Leveraging Opportunities in the Indian Civil Aerospace Industry: Status Quo & Future Outlook

16th February 2015
Project Supervisor: Prof. Dr. Roger Moser
Foreword

This report is to help UK and Indian aerospace companies develop business partnerships. The report which UKTI has produced along with IIM Bangalore will serve as a strategy tool in understanding the Indian aerospace ecosystem.

The UK aerospace sector is the European leader and global number two. It has world class capabilities in the manufacture of the most sophisticated and high value parts of modern aircraft.

The UK has created a high-tech and high-skill industry of 3,000 companies and 230,000 employees. Some undisputed global leaders operate from the UK such as BAE Systems, GKN and Rolls-Royce. European leaders in the UK include Airbus, Cobham, AgustaWestland, Finmeccanica and Thales alongside global businesses such as Boeing and Bombardier.

The UK is one of the few countries with advanced capability across the whole civil aerospace product range. Capability includes design, manufacture and support of aero-engines, airframes, avionics, landing gear, electrical and fuel systems, actuation and interiors.

Success in the global economy depends on being at the forefront of technological innovation. The UK government supports the aerospace industry to be at the cutting edge of new technologies through the Aerospace Growth Partnership (AGP). The UK invests heavily in new technology related to sustainable air and road transport. UK leadership in these areas is propelled by our internationally recognised academic institutions and design engineering companies.

Many UK companies already have a strong commitment to India, just as Indian companies show a strong commitment to the UK. I am confident that this UK-India engagement will lead to further profitable collaborations between Indian and UK companies.

Ian Felton
Deputy High Commissioner
Bangalore
UK Trade & Investment
UK Trade & Investment
UKTI works with UK based businesses to ensure their success in international markets through exports. We encourage and support overseas companies to look at the UK as the best place to set up or expand their business.

Who we are
We have professional advisers around the UK and staff across more than 100 countries. Our headquarters are in London.

Responsibilities
We are responsible for:
• international trade and investment
• helping UK companies achieve their potential overseas through exporting
• encouraging investment in the UK by overseas businesses

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Years of robust economic growth coupled with an increasing demand for aviation services from the country’s teeming millions mean that a massive expansion of aerospace activities is probably imminent in India. The country is emerging as a vibrant domestic industry backed up with an increasingly well-educated, highly-motivated and talented workforce and a rising prowess in Information Technology (IT). These fundamentals are complemented through an increasingly growing low-cost manufacturing base and numerous government initiatives such as *Make in India* that create an interesting investment climate for UK aerospace companies.

**However, what does this situation actually imply for UK aerospace companies?**

This report is based on a decision intelligence based approach that intends to support the decision making of UK aerospace executives about whether and how to enter/expand in the Indian aerospace market. The report provides UK aerospace executives with the following insights (Exhibit 1):

a) **Cluster Intelligence**: Which cities/clusters in India are the major aerospace hubs for which kind of activities, how does the national and local aerospace policies look like today and what is expected to change in the future?

b) **Industry Intelligence**: What is the status quo of the Indian aerospace value chain, who are the major players, who collaborates with whom for what kind of project and how do some future trends look like?

c) **Process Intelligence**: What are key insights on how to successfully enter the Indian market and which other aspects do UK aerospace companies need to consider when entering or expanding in India?

d) **Intercultural Intelligence**: Which cultural differences impact the outcomes when doing business in India, which kind of negotiation tactics are commonly applied and how can you properly react?
Exhibit 1: Business Development Intelligence for UK aerospace executives

This report represents a unique service of UK Trade & Investment in collaboration with IIM Bangalore in order to provide a practical guide for UK aerospace executives that are interested in seriously evaluating the status quo and future outlook of the Indian civil aerospace industry and are ready to leverage the existing opportunities in India.

The reminder of this practical guide is therefore structured as follows. First, a brief introduction into the Indian aerospace markets and major initiatives in India is provided. Second, this guide provides executives with an overview on the major aerospace clusters in India (Cluster Intelligence) followed by a detailed analysis of the current aerospace value chain (Industry Intelligence). This is then complemented by an expert panel (Delphi) study offering unique insights about how more than 35 local industry expert see major future developments in the Indian aerospace industry.

In a next section, this practical guide offers UK aerospace executives a selection of lessons learned from foreign and Indian aerospace companies operating in India.
Finally, this guide provides UK aerospace executives with additional lessons learned about how to successfully enter / expand in the Indian market (Process Intelligence) and overcome intercultural management challenges (Cultural Intelligence).
India Progressing

In 2016, India’s middle income population is expected to comprise of more than 267 Million people with the country planning to increase the number of operational airports to 250 by the year 2030. With strong economic growth drivers, the Indian aerospace market is emerging as one of the most interesting in the world experiencing growth in domestic and international passenger & cargo traffic. The Government of India has also started a major new national initiative called ‘Make in India’, designed to facilitate investments into manufacturing capacities, foster innovation and build best-in-class manufacturing infrastructure. The aerospace sector in India is an integrated part of this initiative. In general, the major objective behind most emerging government initiatives in the Indian aerospace sector is to turn India into a preferred manufacturing / engineering / aftermarket services hub for aerospace companies across the globe, also fostering foreign direct investment and technological upgrades of the local industry base. Alongside the investment scenario in the aerospace manufacturing sector, India is also a growing market for After Care / Maintenance, Repair and Overhaul (MRO) services, and a proven ground for Information Technology Enabled Services (ITES) including high-end engineering. These developments are also backed with a pro-active government with distinct financial policy measures intending to encourage private investment in the aviation and aerospace sector encouraging technology transfers, achieving indigenisation and substantially liberalising the civil aviation sector. In the civil aerospace domain, Foreign Direct Investment (FDI) opportunities are allowed to an extent of 100% in several private sector manufacturing, research & development and service segments. Given the federal nature of India, several states are also actively promoting the aerospace sector by offering attractive Special Economic Zones (SEZ) to setup industries and State Level Single Window Clearance Committees for speedy clearance of proposals. Finally, these efforts are now also backed by an increased simplification of the tax administration with the central government planning to introduce the Goods and Service Tax (GST), which is intended to subsume central excise, luxury tax, octroi, electricity duty and purchase tax.
‘Make in India’ Program

The highlights and purpose of the ‘Make in India’ program include turning India into a manufacturing hub along with an economic and political transformation in India that eliminates unnecessary laws and regulations, making bureaucratic processes easier, as well as make the government more transparent, responsive and accountable.

There are already a few ‘Make in India’ examples in the context of the aerospace industry:

- ThyssenKrupp India is said to open a dedicated aerospace component facility in Bengaluru to supply components for Indian and international airlines for aircraft families including The Boeing Co. and Airbus SAS.
- In a major breakthrough for the ‘Make in India’ initiative in the aerospace sector, the Federal Aviation Administration approved for the first time two aircraft parts developed in India for use by manufacturers in the United States in January 2015. The two products approved by the regulator are a four-person life raft developed by the Indian arm of UTC Aerospace Systems (UTAS), and nickel-cadmium batteries developed by Hyderabad-based HBL Power Systems. The approval accorded by the FAA is significant as it enables UTAS and HBL to directly supply these products to manufacturers in the United States.

Aerospace Policy Framework

The Government of India has considerably liberalised the framework for operations in the aerospace industry over the past decade. Some of the policy aspects that are notable are:

- Manufacturing and R&D activities are allowed with 100% FDI on automatic route in all areas, except air traffic services.
- While 100% domestic private investment is allowed in the defence sector, there is a limit of 49% FDI in the manufacture of defence equipment, which is also subject to licensing requirements.
- 100% FDI is permitted on automatic route for MRO, flying training institutes and technical training institutes.
• Up to 74% FDI is permitted for existing airport projects on the automatic route, above 74% and up to 100% permitted under government approval route. 100% tax exemption for airport projects for a period of 10 years.
• 100% FDI on the automatic route is permitted in setting up of Greenfield airport projects.
• FDI up to 49% is permitted for scheduled air transport services/domestic scheduled passenger airlines on the automatic route.
• FDI up to 49% is permitted in ground handling services on the automatic route. FDI above 49% and up to 74% is permitted under government approval route.
• FDI up to 100% is permitted under the automatic route for helicopter services / seaplane services requiring DGCA approval.
• The Ministry of Defence of the new government has proposed to come up with a brand new “simplified and time-bound” Defence Procurement Procedure (DPP) by March 2015 that will help smoothen defence procurements. Tax incentives are given for investments in Special Economic Zones.

• Aircraft engines and parts thereof are eligible for duty exemption when imported for servicing, repair or maintenance of aircrafts used for scheduled operations.
• The budget envisages the development of new airports in Tier I and Tier II cities.
• The Income Tax Act provides presumptive taxation under Section 44AE in respect of assets which are engaged in the business of plying, hiring or leasing goods carriages.
• Exemptions under the Income Tax Act for infrastructure development under section 80 IA.
• Basic customs duty exemption is available for parts and testing equipment used for the maintenance, repair and overhaul of aircraft.
• Budgetary support is provided to the AAI for the development of airport infrastructure in the north-eastern states of India.
Aerospace Clusters in India

The Indian aerospace industry is distributed all over the country. However, there are also a few regions where certain kinds of companies or activities are clustered. Executives from the UK aerospace industry need to first understand this cluster distribution in order to gain a basic overview.

*Exhibit 2: Indian Aerospace Clusters: Approx. Number of Companies per Region/State*

According to the Ministry of Statistics and Programme Implementation, Government of India, passengers carried by Indian scheduled operators (domestic services) increased by
about 373% from 12,854,000 to 60,838,000 between 2001 and 2011 whereas that in international services increased by about 290% from 3,689 to 14,435 in the same time period. The increase in cargo during this period was at about 124% (161 to 361 thousand tonnes) & 163% (98 to 258 thousand tonnes) respectively for domestic & international services. As of October 2014, the data furnished by the Civil Aviation Ministry, showed that domestic air passenger traffic increased by 18% in October 2014 to 59,250 thousand passengers - up from 50,080 thousand ferried in the corresponding month in 2013. It is important to note that although the international domestic travel demand rose 5.8% in October 2014 compared to October 2013, the strongest growth in passenger numbers are occurring within the developing world led by India and China.

Based on these growth figures, the Indian civil aircraft After Care / Maintenance, Repair and Overhaul (MRO) industry is set to significantly grow over the next two decades. Currently, the Indian MRO market is at a nascent stage and at present constitutes only 1 percent of the total global MRO market. The Indian civil aviation MRO market, at present, stands at around $900 Million and is anticipated to grow to $2.6 billion by 2020 and $4.33 Billion by 2025 increasing at a CAGR of about 14-15 percent.

However, the aerospace industry worldwide is continuously challenged by increasing cost and competition pressures as well as a shrinking high skilled labour market and dynamic regulatory environments. In order to combat these challenges, aerospace OEMs and Tier 1 suppliers are increasingly leveraging the advantages arising from the globalisation of the aerospace supply chain. OEMs are adapting to these challenges by working with specialists and partners on more and more elements of technology, design and component/sub-assembly manufacturing.

The typical go-to-market strategy for India has been to leverage the manpower in general, ITES skills, operational cost advantages in optimising the supply chain while establishing a foundation in the country in purview of the emerging business opportunities. For example, the aerospace and engineering major QuEST Global launched the country’s first aerospace Special Economic Zone for development and manufacture of aerospace precision engineering products in Belgaum, Karnataka in 2009. The SEZ has come up on a 300 acre site at an investment of Rs. 150 crores.
The Karnataka Industrial Areas Development Board (KIADB) has acquired about 3000 acres of land for the formation of a ‘Bangalore Aerospace Park’ and SEZ near Devanahalli and the Bengaluru International Airport. The park has received investments of Rs. 7,000 crores with big-ticket residents including European Aerospace and Defence Systems/Airbus, defence public enterprises Hindustan Aeronautics Ltd. and BEML, Jupiter Aviation, Dynamic Technologies, Centum Electronics, Starragheckert, AMADA, Wipro, Tyco, Dynatech, System Controls, Aero Electronics Private Limited and several others. An aerospace-focused university and a technology innovation center in collaboration with reputed overseas institutions as well as an international convention centre are proposed in 30 acres of land near the Bangalore Aerospace Park.
A 250-acre aerospace and precision engineering industries park at Adityanagar, Adibatla, Ranga Reddy District in the State of Telangana is upcoming. Tata Advance System Ltd, a unit of the Tata Group, has obtained 50 acres of land in this aerospace SEZ. The government has also allotted space to 32 Small and Medium Enterprises (SMEs) for locating their units in the Adibatla SEZ.

Recently, the Telangana government has decided to develop two additional aerospace parks as part of its efforts to host a 15 to 20 percent market share of the Indian aerospace and defence sector within next five years. The proposed aerospace park with over 1,000 acres near Ibrahimpatnam on Hyderabad-Vijayawada highway will be an extension of the existing aerospace SEZ at Adibatla, which houses Tata's four units in joint ventures with global majors like Sikorsky, Lockheed Martin and RUAG Aviation. The third facility is being planned on the northern side of Hyderabad and it is most likely to come up near Warangal, which has already an airstrip. This park will be focused on the aero-replacement segment. With the policy framework from the central government opening up space for the states, they are said to invest in creating several aerospace infrastructure SEZs.
The Indian Aerospace Industry: INDUSTRY Intelligence

While the Indian aerospace cluster structure is still at a nascent stage and easy to understand given the limited number of active aerospace-related clusters and SEZs, it is very challenging for any aerospace executive to keep an overview on what is currently going along the aerospace value chain in India. However, especially for smaller aerospace companies such a detailed understanding of the value chain evolution in India is crucial if they want to find their ‘market niche’ and identify potential local collaboration partners. In this context, this UK Trade & Investment guide in collaboration with IIM Bangalore has tried to create an up-to-date overview on which parts of the value chain are currently covered by which players. This overview is based on numerous interviews with local industry experts but will still not cover all relevant and recent developments. However, this guide provides some first insights about what is currently happening and who is active where.

The Aerospace Value Chain in India: An Introduction

First, almost all of the aerospace grade raw materials are currently imported to India for further treatment, manufacturing and finishing. This is due to the lack of significant technologies, process capabilities and quality assurances that the high quality aerospace material requires. India also has no significant base of global aerospace OEM certified materials suppliers in metals, composites, alloys, etc. The only advancement for the raw materials industry will happen when large global companies set up JVs in India. Sheet metal processing as well as composite technologies are therefore some of the critical raw material areas that India is currently heavily lacking. The opportunities for Tier-2/Tier-3 companies from abroad for JVs in India will involve bringing in the technology into India to partner with the evolving Tier-1 eco-system within the country to add novel capabilities to them.

Second, largest players in the Indian aerospace market are mainly Public Sector Undertakings (PSU) setup by the Government of India. Unlike in mature aerospace value chain markets, they act as both OEMs and Tier-1 suppliers. Due to the lack of an evolved domestic civilian airline manufacturing program, much of the PSU work involves
production for defence. International aerospace OEMs have chosen to work with Indian PSUs as an entry strategy (JVs) into India in order to work towards their offset requirements. There is no significant Public-Private Partnerships (PPP) within the country that has yet made strides towards establishing a Tier-1 capability for demands from within the country. Although the Government of India has been recommended to create such avenues, the realisation of a strong PPP scenario within the country might still take more than a decade.

