



# **Malaysian Aerospace Industry Blueprint 2030**

*Cruising Into A Complete  
Aero-systems Life Cycle*

**AIR**

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## Executive Summary

The Malaysian Aerospace Industry Blueprint 2030 contains the shared aspiration of the Malaysian aerospace industry stakeholders to ensure continued growth of the industry subsequent to the expiry of the first blueprint that was launched in 1997. This document is the main reference for long term industry planning beyond 2020, forming the common development basis for the next 15 years.

The blueprint identifies key initiatives to enable the industry to become a strong high technology sector that supports the complete aero-systems life cycle, taking advantage of the rapidly growing global air transportation industry. It emphasizes the need for Malaysia to leap forward to a higher plane not only in terms of revenue, but also in terms of value adding which can only be materialized through involvement in upstream activities, having high value advanced science and technology applications, and employing high productivity skilled workforce.

The commitment of all stakeholders in implementing the initiatives of the blueprint is critical to the success of the industry as well as the nation. Through rigorous implementation, the aerospace industry in 2030 will be an important economic activity for Malaysia as a developed nation.

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## THE MALAYSIAN AEROSPACE COUNCIL



The Malaysian Aerospace Council (MAC), a national level steering body, is dedicated to the development of the aerospace industry in Malaysia. The MAC is chaired by the Honourable Prime Minister of Malaysia and represented by cabinet ministers, heads of Government agencies and captains of industry. Established in 2001, the objectives of the Council are:

- To provide vision, direction and the overall development plan of the national aerospace industry
- To provide policy guidelines and identify priority areas of aerospace activities

The Malaysian Industry-Government Group for High Technology (MIGHT) is the Secretariat of the Malaysian Aerospace Council.

## About MIGHT

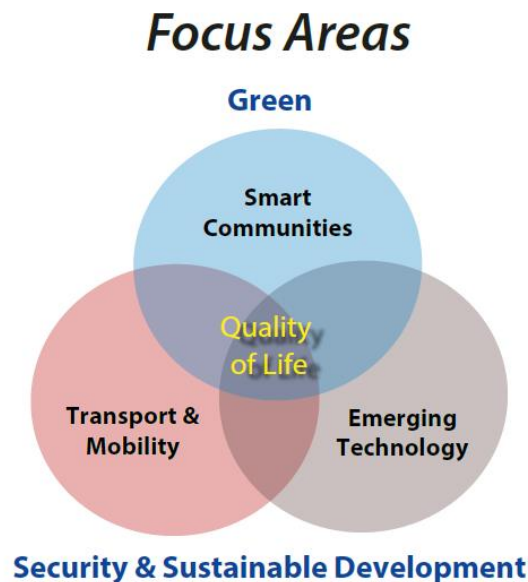
MIGHT was established as an independent, industry-driven not-for-profit organization in 1993 and operating under the purview of the Prime Minister's Department. It is subscribed to by more than 100 private and public sector membership and has no shareholder.

Under the patronage of YAB Prime Minister of Malaysia, MIGHT is governed by a Board of Directors, helmed through the joint-chairmanship of the Science Advisor to the Prime Minister and a prominent private sector personality.

MIGHT's core businesses are supporting the Science Advisor to the Prime Minister, as the Implementing Agency for the National Agenda - Science to Action (S2A); and addressing the country's needs for growth through the accelerated use of high technology. Three key activities for MIGHT in fulfilling its responsibilities are performed via its unique consensus building think-tank-do, providing facilitating platforms, and nurturing high-technology industries through positive catalytic intervention programmes.

As the Implementing Agency for S2A, MIGHT carries the coordinating, facilitating and harmonizing roles on the Agenda; that is focused to raise the profile of Science, Technology, and Industry (STI) whilst capitalizing STI as the enabler in the nations aspiration to succeed as a high income nation by 2020. Correspondingly, MIGHT's current initiatives are streamed under the three (3) thrusts of S2A, i.e. Science for Industry, Science for Wellbeing and Science for Governance.

