land during extreme weather conditions or at difficult terrain.

Heli-tracker systems with three-dimensional GPS coordinates send signals which are then translated into a visual record of the helicopter flight path and defined on the topographical maps. AAI should consider implementing PinS and heli-tracker systems in India.

j) Geo-fencing

With thousands of vehicles entering and exiting airports, a comprehensive vehicle tracking system is necessary for safety, security and traffic management. GAGAN-based vehicle tracking devices fitted in each of these vehicles can report to a central server periodically. Authorized users can monitor these vehicles on a mapping application with several layers of information. Geo-fencing through GAGAN can help create virtual boundaries, which can restrict the movement of an aircraft, vehicle or equipment within a defined area.

k) GAGAN Technology Parks

The GAGAN PMU should consider the feasibility of establishing GNSS Technology Parks in the country to centralize the GNSS data centers. The Technology Parks will provide a platform to receiver manufacturers, application developers, and GNSS application software providers to establish incubators and provide base for receiver certification and data validation activities. These Parks can further promote research and application development in aviation and non-aviation sectors. AAI may consider taking a small equity stake in promising ventures - with due checks and balances - that can give a significant upside later once the products are commercialised.

l) Skill building

Given the complexity of new navigation technologies like IRNSS/ GNSS/ GAGAN/ Artificial Intelligence/ Block-chain, high capital investments and a long-drawn implementation process; developing a robust training program for AAI staff is essential for successful implementation of these technologies prior to their installation and operations.

m) Indian Institution of Satellite Navigation

To create and disseminate knowledge about satellite navigation through collaboration with practitioners, end-users, academia and young entrepreneurs, the GAGAN PMU may consider establishing an Indian Institution of Satellite Navigation (IISN).

A case in point is the highly-reputed Institute of Navigation (ION) in Virginia, USA, a not-for-profit professional organization dedicated to advancing Positioning, Navigation and Timing (PNT). ION's international membership is drawn from professional navigators, engineers, physicists, mathematicians, astronomers, cartographers, meteorologists, educators, geodesists, surveyors, pilots, mariners and anyone interested in position-determining systems. Corporate members include corporations, civil and military government agencies, private scientific and technical institutions, universities and training academies, and consulting firms. ION members get access to the institute's journals, technical papers, seminars and conferences.

With the advent of IRNSS, the need for such an institution will increase. AAI can partner with ISRO, Rajiv Gandhi National Aviation University (RGNAU) Rae Bareli, CATC Allahabad, airlines, airports and general aviation players to set up the institution.

11 Ground Handling



11 Ground Handling

11.1 Current status

Ground handling is a critical component of airline operations which includes aircraft cleaning and servicing, passenger handling, catering, cargo and baggage handling etc. The ground handling regulation of 2007 allowed ground handling services by Airports Authority of India or its JV, subsidiary or joint venture of Air India and third party ground handling agency (GHA). As per an interim order by the Hon'ble Supreme Court in 2011, domestic airline operators were permitted to carry out self-handling.

Following are salient features of the 2018 ground handling regulations issued by Airports Authority of India:

a) All domestic schedule airline operators and helicopter operators can carry out self-handling at all airports including civil enclaves

b) Foreign airline can undertake self-handling with respect to passenger and baggage handling activities excluding security functions at all airport except civil enclaves

c) No royalty is payable in case of self-handling

d) Airports with annual passenger throughput of 10 million or more shall have three ground handling agencies

e) At airports with annual passenger throughput of less than 10 million, the airport operator to decide on the number of GHAs, which shall not exceed three.

f) A GHA with foreign ownership of 50% or more of its paid-up capital shall not be allowed to undertake ground handling activities at Civil Enclaves

g) Hiring of employees through handling contractors or manpower suppliers is not permitted

As per IATA, approximately 50% of the aircraft turnarounds are handled by third party GHAs globally and it is expected to reach 70% by year 2022. In contrast, in India, most leading airlines handle most of their ground handling operations on their own.

The global ground handling market is estimated to be USD 360 million in 2016-17 and is estimated to double in next 3-5 years. This is likely to grow faster in India driven by rising traffic, aircraft fleet expansions, augmentation in airport capacity and policy interventions.

Leading GHAs in India include: AIATSL, AISATS, Celebi, Bird, GGI, Menzies Bobba, Indothai and Bhadra. These account for almost 80% of the revenue market share.

Bangalore and Hyderabad airports have selected Celebi and GGI based on competitive bidding. Airports Authority of India is in the process of appointing GHAs through competitive bidding at more than 80 airports in India.

Key challenges

a) Ground handling business volume available to a third party GHA at many airports is low, which can lead to such operations being financially unviable for the GHA

b) Level playing field: Air India's ground handling subsidiary and JV should be subject to same terms of Concession Agreement and SLAs as the third party GHAs are subject to at the respective airport. SLAs, training requirements, GSE standards, emission norms etc. applicable on third party GHAs should also be applicable on self-handling airlines.

c) Apron congestion due to multiple agencies: self-handlers and third party GHAs

d) Hiring of non-bonafide contract labour for ground handling by airlines

e) High employee turnover specially with respect to skilled workforce in critical ramp functions

f) Achieving operational SLAs and providing hassle free check-ins while the passengers and ATMs are increasing at airports

11.2 Vision 2040

a) Automated passenger movement

Check-ins will be automated, using minimal staff and powered by Internet of Things (IoT) and biometrics (facial and iris). The same shall be used in baggage drop, immigration clearance, entering lounges, aircraft boarding, retail shopping etc.

b) Zero emissions

Almost 99% of all Ground Support Equipment (GSE), used by third party GHAs or airlines, shall be electric by 2040 at all airports in India.

c) Driverless GSE

Transfer of baggage and freight from terminal to aircraft, ferry documents for air cargo, delivery of food to lounges etc. shall be by unmanned GSE.

Passengers with reduced mobility (PRM) will be transported to their gates by electrically powered smart wheelchairs or golf carts with manual and visual control systems.

d) Minimal apron congestion

GSE would be through a shared pool, to increase efficiency, reduce costs and minimise apron congestion. The pooling would be either by way of GSE being owned by the GHAs or airport or a third party; and handed over to GHAs on a 'pay per use' basis.

e) Minimal safety incidents

Automated GSE, high services standards for GHAs and stringent training requirements for GHA staff will ensure minimal safety incidents at airports. For instance, radar sensors on cargo loaders will detect and slow down when the equipment is nearing the plane fuselage, especially in low visibility.

f) Real time data sharing

There will be real time data sharing and updates between GHAs, airports and airlines with respect to ground handling operations, compliance with SLAs, near misses and safety violations etc. This will drastically reduce surprises and traffic disruptions.

11.3 Key action steps to achieve Vision 2040

a) Comprehensive ground handling policy

While NCAP 2016 and GHR 2018 have spelled out the broad direction for ground handling, MoCA should develop a detailed policy and roadmap for ground handling in consultation with airlines, airports, ground handling agencies, AERA, BCAS, and CISF etc. The roadmap should cover specific actions, standards and deadlines for:

i) Ground handling agencies

ii) Electric GSE

iii) GSE pooling

iv) Driverless GSE

v) Training

vi) Data sharing mechanism between GHAs, airports and airlines

b) Level playing field

The policy should ensure that AIATSL, AISATS and the GH JV formed by the airport adhere to the terms of the Concession Agreement applicable on the private sector GHAs selected by the airport.

The same applies to the SLAs and commercial terms (like apron rentals, utilities charges etc.) applicable on the private sector GHAs selected by the airport.

c) Privatisation of Air India GH ventures

Divestment of Air India's stake in AIATSL and AISATS should be done at the earliest possible. This will ensure effective competition, better services and efficient price discovery for airlines.