Third, India lacks a Tier-1 aerospace supplier base in aerospace manufacturing. Dynamatic Technologies is a noted Tier-1 player in India. While some large business conglomerates such as Mahindra & Mahindra (M&M) have sought to acquire foreign companies to setup operations in India (e.g. M&M has majority stakes in component-maker Aerostaff Australia and general aircraft manufacturer Gippsland Aeronautics), their activity is limited to small civil aircrafts and the overall turn-over has been less than $100 mil in 5 years. The probability of Tier-2 and Tier-3 companies in India to move towards Tier-1 by the year 2020 is also low. Instead, there will be growth in the Tier-1 ecosystem with larger business houses such as M&M, Tata, L&T (due to their brand and bandwidth) will look to invest with a 10-15 year roadmap in scaling the industry.

In short, the Indian aerospace value chain provides tremendous value in Tier-2/Tier-3 manufacturing services. The value for investments from abroad comes with realising the benefits arising due to cost arbitrage and access to highly skilled man power while the foreign partner scales activities locally by moving up the supply chain for global OEMs. The local Tier-2/Tier-3 ecosystem in its current state is not affected much by the offset policies. Tier-2/Tier-3 players are driven due to the obvious labour market advantages alongside competitive state government policies which actively encouraging SMEs via the creation of SEZ and tax benefits.

The After Care / MRO industry in India is potentially at the stage of evolving into a larger industry in itself. This is primarily due to the local civil airline industry growth while some regulatory issues still needs to be resolved so that some of the investments in the After Care / MRO segment by foreign investors seemed to be slightly premature (e.g. MAS-GMR Aerospace Engineering Co. Ltd.). The technical abilities, the processes and
bandwidth to conduct After Care / MRO activities within the country is not the current impediment. The After Care / MRO industry heavily relies on imports of components from abroad due to the strict process and procedure controls by OEMs. These imports face a complex tax regime that include customs and excise from the central government and local state government tax regimes in sales and service taxes. These tax regimes have been counter-productive for the development of the After Care / MRO ecosystem resulting in situation where Indian carriers prefer to use overseas MROs to avoid local taxes and red tape. There have been recommendations to the policy makers to defer the collection of taxes for After Care / MRO activities. Although the government is likely to take a decision in favour of the recommendations, the decision is yet to be arrived at. Systemic scaling of After Care / MRO related activities are to be expected only with a concrete tax regime change in the segment alongside large OEMs looking to partner locally for offset requirements.

In India Aerospace OEMs and Tier-1 suppliers from the West can derive as much as 50% savings in costs on engineering design. Indian companies in IT and Engineering Services have an advantage of a competent level of domain knowledge, especially in mechanical engineering and avionics. OEMs and Tier-1 suppliers currently do no source large volume/complex services from India and still prefer that such work is done by existing Tier-1 companies in the West. However, there is a distinct phenomenon of Tier-1 companies utilising the services of Indian companies for further subcontracting (e.g. CAD, CAE, electrical wiring/harness design, technical publications, manufacturing engineering, avionics design, testing and integration). In many cases, the process has been established by Tier-1 companies providing the domain knowledge, guidance and hand holding necessary to ensure the smooth execution of the work. There are opportunities in helping Indian companies in further implementing EFQM (European Foundation for Quality Management) systems and to move towards getting EASA and FAA approved processes to move up the value chain. The outlook for aerospace-focused ITES looks more than bright if leveraged in long-term collaborations between Western and Indian companies.
In sum, the aerospace value chain in India in its current state is placed in a way that each segment performs independently. There is little exchange between the different sub-systems of the Indian aerospace eco-system. There will be tremendous value in companies trying to push these boundaries and connecting OEMs, suppliers across segments and continents to further reduce time/costs via local cross-coupling. A typical example would be to save costs by completing a complete Tier-1/Tier-2 job through design services, certifications, material costs, machining operations, assembly costs, testing and integration realised in the local aerospace value chain.
Exhibit 4: The Aerospace Value Chain in India: Overview

Prime/Original Equipment Manufacturers
- National Aerospace Laboratories
- Aeronautical Development Agency
- Gas Turbine Research Institute
- Defence Research and Development Organization
- Aeronautical Development Establishment

Tier 2 Suppliers
- Dynamic Technologies - Flap track beam
- Mahindra Aerospace - Small civil aircraft and systems
- Tata Advanced Systems – Sikorsky S-92 Helicopter Cabin

Tier 1 Suppliers
- Bharat Electricals Limited
- Hindustan Aeronautics Limited
- Electronic Corporation of India
- Bharat Dynamics Limited
- MBDNL

Tier 3 Suppliers
- Samtel – Avionics
- Tata Lockheed Martin Aerostructures – Airframes for Hercules and Super Hercules
- Tata Manufacturing Solutions - Floor beams

Consumers
- Boeing
- Airbus
- BAE Systems
- Lockheed Martin
- Honeywell

Engineering Services
- Tata Technologies - Aero Structures, Aero Interiors, Aero Systems, Manufacturing Engineering, Aftermarket Services
- Altran India - Stress analysis in structures to fatigue analysis to flight physics studies
- Calsoft Labs - Aerostructures, Embedded systems (software, real time), Technical documentation and In-service support
- Acumen Aviation - Aircraft asset management services
- Infosys, Tech Mahindra, Wipro, Infotech Enterprises, Cognizant, Quest Global – Engineering and Design services for avionics software and harness.
Industry Profile Overview

Besides a general overview, UK aerospace companies obviously need to understand the details of the value chain in their specific areas of activities. This report tries to provide some more insights for each major part of the aerospace value chain such as in Exhibit 5 (please see Appendix I for more details about most companies listed in this report).

Exhibit 5: Companies with Major Operations in Design, Manufacturing & Testing Services
ITES (Information Technology & Engineering Services)

The traditional Indian IT ecosystem which has emerged to the global scene has complemented the evolution of the aerospace ITES in India. In its current state, the Indian aerospace ITES ecosystem is a combination of

- Global OEM/Tier-1 established centres
- Large traditional IT companies moving into aerospace ITES
- Mid-sized aerospace ITES focussed indigenous enterprises
- Public sector undertakings

The traditional large IT companies in India are focused on offering engineering and design services to OEMs and aircraft makers. While some of the large companies have chosen to partner with strong foreign technology partners (E.g. Wipro with Apsys) with the technical know-how and look to apply the partnership advantages to the local market, others are capitalising on the indigenous resources created at traditional aerospace Indian giants such as HAL, NAL, etc., to create a foundation of strong private sector ITES offerings. There are also several core-aerospace ITES focussed enterprises (e.g. Shakti Aerospace, Axis Aerospace) that over a period of a decade have achieved critical sizes and are looking to expand in the upcoming years. Companies such as Quest Global have created value connecting professional talent in India and Europe to build a strong foundation and in the process created immense value of trust for foreign clients. Some of the global OEM/Tier-1 suppliers have chosen to partner with Indian PSUs (e.g. HAL-BAE Systems). The general sentiment in the aerospace ITES segment remains to move higher up in the value chain while others are more cautious and evaluate how Indian and foreign companies can join forces and create synergies for the benefit of both partners. Traditionally, global Tier-1 suppliers have chosen to outsource some of the lower end ITES with some hand holding and knowledge transfer to the Indian partners. These successes have now created a case of several Indian aerospace ITES firms looking for higher value and critical projects in an effort to move up the value chain in selected areas. Flight critical software in avionics, intelligent systems for flight and other allied advanced ITES value chain activities are some of the critical value addition that Indian ITES companies might add in coming years. There are opportunities for foreign partners who can support Indian enterprises in this regard. Exhibit 6 provides an overview of existing players in this aerospace value chain segment.
The Indian aerospace manufacturing value chain segment has historically been built up with the support and involvement of Public Sector Units (PSU) such as HAL, NAL, DRDO, etc. From the traditional Indian PSU driven SME development programme, the country has evolved into a place where global OEMs and Tier-1 suppliers partner with Indian enterprises.
to take advantage of the labour and operational costs. The current manufacturing ecosystem in India is now set to undergo a major overhaul with the new government focusing on advancing the manufacturing sector – the ‘Make in India’ campaign. In its current structure, the aerospace manufacturing segment is witnessing the formation of JVs of OEMs/Tier-1 suppliers and renowned business houses of Indian origin such as the Tata group. In such arrangements the Indian manufacturing sector has witnessed the formation of several companies with the same Indian business house partner for their interest (E.g. Aerospace Processing India, Aerostructures Assemblies India with Aequus India). Only a select few of the companies which have traditionally worked with large PSU companies have been able to make it to a higher level in the value chain. India’s manufacturing sector is still heavily focused on Tier-2/Tier-3 activities and the future lies in the movement towards Tier-1 (supported by offset) – however, this will take time. The key to the success in the Indian aerospace sector lies in systematically building up domain knowledge at a rapid pace and mastering state-of-the-art manufacturing processes in several areas that are currently missing in India. India has established an excellent base for machining, however, areas such as sheet metal working or composites, which are critical to the success of the modern aerospace industry, are still to take shape in the country. Opportunities for foreign partners lie in bringing such critical IP that shall leapfrog the Indian partner by several years. Some of the other areas of interest lie in special finishing and precision manufacturing processes. With several State governments in India creating Special Economic Zones (SEZs) for aerospace manufacturing there lies an opportunity for creating enterprises moving up the value chain to produce sub-systems and system level equipment based on the traditional components / sub-assemblies. There shall be real value in the manufacturing sector once the ecosystem moves towards coupling and optimising design with manufacturing in the country. This way, OEMs/Tier-1 suppliers will have an immense value proposition with the possibility of performing cost optimised value chains within the country that will be of importance for both the local and international markets. Exhibit 7 provides an overview on existing players also including the most promising company Dynamatic Technologies.
Exhibit 7: Major Indian Aerospace Manufacturing Profiles (Airframes / Avionics)

**Hindustan Aeronautics Ltd. (India)**

Hindustan Aeronautics Ltd. (Accessories Division)

Hindustan Aeronautics Ltd. (Aircraft Division Bangalore)

**Tata Group**

Tata Sikorsky Ltd
- Fuselage Sections for Sikorsky S-92

Tata Advanced Systems Limited
- Dornier 228 - Fully assembled fuselage; Wings
- Lockheed Martin C-130J Hercules - Empennage; Fuselage Sections - Centre wing box
- Plasser PC-12 - Fuselage Sections - Aeronautics
- Sikorsky S-92 - Fuselage Sections - Cabin fuselage assembly

**Avionics**

**PSUs**

Hindustan Aeronautics Ltd.

**Establishing JVs**

Samtel Avionics Ltd
- Automated Test Equipment, Electronic Flight Instrument Systems, Head-Up Displays, Helmet-Mounted Displays (HMD), LCD Displays

Samtel HAL Display Systems Ltd
- Enhanced Vision Systems (EVS)

Samtel-Thales Avionics
- Enhanced Vision Systems (EVS)

**SMEs**

RadioSound
- Communications (Airborne), Electrical/Electronic Connectors, Fasteners, Passive Electronic Components

Spectrum Antenna & Avionics Systems (P) Ltd
- Automatic Direction Finders, Communication Antennas, Distance Measuring Equipment, Navigation Antennas, Radar Transponders

Vandnthal Telemetry & Antenna Systems Pvt Ltd
- Antenna Couplers, Communication Antennas, Navigation Antennas, Radar Covers, Radomes
After Care / MRO (Maintenance, Repair, Overhaul)

The civil aircraft After Care / Maintenance, Repair and Overhaul (MRO) industry of India is only 1% of the overall global market but has an immense growth outlook since the Indian carriers are expected to double their fleet size by 2020 to 900-1000 aircrafts. Currently, only about 5-10 per cent of the After Care / MRO work for Indian airlines is done in India of which mostly “A” and “B” checks (Line Maintenance/Components) are mostly performed by the owner/operators as a part of their daily and weekly aircraft operations involving only their own personnel or selected contracted vendors. “C” and “D” checks (Engine/Airframe/Heavy Maintenance) which is more laborious and infrastructure intensive is performed by specialized agencies mostly outside India.

*Exhibit 8: Major Indian Aerospace MRO Profiles & Potential Opportunities in Different Segments*

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<th>Indian Companies in MRO Industry</th>
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<tr>
<td>Taneja Aerospace &amp; Aviation Ltd</td>
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<td>Max Aerospace &amp; Aviation Ltd</td>
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<tr>
<td>Air Works India Engineering Pvt Ltd</td>
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<td>Air India Limited</td>
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<td>Hyderabad Aircraft Maintenance Company</td>
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<td>Indamer Company Pvt Ltd</td>
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<td>Arrow Aviation Services Private Limited</td>
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<td>Cochin International Aviation Services</td>
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<td>Eaton Aerospace</td>
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<th>Engine Maintenance (50%)</th>
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<td>Component (17%)</td>
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<td>Mas &amp; GMR</td>
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<td>Boeing &amp; Air India</td>
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<td>Airbus &amp; Air India</td>
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<td>Sabena Technics of TAT Group &amp; TAAL</td>
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<td>Timco Aviation Services &amp; HAL</td>
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<td>SIA Engineering of Singapore &amp; Wadia group</td>
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</table>

India is a mixed After Care / MRO market with several third party MRO service providers alongside emerging local MRO service providers. One of the most established After Care /
MRO players in the Indian industry is Air Works Indian Engineering. They have benefitted by acquiring the UK based Air Livery providing them with advanced capabilities in aircraft repainting, livery, paint stripping, and interior refurbishment for commercial and executive/corporate jets. India currently lacks well developed MRO infrastructure and has several taxation issues (customs, sales tax, service tax), which drive the Indian carriers to perform MRO services outside of India. One of the prime recommendations made to the Indian government in the Union Budget of 2015 is to provide a tax holiday for 10 years for the MRO industry. Alongside the government is investing into building new MRO infrastructure and is planning SEZs for this aerospace segment. Today, the MRO segment JVs that are being formed with OEMs are looking more towards the offset market. There have been some cases of premature JVs (e.g. MAS-GMR) which have shown sustained losses over the past years. In particular airframe inspection shall be one of the key areas in MRO, as such inspections mostly constitute 70% labour and 30% material costs. One of the key challenges apart from the taxation/infrastructure issues within the Indian market is the difference in standards between the Indian Directorate General of Civil Aviation (DGCA) and its European counterparts. One of the major strides to be achieved in the Indian MRO industry is to upgrade standards to match the EASA and FAA standards which shall enable Indian MRO players to leverage the manpower and operational cost advantages.
The Indian Aerospace Industry: A Delphi Study

From Status-Quo to Future Outlook: Insights from a Delphi Study among Indian Aerospace Experts

Introduction

While the analysis of the current value chain activities for UK aerospace companies is relevant and essential to understand where they could leverage business opportunities it is also key for them to understand how the investment environment in the Indian aerospace industry is evolving in the future. For this purpose, IIM Bangalore has conducted an expert-panel study with more than 35 participants in order to answer a few questions with respect to questions such as:

- How investment-friendly will the Indian aerospace industry be in the future?
- What are the growth plans of Indian aerospace companies and what are their major challenges?
- Which clusters in India seem to be the most promising in the future but also which other countries besides India are relevant for potential investments?