MIGHT has in its proven inventory various institutionalized instruments and mechanisms to undertake required tasks within the challenging responsibilities above. In order to ensure efficient and effective utilization of resources and building synergies within, MIGHT's focus areas are as follows:



## Chapter 1 - INTRODUCTION

### THE BLUEPRINT INITIATIVE

The Malaysian Aerospace Industry Blueprint 2030 is an initiative by the Malaysian Industry-Government Group for High Technology (MIGHT), an organization under the Prime Minister's Department, as the Secretariat of the Malaysian Aerospace Council (MAC), to chart the long term plan for the development of the aerospace industry in Malaysia until 2030. This blueprint is a follow up to the first blueprint that was introduced by MIGHT and launched by the Prime Minister in 1997 which expires in 2015. The development of this blueprint was initiated in April 2014 and took 10 months to complete.

The aerospace industry defined in this blueprint covers the industrial activities that relate to design, development, manufacturing, construction, maintenance & disposal of aircraft, spacecraft, missiles and rockets. It includes the enablers to the above activities namely regulatory of civil and military aviation, talent development particularly aerospace education & training, as well as the supporting infrastructures such as airports, fix based operators (FBO) and technology parks.

For the purposes of this blueprint, the definition of aerospace industry excludes the "operation" aspect of aircraft, spacecraft, and missile & rockets such that the scope of aerospace industry is confined only to those that serve and support the needs of the aviation sector namely Commercial Aviation, General Aviation (GA) and Military Aviation. This exclusion is in line with the Government decision in 2012 to establish the National Aviation Council to oversee the aviation sector and coordinate all policies related to the aviation industry in the country.

The breakdown of the four focus areas or subsectors of the aerospace industry covered by this blueprint is as follows:

#### Maintenance, Repair and Overhaul (MRO)

- Engineering and Design;
- Aircraft - Commercial (Line, Heavy, Engine Composite, Modifications);
- Aircraft - Military (Line, Heavy, Engine, Composite, Modifications);
- Ground Systems (Air Traffic Control (ATC), Air Space Management, Air Defence Systems);
- Simulators; and
- Ground Support Equipment.

#### Aero-Manufacturing

- Engineering and Design;
- Aerostructure (Composites and Metallic);
- Avionics Equipment;
- Engines; and
- Airframe Equipment.

#### Systems Integration

- Aircraft - Avionics (Mission Systems, In-flight entertainment);
- Spacecraft (Remote Sensing and Communications Satellites);
- Unmanned Aerial Vehicles (UAV);
- Simulators (Flight, ATC, and Maintenance);
- Ground Systems (ATC, Air Traffic Equipment (ATE) and Mechanical); and
- Missiles and Rockets.

#### Education and Training

- New Entrant - White Collar (Basic and Bridging);
- New Entrant - Blue Collar (Basic and Bridging);
- Continuing Professional Development; and
- General Education (Sports Aviation, Planetarium, and Royal Malaysian Air Force (RMAF) Museum).

METHODOLOGY

Foresight has been adopted as the approach to develop this blueprint. In brief, Foresight is not about predicting the future, but is concerned with anticipating a variety of possible futures. It can be defined as the application of systematic, participatory, future intelligence gathering and medium-to-long term vision building process to inform present day decisions and mobilizing joint-action.

In the blueprint initiative, MIGHT utilized one of the foresight methodology known as strategic road-mapping. In executing this, the process involved literature review, expert panels, brainstorming, interviews, questionnaires and surveys, direct stakeholders engagements and others. Road-mapping is essentially a planning process that guides decision-making in identifying and evaluating strategic alternatives for achieving specified objectives (Figure 1.1). It involves the change from one state to another through the understanding of internal and external influences and their impacts to the overall eco-system. It helps to answer three main questions:

- “Where are we now?”;
- “Where do we want to go?”; and
- “How do we get there?”.

Based on the above, formulation of the blueprint was undertaken by examining and analysing information, but not limited to the following perspectives:

- Trends and drivers that shape the future landscape of the aerospace industry;
- Industry supply chain in terms of strengths and weaknesses and critical areas that need to be promoted;
- Talent development requirements to further develop the aerospace industry;
- Roles of aerospace-related stakeholders (the Government, the Industry and Academia) to support the recommendations of the blueprint; and



Figure 1.1: Foresight Methodology used for the Blueprint 2030 <sup>1</sup>

- Monitoring mechanism for effective implementation of recommendations of the blueprint.