12 Aviation Security



12 Aviation Security

12.1 Current status

With over four billion passengers taking to the skies in 2017 and the nature of threats becoming more sophisticated by the day, the pressure on aviation security ('Avsec') has increased tremendously.

Aviation security is now increasingly relying on biometrics, big data, artificial intelligence (AI) and behavioural analysis etc. This helps them reduce the workload of individual security staff and focus on high risk passengers and cargo.

Countries such as US, UK, Germany etc. are upgrading their monitoring systems to remote screening technologies, with stand-off screening systems. Focus is on developing technological solutions which can integrate the best practices of stand-off screening, CCTV, behavioural analysis and sniffer robots to ensure a seamless security process flow. Detection capability and technical solutions are expected to continue evolving which will help in faster processing with lower level of investments.

Key agencies

The government of India has delegated the roles and responsibilities of AvSec to three agencies:

a) Bureau of Civil Aviation Security (BCAS): Responsible for the regulation, training and monitoring of all aspects of aviation security in India. This includes oversight of personnel training, industry monitoring, compliance and supervising the physical security of aviation infrastructure

b) Central Industrial Security Force (CISF): Responsible for security of aviation, industrial and other strategic assets of the country. CISF works in coordination with BCAS to secure the aviation assets; screen people and cargo; and prevent and neutralize security threats.

c) Bureau of Immigration (BI) - The bureau of immigration is the nodal agency responsible for monitoring and enforcing border control in coordination with the CISF and BCAS.

d) State police, Central Reserve Police Force (CRPF) and Indian Reserve Battalion (IRB) - The state police are assigned to small airports from a cost perspective. CRPF and Indian Reserve Battalion are usually placed in areas affected by insurgency or airports which are very close to the international border.

Digi Yatra

In line with global trends, the government has embarked on a major implementation of biometric technology and connected airports across the country. The Digi Yatra Central Platform (DYCP), expected to be launched in 2019 will require passengers to get a one-time registration done and generate a unique identity number. Once done, the unique id would be shared by the airline to the takeoff airport. The passenger would seamlessly move through from kerbside to the aircraft through e-gates using facial recognition.

This will be a voluntary facility and those not comfortable with it can use physical id cards to gain entry. DYCP is expected to be launched at Kolkata, Varanasi, Pune and Vijayawada airports by April 2019.

CT scanners

BCAS has introduced a new 3D-based computed tomography (CT) scanning system, which is expected to be launched at Delhi, Mumbai and Hyderabad airports. These scanners would be able to detect prohibited items without the need to take out liquids, electronics etc. out of the hand baggage.

Robotic canines

The CISF is expected to replace its canine squads with robotic canines at Indian airports. The robots are equipped with sensors capable of detecting explosives and detecting prohibited articles through passenger luggage. Currently, the technology is deployed in countries like USA, Canada, Japan and South Korea.

Key security challenges

a) India's rapid growth as an aviation market is leading to capacity constraints in the short term, resulting in lengthier security queues, passenger discomfort and irritation. The resultant pressure and fatigue of the baggage screening officer may lead to suspicious items passing through undetected.

b) Many airports like Mumbai, Dabolim, Patna, Jaipur etc. are over-exposed to the external environment. Many of these are located in close proximity to the city with less-than-adequate separation of the facility.

c) India is expected to operationalise around 100 more airports over the next two decades. This will require a significant increase in trained security personnel, security infrastructure and equipment.

d) Under the UDAN scheme, many new airports and water-domes are likely to get operationalised. The water-domes, spread across the coastline, riverbanks, islands, lakes and dams, are especially high risk given that they may not be a stand-alone cordoned off facility like airports. Many of these will not be secured by CISF but by the local police and private security firms, to keep costs sustainable. These are vulnerable areas and will need a new security approach, using technology.

12.2 Vision 2040 - A technology-driven, pre-emptive security system

a) By 2040, India will have a sophisticated aviation security architecture, predictive data analytics programs and passenger flow management systems.

b) An integrated aviation security operations centre (ASOC) would be the new norm, wherein CISF, BCAS, intelligence agencies, immigration and customs would be able to seamlessly store and share information with each other. The ASOC will be equipped with a centralised command and communication system, which will be of critical importance during natural disasters, accidents and terror attacks.

c) With a forecasted base of over 500 million unique passengers under DigiYatra, India will have a full-fledged trusted-traveler program along the lines of other leading countries. Using AI, this would allow authorities to speed up passenger movement and also detect suspicious cases for covert and overt scrutiny.

d) Security surveillance at airport will see a transformational change, whereby the airport surveillance feed would be integrated with the national criminal databases. This will allow the CISF officers to carry out a facial scan to detect those with a criminal past or on the wanted list.

12.3 Key action steps to achieve Vision 2040

The avsec technology and infrastructure needs continuous review and upgrade, believing the simple adage that 'the criminal is always smarter'. Key initiatives include:

a) Advanced Imaging Technology (AIT)

This uses non-ionizing electromagnetic radiation, similar to that used by wireless data transmitters to detect objects concealed on a passenger's body without physical contact. It applies necessary algorithms to the reflected millimetre wave length signals to determine the location of possible anomalies.

In case of anomalies, the security officer steps in and resolves the alarm with a pat-down, with a total time of just 5-10 seconds per passenger. The next generation AIT is set to offer enhanced image resolution by using wide band antennas to provide advanced automated threat recognition (ATR) detection algorithms.

b) Explosives Trace Detection (ETD)

This is a secondary screening technology to inspect benign threats. ETD systems use a technology called Ion Mobility Spectrometry (IMS) to detect nanograms of explosive particles. This technique separates and identifies ionised molecules based on their mobility in the IMS.

When a passenger or luggage goes through secondary screening, a security officer can collect samples using a swab, then insert the sample into what is called a desorber. The desorber applies heat to the sample, converting the harvested explosive

materials into a gas form. This gas stream then passes through a region of energised electrons, which ionise the explosive molecules. The time required for them to traverse the chamber and reach a collector plate is measured to determine if explosive materials are present.

c) Suspect Detection System (SDS)

It is an automated interrogation and background check technology to act as a polygraph for catching potential suspects. It monitors levels of different chemicals in a passenger's body and uses advanced algorithms to determine the threat level.

These technologies are currently being tested and deployed in the United States and Israel etc. These would be greatly beneficial for Indian airports with high terror risk.