In the following, we provide a detailed overview on the insights and perceptions that the participating Indian experts have been sharing with us — both in terms of quantitative assessments of probabilities as well as comments that justify their assessment.

The subsequent discussion of the results is structured according to the following logic. First, we clarify again which challenges matter most for Indian aerospace companies and how they want to grow in the near future. Next, we evaluate how the general investment climate for the Indian aerospace market will look like in the near future and which clusters in India are perceived as the most interesting in 2020. We then switch to a more value-chain focused perspective and evaluate for engineering, manufacturing and after-care how the Indian aerospace industry is perceived in terms of attractiveness. Finally, we ask the participating experts whether new comers to Indian aerospace industry face any significant disadvantages compared to the incumbent players in order to highlight those areas that need special attention when making long-term investments in India.
A Guide to Understand Expert-Panel (Delphi) Studies

In order to allow for an effective assessment of the different expert panel (Delphi) study results, we provide a brief guide on how to interpret the results of such Delphi studies.

During such expert panels, experts see projections one by one, in scattered order, and respond to one quantitative and one qualitative question about each of the statements. First, they evaluate the probability that the statement provided will be true in the future by choosing a probability estimate between 0% and 100%. Second, the experts are asked to provide written arguments (i.e. statements) for their assessment. In a second stage of the survey, the participating experts are shown for each of the statements where their answers lie in comparison to the other respondents and they are given a chance to revise their evaluations and/or arguments based on the arguments they have read from the other experts. Once an expert has finished the survey he/she can go back and revise his/her opinion again until the survey is closed.

However, what do such probabilities actually tell me?

*Probability* (expected value of the probability estimate) is used to estimate the expectations of the participating experts. While a very strong average probability among the participating experts of e.g. 10% or 90% would simply show a low or high probability for a specific statement the actual insights of such a statement would minimal. Why?

The purpose of a Delphi study is not that experts confirm likely or unlikely developments that are clear for all but that they provide their opinion on statements that are not so obvious. In such a research context, probabilities in the range of 45% to 55% are very common and probabilities below 35% or 65% are perceived as very low resp. very high – a little bit like election results in democracies.

Besides the average probability of a statement the distribution of the probability estimations among the experts matters as much. Why?

Let’s assume that for a given statement we have an average probability assessment of 60%. The interpretation of this 60% now much depends on the actual distribution of the answers among the experts. There is a big different whether an average probability of 60% is calculated primarily through individual assessments among the experts between 50% and 70% or whether most individual assessments are in the range of 30% to 90%. While the first
case shows a high degree of consensus (distance between the first and third quartile of probability estimations among the experts; i.e. interquartile range) the second case shows a low degree of consensus among the participants.

Especially in cases where we have a low degree of consensus, it is important to carefully study the arguments for a low or high assessment provided by the experts in order to understand in detail why some experts perceive the probability of a future development as very low or very high. Only such a detailed understanding provides more clarity on what the local experts actually think. This is why we do not only report the probabilities for each statement and the respective degree of consensus but also the key arguments that the experts have provided to justify their low or high assessment.

In addition, there are some questions where the evaluation of probabilities does not make sense but classic Likert scale assessments (1-5) are more useful to understand what the experts think. This is mostly the case when we do not talk about future developments.

**Expert-Panel (Delphi) Results**

*What challenges do Indian aerospace companies face today and how do they want to grow in the future?*

First, the more than 35 participating experts have evaluated which challenges Indian aerospace companies are currently facing (Exhibit 9). We have focused our evaluation on key issues such as Research & Development, Operations & Quality Management, After Market Care, Human Resources Management, Intercultural Team Management and Access to Raw Materials. Except for Research & Development with the highest average rating of 4,0 (Likert Scale 1-5) and Operations & Quality Management (3,5) the other issues listed where all rated at the same level (3,3). Therefore, R&D activities currently seem to be the most relevant challenge for Indian aerospace companies in general while Operations & Quality Management is very much in the focus of the manufacturing companies in India. The other topics (except for raw materials) are relevant to all Indian companies but less an issue.

This situation offers interesting opportunities but also some challenges for UK aerospace companies when evaluating a potential investment in India. Foreign companies with substantial R&D competencies currently have a strong negotiation position if they are willing and able to integrate an Indian partner into their specific value chain and operations.
Exhibit 9: The Biggest Challenges of Indian Aerospace Companies Today

Today, Indian companies in the aerospace sector face their biggest problems in India with respect to...
1 = do not agree at all
2 = do not agree
3 = indifferent
4 = agree
5 = completely agree

- Indian companies fight most with sufficient R&D capabilities given the low number of education institutions that equip the local workforce with the required skills – even the automotive sector in India still faces this challenge.
- R&D issues are followed by manufacturing challenges (production/quality/partially raw material) given the missing "ecosystems" India.
- While all three value chain steps (engineering, manufacturing, after care) face HR and intercultural challenges it is primarily the engineering sector that faces the intercultural (communication / management / process design) challenge.

In this context, we have then asked the participating experts how they think that Indian aerospace companies prefer to grow today (Exhibit 10).

Exhibit 10: The Preferred Growth Modes of Indian Aerospace Companies Today

Today, Indian aerospace companies prefer to grow in India through ...
1 = do not agree at all
2 = do not agree
3 = indifferent
4 = agree
5 = completely agree

- Domestic companies from the civil aerospace sector are clearly in favor of co-operations with foreign companies to support future growth.
- The present situation offers a great opportunity for UK companies to start/expand activities in India with a strong position at the negotiation table!
- Companies that can provide support in R&D and/or manufacturing will have an especially strong negotiation position.
- However, in order to leverage this opportunity negotiation tactics and cultural process design matter.
The assessment of the participating experts clearly indicates that Indian aerospace companies have a clear preference for growth via Joint Ventures or Strategic Alliances with FOREIGN companies (4,2) as compared to other modes of growth including joint ventures or alliances with DOMESTIC companies (3,0), organic growth (2,7) or the acquisition of other companies (3,2). In addition, there seems to be an interesting number of companies where investors are willing to sell their stakes in the aerospace sector and invest the money in other industries. There are two major implications for UK aerospace companies based on these results. First, foreign companies are still in a strong negotiation position when entering the Indian aerospace sector today given that they can offer relevant R&D capabilities. Second, there are also interesting investment opportunities for foreign companies given that some investors in the Indian aerospace sector have understood that this sector requires long-term investments which they are not willing or able to make.

How attractive is the future investment climate of the Indian aerospace sector and which clusters are most attractive?

The results on the current major challenges and preferred modes of growth for Indian aerospace companies indicate that there are interesting market opportunities for UK aerospace companies in the near future. However, other factors such as the general investment climate for aerospace companies in India matter as well. Therefore, we have evaluated how the participating experts perceive the probability that the Government of India has significantly reduced red tape and increased the ease of doing business in 2020 (Exhibit 11).

The assessments of the participating experts result in an average probability of 64% and a degree of consensus (i.e. interquartile range) of 30. This first future projection can therefore be classified as quite likely with a strong dissent among the experts. The original arguments of the participating experts for a high or low assessment can be seen in Exhibit 12.

While a very enthusiastic group of experts is convinced that the new government will significantly change the way how doing business in India is done there is also another group of experts that highlight how difficult it is to change the red tape in the Indian bureaucracy. This partially explains the strong dissent among the experts.
Exhibit 11: The Ease of Doing Business in India in 2020

In 2020, the Government of India has significantly reduced red tape and increased the ease of doing business in India for aerospace companies.

Key Insights

- The general perception of the future ease of doing business in India is positive.
- However, an expert describes the biggest challenge as follows: “Indian aerospace industry is not only complex on the operational front but being a regulated sector, suffers from a “double whammy” of bureaucracy and siloization at decision making level. The present Government while addressing process seems to be missing a few core issue.”
- Discussions with experts outside the Delphi panel indicate that some areas are developing in positive direction while others might remain a challenge that will require some efforts to be mastered.

Results (Statistics)

<table>
<thead>
<tr>
<th>Probability in %</th>
<th>Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>Strong Dissent</td>
</tr>
<tr>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

Exhibit 12: The Ease of Doing Business in India in 2020 (Expert Comments)

In 2020, the Government of India has significantly reduced red tape and increased the ease of doing business in India for aerospace companies.

LOW

- The ease of doing business in India will not improve in the next years to come - the administration in India simply does not understand how to support business.
- It is too early to predict this. while the Top is trying to implement this, the middle and the Bottom are yet to actually practice.
- Politicians do not want to let go their controls. Every govt when it is new said the same but failed bureaucracy aids this
- Whatever the govt wants to implement needs a wholehearted participation from the civil administration & IAS which I feel is missing at the moment.
- With the new Government now formed India is in a stronger position to change and reduce its red tape, however this being actioned in 5 years is less likely due to other restrictions from the lower Government parties making changes difficult
- Manual processes and systems need to be replaced which will be difficult until, power, security and IT support is improved.
- The indicators are right at the moment. However, air travel is still seen as ‘luxury’. Unless that attitude changes, ease of doing business for aerospace companies will not change significantly

Results (Expert Comments)

LOW

- There will be issues such as safety, security and certification which will, and should, take time. But there is no reason that all commercial issues will not be liberalized.
- The new government at the highest level (PM) has demonstrated it clear intent to streamline the process of doing business in India hassle free. Hence the optimism in expecting improvement.
- Indian aerospace industry is not only complex on the operational front but being a regulated sector, suffers from a “double whammy” of bureaucracy and siloization at decision making level. The present Government while addressing process seems to be missing a few core issues and therefore I see there is only a 60% chance of things changing for the good.
- By 2020 I am hoping the current laws pertaining to setting up of Industries that deal with Defense sector and Manufacturing sector will be liberalized. 2. Business environment in India for setting up of Manufacturing Industries in general and especially Aerospace industry will be improved significantly due to low costs, highest talent and mature processes in India.
- Under MAKE IN INDIA initiative of Mr. Narendra Modi’s Government, this would be a reality.
- Because now there is no way to avoid this industry.
In addition to the “Ease of Doing Business” statement, we also asked the participating experts on their opinion how likely it is that India has a consistent aerospace policy framework in 2020 (Exhibit 13) and their arguments for a high or low probability assessment (Exhibit 14).

**Exhibit 13: Consistent Aerospace Policy Framework in India in 2020**

<table>
<thead>
<tr>
<th>Key Insights</th>
<th>Results (Statistics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Similar to projection (1) the participants do not agree on their perception. However, in general the assessment is quite positive.</td>
<td></td>
</tr>
<tr>
<td>• Many of the experts refer to the relatively short-term outlook with respect to policy making which takes time in India.</td>
<td></td>
</tr>
<tr>
<td>• The substantial efforts of states such as Karnataka to developing aerospace-specific policy frameworks, however, indicate that while national efforts might not work till 2020 there is reason to believe that some states will offer the necessary regulatory environment.</td>
<td>Probability in %</td>
</tr>
<tr>
<td>• A participants summarizes “India is slowly progressing towards robust policies and the process has already been set rolling.”</td>
<td>Consensus</td>
</tr>
<tr>
<td>61</td>
<td>Quite Likely</td>
</tr>
</tbody>
</table>

**Exhibit 14: Consistent Aerospace Policy Framework in India in 2020 (Expert Comments)**

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The Govt. will likely to lag global trends and so policy will not keep up with global norms. However, because of technology, this lag will be small.</td>
<td>It will be necessary for GOI to create consistency because of privatization and market demands.</td>
<td></td>
</tr>
<tr>
<td>• Many Aerospace companies are still very ill advised on what is required to support this market. Larger companies are making progress. The whole policy needs addressing and 5 years is too short to complete this</td>
<td>Without a clear policy framework it will be impossible to attract foreign participation. The make in India policy is a well thought out policy and the government has already started considerable efforts in educating industry and public at large on the intent of this policy.</td>
<td></td>
</tr>
<tr>
<td>• Expert panels come and go but bureaucracy is here to stay and understand bureaucracy stands for mediocrity. Also it is easy to get certification but difficult to get sustain quality</td>
<td>The new Government seems to understand the importance of this sector and is taking some very proactive steps to resolve the basic issues being faced by the industry. Case in point is the larger allocation towards R&amp;D in its intermin budget and the steps being considered for availability of capital.</td>
<td></td>
</tr>
<tr>
<td>• So far the Governments have not succeeded in having such a policy framework. The main impediment is that there are many independent stakeholders unlike in the Space Department where cohesive space policy exists.</td>
<td>India is slowly progressing towards robust policies and the process has already been set rolling. This is the only way by which we can ensure a steady growth in the Aerospace Industry.</td>
<td></td>
</tr>
<tr>
<td>• To create a reliable aerospace policy framework, there is a need to involve experienced aerospace professionals in the process. Unfortunately, presently unqualified bureaucrats and politicians make the policies. This must change.</td>
<td>Policies are evolving steadily with more and more industry participation</td>
<td></td>
</tr>
<tr>
<td>• Given the federal nature of India, each state might have different priorities and only some may lead the aerospace sector policy like the IT sector.</td>
<td>Yes, India is learning from the past mistakes and sure they will come out with a good and reliable policy frame work</td>
<td></td>
</tr>
<tr>
<td>• There will be a framework and policy documents as before. How it is executed will be the key. The govt is not shy of publishing lofty policy frameworks.</td>
<td>There will be a framework and policy documents as before. How it is executed will be the key. The govt is not shy of publishing lofty policy frameworks.</td>
<td></td>
</tr>
</tbody>
</table>
The results of Exhibit 13 and Exhibit 14 confirm a consistent picture with the first projection on the “Ease of Doing Business in India” when it comes to probabilities (61%) and degree of consensus (30).

In sum, the participating experts have the tendency to believe that there is increased ease of doing business as well as consistent aerospace policy framework but the distribution of the individual opinions among the experts indicate a strong degree of dissent among them. Executives of UK aerospace companies are therefore well advised to carefully see how the new government is working on a significant improvement of the investment climate for aerospace companies in India.

In addition to the evaluation of the general investment climate for aerospace companies in India, UK aerospace companies also need to understand which specific locations are the most attractive ones in the future. For this purpose, we have asked the participating experts how they perceive the overall attractiveness of the five major aerospace states/regions in India (Exhibit 15).