Altogether, seven stakeholder engagement workshops were conducted throughout 2014. More than 80 companies, 20 Government agencies and 25 education and training institutes were involved in the workshops. Data gathering for various parameters

<sup>1</sup> ANU Edge / University of Cambridge Institute for Manufacturing Education and Consultancy Services (IfM-ECS)

## Chapter 1

described earlier was carried out throughout the blueprint development process as follows:

### *Achievement Review*

During this stage, the first Blueprint (Blueprint 1997) was reviewed and the status of each of the 45 recommendations were complied. At the same time the current status of each of the four focus areas were reviewed in comparison to their status prior to the implementation of the 1997 Blueprint.

### *Establishment of Working Committees*

With the initial industry status data gathered, the team set up working committees for each of the four focus areas to verify the data. These committees comprised of representatives from Government, industry and academia, and were responsible for guiding the subsequent stakeholders meetings.

### *Stakeholders Meetings*

Four workshops conducted were with the various stakeholders for each of the focus areas. The first workshop focused on industry drivers, trends, issues and challenges. The second workshop actively allowed the stakeholders to identify and key in the domestic and international opportunities

based on the trends and drivers compiled in the first workshop. The third workshop focused on identifying capabilities that existed within Malaysia, along with the gaps. The last stakeholders meeting facilitated direct stakeholders input in finalising the proposal for each respective focus areas.

### *Inclusion of Engineering and Design Services*

The inclusion of this focus area as an addition to the existing four was done after the second workshop following the suggestion and agreement of the relevant stakeholders. This proposal was well taken by the stakeholders as it is in line with the current Government initiative, particularly the Economic Transformation Programme (ETP).

### *Formulation of the Blueprint*

The draft blueprint was formulated after all of the above activities were completed. All necessary analysis were carried out based on the requirements of the Foresight methodology in order to clearly answer the three questions of industry road-mapping. Upon completion of the first draft, the blueprint was presented to the stakeholders on 4<sup>th</sup> November 2014 at Putrajaya. Additional inputs from the stakeholders were collected and evaluated to form the final blueprint.

## CONCLUSION

The Malaysian Aerospace Industry Blueprint 2030 contains the shared aspiration of the Malaysian aerospace industry stakeholders to ensure continued growth of the industry subsequent to the first blueprint. This document is the main reference for long term industry planning beyond 2020, forming the common development basis for the next 15 years.

In order to ensure robustness, this blueprint must be inclusive and comprehensive in terms of its scope of coverage based on the definition

used to describe the aerospace industry. In this context, the content of the blueprint takes into account the following:

- Content of the Strategic Paper for the Manufacturing Sector in the 11<sup>th</sup> Malaysian Plan (RMK11) prepared by the Ministry of International Trade & Industry (MITI);
- Draft content of the Malaysian Industry Council for Defence, Enforcement & Security (MIDES) Blueprint which is under



## Chapter 1

development by the Ministry of Defence;  
and

- All Economic Transformation Programme (ETP) projects that are related to Aerospace Industry handled by PEMANDU<sup>2</sup> including Entry Point Project (EPP) 1 (Growing Aviation Maintenance, Repair and Overhaul Services), EPP 5 (Nurturing Pure-Play Engineering Services) and EPP 7 (Making Malaysia the Hub for Aerospace OEM in south East Asia).

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<sup>2</sup> PEMANDU is the Performance Delivery Unit an agency under the Prime Minister Department.

## Chapter 2 - BLUEPRINT 1997

In 1997, the first national aerospace blueprint entitled “Piloting the Aerospace Industry Take-Off” (Figure 2.1) was launched by the former Prime Minister, Dato’ Sri Dr Mahathir Mohamed, during the Langkawi International Maritime & Aerospace (LIMA) 1997 exhibition. The blueprint contained key initiatives to transform Malaysia into a nation with regional and international aerospace industry capabilities by the year 2015. The blueprint divided the aerospace industry into five subsectors that include Manufacturing, General Aviation, Space, Systems, and Commercial Aviation for Malaysia to develop.