d) Infrastructure and training

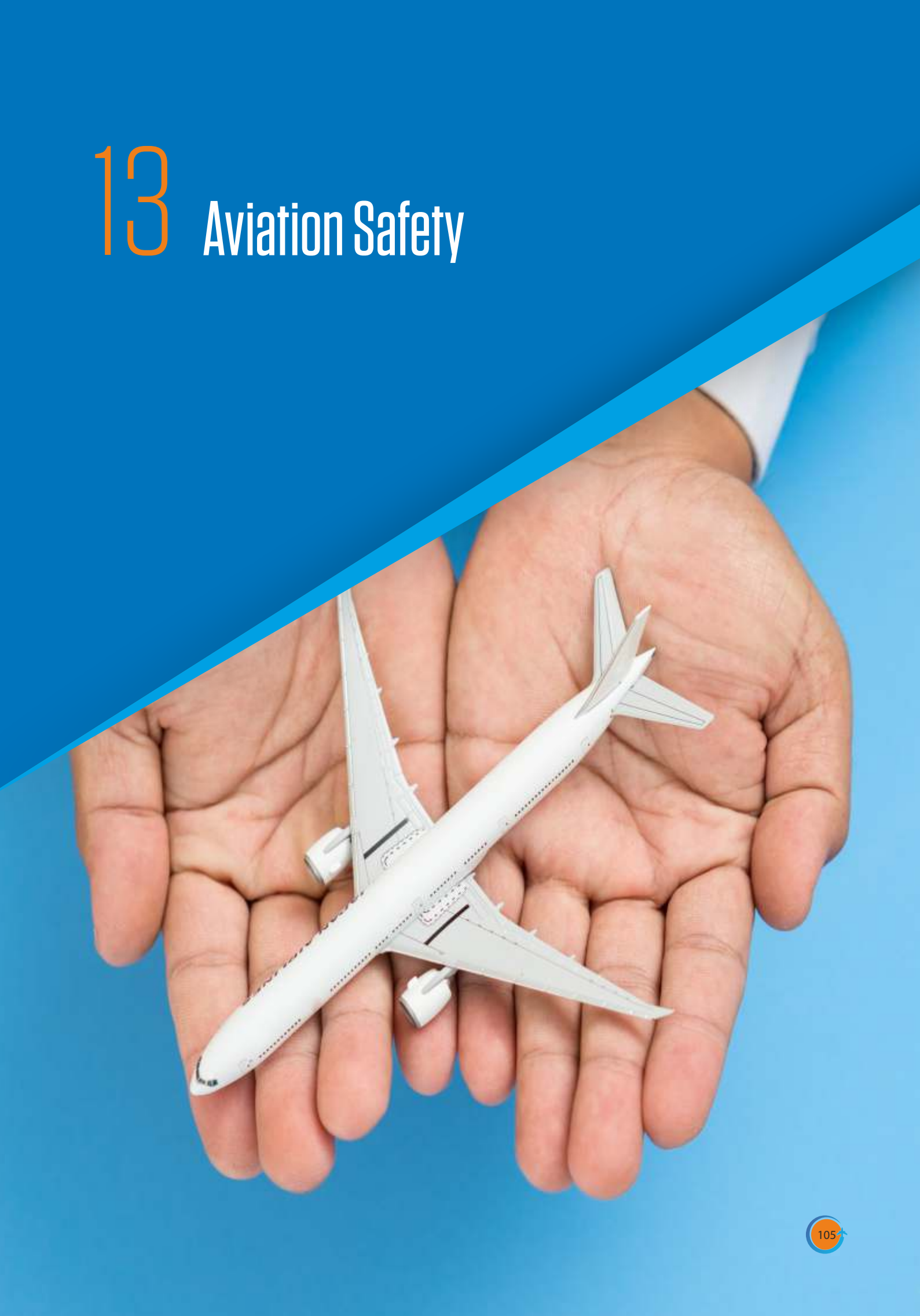
Indian airports and CISF will need to consider investing heavily in local computer servers, with cloud computing capabilities, which would enable integration of different safety and security data sets such as security camera feeds, facial recognition data, luggage scan data, security breach/incident report information etc.

CISF would need to heavily invest in IT training of its manpower, especially in the use of AI, data analytics and behavioural analysis tools.

e) Selective outsourcing

With increased pressure on the security establishment, MoCA and BCAS should consider selective outsourcing of the airport security operations, along the lines of other leading countries in the west. Almost all foreign embassies, banks and private institutions in India use private security. The core security functions at the airports may continue to be with CISF.

13 Aviation Safety



13 Aviation Safety

13.1 Overview

Aviation safety is referred to as the state of an aviation system or organization in which risks associated with aviation activities, pertaining to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level. This principle consists of theory, practice investigation and categorisation of risks and hazards, as well as the prevention of such failures through regulation, education, and training.

The guidelines of the International Civil Aviation Organisation (ICAO), vide Annexes 1, 6, 8, 11, 13, 14, and 19 (Chapter 3.1) to the Chicago Convention, require member states to establish a State Safety programme (SSP).

ICAO, through its Standard and Recommended Practices as contained in Annex 19 and Document 9859, has adopted the concept of Acceptable Level of Safety (ALoS). ICAO's practical approach for safety management recognises the limitations of a prescriptive approach and the fact that the absolute safety is generally an unachievable and very expensive goal.

According to ICAO, a safety management system (SMS) is a systematic approach to managing safety, including the necessary organisational structures, accountabilities, policies and procedures in order to achieve a tolerable level of safety.

Aviation safety in India

As highlighted earlier, India is set to become one of the world's largest aviation markets by 2040, with over 1 billion passengers, 2,300 commercial aircraft and 200 airports. The sheer scale of aerial and surface infrastructure required to sustain this multifold increase would place significant pressure on MoCA and DGCA to ensure compliance with safety standards and prevent adverse incidents.

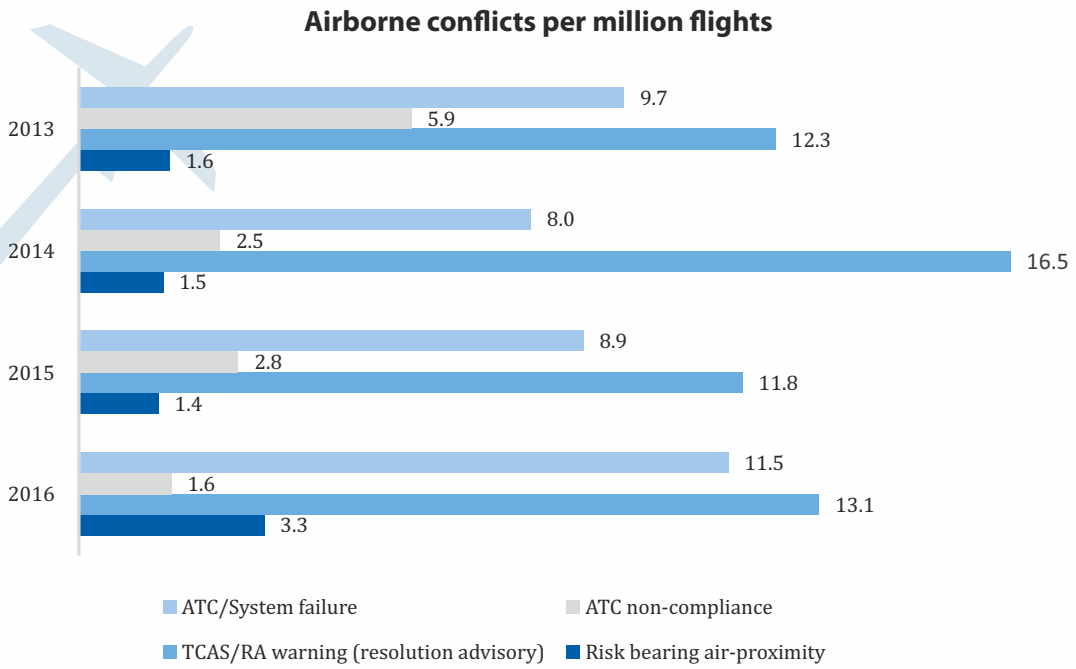
India has developed its State Safety Programme (SSP) in line with ICAO guidelines. The SSP was first released by DGCA in November 2010, where it presented the purpose, definitions and a safety oversight system for all stakeholders.

DGCA regularly updates the aviation community through its Air Safety Circulars (ASC), which provide information regarding adverse weather operations, general aviation aircraft operations and flight safety documentation systems etc.

Despite the presence of stringent safety guidelines and enforcement means, the state of aviation safety in India has been in a flux. In December 2012, an ICAO audit found deficiencies in safety oversight by DGCA. In January 2014, India was downgraded by USA's Federal Aviation Administration (FAA) to Category 2 for failing to comply with ICAO standards. Only 15 out of 96 countries reviewed by FAA were in Category 2.