**Exhibit 15: Attractiveness of Major Aerospace States/Regions in India in 2020**

<table>
<thead>
<tr>
<th>Results (Statistics)</th>
<th>How ATTRACTIVE are the following Indian states for investments of aerospace companies in 2020?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karnataka</td>
<td>3.9</td>
</tr>
<tr>
<td>Gujarat</td>
<td>3.7</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>3.1</td>
</tr>
<tr>
<td>Telangana</td>
<td>2.7</td>
</tr>
<tr>
<td>NCR Region (Delhi, Haryana, Uttar Pradesh)</td>
<td>2.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Insights</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Karnataka respectively Bangalore has been the operational capital of the aviation industry for over 5 decades and is investing into new locations (e.g. Belgaum) and advanced policies. However, some experts criticize the local state government’s performance and do not see Belgaum as real alternative.</td>
</tr>
<tr>
<td>• Gujarat is perceived as best state to do business in general but experts claim that there are no substantial aerospace activities located so far.</td>
</tr>
<tr>
<td>• Andra Pradesh is perceived as risky due to the split up with Telangana and the former capital of Hyderabad where most aerospace related activities located. However, the current Chief Minister is perceived as trustworthy and competent.</td>
</tr>
</tbody>
</table>

The opinions of the participating experts clearly indicate that Karnataka is and will be the favourite state for aerospace investments (Exhibit 16). The high rating of Gujarat as second most attractive aerospace state in the near future (in 2020) is primarily due to the belief that
the Modi government will push this sector also in the former home state of the Prime Minister of India (Exhibit 17). The other states/regions are much less attractive as the expert comments in Exhibits 18-20 show. In sum, the results indicate that there might be 1 max. 2 states that integrate most of the aerospace activities in India with Karnataka as the most likely candidate to be one of them. Based on this general picture about the future of the Indian aerospace sector, we focus now on a more detailed understanding of the three major value chain steps including engineering, manufacturing and after market care.

**Exhibit 16: Attractiveness of Karnataka (Expert Comments)**

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangalore is too costly and the local government does not make a good job. Bengaluru is not compensating for that.</td>
<td>Karnataka is already the leader in Aerospace Sector and will continue to be so. Also expecting BJP to come back to power in next election</td>
<td></td>
</tr>
<tr>
<td>This region is already heavy on companies.</td>
<td>For over 5 decades Bengaluru has been the aviation industry capital of India. Hence it is most suited amongst all states.</td>
<td></td>
</tr>
<tr>
<td>All State govs want money</td>
<td>Karnataka has numerous positives going its way despite the recent dip in its attractiveness to industry. However, let us also remember that it is one of the states where public opinion has been strong and in all likely-hood, we will see a change in the state leadership in near future for the better.</td>
<td></td>
</tr>
<tr>
<td>High costs, infrastructure woes and tendency to view every project as real estate project will continue to haunt Karnataka</td>
<td>The right feed of resources, policies and focus on the Aerospace SEZ. Focus on Infrastructure requirements is also a key.</td>
<td></td>
</tr>
<tr>
<td>Willingness to do things</td>
<td>Karnataka already has Aerospace activities happening for the last 25-3 years (HAL, BEL, etc.) and in the past 10-15 years many private sector companies (Indian as well as foreign) have set up engineering and manufacturing facilities in Karnataka.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infrastructure is available</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bangalore being the Aerospace hub of India - the talent pool is available here</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Karnataka is the hub of aerospace activity in India with supporting industries in Electronics, IT, Manufacturing etc. The main bottleneck is infrastructure facilities not keeping pace with needs and lack of vision and pro-activism at decision levels.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good infrastructure, high technology aerospace industries, research establishments of global standards and adequate availability of trained and skilled manpower will make Karnataka attractive</td>
<td></td>
</tr>
</tbody>
</table>

**Exhibit 17: Attractiveness of Gujarat (Expert Comments)**

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The former CM has set a very high standard for other states to emulate with a major focus on ease of business. However, availability of skilled talent for a niche industry, relatively higher per capita leading to higher manpower costs and absence of a strong existing industry may be bottlenecks difficult to surmount</td>
<td>Gujarat will get an indirect push via Modi.</td>
<td></td>
</tr>
<tr>
<td>No major aerospace industry base at present. The industrial support environment is good. The Govt. would be very supportive and facilitate the process.</td>
<td>Good Advertisement, friendly policies and support from center.</td>
<td></td>
</tr>
<tr>
<td>Skills and understanding are low</td>
<td>Excellent infrastructure and responsive government.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is already the most attractive state for the foreign investment due to right Government policy environment and strong industrial and economic base.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Good chances as substantial investment would happen in Gujarat due to Mr. Modi’s influence.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It being Modi’s state - automatically it becomes the Power centre</td>
<td></td>
</tr>
</tbody>
</table>

33
### Exhibit 18: Attractiveness of Andhra Pradesh (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Companies will prefer states that are more reliable.</td>
<td>• Responsive government led by a CM with a track record of progressive thinking.</td>
</tr>
<tr>
<td></td>
<td>• A big question mark lingers on the state capital Hyderabad and its division (who gets what) vis a vis Telangana. Notwithstanding a few advantages and Tata Groups focus on AP, the State will find it difficult to compete internationally due to uncertainties.</td>
<td>• Direct focus from CM and availability of skilled manpower. Investment friendly policies.</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>• With Hyderabad going out of its fold, everything has to start afresh. There is no base outside of Hyderabad. The Govt, though, would be very supportive.</td>
<td>• AP has seen a lot of Aero activity in the last 5-10 years.</td>
</tr>
<tr>
<td></td>
<td>• State separation and new government in place may have several other priorities in development</td>
<td>• Will have to stabilise on the recent demarcations - May not be a priority for the Government.</td>
</tr>
</tbody>
</table>

### Exhibit 19: Attractiveness of Telangana (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• As a new state there is too much uncertainty and missing transparency about its future business policies etc.</td>
<td>• The new government is very proactive and dedicated to attract new business including aerospace.</td>
</tr>
<tr>
<td>Telangana</td>
<td>• Poor &amp; Regressive mindset of present government</td>
<td>• The new government has not demonstrated ability to sort issues relating to partition of the state.</td>
</tr>
<tr>
<td></td>
<td>• Hyderabad and its division (who gets what) vis a vis AP. Notwithstanding a few advantages, the State will find it difficult to compete internationally due to uncertainties.</td>
<td>• AP has seen a lot of Aero Telangana area has seen a lot of Aero activity in the last 5-10 years.</td>
</tr>
<tr>
<td></td>
<td>• Except Hyderabad not very great initiatives.</td>
<td>• The Present Chief Minister might be instrumental in bringing up the right policies to attract the investors.</td>
</tr>
<tr>
<td></td>
<td>• Skills are low</td>
<td>• Hyderabad has established good infrastructure and facilities and has the necessary base. But political/policy uncertainty may be a dampening factor.</td>
</tr>
<tr>
<td></td>
<td>• State separation has already led to several businesses moving. It might take a while before new businesses in high tech which need sizable political and policy framework take shape.</td>
<td>• A learning Government - Lack of focus</td>
</tr>
</tbody>
</table>

### Exhibit 20: Attractiveness of NCR Region (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCR Region (Delhi, Haryana, Uttar Pradesh)</td>
<td>• Too costly.</td>
<td>• Aerospace can benefit from strong automotive cluster.</td>
</tr>
<tr>
<td></td>
<td>• Cost of land and absence of existing industry makes it very uncompetitive for future investments.</td>
<td>• OK, since, the investment in Aerospace calls for patience which is not NCR region is know for:</td>
</tr>
<tr>
<td></td>
<td>• I understand this region is expensive for skills and unsafe for Expat</td>
<td>• Cost of infrastructure set up very high. Not the best location. Suitable for Avionics industries.</td>
</tr>
<tr>
<td></td>
<td>• No major Aero activity here till now.</td>
<td>• Good for head offices but not the core manufacturing hub. Acute shortage of skilled manpower.</td>
</tr>
<tr>
<td></td>
<td>• The industrial base exists in a general sense.</td>
<td>• Close to policy makers - Centrally located</td>
</tr>
<tr>
<td></td>
<td>• NCR has typically not been a leader in any tech. The talent pool for aerospace in India is heavily in the South.</td>
<td>• Being the Capital - the MNCs certainly like to have their HQ at Delhi</td>
</tr>
</tbody>
</table>
**How attractive is the aerospace engineering sector in India in 2020?**

Based on the insights that we have received from the participating experts with respect to the overall investment climate for the aerospace sector in India, it is then crucial to better understand each of the three major value chain activities (engineering, manufacturing, after market care). In the following, we first assess the attractiveness of the Indian aerospace engineering sector. For this purpose, we have proposed to the participating experts that:

- India is the fastest growing aerospace engineering services hub in Asia in 2020 (Exhibit 21 & Exhibit 22)
- More than 50% of the domestic aerospace engineering service providers in India are able to offer the same range of standard services as their European or US competitors in 2020 (Exhibit 23)

In addition, we have asked the experts how they rate the future attractiveness (in 2020) of three other major markets for engineering services in Asia namely China, Singapore and Thailand compared to India (Exhibit 23-27).

**Exhibit 21: India as the Fastest Growing Aerospace Engineering Hub in Asia**

<table>
<thead>
<tr>
<th>Key Insights</th>
<th>Results (Statistics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In 2020, India is perceived as the fastest growing aerospace engineering services hub in Asia.</td>
<td><strong>Probability in %</strong></td>
</tr>
<tr>
<td>Actual speed and size of growth will depend primarily on the future improvement of the respective regulations and policies.</td>
<td>60</td>
</tr>
<tr>
<td>However, the perception of the role of the government is the major reason for the dissent among the participating experts.</td>
<td>25</td>
</tr>
<tr>
<td>Additional factor to consider is the growth of manufacturing activities in India.</td>
<td></td>
</tr>
<tr>
<td>IP and IT skill offer India a competitive advantage over other Asian countries.</td>
<td></td>
</tr>
<tr>
<td>The past investments have built up a level of expertise and experience that allows domestic players to manage increasingly large and complex projects.</td>
<td></td>
</tr>
</tbody>
</table>

The assessment of this statement among the participating experts reveals that India is quite likely (60%) to serve as the fastest growing hub in Asia as there is only a moderate dissent.
among the experts (Exhibit 21). However, a more detailed overview on the specific arguments can be found in the expert comments section in Exhibit 22.

Exhibit 22: India as the Fastest Growing Aerospace Engineering Hub in Asia (Expert Comments)

3 In 2020, India is perceived as the fastest growing aerospace **engineering services** hub in Asia.

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>• India has to compete with many other countries in Asia.</td>
<td>• India already holds a leadership position in the Asian civilian engineering services space.</td>
<td></td>
</tr>
<tr>
<td>• Mind set needs drastic change</td>
<td>• Fastest growing yes, due to MAKE IN INDIA &amp; HUGE GROWTH IN AIR TRAFFIC</td>
<td></td>
</tr>
<tr>
<td>• Government stringent import policies/ the bottle necks in custom clearing of goods are the grey areas of concern</td>
<td>• Technically this is a possibility in terms of know how and infrastructure. Success is dependent on policy framework which as to critically change import/ export regulations which is crucial to speed of turn around time for MRO activities.</td>
<td></td>
</tr>
<tr>
<td>• There is still a lot to be done in this front as the overall manufacturing practices itself is a challenge</td>
<td>• I believe it is based on Governments spending on defence and commercial sectors</td>
<td></td>
</tr>
</tbody>
</table>

While it does not come as a complete surprise that Indian experts are positive about their home market as the fastest growing hub in Asia the assessment of the number of globally competitive Indian engineering companies is perceived more critical. Only a little majority (55%) does agree that this statement is true in 2020 (Exhibit 23). There is also a moderate dissent among the experts indicating that different perceptions of this possible development exist (Exhibit 24).

Exhibit 23 also shows the general assessment of the future attractiveness of India compared to China, Singapore and Thailand. The results indicate that China is slightly more attractive for foreign investments than India in 2020 while Singapore and Thailand will significantly be less attractive in 2020. The detailed reasons of the participating experts for these assessments are shown in Exhibits 25-27.
Exhibit 23: India as Home of Globally Competitive Engineering Service Providers / India’s Future Attractiveness Compared to Other Asian Markets

In 2020, more than 50% of the domestic aerospace engineering service providers in India are able to offer the same range of standard services as their European or US competitors.

Results (Statistics)

<table>
<thead>
<tr>
<th>Probability in %</th>
<th>Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>Likely</td>
</tr>
<tr>
<td>28</td>
<td>Moderate Dissent</td>
</tr>
</tbody>
</table>

How ATTRACTIVE are the following countries as investment locations for aerospace engineering services in 2020 compared to India?

1 = much less attractive for foreign investments
2 = little less attractive for foreign investments
3 = equally attractive for foreign investments
4 = little more attractive for foreign investments
5 = much more attractive for foreign investments

Exhibit 24: India as Home of Globally Competitive Engineering Service Providers (Expert Comments)

In 2020, more than 50% of the domestic aerospace engineering service providers in India are able to offer the same range of standard services as their European or US competitors.

- 50% is too much. The number of companies with real world-class niveau might be 10%.
- Only some domestic companies will be able to compare with Western companies, who have a 2-3 decade lead over India in this space (In-depth domain knowledge & System Level capabilities will be the challenge)
- Quality and speed concerns
- Indian industry is geared for quick profits not long term goals. Industry without R&D will not survive in space segment
- Indian industry is geared for quick profits not long term goals. Industry without R&D will not survive in space segment it has not demonstrated ability in large volume production
- Limited availability of skill sets & limited investment

- Given the expertise and experience that the Indian engineering industry has built up over the last 8 years or so this is very likely in a few years from now.
- With the right international collaborations and access to technology and process excellence. Indian companies will be able to offer high value added services on par with European and US competitors
- Quality of services will be high. Overall success will be based on government ability to improve business climate.
- Available Knowledge & Capabilities - Favourable Governmental Policies
- JVs led by Indian companies will lead India’s Aerospace sector business
- Companies such as IndiGo are already doing it.
- Companies such as TCS are already doing it...
Exhibit 25: **China’s Attractiveness compared to India (Expert Comments)**

<table>
<thead>
<tr>
<th>LOW</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| - Transparency is a major issue. Not one knows for sure what is happening inside China. Recent events in Hong Kong are only likely to increase.  
- China is starting to lose its competitive edge  
- Neary saturated  
- Red tape and copy of IP rights by China is a global concern  
- Lack of transparent policies, internet security, laws that are suitable for audit etc. | - China is investing heavily into the respective capabilities and has a government that will much better support its growth.  
- High returns and increased market share will surely continue to attract foreign investors.  
- Non-market economy - Internal growth is expected to accelerate the economy  
- China already has a big lead over India and has established itself. The Govt has a cohesive and integrated aerospace policy which helps in both large scale of operations and reducing time frames. However, Data Security and IP protection are issues. |

Exhibit 26: **Singapore’s Attractiveness compared to India (Expert Comments)**

<table>
<thead>
<tr>
<th>LOW</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| - Singapore is too costly for most services.  
- NO Big space available and also manufacturing is moving out of Singapore  
- Talent availability for the aerospace industry is likely to impede its growth in ES  
- High cost and low returns will be a deterrence  
- not a low cost option  
- Nearly saturated  
- Expensive economy - Stressed living conditions  
- Availability of talent pool is a cause of concern  
- Pro-investment policy is the only attraction. No natural resources. Human Resources also may be a problem.  
- Cost of operations might be too high due to the economics of the country for service industry | - Singapore offers a lot of investment benefits based on the long-term perspective of the Economic Development Board  
- Scope for growth will be limited due to lack of available land for industrial bases. |

Exhibit 27: **Thailand’s Attractiveness compared to India (Expert Comments)**

<table>
<thead>
<tr>
<th>LOW</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| - Thailand is not stable enough for the foreseeable future.  
- Numerous factors make Thailand uncompetitive in ES  
- Required a stable government - May loose out on competition to other Asian economies  
- political uncertainty  
- Can’t predict the future of the Government and also the King’s influence.  
- Political instability  
- Skilled human resources, high-tech engineering base and lack of aerospace programmes may be an issue.  
- Political and talent pool situation not be attractive for ITES  
- Lack of Skilled human resources, high-tech engineering base, and big aerospace programmes may be an issue. | - Thailand benefits from its strong automotive sector for many basic engineering services. |
How attractive is the aerospace manufacturing sector in India in 2020?