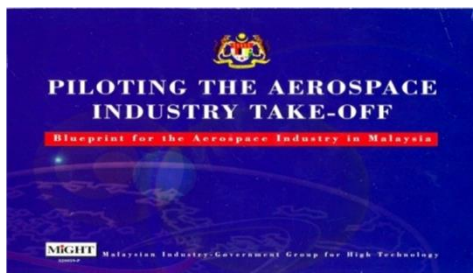


Figure 2.1: National Aerospace Blueprint 1997

Back then, the Malaysian aerospace industry was small and domestically focused mainly evolving around Malaysian Airline System (MAS) and the Royal Malaysian Air Force (RMAF). The major aerospace industry players and the types of aircraft systems which made up the industry in terms of MRO and aircraft, as well as parts and components manufacturing, are as shown in Figure 2.2.



Figure 2.2: Major Aerospace Industry Players and Aircraft Systems in 1997

### IMPLEMENTATION STATUS

Throughout the 17 years of implementing the blueprint, 43 out of 45 recommendations (equivalent to 95%) have been acted upon either through the Malaysian Aerospace Council (MAC) or by the relevant public and/or private organisations. Meanwhile, 36 of the recommendations (equivalent to 80%) resulted in positive outcomes.

When the blueprint was tabled to the Government, 6 out of 45 recommendations were considered the main initiatives to be implemented namely:

- Preparation of the Aerospace Industry Framework;
- Establishment of the Malaysian Aerospace Council (MAC);
- Establishment of the Malaysian Aviation Authority (MAA);
- Establishment of the National Aerospace Coordinating Body;
- Aerospace Industry Inventory Survey; and

## Chapter 2

- Aerospace Industry Human Capital Development Study.

To date, two of the above initiatives have not been implemented (MAA and the Coordinating

## OUTCOME

One of the major milestones as a result of the blueprint is the establishment of the Malaysian Aerospace Council (MAC) in 2001. During the council's inaugural meeting, it was decided that the aerospace industry development for Malaysia would only focus on four key areas, which are:

- Maintenance, Repair and Overhaul (MRO);
- Aerospace Parts and Components Manufacturing;
- Avionics and Systems Integration; and
- Aerospace Training and Education.

This decision is significant as it further refined the framework for aerospace industry that was accepted earlier by the Government in 1997. Subsequently, all aerospace industry development initiatives are guided by the above policy as depicted in Fig. 2.3.

Since its inception, the Malaysian Aerospace Council has been an effective high level steering body that drives the development of the aerospace industry in a structured and orderly manner. Fig. 2.4 shows the key Council decisions in the past 14 years that have accelerated the development of the aerospace industry in Malaysia. The implementation of key decisions made by the Council were monitored

Body). Since these recommendations are still highly relevant, both were carried forward as initiatives in the new blueprint. On overall, the status of the 45 recommendations of Blueprint 1997 is as summarised in the Appendix.

and reported in the biennial industry report known as Aerospace Industry Report (AIR) published and released during LIMA trade exhibition once every two years by MIGHT as the Secretariat.

The aerospace industry is further promoted and supported by the Government through business-friendly policies, have significantly contributed to the progress and growth of the industry are as follows:

- Incentive package for aerospace industry from 2010 to 2014;
- Tax exemption (Blanket Approval) on imports of parts and components for MRO;
- MRO outsourcing of aircraft, components, ground systems, simulators, ground support equipment;
- International Aircraft Development Programme; and