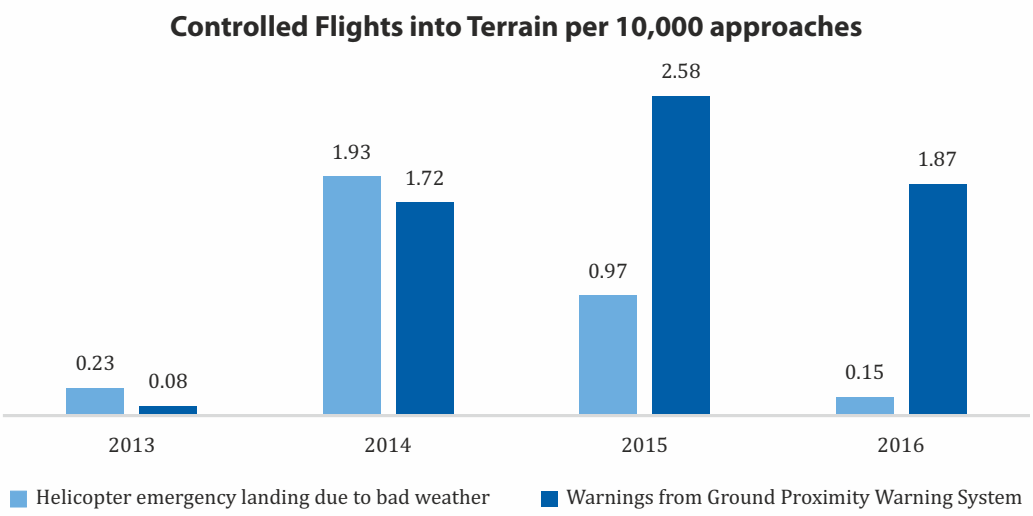
The downgrade resulted in Indian carriers being barred from starting new flights to USA and operating code-shares with USA carriers. DGCA undertook remedial measures and India's Category 1 status was restored by FAA in April 2015.

According to the Annual Safety Review Report (ASRR) 2017, the number of airborne conflicts during 2013-2016 are as follows:



Source: DGCA

During 2013-2016, the number of controlled flights into terrain (CFIT) per 10,000 approaches are as follows:



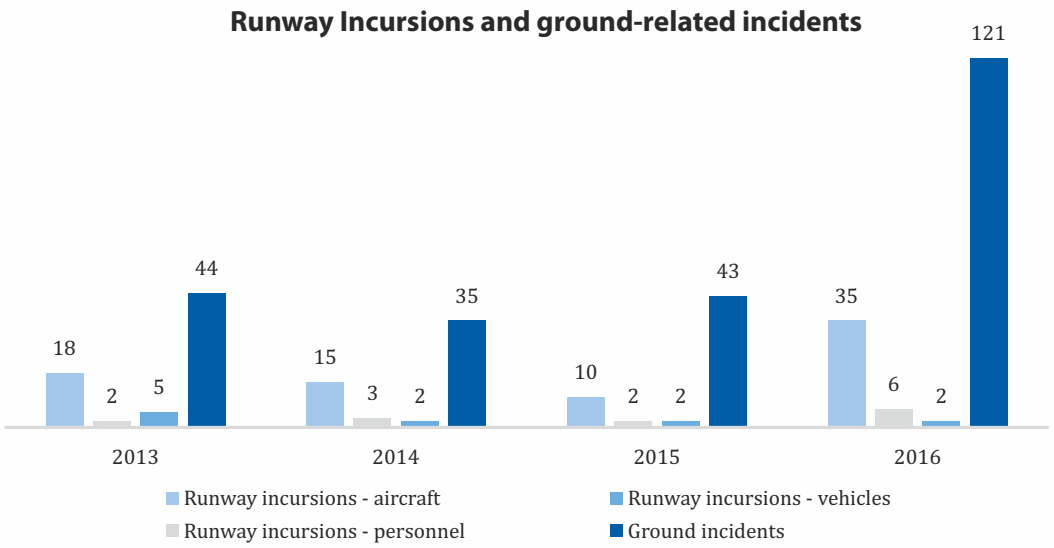
Source: DGCA

The number of unstabilised approaches and runway excursions per 10,000 movements in 2016 are as follows:

S No	Incidents per 10,000 movements	Target performance	Achieved performance
1	Unstabilised approach	9.03	8.61
2	Unstabilised approach continued to land	1.22	7.61
3	Unstabilised approach when performing precision approach	4.73	5.4
4	Unstabilised approach when performing non-precision approach	1.48	1.73
5	Unstabilised approach when performing visual approach	2.82	1.5
6	Near runway excursion	0.039	0.010
7	Runway excursion	0.068	0.033

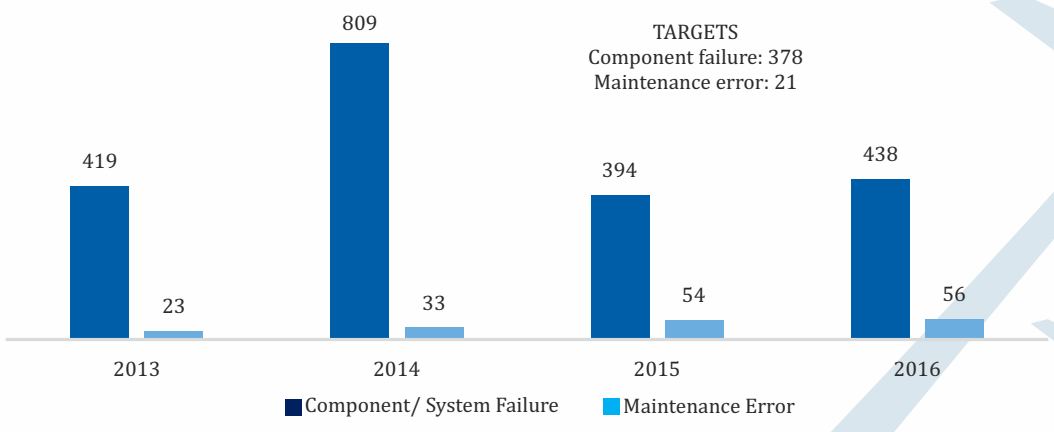
Source: DGCA

During 2013-2016, the number of runway incursions and ground incidents have shown an increase. These need to be addressed on priority through technology, training and enforcement.



Source: DGCA

Incidents related to deficient maintenance of passenger aircraft during 2013-16 are as follows. Both are higher than the target number of errors.



Source: DGCA

The data highlights that while India's safety record is improving with time, with greater global scrutiny and several reforms at DGCA, there is still a long way to go.

13.2 Vision 2040

a) By 2040, India's safety management system will be transformed from a reactive to a predictive and pre-emptive one, through integration of information, technology and human skills.

b) Proliferation of blockchain technologies will enable DGCA, airports and airlines etc. to reduce information duplication through real-time access to common safety monitoring systems.

c) Artificial intelligence would be used to regularly monitor safety parameters and raise a red flag for DGCA and industry to take remedial action.

d) GAGAN will become the mainstay of India's commercial air navigation, thereby guaranteeing flexible use of airspace (FUA) between commercial and defence airspace; optimised airspace utilisation and safer operations despite reduced horizontal and vertical separation of aircraft. This would ensure safety in air, through better awareness among air traffic control officers.

e) The next decade will see introduction of remotely piloted aircraft (RPA) - first for cargo and thereafter passengers. These will require DGCA to develop new safety management standards related to airspace management, OEMs and component manufacturers and landing areas etc.

f) India would gradually move towards an Unmanned Traffic Management (UTM) system. This would be a de-centralised, networked collection of services available to different service providers that operate together based on common protocols. UTM would allow operators of different types of aircraft, such as commercial aircraft, unmanned aircraft, dirigibles etc. to operate safely and seamlessly within the same airspace.

13.3 Key action steps to achieve Vision 2040

a) Civil Aviation Authority

The government should consider converting DGCA into a fully-independent Civil Aviation Authority, with its own sources of funding through user charges. It should have the freedom to recruit experts at market-linked salaries and impose penalties as per laid down procedure.

b) Networked air grid

The aviation industry should invest in an automation-centric, networked and integrated working environment, including extensive use of AI for safety monitoring and advance alerts.

c) Implementation of eGCA

The long delayed digital transformation of DGCA - called eGCA - should be expedited on a mission mode. It should undergo a review every two years based on new technological trends and user feedback.