In the following, we assess the attractiveness of the Indian aerospace manufacturing sector. For this purpose, we have proposed to the participating experts that:

- India is the fastest growing aerospace manufacturing cluster in Asia in 2020 (Exhibit 28 & Exhibit 29)
- More than 25% of the domestic aerospace manufacturing companies in India are able to offer the same range of standard parts and systems as their European or US competitors in 2020 (Exhibit 30)

In addition, we have asked the experts how they rate the future attractiveness (in 2020) of three other major markets for aerospace manufacturing in Asia namely China, Singapore and Malaysia compared to India (Exhibit 30-34).

**Exhibit 28: India as the Fastest Growing Aerospace Manufacturing Cluster in Asia**

<table>
<thead>
<tr>
<th>Key Insights</th>
<th>Results (Statistics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many experts predict that only one or two states will be able to attract sufficient companies (investments, skills, land, policies etc.) in the long run.</td>
<td>Probability in % 62</td>
</tr>
<tr>
<td>Experts are also more confident for the defense area than for the civil sector.</td>
<td>Consensus Moderate Dissent</td>
</tr>
<tr>
<td>While some experts highlight the engineering talent required for high-end manufacturing, other experts strongly disagree on the fact that there is sufficient expertise and experiences already available.</td>
<td></td>
</tr>
<tr>
<td>Lack of trust in local manufacturing competences from foreign players also seems to be an issue.</td>
<td></td>
</tr>
</tbody>
</table>

The assessment of this statement among the participating experts reveals that India is quite likely (62%) to serve as the fastest growing hub in Asia in 2020. The degree of consensus has to be classified as moderate dissent indicating that there is not too much of divergence in this opinion resp. that a substantial majority among the experts is at least giving this statement a probability of more than 50%. This comes slightly as a surprise as there are still major issues today when it comes to aerospace manufacturing in India. The detailed comments among the
experts (Exhibit 29) indicate that this growth is less based on the natural competitive advantages of India as manufacturing hub but rather due to the fact that India represents one of the largest aerospace markets worldwide and that local content requirements and other external factors will lead to a situation that requires aerospace companies to manufacture locally in India.

**Exhibit 29:** *India as the Fastest Growing Aerospace Manufacturing Cluster in Asia (Expert Comments)*

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>China and Thailand with their strong automotive clusters will be much stronger.</td>
<td>China needs to further encourage local production in order to become the most competitive in production.</td>
</tr>
<tr>
<td></td>
<td>New initiatives such as &quot;Make in India&quot; and greater focus on &quot;Ease of business&quot; are likely to give a shot in the arm for growth of the industry. However, it is not possible to create aerospace manufacturing industry across the country. While India is famous for diamond cutting, it is understood that one state (and within that, one district) drives 90% of the business. The auto sector in India is centered around 3 clusters in TN, MH and Haryana. Aerospace will have 2 clusters at best. Governments both Central and States will have to accept this reality, identify 2 such clusters and accordingly align its policies. At the moment, it appears that there is too much of push and pull between the states themselves.</td>
<td>This will certainly be true in military aviation. The huge home market in both military and civil areas provides assured market advantage.</td>
</tr>
<tr>
<td></td>
<td>Corruption at higher level, absence of stringent punishments to the corrupted, lack of strong policies etc.</td>
<td>Because of the user growth itself which will be the highest in India.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If cost escalations can be controlled, this is a real possibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Availability of low cost skill sets &amp; capabilities - Localisation push by the GOI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It is one of the tough competitor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Growing fleet of Airlines and growing demand for aircrafts in both defence and civil may drive OEMs to setup shop in India.</td>
</tr>
</tbody>
</table>

Similar to the assessment on India as the fastest growing manufacturing hub in Asia the experts also confirm (62% probability, moderate dissent) that in 2020 there will be more than 25% of domestic aerospace manufacturing companies that are able to produce parts and systems at the same level as their competitors in Europe and the US (Exhibit 30). This assessment is a strong signal for the local market as well as foreign companies that it is time now to evaluate in detail what kind of manufacturing opportunities exist in the Indian market and which domestic players might be relevant collaboration partners to cover some manufacturing activities out of India.

Exhibit 30 also shows the general assessment of the future attractiveness of India compared to China, Singapore and Thailand. The results indicate that China is perceived as slightly more attractive for foreign investments than India in 2020 when it comes to aerospace manufacturing while Singapore and Malaysia are likely much less attractive in 2020. The detailed reasons of the participating experts for these assessments are shown in Exhibits 32-34.
Exhibit 30: India as Home of Globally Competitive Manufacturing Companies / India’s Future Attractiveness Compared to Other Asian Markets

7 In 2020, more than 25% of the domestic aerospace manufacturing companies in India are able to offer the same range of standard parts and systems as their European or US competitors.

Results (Statistics)

<table>
<thead>
<tr>
<th>Probability in %</th>
<th>Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>Moderate Consensus</td>
</tr>
</tbody>
</table>

How ATTRACTIVE are the following countries as investment locations for aerospace manufacturing activities in 2020 compared to India?

1 = much less attractive for foreign investments
2 = little less attractive for foreign investments
3 = equally attractive for foreign investments
4 = little more attractive for foreign investments
5 = much more attractive for foreign investments

Exhibit 31: India as Home of Globally Competitive Manufacturing Companies (Expert Comments)

7 In 2020, more than 25% of the domestic aerospace manufacturing companies in India are able to offer the same range of standard parts and systems as their European or US competitors.

LOW Results (Expert Comments) HIGH

• Complex sub-systems, Complete LRUs, etc. may be a challenge
• Same remarks as earlier question

• Local Advantages - Prevailing Government Policies
• There is phenomenal changes in the process and systems
• Offset Policy and Make In India might drive these changes.
### Exhibit 32: China’s Attractiveness compared to India (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| China | • Aerospace companies will not invest too much in China due to IP issues - automotive and aerospace are not the same.  
• China is likely to protect its aerospace market, except in certain areas  
• Competitive edge is lost and lower skill levels.  
• China’s authoritarian rule coupled with lack of transparency is likely to be a major stumbling block with respect to being attractive in a sensitive sector in the long run. China is also likely to lose its cost competitiveness due to wage hikes and inflation in the near to medium term.  
• Poor IP rights protection. | • China will benefit from its manufacturing competence in other sectors such as automotive, electronics, IT  
• Higher productivity & discipline - Positive Governmental intervention  
• Lower cost and not quality  
• Traditionally has been a leader in manufacturing.  
• Already well established as investment location; Govt’s focus & support would continue. |

### Exhibit 33: Singapore’s Attractiveness compared to India (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| Singapore | • Singapore will not be cost-competitive enough for large-scale manufacturing.  
• Not cost effective  
• Singapore’s aerospace will be restricted to services.  
• Cost of living - Constraining Space  
• Cost of operations might not make Singapore feasible | • Singapore will add more space for high-value-added manufacturing activities and offer a competitive investment package.  
• Good infrastructure, strong govt control and policies |

### Exhibit 34: Malaysia’s Attractiveness compared to India (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| Malaysia | • Malaysia will not be competitive in the near future - either companies go for low-cost in China or India or high-end in Singapore.  
• Similar to Singapore; Malaysia’s aerospace will be restricted  
• Un-favourable Demographic dividend - Unattractive local conditions  
• Very small domestic market - hence investors might not be interested in investing largely only to manufacture here  
• Would make sense to have manufacturing setup alongside demand and taking offset policy into account destinations like China/India would be more preferable.  
• Lack of technical talent and supported weather conditions  
• Short on technical capability. | • Good financial and land incentives  
• Already has activities going. Enjoys same advantages as in India. |
How attractive is the aerospace after care market sector in India in 2020?

In the following, we assess the attractiveness of the Indian aerospace manufacturing sector. For this purpose, we have proposed to the participating experts that:

- India is the fastest growing aerospace after care services provider hub in Asia in 2020 (Exhibit 35 & Exhibit 36)
- More than 50% of the domestic aerospace after care service providers in India are able to offer the same range of standard services as their European or US competitors in 2020 (Exhibit 37)

In addition, we have asked the experts how they rate the future attractiveness (in 2020) of three other major markets for aerospace after care services in Asia namely China, Singapore and Dubai compared to India (Exhibit 37-41).

Exhibit 35: India as the Fastest Growing After Care Services Provider Hub in Asia

Compared to the assessments of the same statements for engineering (Exhibit 21) and manufacturing (Exhibit 28) the participating experts give this statement a much lower probability of only 54% including a strong degree of consensus. This result clearly indicates that the majority of experts perceive the future growth potential for after care services in India as very uncertain. A detailed analysis of the expert comments (Exhibit 36) shows that this assessment is mostly justified through the fact that there is a potential and very large after
care market in India but that this market can only be leveraged if the Government of India is able to create a legal and regulatory environment that allows for efficient processes and reliable planning.

Exhibit 36: India as the Fastest Growing After Care Services Provider Hub in Asia (Expert Comments)

Exhibit 36: India is perceived as the fastest growing aerospace after care services provider hub (spares, maintenance, repair and overhaul) in Asia.

When further evaluating the question whether in 2020 more than 50% of the domestic aerospace after care service providers will be able to offer the same standard services as their competitors from Europe or the US the participating experts are consistent in their assessment. Thus, the average probability is again 55% with a very strong consensus among the experts (Exhibit 37). The same pattern of arguments can be identified when it comes to the justification of this indecisive situation highlighting the huge market potential and opportunities to achieve economies of scale while critical voices highlight that the maintenance and repair of complex sub-systems requires substantial experience which does not exist in India yet.

Exhibit 37 also shows the general assessment of the future attractiveness of India compared to China, Singapore and Dubai for after care services. The results indicate that Dubai (3,4), Singapore (3,2) and China (3,1) are all rated as more attractive for after care services than India. Again, these assessments are primarily due to the weak legal and regulatory environment in India as compared to the other markets and the large home market that China
has as well. The detailed arguments of the participating experts for these assessments are shown in Exhibits 39-41.

**Exhibit 37:** *India as Home of Globally Competitive After Care Market Providers / India’s Future Attractiveness Compared to Other Asian Markets*

*In 2020, more than 50% of the domestic aerospace after care service providers (spares, MRO) in India are able to offer the same range of standard services as their European or US competitors.*

<table>
<thead>
<tr>
<th>Probability in %</th>
<th>Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>14</td>
</tr>
</tbody>
</table>

*How ATTRACTIVE are the following countries as investment locations for aerospace after care service providers in 2020 compared to India?*

1 = much less attractive for foreign investments
2 = little less attractive for foreign investments
3 = equally attractive for foreign investments
4 = little more attractive for foreign investments
5 = much more attractive for foreign investments

---

**Exhibit 38:** *India as Home of Globally Competitive After Care Market Providers (Expert Comments)*

*In 2020, India is perceived as the fastest growing aerospace after care services provider hub (spares, maintenance, repair and overhaul) in Asia.***

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Complex sub-systems, Complete LRUs, etc. may be a challenge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HIGH</th>
<th>Results (Expert Comments)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local Advantages - Prevailing Government Policies</td>
</tr>
<tr>
<td></td>
<td>There is phenomenal changes in the process and systems</td>
</tr>
<tr>
<td></td>
<td>Offset Policy and Make In India might drive these changes.</td>
</tr>
</tbody>
</table>
### Exhibit 39: China’s Attractiveness compared to India (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| China | • The geography is not ideal.  
 • Culture of China - Fear of IPR violations | • The Chinese Government will strongly focus on supporting this industry segment - regulatory issues and local demand.  
 • Good infrastructure and low labour cost  
 • Driven by rising domestic traffic China might equally be attractive. |

### Exhibit 40: Singapore’s Attractiveness compared to India (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| Singapore | • Too costly.  
 • Small country & low domestic consumption  
 • Cost of operations for MRO might be counterproductive | • Has already a strong cluster.  
 • Good trading environment already exists in Singapore  
 • Already in this space  
 • Can be an attractive services Hub - Ease of doing business  
 • already well established |

### Exhibit 41: Dubai’s Attractiveness compared to India (Expert Comments)

<table>
<thead>
<tr>
<th>LOW</th>
<th>Results (Expert Comments)</th>
<th>HIGH</th>
</tr>
</thead>
</table>
| Dubai (UAE) | • India has a stronger local demand and can attract similar international business.  
 • MRO for international flights may be attractive for Dubai. However, not for domestic. | • Strong cluster - good location and support from government (taxes etc.)  
 • Good trading environment in Dubai.  
 • Investing significantly to make Dubai an MRO hub  
 • Continued Government support - Preferred destination by many companies  
 • Good infrastructure and supportive Policies of the Government  
 • already well established |
**Are there any market entry challenges for new players as compared to incumbent players in 2020?**

In addition to the detailed evaluation of the market attractiveness of India for engineering, manufacturing and after care services, UK aerospace companies might also be interested in understanding whether new players in the Indian aerospace industry face significant disadvantages as compared to the incumbent players. For this purpose, we have tested for statements focusing on:

- Access to local talent (Exhibit 42 & 43)
- Access to local supply chain (Exhibit 44 & 45)
- Cost-efficient operational expenditure management (Exhibit 46 & 47)
- Cost-efficient capital expenditure management (Exhibit 48 & 49)

In general, the results across the four issues indicate that there are no major challenges for new players as compared to incumbent companies. However, there are some interesting lessons learned when it comes to managing aerospace activities in India.

The results as shown in Exhibit 42 confirm that new players are unlikely (47%) to face severe problems in accessing the local talent base compared to incumbent companies.

**Exhibit 42: Accessing Local Aerospace Talent in India in 2020**

- Most experts agree that there won’t be a big difference between new and incumbent players. However, the challenge to find the right talent will be still high.
- However, an expert puts it as follows: “New companies will always face challenges in finding, hiring and retaining talent. They will have to pay a lot more and create a much stronger proposition for their potential employees.”
- Some experts are also convinced that India can still leverage a demographic dividend. However, experience shows that this assumption has also not been realized on high-end engineering yet in the automotive sector that is 7-10 years more mature.
The strong degree of consensus among the experts highlights that basically all of them do not have a strong opinion against or in favour of this statement. However, the comments of the experts (Exhibit 43) highlight that new players without a strong brand value might face the challenge to attract local talent as they offer neither a long-term career perspective nor an additional image boost for the employee when looking for a new job after 2-3 years working with the respective company. New players in such a situation might want to consider this aspect and try to create either more competitive offers in terms of salary or focus on other fringe benefits such as extensive training programs back in UK distributed over 2-3 years.

**Exhibit 43: Accessing Local Aerospace Talent in India in 2020 (Expert Comments)**

<table>
<thead>
<tr>
<th>LOW</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>• I think by then the talent will be available at a cost</td>
<td></td>
</tr>
<tr>
<td>• The availability of talent will make this statement less true</td>
<td></td>
</tr>
<tr>
<td>• Abundance of talent pool - Advantageous demographic dividend</td>
<td></td>
</tr>
<tr>
<td>• Aerospace talent is insignificant compared to requirements. Non aerospace people rule the roost in this sector</td>
<td></td>
</tr>
<tr>
<td>• India shall be reaping a high demographic dividend.</td>
<td>• New companies will always face challenges in finding, hiring and retaining talent. They will have to pay a lot more and create a much stronger value proposition for their potential employees.</td>
</tr>
<tr>
<td></td>
<td>• Not across the board, may be true in some hi-tech areas.</td>
</tr>
<tr>
<td></td>
<td>• Initiatives have been taken up by Organizations like IITs, HAL etc in developing the talent pool in India.</td>
</tr>
</tbody>
</table>

In addition to access to talent, new players also need to understand whether they face severe problems in tapping into the local aerospace supply chains in 2020. The results in Exhibit 44 indicate that this is unlikely (45%) to be case. However, the participating experts show a moderate dissent indicating that there are more different arguments that need to be considered in this context (Exhibit 45). For example, there are certainly significant differences when we evaluate the three major aerospace value chain activities including engineering, manufacturing and after care. In general, the experts highlight the fact that the Indian supply chain is still evolving and far away from any mature stage. On the one hand, this allows new players to still tap into a growing market, on the other hand there is the risk that the best suppliers are completely busy with covering the growth of existing long-term customers making it hard for new players to benefit from existing high-quality suppliers in India.
Exhibit 44: Tapping into the Indian Aerospace Supply Chain in 2020

**In 2020, new aerospace companies entering India face severe problems in tapping into the Indian aerospace supply chain (i.e. working with suppliers) when compared to incumbent companies.**

**Key Insights**

- Experts mostly agree that especially the access to the supply chain will be available to both new and incumbent players.
- One expert describes it as follows: “The playing rules will be the same for all players.”
- However, additional discussions and experiences from the automotive sector indicate that new players always require 2-3 years to develop sufficient informal networks among key executives in supplier or customer firms to be effective and overcome the missing institutional trust.

**Results (Statistics)**

<table>
<thead>
<tr>
<th>Probability in %</th>
<th>Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>Unlikely</td>
</tr>
<tr>
<td>25</td>
<td>Moderate Dissent</td>
</tr>
</tbody>
</table>

**Probability Assessment (Distribution)**

Exhibit 45: Tapping into the Indian Aerospace Supply Chain in 2020 (Expert Comments)

**In 2020, new aerospace companies entering India face severe problems in tapping into the Indian aerospace supply chain (i.e. working with suppliers) when compared to incumbent companies.**

**LOW**

- Companies will always be open to more business, so this situation is not likely to happen.
- Is an evolving industry - Requirements will outstrip supplies
- There is no such reliable supply chain. Due to want of such suppliers any body who has manufacturing capacity jams in
- Any new company entering India is more business for local companies in supply chain.

**RESULTS (EXPERT COMMENTS)**

**HIGH**

- Indian business has always been adaptable and will not let go of opportunities.
- Key suppliers will already be there
- The playing rules will be the same for all players.
- The supply chain always grows with increased demand

Besides the access to local talent and supply chains, new players also need to understand whether they face significant disadvantages when it comes to the cost-efficient management of operational (Exhibit 46 & 47) and capital expenditure (Exhibit 48 & 49). Both results indicate that new players are rather unlikely (43% / 45%) to face more severe challenges in 2020 than incumbent companies. In fact, while some experts highlight the challenge for new players to access the best locations for cost-efficient capital expenditure management some others also mention the chance of new players to make better location decisions and invest into new equipment that optimally suits the local requirements.
Exhibit 46: Managing Operational Expenditures Cost-Efficiently in 2020

In 2020, new aerospace companies entering India face severe problems in cost-efficiently managing their operational expenditure (e.g., internet bandwidth, production machinery, service tools) in India when compared to incumbent companies.

Key Insights

- The experts agree that operational expenditure will be similar to new and incumbent players.
- In fact, one expert even indicates that new players could have a competitive advantage: "Quite possible as in case of any new company technology changes may favour new investments."
- Discussions with experts also indicate that new players can now better evaluate which clusters might be most promising and directly invest there—without the loss of early mover investments.

Results (Statistics)

<table>
<thead>
<tr>
<th>Probability in %</th>
<th>Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Unlikely</td>
</tr>
<tr>
<td>20</td>
<td>Moderate Consensus</td>
</tr>
</tbody>
</table>

Probability Assessment (Distribution)

Exhibit 47: Managing Operational Expenditures Cost-Efficiently in 2020 (Expert Comments)

In 2020, new aerospace companies entering India face severe problems in cost-efficiently managing their operational expenditure (e.g., internet bandwidth, production machinery, service tools) in India when compared to incumbent companies.

LOW

- Generally, infrastructure will not be a problem. Both the government and the private sector is working towards boosting infrastructure availability.
- INDIA being very strong in Software & having High Quality engineers, these problems will be overcome in next 2-3 years.
- These companies will hire professionals who have been doing all this for years, so this will not be a challenge.
- I am hoping this not to be a problem due to changes in policies.
- Due to globalization and increase in competition the cost efficiency is likely to be steady.
- Operational expenditure for machinery and service tools might be high. However, one has to consider maintaining them as well.

Results (Expert Comments)

HIGH

- Dependent of growth of standard of living in India. If standard grows rapidly then costs will also correspondingly increase.
- Quite possible as in case of any new company - Technology changes may favour new investments, looking at positively.
- The effective cost in India is steadily rising compared to other nations. This makes the situation very challenging.
There is little value to executives when only talking about future developments in the Indian aerospace sector and their specific value chains. Based on work with the German automotive industry in China we have developed an “Institutions-Resources Matrix (I-RM)” approach that guides executives to transfer insights about future developments into functional consequences for their functional strategies today (impact). A guide on how to apply the I-RM can be requested from IIM Bangalore (raju.subbarao@IIMB.ERNET.IN).
CASE EXAMPLES: Aerospace Manufacturing

The need to cut costs in delivering aerospace design, development, and production globally at a faster pace is the key for OEMs showcasing interest in increasingly making use of a global supply chain. This global supply chain transition is the key reason for the Indian aerospace manufacturing area witnessing a growing number of private players entering this value chain segment. Several estimates predict that India can offer cost advantages of between 15 to 25 per cent in manufacturing, depending on the type of components and complexity. Excellent machining based manufacturing expertise and infrastructure has been leveraged to realise the cost advantages in managing operational expenditure (labour, energy, material, etc.). Apart from the subsidiaries of large foreign aerospace OEMs/Tier-1 suppliers, some of the successes achieved by Indian players are led by companies such as Dynamatic Technologies and Aequs Aerospace.

Example: Dynamatic Technologies Limited

Dynamatic Technologies is combining the technical competence of its facilities in UK with the cost and manufacturing advantages offered by its Indian plants in a unique way to combine the best of both worlds and create a unique competitive advantage in the Indian context.

Activity Focus

The acquisition of UK based Oldland a precision a machining company by Dynamatic Technologies has enabled the company to gain capabilities in advanced precision engineering. Dynamic Technologies now produces major Airframe Structures for the Indian defence sector as well as Flap Track Beams for the Airbus Single Aisle A-320 family. The order book of Dynamatic Technologies, one of the few Tier-1 suppliers in India, has tripled its orders to about Rs. 6,000 crores (executed over the next decade) since the beginning of 2014.

Value Creation

Dynamatic Technologies has developed 5-axis machining capabilities for the manufacture of aerospace components and tooling via established processing and technologies in the UK. Dynamatic Technologies has achieved Single Source Supplier status for the Airbus 320 Flap Track Beams being supplied to Spirit AeroSystems (Europe) Limited.
Example: Aequus Pvt Ltd

The Aequus Aerospace approach to manufacturing is based on the collaboration with partners to build efficient global ecosystems. These collaborations mostly happen in the form of joint ventures with global majors (such as Magellan Aerospace, Saab AB, Aubert & Duval SA, Setforge Societe Nouvelle SAS) allowing Aequus Aerospace to offer integrated manufacturing solutions.

Activity Focus

Aequus Aerospace (formerly QuEST Global Manufacturing) specializes in advanced precision machining, sheet metal fabrication, assembly, forging, and special processing for the aerospace, automotive, and oil & gas industries. Customers include Airbus, UTAS, Eaton, Baker Hughes, Halliburton, and Bosch.

Value Creation

Airbus, EATON, GE Aviation, Goodrich, HAL, Honeywell, Magellan, MOOG, SAAB, SABCA approved Aequus Aerospace’s precision machining, sheet metal fabrication and sub-assemblies facility equipped with state of the art CNC turning and milling machines with 3-Axis, 4-Axis and 5-Axis machining technology including AS:9100 Rev C certification. Aequus Aerospace has established Aero Structures and Aero Systems with a capacity of over 350,000 hours / year.

Example: Tata Advanced Systems Limited

Tata Advanced Systems Limited, a fully owned subsidiary of Tata Sons, a holding company for the Tata Group, has entered into a joint-venture with Sikorsky Aircraft Corporation to manufacture the Sikorsky S-92 helicopters in India for the domestic civil and military markets including a USD 200 million manufacturing plant. Another joint venture between Tata Advanced Systems and Lockheed Martin (Tata Lockheed Martin Aerostructures) has been formed to build aero-structures for the C-130 Hercules and the C-130J Super Hercules in India. They have delivered the first batch of the C-130 Center Wing Box “Made in India” to Lockheed Martin in 2012 and are expanding the operations.

Activity Focus

The first S-92 cabins were delivered in November 2010, and capacity has been increased to 36-48 cabins a year as of 2014. From 2016 to 2026, structures for the Pilatus PC-12NG will
also be produced. Banking on agreements with Israel Aircraft Industries (IAI) and Urban Aeronautics for a cooperation and co-development of UAVs in India, Tata Advanced Systems Limited is bidding to develop and build unmanned aerial vehicles (UAV) (drones) for the Indian Armed Forces for surveillance.

**Value Creation**
- Tata Advanced Systems Limited is rated Level 3 in Capability Maturity Model Integration by SEI – CMMI
- The company is also certified to AS 9100, NADCAP standards towards highest level of customer focus and safety, delivered through robust quality systems, procedures and practices.

**Summary: Key Challenges & Outlook for Aerospace Manufacturing in India**
- Obtaining approvals for statutory regulations (including certifications for processes and parts) from international bodies like FAA is still difficult.
- Indian SMEs face numerous hurdles due to the high capital cost, low volumes and long gestation period of projects.
- The aerospace manufacturing sector in India will need to inculcate some of the technology transfer practices in several upcoming areas of manufacturing such as sheet metal or composites to further add value to OEMs/Tier-1 suppliers.
- The right mode of technology transfer (licensing, JVs), the investment approach to ramp up the production process and its subsequent approval for export clearances for all relevant technologies in question will be the key to improve the aerospace manufacturing ecosystem in India.
- Indian certification bodies such as CEMILAC and DGCA need to be strengthened to match their foreign counterparts in an effort to advance the market sentiment.
- There is also immense scope for establishing independent industry benchmarking organizations that shall assess best practices in the global industry and help Indian companies establishing processes in adhering to them.

**CASE EXAMPLES: After Care / MRO**

With the expected tax breaks and improved regulatory environment to take-off, the After Care / MRO industry is poised to become one of the fastest growing markets worldwide. This would include tripling its worth to $1.5 billion over the next decade as airline companies buy
more planes to cater for the country's rapidly growing traffic demand.

**Example: Air Works India Engineering Pvt Ltd**

Air Works is an independent provider of aviation maintenance, repair and overhaul (MRO) services in India, and aircraft paint and refinishing in the UK. Established in 1951, Air Works provides aviation services qualified to support 50 types of planes for over 100 customers across 15 maintenance locations in India.

**Activity Focus**

After the acquisition of UK based Air Livery, Europe’s leading aircraft repainting and refurbishment company, Air Works has set up a dedicated paint hanger in the industrial hub of Hosur, Tamil Nadu. The facility follows stringent global standards. The plant in Hosur utilizes the latest application techniques, advanced equipment and high quality materials for its aircraft painting operations. Full extraction and climate control provide excellent conditions for repainting aircrafts.

**Value Creation**

Getting the painting work done locally in India should save carriers time and money if only by reducing the painting and turnaround time. With the capacity for two narrow bodies or one wide body up to and including the Airbus A340-600s and Boeing 777-300s, the facility prevents the need for Indian carriers to fly their aircraft to Singapore or the UAE for repainting. The Air Works facility provides value in economics for all aircrafts within five hours of flying distance to use this facility.

**Example: MAS-GMR Aerospace Engineering Company Ltd**

MAS-GMR Aerospace Engineering Co. Ltd is a joint venture between Malaysian Aerospace Engineering Sdn. Bhd. (MAE), Malaysia, and GMR Hyderabad International Airport Ltd. (GHIAL), Hyderabad, India. MAE has developed an integrated, aircraft MRO facility at Rajiv Gandhi International Airport, Hyderabad, providing aviation infrastructure to meet end-to-end maintenance needs of the aircraft operators.

**Activity Focus**

Malaysian Aerospace Engineering (MAE) is a wholly owned subsidiary of Malaysia Airlines System Berhad (MAS), which caters to all the engineering and maintenance needs of MAS aircrafts but also provides MRO services to a large number of 3rd party airlines across the
world. MAE possesses forty years of technical expertise in engineering & maintenance consisting of six mega-hangars (17 bays) at Subang and Sepang, Malaysia. The MRO facility in India was set up at an investment of around Rs. 350 crores and began MRO operations end of 2011. The MRO unit is located at the SEZ near Hyderabad International Airport. Since then MAS-GMR has been providing MRO services including airframe maintenance, workshop repairs, component repairs, seat retrofit and aircraft painting to its customers.

**Value Creation**

MAE is capable of providing MRO services for F50, ATR, B737, A320, A330, A340, B777, B747, and B767 series of aircrafts. MAE has obtained certifications from thirty-four national aviation authorities including Directorate General of Civil Aviation, India (DGCA), Federal Aviation Administration, USA (FAA) & European Aviation Safety Agency, Europe (EASA). MAE has a broad customer base with over 145 customers world-wide & has staff strength of about 4000. The workshop facility in Hyderabad is a replica of the MAE facility in Malaysia and which offers aircraft license training for Indian Engineers in order to build up comparable capabilities in India.