DGCA should have nearly 90% of its user interactions, applications and examinations etc. on an online basis. Face to face interactions at DGCA should be minimised to specific cases as per laid down procedure.

d) Training

DGCA needs to have a robust training program for its safety auditors, including exposure to best practices employed by FAA, EASA and CAAS and other leading safety regulators across the world. Knowledge of digital platforms, data analytics and safety monitoring systems would be critical.

e) Incident reporting

DGCA should consider allowing incident-filing and reporting through phone-based applications and cloud computing. Such options would enable operations staff to file an immediate incident report. This would allow DGCA and professionals involved in high-risk activities like air traffic control, ramp operations, dangerous goods handling and airline operations etc. to have a real-time visibility of all incidents and threats. These in turn, could be acted upon by DGCA and other industry stakeholders to take remedial actions immediately. The detailed reports can be followed up subsequently.

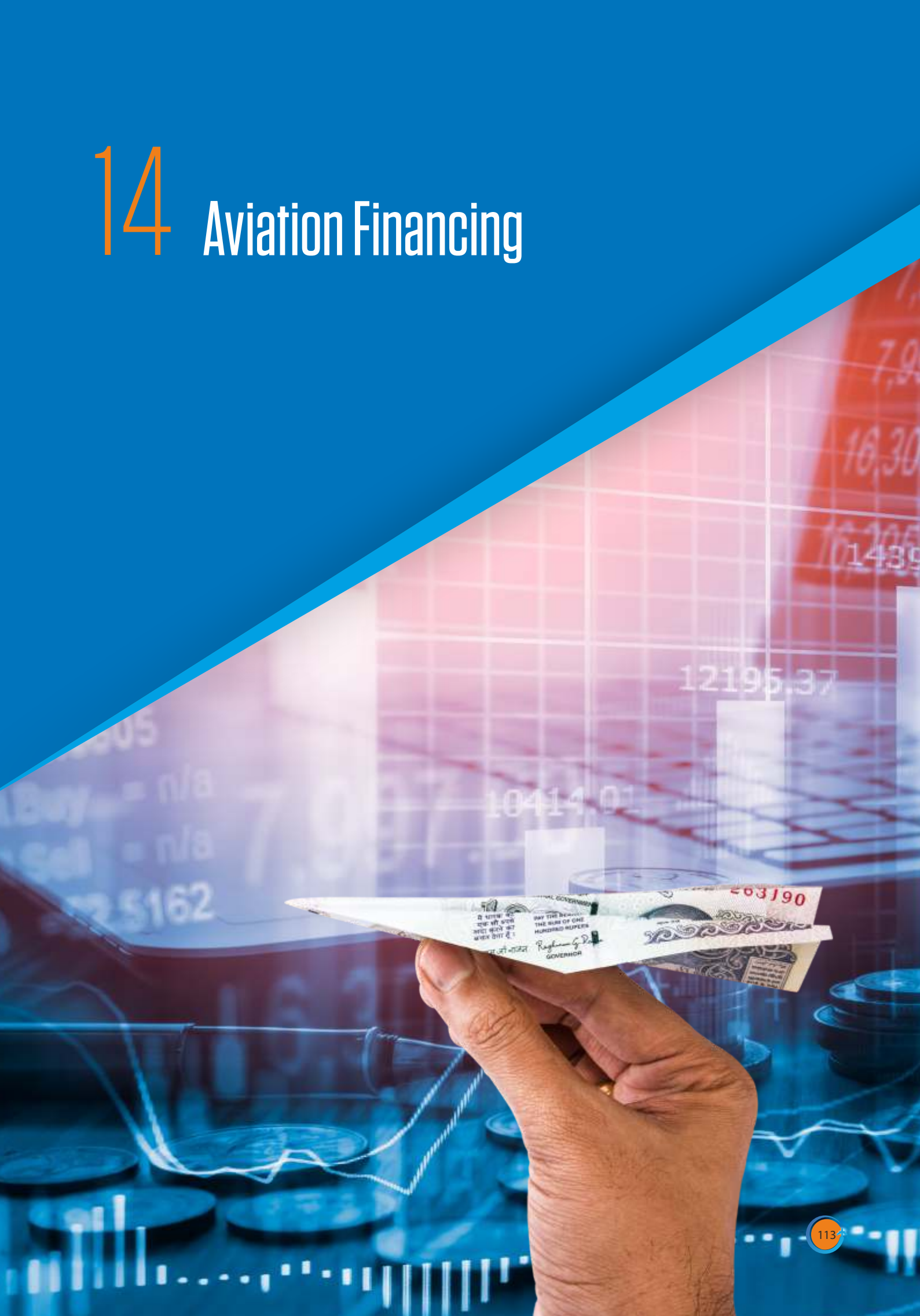
f) Review of CARs

Clause 5 (g) of NCAP 2016 states that DGCA will carry out a review of all Civil Aviation Requirements (CAR) as and when required on need basis and at least once every five years starting from FY 2017. It also states that such a review may be done by engaging an outside agency or by engaging experts on contract basis for a limited period.

DGCA has been carrying out changes in certain CARs based on industry feedback. This review process needs to be institutionalised and should involve a wider set of stakeholders.


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14 Aviation Financing



14 Aviation Financing

14.1 Current status - Aircraft financing

Typically airlines use leasing, debt, export credit and a combination of these for financing their aircraft procurement.

Over the last two decades, a large part of aircraft financing in India has been done through the operating lease model. Structuring an operating lease allows an airline to enjoy all the benefits of aircraft ownership for a fraction of the initial cash outlay. It keeps debt off the airline's books. The sale-and-lease-back (SLB) model allows the airline to make a profit on the aircraft sale value even before it flies. The airline can upgrade, replace or return the aircraft during the lease period.

The operating lease contracts are tailored to meet the individual requirements of the lessee as against a straightforward commercial bank loan. Since leading aircraft lessors have several decades of specialised experience, they are able to manage and price risks better than commercial banks. This allows them to offer leases at more competitive rates than the latter.

Over 40% of the global commercial aircraft fleet is on a lease basis, especially to airlines that have come up in the last two decades. In India, over 70% of the private airlines' fleet is on an operating lease basis and the trend is expected to continue.

Learning from Ireland

Globally, there are around eight aircraft leasing companies with assets of over USD 10 billion. Most of the leading aircraft leasing companies are headquartered in Ireland. The country's visionary approach over the last three decades has made it the global capital of the aircraft financing industry.

Ireland is a signatory to the Cape Town Convention (CTC 2001), has tax treaties with over 70 countries with a tax credit policy for non-treaty countries; low corporate tax rate on leasing companies; accelerated tax depreciation rate and a vibrant talent pool. For other countries to emulate Ireland, the benefits will have to be significantly superior to these.

Over-dependence on foreign lessors

For a fleet of 600 aircraft, assuming an annual lease rental of USD 4 million, the foreign exchange outflow is to the extent of USD 2.4 billion. The loss of jobs and taxes thereof are additional. As India's fleet grows, so will its forex outflow, with no asset being built in India.

With the gradual depreciation of the rupee, the cost of leasing in rupee terms will rise. Airlines may not be able to pass on the same to the passenger, squeezing their margins further. This is not sustainable in the long run.

In the unlikely event of a war or trade dispute, there's a risk that foreign lessors can be influenced by their governments to restrict the use of aircraft by their Indian lessees.

These challenges will only increase with time, till India develops its own leasing industry. This is no more an option, but a necessity. The domestic industry can be built by large Indian institutions on their own or in collaboration with global players, like in the base of insurance industry.

Establishing a domestic aircraft finance industry will require a long-term vision and significant policy reforms, especially on the taxation front.