**The MAS-GMR Joint Venture: Lessons from an Early Market Entry**

During the last four years, the MAS-GMR Aerospace Engineering Co. Ltd incurred cumulative losses of approx. Rs. 240 crores as on March 31, 2014. Some of the reasons might include:

- Initially, Jet Airways was expected to become a partner in the project as well but it finally backed out. A strong local commercial airline partner would have helped the MRO activities to kick-off smoothly adding confidence in the market.

- The Hyderabad MRO facility has been unable to attract long term business as airlines in India still send their planes abroad for major maintenance checks owing to high and complex tax structures in India.

- The losses have been further aggravated by the mysterious disappearance of flight MH370 a few months ago and the subsequent problems of Malaysia Airlines.

GMR Group has made a proposal to buy out the 50 per cent stake owned by its partner Malaysian Aerospace Engineering in the MRO unit for which the Board of Approvals, under the Union Ministry of Commerce has given a conditional nod. At the same time, there are reports of Airbus being in talks for a deal with GMR that will help raise cash as a part of its ‘asset light’ strategy and enable Airbus to fulfill its commitment of developing an MRO hub in India.
Summary: Key Challenges & Outlook for After Care / MRO

- Until today, the high incidence of Indian taxation from multiple points, including service tax and customs duties, nullify the labour cost advantage enjoyed by India for MRO activities.
- Convincing Indian airliners to choose native MRO services over flying abroad is therefore still difficult.
- Developing indigenous MRO component suppliers for local procurement is another open challenge.
- The MRO industry in India is poised to kick-off on the positive sign of the government supporting a 10-year tax holiday for MRO related activities. There will be scope for ‘C’ and 'D' check establishments to provide services within the country from a mid-term perspective.

CASE EXAMPLES: ITES

The aerospace ITES in India is a combination of traditional IT companies offering to aid in the development of the Tier-2 activities in software development such as cabin software, harness design, etc., while core-aerospace ITES companies such as Quest Global try to move up the value chain towards flight physics related software. Traditional project and life cycle management related software technologies are also increasingly outsourced to India by Tier-1 suppliers.

Example: BAeHAL Software Limited

Established in 1993 in Bangalore BAeHAL provides IT solutions and services to aerospace, defence, transport and engineering industries. BAeHAL provides services through its offshore Software Development Center at Bangalore, India.

Activity Focus

Value Creation


Build aerospace software applications based on the following standards

- DOD-STD-2167A ("Defence system software development")
- RTCA/DO-178B ("Software considerations in airborne systems and equipment certification")
- MIL-STD-498 (Software development and documentation)
- ISO/IEC-12207 (Software engineering)
- ADDIE-Model for instructional systems design process. Analysis, Design, Development, Implementation, and Evaluation
- ASD/AECMA S 1000D - Standard adopted by European Association of Aerospace Industries
- Customer-specified standards like (ATA100/ATA2100, AVP77, ATA 101, ATA102, ATA200 / 2000, ATA iSPEc 2200)

Example: Geometric Limited

Geometric is a specialist in the domain of engineering solutions, services and technologies. Its portfolio includes Product Lifecycle Management (PLM), Global Engineering Services, Embedded System solutions, and Digital Technology solutions. Geometric offers Product Engineering & Design Support, FE Analysis / CAE, Manufacturing Support for the aerospace market.

Activity Focus

Product Engineering & Design Support such as aero structures, sheet-metal components, landing gear, interiors and HVAC systems, System installations, etc. FE Analysis / CAE such as linear and non-linear structural analysis, impact analysis and bird hits, dynamic analysis, flow and thermal analysis, external aerodynamics, etc.

Manufacturing support such as process planning, digital mockups, tool design & production, simulation, casting, sheet metal and plastic components simulation, etc.

Value Creation

- Over the years Geometric has strived for excellence in its capabilities by acquiring certifications that would enable it to delivery to Internationally acceptable standards
o AS 9100 C certified operations for aerospace standards
o Gold Supplier Certification from United Technologies Corporation (UTC) - the first company to receive this certification for software services in engineering IT (including PLM and CAD) in addition to engineering services.
o Geometric was assessed as CMMI 1.1 Level 5 for its software services and is ISO 9001:2008 certified for engineering operations. The company’s operations are also ISO 27001:2005 certified.

Summary: Key Challenges & Outlook for ITES

- There are only pockets of experts within the country for high-level flight physics based developmental activities in the ITES industry. However, compared to the situation 8 years ago the number of experts and the general level of expertise have highly increased.
- What is still required is to further improve the skills base and the confidence level to create trust and showcase value to OEMs in direct outsourcing which is currently still very limited for Tier-1 activities.
- Moving up the value chain to provide services in several high level ITES activities that also include flight physics. This will involve creating a much more extensive pool of aerospace professional who are trained in software implementation of flight physics.
- Obtaining certifications for several of these above mentioned development activities.
Doing Business in India – Lessons Learned

Numerous studies of Prof. Dr. Roger Moser and other colleagues of IIM Bangalore and the University of St.Gallen confirm a number of key success factors but also major challenges that companies of any size face when entering or expanding in new markets such as India.

"Show commitment and visit the country regularly to get a flavour and to build your local network."
European General Manager

Exhibit 50 illustrates how experienced business development managers perceive that market entry/expansion activities in Asia need to be developed. It all starts with Time, Money and Passion – the core of our framework. Numerous studies on how to enter the Indian, Chinese, Brazilian or Mexican markets emphasize the importance of patience (time), sufficient resources and expertise (money) as well as a personal drive of the senior executive team (passion).

When a company is willing and able to invest these resources (money, time and passion) it begins to develop a Network in its target market. However, it is not sufficient to have a network of business contacts in an emerging market. For numerous reasons, it is crucial to develop trustful relationships with different stakeholders in the related target market (see side box). Only if there is trust, a company will gain Access to local experts and decision makers that is key to get the Insights into local industry developments, regulatory changes, consumer preferences etc. These insights are necessary to develop the right Business Model for the company’s target market and to enable a successful Market Entry.

The mastering of market entry challenges for European companies in India requires a comprehensive approach as the root causes of many market entry challenges for European companies are related to numerous “hard” and “soft factors” – European experience clashes...
with Indian reality. A recent study of Prof. Dr. Roger Moser and his colleagues of IIM Bangalore and University St.Gallen has evaluated 13 critical incidents along four phases of a market entry from Europe into India (Exhibit 51).

Exhibit 51: Market Entry Phases & Critical Incidents When Developing Business in India

<table>
<thead>
<tr>
<th>Market Evaluation</th>
<th>Entry Planning/ Preparation</th>
<th>Market Entry Implementation</th>
<th>Local Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. CEO expectations</td>
<td>1. Choosing the right location</td>
<td>1. Business Process design</td>
<td>1. Managing the workforce</td>
</tr>
<tr>
<td>2. Evaluating market potential</td>
<td>2. Financial planning</td>
<td>2. Managing Indian partner(s)</td>
<td>2. Technology protection</td>
</tr>
<tr>
<td>3. Adapting product for Indian market</td>
<td>3. Entry mode choice</td>
<td>3. Developing a leadership team in India</td>
<td>3. Quality management</td>
</tr>
<tr>
<td>4. Land acquisition</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The study results confirm that European executives rate the market evaluation phase as most critical for the overall market entry success. However, they rate the challenges during the implementation phase as most complex to address. Specifically, European executives perceive the following challenges as most important for overall market entry success:

- Correct evaluation of market potential & adaptation of product portfolio for Indian market (market evaluation phase).
- Rigorous financial planning (market entry planning phase).
- Developing a strong and trustworthy leadership team in India (market entry implementation phase).
- Quality management (local operations phase).

Moreover, European executives perceive the following challenges as most complex to address:

- Right adaptation of own product portfolio for Indian market.
- Taking the right entry mode decision (independently vs. with Indian JV partner).
- Finding a business process design which works (Swiss vs. Indian way of doing business).
- IP/ Technology protection as part of ongoing operations.

"It’s good to develop a strong local management team from the start – but make sure you don’t depend too much on them. Maintain your own network in India.”

European Business Development Manager

"Having the right partner you can trust is key for success in India.”

European Marketing Manager
In addition, European executives rate the complexity of market entry solutions significantly higher than their Indian peers working for European companies in India – this tendency is particularly distinct for “people management related challenges”.

The detailed answers of the European executives also suggest that the most complex challenges along the market entry process into India can be efficiently addressed by the following guidelines:

- Patience: Allocate sufficient time to “know your market”
- Invest in personal, ‘overlapping’ networks
- Calibrate the Swiss vs. Indian way of doing business/combine strengths of both management cultures
- Align IP/ Technology protection measures with overall business strategy/ value chain

**When entering India, executives of European companies should …**

**Market Evaluation phase:**

- …think long-term and show persistence in your market entry plans.
- …show strong personal interest and spend time ‘on the ground’ in India: “Relationships x Trust = Market Insights” – most manager underestimate the value but also the resources that such a network management requires.
- …when facing the “Price – Margin – Quality” trade-off: Don’t give in to short-term thinking. It simply takes time to convince Indian customers about the good value-for-money offering of Swiss quality products and services.

**Market Entry Planning phase:**

- …perform a rigorous, fact-based and individualized location analysis and do not simply follow other companies from Europe or their specific industry.
- …apply (financial) contingency planning from the outset and plan for sufficient buffer.
- …invest time and resources in finding the right partner – make sure he/ she depends on you as much as you do on him/ her (i.e. create personal, ‘overlapping’ networks in your industry).
Market Entry Implementation phase:

- …combine the strengths of European (quality mindset, process management) and Indian (customer focus, jugaad) management styles. However, be aware that you need to decide which management processes and operations are done the Swiss or the Indian way.
- …make sure agreements always address the exit situation (of the partnership) as well and agree on the applied dispute resolution mechanisms if problems occur.
- …develop an Indian leadership team: Include, empower, control.
- …not compromise on corporate policy within the “Ethics – Time – Corruption triangle”.

Local Operations phase:

- …invest in people but secure your interest with long-term incentive systems.
- …adapt the technology strategy to market requirements and production location decisions (Europe vs. India).
- …aim to offer “European quality – delivered the Indian way” applying Jugaad where necessary.

Establishing Engineering Operations in India – Lessons Learned

The following few lessons learned about the (more or less) successful establishment of ITES activities for the aerospace industry are based on several interviews of Prof. Dr. Roger Moser with experienced managers in India. The focus lies primarily on leadership decisions from the perspective of a Western executive in India and covers the following challenges:

- How much autonomy does a captive Engineering center in India require to operate successfully? What is necessary to gain autonomy from HQ?

*The most important factor here is the trust of HQ into the local CEO. Especially executives of European SMEs tend to micro-manage the local setup which does not allow the local CEO in India to solve some problems in a local manner. This means that HQ has to show some patience and, for example, only review the progress of the local setup after six months in a “light” mode and after a year in-depth. However, this will also require that the local CEO is travelling to HQ every 5-6 weeks during the first 6 months and every 8 weeks after that. This has also implications for the deputy in India as during the time of absence progress also needs to continue on the ground in India.*
From such a perspective, there is hardly any other choice than appoint a person from within
the company showing the following features:

- Good network within the company including strong management support
- Successful track record of “getting things done” – it’s not an administration job
- Convincing by actions and results
- Persuasive power and perseverance in discussions – both with HQ and the local team

- Should an Engineering Center be headed by a local or expat manager?

There is no right or wrong answer. Ideally the CEO of the Engineering Center combines the
key elements of both choices. However, this is often only possible when the company has
started to recruit talent from all over the world (including India) years ago and could send a
CEO to India who is well connected within HQ and knows the corporate (working) culture
but also understands the local culture. This case will seldom happen. Especially SMEs do
normally not have the necessary networks and human resources policies to plan their
internationalization activities so systematically. The table below briefly summarizes the pros
and cons. However, experience shows that it is easier to find an executive from HQ who has
the trust, interest and capabilities to tackle such a project than an Indian who can quickly
win the trust of the board as well as understand the specific corporate culture and networks
at HQ.

<table>
<thead>
<tr>
<th>Non-local Executive (Expat)</th>
<th>Local Executive (Indian)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knows national and corporate culture of Headquarters</td>
<td>Knows national culture and different corporate cultures for engineering activities in India</td>
</tr>
<tr>
<td>Has an established network within the company (HQ)</td>
<td>Has fewer language barriers</td>
</tr>
<tr>
<td>Has often an easier access to Executive Board at HQ (trust issue)</td>
<td>Knows better how to deal with local authorities</td>
</tr>
<tr>
<td>Can often take a different view than local colleagues (\rightarrow) positive effect on diversity</td>
<td>Understands better the local hiring/retention practices</td>
</tr>
<tr>
<td></td>
<td>Can often easily facilitate the building of networks with suppliers, employees and customers (\rightarrow) positive effect on accessing potential talent</td>
</tr>
</tbody>
</table>

Once a company has established an engineering center and first operations have shown to be
successful this question might be answered differently.

- Should a captive R&D center start off with high-end or low-end engineering work? What
  are respective implications regarding workforce motivation?
The answer to the first question strongly depends on the long-term strategy of the company for India. In any case, talented engineers in the aerospace industry expect from their employers to show them how they can develop their careers – content/capability-wise but also leadership-wise. The motivation of the engineering talent is key for any such center in India:

Interesting, challenging and diversified tasks have strong positive impact on motivation. Graduates from Indian Institutes of Technology (IITs) and similar top engineering institutes as well as professionals with several years of work experience “want” to work on challenging tasks that advance their skills and career prospects.

**Low-end engineering work**: Difficult to attract and retain engineers

- Indian engineers equate low-end engineering work with work nobody wants to perform in developed countries → not challenging and dead end for career
- ‘Not-invented here’ phenomenon

**High-end engineering work**: Easier to attract and retain (talented) engineers

- A lot of responsibility and higher degree of engineering freedom
- Steep learning curve and promising opportunities for personal and professional development → increasing market value of employees; danger of other companies soliciting engineers
- ‘Invented-here’ phenomenon → proud to be part of a ‘real innovation’ – this factor is not to be underestimated.

- What mechanisms can be introduced to encourage engineers to take responsibility and share information with their team members?

**Encouraging engineers to take over responsibility:**

- Explain and outline the personal advantages of taking responsibility
- Create a culture where failure is not only seen negative but as a chance of learning and improving
- Spread responsibility among several employees to lower individual burden
- Open Door Policy – easy accessibility of superiors to ask for help and advice

**Encouraging engineers to share information/knowledge/domain expertise:**
✓ Explain and outline the advantages of sharing information/domain expertise within the context of a team building event:
   o Working atmosphere to be improved
   o Efficient working style → team members as sparing partners
   o Quality of output – joint success of engineering center
✓ Make information sharing part of the agreed targets → Employee has a monetary disadvantage if not sharing information/domain expertise with colleagues
Negotiation tactics in a European-Indian context

In another study with more than 50 Indian and European executives based on the critical incident technique, IIM Bangalore and the University of St.Gallen have evaluated negotiation tactics in the European-Indian context. The study asked the participants to analyse and assess the applicability of 10 negotiation tactics in the European-Indian negotiation context. The 10 tactics comprise of:

1. Embracement
2. Precedent
3. Blandishment
4. Promises
5. Meet One Another Half-Way
6. Seating plan
7. Untruths
8. Time management
9. Go to higher authority
10. Good cop, bad cop.

In general, the study also confirms that there exists a similar understanding between Europeans and Indians on how to conduct negotiations by focusing on an integrative, win-win approach.

In sum, the following general recommendations can be given:

- Do not focus on applying pressure – rather expand the pie.
- Stay firm, openly discuss business problems face-to-face and defend your standpoint factually.
- Be aware that the applying pressure strategy is used despite the fact that it is assessed to be the most unsuccessful strategy.
- Be just as assertive as cooperative.

However, in reality it matters more for executives to understand how specific negotiation tactics might be applied in a European-Indian context. We therefore focus on the evaluation of negotiation tactics and reactions:

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“It is generally a fatal and serious mistake to become aggressive and push an Indian towards a yes or no answer. It simply does not make sense to pressurize an Indian as they will respond aggressively, caustically, and probably shrink into their shell.”

European CEO

“Avoid comparing an Indian partner with others – counterparts will not be amused if they are told that work can be done with someone else.”

Indian Manager

“One should focus at all times on being neutral and expand the pie in order to reach an agreement – even if the Indian tends to become vocal and impulsive.”

Indian Manager
1. Embracement

Europeans and Indians only seldom use this tactic with average scores of 2.0 respectively 2.1 (Scale 1-7). When analysing the reaction, it becomes clear that Indians endorse the presented reaction of not making any concessions towards the other negotiation partner more than the Europeans. Overall, the following recommendations can be given:

- The Indians will expect a certain degree of embracement, hospitality, and esteem but do not try, as a European, to devote attention and time to an Indian to bias him in favour of a decision.
- Business should remain business - this should clearly be articulated from both sides.
- Exaggerated attention towards the Indian partner is perceived suspicious.
- As a European do not “fear” a direct and rejecting answer as the evaluation shows that Indians appreciate a clear, factual and precise reaction.

In sum, the normal process of relationship building and embracement is highly welcomed. Thus, finding a good mixture between hospitality and professional business atmosphere is crucial.

2. Precedent

Europeans and Indians seldom use explicitly the tactic of making precedents. Though, the reaction is perceived to be promising. Overall, it is conspicuous that both sides state that they rather experience the tactic to be used by their counterpart than apply it by themselves. The following recommendations can be given:

- It can be inferred that one should directly argue against the comparability of underlying cases if opposed with such claims in European-Indian negotiations.
- As a European manager avoid referring to third parties when using the precedent tactic. Indian partner would interpret this as a lack of trust and some form of market or bazar bargaining in the actual negotiation process.
- Thus, plain speaking, the emphases on personal advantages, and the ‘focus on the here and now’ is core to react appropriately.
3. Blandishment

Europeans and Indians do not perceive the tactic to be helpful and, moreover, do not experience it to be used in professional business negotiations. However, managers from both countries perceive the reaction to consult the CEO to be right if problems during the negotiation process arise. Overall, the following recommendations can be given:

- As a European do not follow the “grit your teeth and get to it” approach by leaving discrepancies open and taking them along into final talks as Indians do not perceive balanced and open discussions as an exertion of pressure.

- Only send your highest representatives into European-Indian discussions and carefully consider that negotiation partners have to come from the same hierarchical level. Otherwise, this is perceived as a sign of disrespect.

- Overall, It is of major importance that “key decisions need key people”, “discussion should be conducted between equals”, and “all important people should be on board when discussion topics of high interest”.

4. Verbal Promises

On average, Indians (3,9) use promises more often than Europeans (2,3). Though, data shows that the reaction is perceived to be only partially useful and successful as Indians and Europeans assign a score of 3,7 respectively 3,0. Overall, the following recommendations can be given:

- Do not make concessions and rely on verbal agreements even if you think this potentially facilitates the contract signing process and builds trust among partners.

- Follow the objective to include all topics under discussion in a written contract. The Indian participants largely perceive verbal agreements to be highly problematic in the European-Indian business context.

- Some Indians make the constraint that they would solely rely on a verbal agreement if they deeply know their negotiation partner and have established a high-level of trust and continuous business relationship to them.
An Indian lawyer put it as follows: “It is of major importance to have clear and solid contracts from the beginning on, as contracts regulate future expectations of both JV partners [...] and mistakes are done due to the fact that people do not focus enough as they are too enthusiastically.”

5. Meet One Another Half-Way

“Sometimes you raise the stakes so high at the beginning that meeting halfway can be a great deal.”

Indian Manager

European and Indian managers apply the tactic moderately often. Moreover, Indian managers perceive the reaction to be more promising (4,3) than their European peers (3,4).

Overall, the following recommendations can be given:

- Convince an Indian manager with facts and an in-depth, “iron-clad” analysis of the economic situation and explicitly listed numbers/data.
- Thus a comprehensive analysis, including an in-depth risk assessment, is the inevitable requirement for a decision consensus as an Indian will not be willing to base his decision simply on his gut feeling or magnanimously.

The study results indicate that Europeans sometimes neglect the elemental necessity that they have to convince their Indian counterpart analytical wise and tend to be too reluctant to confront their Indian negotiation partner with a clear expression of opinion.

“Bias the ‘middle’ by illustrating the middle differently.”

European Manager

6. Seating Plan

“Continue negotiating and try persuading. As a general rule, the “Indian” middle is always a maximum claim.”

European Manager

In sum, Indians and Europeans do not perceive the tactic as well as the reaction to be useful. However, the following recommendations can be given:

- Despite the presented situation, Europeans should remain confident and resist such power games irrespectively of the surroundings.
- Like Indians, Europeans should consider to openly address the issue of the seating arrangement – negotiations are supposed to be on equal terms.

“Focus on core issues, such ideas regarding seating arrangements and benefiting one side negotiator are childish.”

Indian Manager
• Thus, Europeans should express their discomfort about the situation to demonstrate and show their equal partner status and not dread a potential discussion and confrontation with their Indian negotiation partner.
• As a European, do not reduce the degree of directness beyond required level, as this would be counterproductive as Indians appreciate a factual, balanced, and respectful face-to-face discussion.

7. Untruths
On average, both Europeans and Indians assessed the use of this tactic with a score of 3.6 and the respective reaction with 3.9 and 3.8 respectively – though, detailed analyses of the statements show differences between Europeans and Indians. If confronted with such a tactic:
• Deeply and thoroughly analyse the negotiation partner upfront (airtight analysis), the situation, all eventualities and (potential) claims to be made, as the Indian partner will also follow this approach.
• As a European act more proactively to explore the context if an Indian uses this tactic. Do not adopt a wait and see attitude, as you do not want to impair the mutual level of trust.
• Do not at all directly ask to see the contract details as it is perceived by Indians to be rather dubious and, thereby, highly problematic.

Overall, it can be stated that the quote “trust, but verify” is particularly true for the Indian way of thinking and acting in this situation.

8. Time Management
According to the study results, Europeans and Indians rarely use this tactic explicitly; however, both sides state that they often experience this tactic to be used by their negotiating partners. Moreover, Indians (5.3) rate the reaction to be far more successful than Europeans (3.9). Overall, the following recommendations can be given:
• With regard to time management, understand that Indians and Europeans perceive problems and delays mostly similarly.

“The discussions & arguments from a European perspective keep on going for ages. Sometimes we tend to make simple things rather too complex.”

European Manager

“I will not negotiate with the time. Because time is the thing we cannot negotiate.”

Indian Manager
• (1) Discuss most important topics first, (2) try to set up a joint agenda with the highest hierarchical negotiator of the other party, (3) arrange enough time for talks, and (4) do not negotiate under time pressure, as this seriously harms and worsens your negotiating position.

• The general advice can be given that one should not try to micromanage Indians as they potentially become touchy about this.

   “Retreat and lay back till the other company comes up with a better proposal.”
   Indian Manager

   In sum, both sides blame each other to prolong negotiations – deliberately or not. Thus, trying to implement a stringent timeframe seems to be the only universal remedy to accelerate processes.

9. Go To Higher Authority

   Europeans (2,8) and Indians (3,0) use this tactic only every now and then explicitly. European managers evaluate the proposed reaction to be applicable (4,2), while Indians are more indecisive about the reaction (3,4).

   Overall, the following recommendations can be given:

   • Do not stubbornly use this tactic even if it is the most convenient way for you to follow your objective.

   • Clearly gauge the consequences that it results in a decreasing level of trust and most likely will be perceived negatively as a pressure tactic by your Indian/European negotiation partner.

   • Give the Indian/European negotiating partner the chance to approach the higher authority than doing it personally.

   European and Indian managers alike have to carefully consider if and when the tactic of approaching the next higher authority is right – one must be certain that this tactic should only be seen as the last choice.

10. Good Cop, Bad Cop

   Europeans assess this tactic with a mean of 2,8 and, thus, only us this tactic once in a while. Accordingly, Indians indicate to use it even less often, as shown by a mean of 2,1. Though,
the reaction is perceived by Indians (4,1) to be more promising than by Europeans (2,9). If you encounter a person using this tactic:

- It is important to realize the tactic, but not to communicate it. Join the game and be patient than to actually reveal what you think to have figured out.
- Focus on a more professional intercourse and do not try to bring your tactic through.
- As so often, be careful by drawing any conclusions from the respondents’ statements as they are not unanimously and differ enormously.

**Overall Results Tactics:**

When summarizing the results of European and Indian managers, it can be stated that they do not permanently use the presented tactics explicitly in negotiations. In detail, meet half way and untruths tactics are used most frequently – embracement and seating plan tactic are used least frequently. The presented reactions are assessed to be applicable. In detail, European managers evaluate the precedent and blandishment reaction to be most useful – while the seating plan and good cop, bad cop reaction are assessed to be most useless. Indians evaluate reactions similar. However, the seating plan, embracement and time management reaction are assessed to be most promising ones.

Interestingly, large perception mismatches exist regarding how often one experiences the counterpart to use a certain tactic and the actual self-evaluation of that counterpart. In detail, European managers perceive Indians to far more frequently use time management in their favour than the actual Indian self-evaluation. Indians perceive a similar perception mismatch with respect to precedents, verbal promises and the seating plan tactic. So there is room for further studies.

Throughout the study, a phenomenon can be identified which is called schematic overcompensation. According to Adair, Taylor and Tinsley (2009) a “schematic overcompensation occurs if negotiators adjust their schemata to match how they anticipate their counterpart would behave” (Adair et al., 2009, p. 158). However, persons acting in an international environment fail to realize that also their counterparts make a simultaneous
schematic adjustment. Consequently, mismatches how to conduct the negotiation occur. In this study schematic overcompensation can be seen throughout the free text evaluations. In this study, Indians state to be very direct, contrary to their “usual cultural habit”. Contrary, Europeans strongly try to avoid direct expressions in order not to confront Indians with too direct talks – also against their average behaviour in a business context. As a consequence, Europeans and Indians talk at cross-purposes in many situations. This can be seen throughout the free text evaluation of this study. In order to facilitate the negotiation process between both sides, schematic overcompensation has to be taken in mind to counteract such challenges within an intercultural negotiation process.
A spreadsheet containing the list of most companies that were analysed as part of this study can be requested from IIM Bangalore (raju.subbarao@IIMB.ERNET.IN).
Union Budget 2015: Expectations of the Aviation Industry

- Notify ATF as a ‘declared good’ with immediate effect. It is much more prudent to generate tax from downstream goods and services than an industrial raw material (ATF). ATF in India is 55-60 percent costlier than the Gulf and Asean region. The cascading effects of ATF taxes have brought ruin to the airline sector. ATF should have a uniform levy of 4 per cent across India. ATF for aircraft weighing less than 40 tons is already a ‘declared good’.

- Announce a clear road-map for auction of Air India to private sector. Else Air India will continue to bleed under increasing competition, falling market share and increasing costs. Flash sales by this taxpayer-funded airline distort the market. The taxpayers’ funds should be used for development of the entire aviation sector and not just one player. It can also be used to provide compensation to states for forgoing VAT on ATF.

- Establish an independent Aeronautics Commission with a budget of around Rs. 500 crores, in line with the ones created for atomic energy and space. The AeroComm should be headed by a technical expert and should report directly to the Prime Minister. Its mandate should be to facilitate cutting edge research and development of aeronautical manufacturing in India. Also, allocate Rs. 1000 crores to establish set up four National Aviation Universities (NAU) in the country and to support upgradation of AME training centers across the country.

- Provide a 10 year tax holiday (covering all taxes and duties – Customs, Excise, Service Tax and Corporate Tax) on aeronautical and defence manufacturing, MRO and import of aircraft. Encourage states to extend the tax holiday to local VAT. This should not be mistaken as a ‘tax loss’ since there’s negligible manufacturing or MRO activity in India and hence hardly any tax collection. The multiplier effect of new investments and jobs would generate government revenue from consumption taxes several times over. Coordinate with Ministry of Commerce and Industry (MoCI) to modify the Served from India Scheme (SFIS) such that exports of MRO services are treated at par with export of ‘Made in India’ products. The one year exemption of import duty on aircraft parts for

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MRO should be extended in perpetuity. Airport royalty on MRO, cargo operators and ground-handling should be reduced.

- Allow private airport operators to issue tax free infrastructure bonds to the public. Investments in these bonds should be allowed for deduction under section 80CCF of the Income Tax Act. Allow Section 80IA benefits for up-gradation of existing airports. Essential airport infrastructure like ground handling, fuel farm etc. should also be covered under the same.

- Provide seed funding for development of LCC terminals at major airports. Provide incentives for outsourcing and sharing of resources among domestic airlines. Today most of the ground handling and airport services infrastructure and staff is duplicated and under-utilized. Provide incentives for smart security solutions and mobile phone technology to improve speed of passenger movement at airports.

- Allocate Rs. 1000 crores as a seed funding for the Essential Air Services Fund (EASF). EASF to provide VGF funding for no-frills-airports (NFA) and air connectivity in Tier 3-4 locations based on a thorough feasibility analysis.

- Provide funding for General Aviation (GA) infrastructure at important hubs. Provide seed funding of Rs. 200 crores to establish 20-25 heliports at important tourist, port and mining locations. Helicopter operations today are extremely costly due to low demand. Incentivise use of helicopter fleet for emergency medical evacuation, law and order and urban transportation.

- Allocate Rs. 500 crores for modernization of Air Navigation Services (ANS). The ANS training center at Allahabad should be expanded to produce trained ATC officers for not just India but also for the global aviation market. Promote Flexible Use of Airspace (FUA) between MoCA and MoD to reduce flight distance and hence fuel wastage.

- Identify funding requirements of DGCA to ensure its financial autonomy and for greater use of e-governance in its interaction with industry. Government of India may provide 50 per cent of the same as seed funding. Balance should come from service charges levied on issuing of licenses to airports, airlines and other stakeholders.