The aircraft finance products in India could be denominated in both foreign and Indian currency. The latter would be extremely helpful to new domestic airlines that may not have international operations and foreign exchange earnings in their early years.

The various long term initiatives being undertaken by China to build its indigenous leasing industry is a good source of learning for Indian policy makers.

Commercial lending

Globally, commercial banks do provide aircraft financing facilities to airlines, but it is not very prevalent. The transaction structure generally involves the setting up of a Special Purpose Company (SPC). It guarantees lenders through pledging of shares and a mortgage granted by the SPC. Setting up of the SPC also helps in ring-fencing the aircraft for the lender in case the airline faces financial distress.

Exim banks

Export credit agency loans have not been very popular amongst Indian carriers over the last decade. Though it is one of the cheapest source of financing, airlines have not opted for it in a big way since it is considered time-consuming and less flexible.

OEM support

Certain OEMs coordinate with commercial banks and insurance companies to arrange 80-85 percent of the aircraft cost for their buyers, with a tenure of 10-12 years. This opens new opportunities for well-capitalised airlines that can take large debt on their books.

14.2 Current status - Airport financing

In the early 2000s, the government of India recognized the need for massive expansion in the airport infrastructure. Given the lumpy nature of airport projects and the long payback period, it was felt that engaging the private sector was the prudent option. The PPP experiment used for both greenfield and brownfield airports has yielded rich dividends to the government and the country at large.

The airport sector has seen an investment in excess of USD 6 billion over the last 15 years. The development of PPP airports was funded by shareholders' equity, commercial banks borrowings,

FDI and refundable deposits from commercial partners. Capital investments by AAI have been primarily through own sources and government support.

Certain states are entering into a joint venture agreement with AAI to fund airport development. The state pays for the land acquisition and connecting infrastructure and AAI funds the capital investments and operations. The initial losses are either borne by the JV company or subsidised by the state, depending on the specific agreement between the state and AAI. The state in turn benefits from the economic activity, tourism, taxes and jobs generated at the airport and its hinterland.

For land acquisition, many states are leveraging the concept of 'land pooling', wherein the landowners are given cash compensation and a plot of developed land in the vicinity of the airport. In some cases, the state also provides a job to one member of the family based on his/ her skill profile and a small equity stake in the airport company. This win-win arrangement reduces the cash outflow of the state government and provides a fair compensation to the land-owner.

The next two decades are expected to see capital investments of over USD 40 billion in the airport sector, not including the cost of land acquisition. This opens up an opportunity for nearly USD 30 billion for Indian and global commercial banks, development financial institutions, private equity firms and pension funds.

The bond market has not matured in India, especially in infrastructure. However a leading Indian airport group has successfully raised over USD 850 million in the international bond market at attractive rates. This is a good beginning and is likely to grow further.

14.3 Vision 2040 - India will be a global aviation finance hub

a) Given the massive requirement of fund raising for its airports, airlines and other related infrastructure, India will witness a significant enhancement of its aviation finance industry.

b) This will be facilitated by policy reforms, tax reforms, greater ease of doing business, government seed-funding, and diversification by large Indian financial institutions; and collaboration with leading financial institutions, leasing companies and pension funds.

c) Most of the leading aviation finance companies will establish or expand their operations in India over the next decade. They along with Indian financial institutions will leverage opportunities in India, South Asia and beyond.

d) India is currently ranked a lowly 56th out of 72 countries on the World Aircraft Repossession Index (WARI). By 2040, India will undertake significant reforms to take it among the top 10 nations.

e) By 2040, almost 90% of aircraft being ordered in India should be financed by entities based in India.

14.4 Key action steps

a) Cape Town Convention (CTC 2001)

India has ratified the CTC 2001 but with observations. The terms of the Convention are not incorporated in DGCA CARs in their entirety. This creates a challenge for foreign leasing companies in India. The failure of a leading Indian carrier in 2012 and the challenges faces by its lessors in repossessing their aircraft thereof has hurt the long term interests of Indian carriers.

There is a need to have a sustained dialogue with the leasing companies to find a via media so that their legitimate concerns around lengthy paper-work and delays in aircraft repossession are addressed. The status quo has to end.

b) Ease of repossession

DGCA has undertaken several measures to speed up the process of deregistration and repossession of aircraft by lessors. The biggest reform required is the concept of automatic de-registration and repossession, say 5 to 7 working days after the repossession notice is issued.

Till India completely incorporates CTC 2001 into its legal framework, this reform can really help bring down the cost of leasing and security deposits for Indian carriers, especially startups and small carriers.

c) Disclosure of Registry

DGCA should make its aircraft registry public. It used to be done earlier but was stopped. Restarting it would give more confidence to the leasing industry and help bring down leasing costs.

DGCA should also disclose the liens and dues of Indian carriers, so that the leasing industry has a good understanding of the creditworthiness of the airline.

d) Exclusive group

The aircraft leasing industry is an elite, exclusive and close-knit group, with close ties to the airline, aircraft and finance circles. Most of the top leasing companies with multi-billion dollar assets operate with barely a few hundred employees each.

The Indian government, financial institutions and airline industry will need to have a long-term horizon and a proactive engagement with top leasing companies to attract them to India.

China has successfully been able to create a local aviation leasing industry with strong support from its government and the government-owned banks. It is not impossible.

e) Tax competitiveness

India will need to create a tax regime for aircraft leasing more attractive than that prevailing in leading jurisdictions like Ireland, Hong Kong and Singapore etc. This will enable leading players to establish their presence in India.

Key action steps include tax treaties with leading countries and zero rating of GST, Corporate Tax, stamp duty and withholding taxes on aircraft leases. This does not cause any tax loss for the government since the aircraft leasing industry does not exist in India currently.

A robust leasing industry in India will add to its GDP, prevent the perpetual drain of foreign exchange, reduce the leasing cost to Indian carriers and create high-end jobs. The taxes paid by the employees on their income and expenses will be incremental.

f) Private investments in airports

To attract global airport companies, private equity and pension funds into the Indian airport sector, the airport concession agreements for greenfield and brownfield airports need to be made simpler, predictable and industry-friendly. The regulatory uncertainties and disputes have to be minimised.

The proposed concepts of pre-determined aeronautical yield and concession fee in terms of Rupees per passenger are simple, transparent and largely litigation-free. These have been covered earlier in the chapter on airports

g) Nabh Nirman Fund

Over the next two decades, over 80-90 new airports are likely to come up under the Nabh Nirman initiative. These include regional airports and also second or third airports in large cities. Many of these may be bid out on PPP basis to leverage the strengths of the private sector.

Some PPP projects may require funding support in the initial stages. The government should consider establishing a Nabh Nirman Fund (NNF) with a starting corpus of around USD 2 billion. This fund could provide capital support to greenfield airports in return for up to 25% equity stake, based on a well laid out investment criteria. The fund may sell its shares to the private partners at a premium based on a pre-agreed valuation criteria. The premium thereof can be reinvested in the next batch of airports.



15 Human Resource Development



15 Human Resource Development

15.1 Current status

Conservative estimates show that the current direct employment in the aviation and aero-manufacturing sector is around 200,000. Given the nearly six-fold increase in air traffic, quadrupling of the aircraft fleet and doubling of the number of airports by 2040, the number of direct employees is expected to increase to roughly around one million.

Industry sources believe that the number of indirect jobs is around 4.8 times the direct jobs. Presuming a lower multiplier of 4.5, the total number of direct and indirect jobs created by aviation and aero-manufacturing will be around 5.5 million.

This includes the number of pilots, cabin crew, aircrafts engineers and technicians, airport staff, ground handling, cargo, retail, security, administrative and sales staff. Nearly 45-50 percent of the jobs created will be for blue collar workers (loaders, cleaners, drivers, helpers etc.).

The direct and indirect employees are likely to create an induced employment of non-aviation people providing them goods and services. This is expected to be a multiplier of 3.8. Assuming a lower multiple of 3.5, the number of induced jobs works out to another 19 million. The total employment due to aviation sector in 2040 is therefore expected to be around 25 million.

Growth in aviation has a catalytic effect on sectors like infrastructure (expressways, bridges, power, utilities and telecommunication etc.), tourism and real estate. The catalytic job growth will be over and above the 25 million mentioned above.

To prepare skilled human resources for this kind of growth, the central and state governments, industry and academia will need to invest in a massive upgrade of the existing education and skill building infrastructure.

Existing infrastructure

India today has various aviation education institutes of repute. These include the Rajiv Gandhi National Aviation University (RGNAU) at Rae Bareli, the Indian Aviation Academy in Delhi, Civil Aviation Training College (CATC) at Allahabad and Hyderabad; Indira Gandhi Rashtriya Uran Akademi (IGRUA) at Rae Bareli and National Flying Training Institute (NFTI) at Gondia, etc.

The prestigious Indian Institutes of Technology (IIT) at Mumbai, Chennai, Kanpur and Kharagpur; Indian Institute of Science (IISc, Bengaluru) and various universities across the country offer course in aeronautical engineering.

According to industry sources, India has over 31 flying academies, 6 type-training facilities, 86 academies offering Aircraft Maintenance Engineering (AME) and over 150 cabin crew training

institutes. Many Indian students go abroad for pilot training and come back for opportunities in India. India has flight simulators at Mumbai, Bengaluru, Greater Noida, Gurgaon and Hyderabad.

Shortfall expected

Given the demand-supply gap, a shortfall is expected in highly trained aircraft commanders, ground staff and aircraft technicians.

Quality assurance

According to industry sources, the quality of training infrastructure, training tools and instructors at many flying academies and AME schools are far from perfect. They need to be upgraded or shut down. Sub-optimal quality of training leads to airlines and MROs investing more time and money in upgrading their skill-sets.

High salary cost

Shortage of aircraft commanders leads to an artificial increase in their salary levels which hurts the profit margins of airlines, especially the LCCs. Bringing in pilots from abroad or attracting them from rival airlines also adds to the cost. There is a need to enhance the number of world class flying academies in India by way of fiscal and monetary subsidies. Gradually these academies can become global training hubs producing pilots for the global markets too.

15.2 Vision 2040

a) India will be a global aviation training hub

India will witness a massive upgrade in its aviation education and skilling infrastructure. This will be by way of policy support, government funding, public-private partnership and collaboration with leading global institutions. Exchange programs between Indian and leading global institutions will being in best practices. India's affordable and high-quality aviation education system will attract students from across the globe.

The course curriculum will be industry-driven and on-the-job training will form a substantial part of the study period. Given the close collaboration with industry, the institutes will have a near 100% placement record.

b) Mobility solutions

To counter pilot shortages and enhancing the standards of pilot training, mobility solutions can be adopted to augment the proven training techniques after the initial coursework is completed. These solutions provide mobile access to training profiles, aircraft manuals, company manuals and electronic charts. Mobile devices provides new ways for pilots and instructors to interact with each other by sharing notes,

creating flash cards, creating websites and hosting video chats to perform specific reviews on weekly basis.

c) Electric trainer aircraft

Currently, pilot training in India is done through aircraft that are old, noisy, fuel guzzling and expensive to operate. Replacing them with electric-powered training aircraft will make pilot training inexpensive and flying experience cleaner, vibration-free and pleasant. Electric trainer aircraft have received airworthiness certificate in Canada, Australia and USA etc. They are likely to replace a large majority of conventional trainer-aircraft across the world.

d) Augmented Reality (AR)

AR is likely to change the face of aviation training. This technology uses real-time information in the form of text, images and audio enhancements integrated with actual objects. This technology can change the way the professionals are trained in field of flying and aircraft maintenance. The virtual images of the actual landscape, equipment and components will enable technical staff to recreate real scenario with lower risk to life and property.

e) Virtual Reality (VR) in pilot training

Today, all pilots are trained in full motion flight simulators which provide pilots with a 180-degree view of a particular airport, helping pilots to precisely locate their approach procedures. A VR flight simulator teaches pilots the basics of flying using a mobile VR headset or a multi-projected environment to simulate a pilot's physical presence in a virtual environment. The VR technology has systems that transmit vibrations and other sensations to the pilot, and has positive results with sufferers of Post-Traumatic Stress Disorder (PTSD). The VR flight simulator is in the experimentation stage currently, but is likely to get certified in the near future.

f) Evidence Based Training

Most airlines are likely to shift to the concept of Evidence-based Training (EBT). According to ICAO, existing airline pilot training requirements in national regulations are largely based on the evidence of accidents from earlier generation of aircraft jets, and on a simple view that, in order to mitigate a risk, simply repeating an event in a training programme was sufficient.

It is impossible to foresee all plausible accident scenarios, especially in today's aviation system where its complexity and high reliability mean that the next accident may be something completely unexpected. EBT addresses this by moving from pure scenario-based training, to prioritizing the development and assessment of key competencies, leading to a better training outcome. Mastering a finite number of competencies should allow a pilot to manage situations in flight that are unforeseen by the aviation industry and for which the pilot has not been specifically trained.

There are Indian companies that are supplying EBT software to leading airlines in the world. They are likely to make India a global centre of excellence for EBT.

15.3 Key action steps to achieve Vision 2040

a) Aviation education task force

MoCA should consider setting up a high-power task force, led by a Joint Secretary, for making India an aviation education hub. The task force should have members from relevant ministries, regulators, aviation industry and academia. The task force should develop a clear roadmap about key industry requirements, education infrastructure, funding strategy and the timelines. The Task Force should report actions and outcomes to the aviation minister on a quarterly basis.

b) Foreign collaboration

There is a need to attract foreign investment and talent in aviation education. The success of CAE in flight training is a case in point. Certificates issued by reputed flying academies in the developed world should be acceptable in India and the graduates thereof should be given faster clearances by DGCA.

c) Pilot training

Many developed countries allow trainee pilots to get a Commercial Pilot License (CPL) within 12-15 months of training vis-à-vis 24 months in India. DGCA should consider evaluating how the training programs in India can be brought at par with global norms without compromising on safety standards.

DGCA should also consider increasing the frequency of pilot exams to at least one per month in the short term and on a weekly basis in the long term through use of modern examination techniques used by GMAT, SAT, CAT etc.

d) Collaboration with Indian Air Force

The Indian Air Force (IAF) has one of the finest pilot training infrastructure in the country. The Task Force should explore ways in which their facilities and staff can be used for producing civilian pilots without affecting IAF's operational requirements. The Task Force should also plan for a seamless post-retirement movement of IAF pilots, ground staff and engineers into commercial aviation.

e) ATC academies

With growing traffic and new airports coming on line, the demand for Air Traffic Control Officers (ATCO) is increasing too. Given the unique nature of this service - zero tolerance for error and high levels of technical skills required - a shortage can be a serious concern. Further, the existing ATCOs would also require upgraded training as AAI is making significant investment in modernizing equipment and operations.

AAI should explore partnership options with international ATC training institutes. The enhanced capacity can also help CATC earn additional revenue in the long run by training foreign ATCOs and providing consultancy services to global ATC service providers.

MoCA should consider the option of allowing private players to set up ATCO training facilities, similar to flying academies and engineering colleges. The schools shall be subject to supervision by AAI and DGCA. This may be started in a PPP mode first and thereafter be made fully open to private sector in the long run.

f) Aircraft Maintenance Engineers (AMEs)

As the Indian fleet grows, with new sophisticated aircraft coming in; and more and more MRO business is carried out in India, the need for high quality Aircraft Maintenance Engineers (AME) will become critical. There have been some concerns about the quality of graduates passing out of certain AME training institutes. Such AMEs then need to be retrained by the airlines at their own cost.

The rapidly changing technology landscape needs to be incorporated in the AME curriculum. Many AMEs take an average 3 years on the job training at their hangers, before they receive their licenses. There is a strong need for a closer collaboration between the airline industry and AME schools, and to overhaul the curriculum and examination systems.

g) Fiscal and monetary support

In order to attract young Indians from lower income groups to train as managers, pilots, engineers, ground staff and cabin crew etc., the trainees should be provided scholarships on a merit-cum-means basis. Since aviation education requires costly infrastructure, the government should consider fiscal and monetary incentives to such training institutes. The short term tax loss will more than compensated once the young students enter the aviation industry as white collar professionals, contribute to the GDP and pay their taxes.

h) Aviation management

There are limited skilling opportunities for business operations and management personnel like route planners, flight dispatchers, revenue and yield managers, airport planners and corporate managers. Specialized training programs for these personnel is the need of the hour. The Rajiv Gandhi National Aviation University (RGNAU) is expected to address this gap. The Task Force also needs to collaborate with IIMs and other leading management institutes to curate elective courses for airline and airport management.

i) Evidence Based Training

As highlighted in the previous section, DGCA should gradually bring in the concept of Evidence-based Training (EBT) in place of the conventional programs. This will help move from a pure scenario-based training, to development of key competencies and

soft skills. These would allow a pilot to manage situations in flight that are unforeseen by the aviation industry. ICAO has already developed EBT training standards.

j) Aligning with global regulators

India is trying to harmonize its safety procedures with that of FAA and EASA. This necessitates providing specialised training to DGCA staff and the industry at large. FAA has an in-house facility to provide such niche training to their personnel.

Currently there is no organisation in India, which provides such specialised technical training in air transportation safety, security and regulatory areas. DGCA should engage with global regulators and training institutes for preparing its in-house group of master trainers.

16 Vision 2040: Monitoring Mechanism



16 Vision 2040: Monitoring Mechanism

A vision is as good as its implementation. While the long term future of Indian aviation looks quite strong, the challenges and roadblocks are many. This Vision 2040 document attempts to paint the likely scenarios in 2040 and highlights the key action steps that are critical to get there.

Implementation of Vision 2040 will require a robust monitoring mechanism to ensure that the action steps are undertaken in a time-bound manner. There will be extraneous factors and surprises along the way. The mechanism should be robust enough to address these and undertake course corrections where necessary.

The proposed action steps are as follows:

a) MoCA may establish a high power Vision 2040 Program Management Unit (VPMU) under the leadership of a Joint Secretary at MoCA.

b) The VPMU Steering Committee may comprise members from MoCA, regulators and the industry. It shall have a dedicated staff for coordination and progress monitoring.

c) The VPMU may appoint ten Vision 2040 Task Forces (VTF) for separate sub-sectors namely: airlines, airports, MROs, cargo, ground handling, aviation safety and security, air navigation, aero-manufacturing, remotely piloted aircraft and general aviation.

d) Each VTF may have a unit head at the level of Director MoCA and shall report to the VPMU head. The unit head in turn will invite members from government and industry, in consultation with the VPMU members.

e) The VPMU may set up an online Vision 2040 progress tracker that will track outcomes and challenges of individual VTFs. This shall be available as a mobile app for easy tracking.

f) The VTFs may develop a granular roadmap in line with the overall Vision 2040 and the vision for their respective sub-sector. This may include wide ranging activities like

   i) Policy, regulatory and procedural reforms

   ii) Inter-ministerial and centre-state collaboration

   iii) Collaboration with foreign entities

   iv) Fund raising,

   v) Land acquisition,

   vi) PPP transactions,

vii) Technology upgradation

viii) Setting up of new entities,

ix) Training infrastructure and delivery monitoring etc.

g) The above activities should be incorporated into the Vision 2040 progress tracker.

h) The VTFs may meet once every month to take stock of the progress and decide the agenda for the ensuing month.

i) The VPMU Steering Committee may meet once every quarter for a detailed review of the work of the individual units, settle issues and undertake course corrections. The VTF may invite officials not below the rank of Joint Secretary from relevant ministries like finance, home, defence, environment, etc. and representatives from the state governments for the Vision 2040 quarterly meetings.

j) The VTF may engage subject matters experts as and when needed, the cost of which will be borne by the VTF's budget.

k) The VTF may share the monthly progress reports with the aviation ministers and aviation secretary.

l) Salient features of the VTF's monthly report may be shared with the public at large through the AirSewa platform. Feedback from the public may be considered by VPMU and VTFs for incorporation into their action steps.

Conclusion

Indian aviation's Vision 2040 targets are lofty and aspirational. The road to 2040 will not be easy. The Indian government, industry and academia will need to work closely together. India will also need to collaborate with aviation leaders across the globe for knowledge and advice.

With the right policies and a relentless focus on execution, India can surprise the world by not just meeting but exceeding the Vision 2040 targets.

We'll get there.



About KPMG

KPMG is a global network of professional services firms providing Advisory, Audit and Tax services. It has over 200,000 people working in over 150 countries.

KPMG in India, a professional services firm, is the Indian member firm affiliated with KPMG International and was established in September 1993. It professionals leverage the global network of firms, providing detailed knowledge of local laws, regulations, markets and competition. KPMG has offices across India in Ahmedabad, Bengaluru, Chandigarh, Chennai, Gurugram, Hyderabad, Jaipur, Kochi, Kolkata, Mumbai, Noida, Pune and Vadodara.

KPMG's aviation practice works with the entire spectrum of clients ranging from government, regulators, airlines, airports, government, regulators, air cargo, aircraft manufacturers, MRO and aviation institutes. It has a mix of business consultants and industry professionals assisting clients in areas like policy, strategy, transaction, finance, IT, operations and people issues.

KPMG has had the privilege of assisting the Ministry of Civil Aviation (MoCA), Government of India, in the drafting of the National Civil Aviation Policy (NCAP 2016) and the policy framework for the Regional Connectivity Scheme (RCS or UDAN). It had earlier assisted MoCA in drafting the 12th Five Year Plan for aviation. KPMG is currently assisting MoCA in drafting the 20 year National Airport Strategy and the model concession agreements (MCA) for greenfield and brownfield airports.

KPMG has been the transaction adviser to state governments for greenfield PPP airports at Navi Mumbai, Mopa and Bhogapuram. It has assisted Airports Authority of India (AAI) in several key engagements like the corporatization plan of Air Navigation Services; assessment of development fee for Delhi and Mumbai airports; feasibility analysis for Juhu and Rohtak Airports; business plan for Rajiv Gandhi National Aviation University (RGNAU) and business strategy for GAGAN etc.

About FICCI

Established in 1927, FICCI is one of the largest and oldest apex business organizations in India. FICCI's history is closely interwoven with India's struggle for independence, industrialization and emergence as one of the most rapidly growing global economies. FICCI has contributed to this historical process by encouraging debate, articulating the private sector's views and influencing policy.

A not-for-profit organization, FICCI is the voice of India's business and industry. FICCI draws its membership from the corporate sector, both private and public, including MNCs; FICCI enjoys direct and indirect membership of over 2,50,000 companies from various regional chambers of commerce and through its 70 industry association.

FICCI provides a platform for sector specific consensus building and networking and is the first port of call for Indian industry and the international business community.

Aviation, aerospace and defence are key focus areas for FICCI.

Contact us

Manoj Mehta
Head- Civil Aviation
Federation of Indian Chamber of Commerce and Industry
Federation House, Tansen Marg, New Delhi - 110 001
Email : manoj.mehta@ficci.com
T: +91-11-23487440
F: +91-11-2332 0736