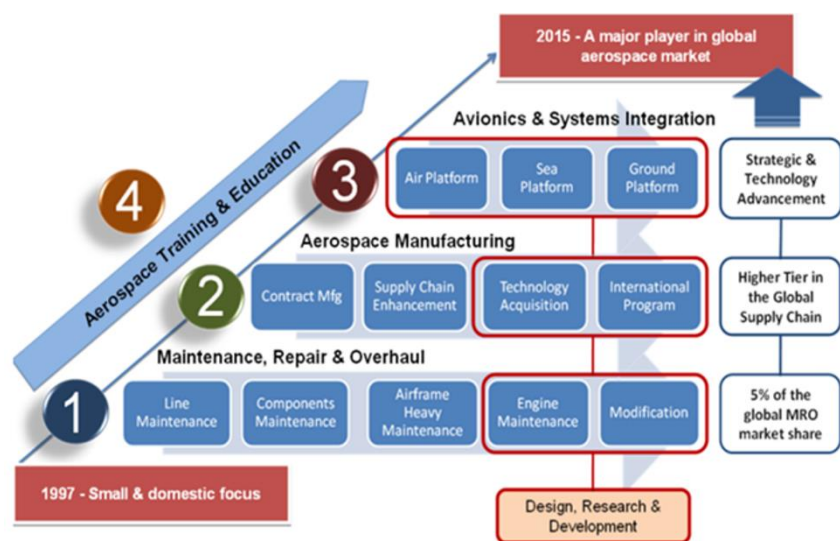


Figure 2.3: Aerospace Industry Focus Areas

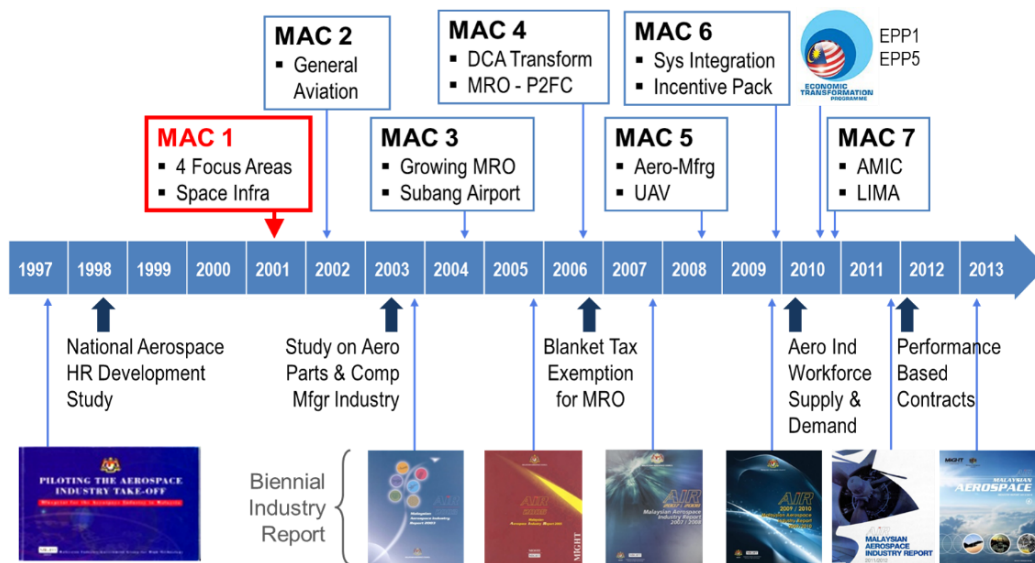


Figure 2.4: Key Decisions of the Malaysian Aerospace Council

- Offset Programme.

At the start of the Economic Transformation Programme (ETP) in 2010, two subsectors of the aerospace industry were chosen to be tracked under Business Services - National Key Economic Area (NKEA) as shown in Table 2.1. Since then, a few more Entry Point Projects (EPP) were being developed to cover other subsectors of the aerospace industry. Aerospace industry participation in the ETP is a testimony to the Government’s interest in growing aerospace as a high technology industry going forward to 2020.

Table 2.1: EPP1 and EPP5 under the Business Services NKEA

		GNI (RM billion)	Job
EPP 1	Growing the MRO Services	RM13.4	20,700
EPP 5	Growing Large Pure Play Engineering Services	RM1.75	5,750

## INDUSTRY GROWTH

The landscape of Malaysian aerospace industry has changed considerably compared to what it was in year 1998 (Table 2.2). Currently, the aerospace industry has progressed and become an important industry sector for the nation, as indicated by the following statistics:

- The total revenue from the aerospace industry has grown from RM0.9 billion in 1998 to RM11.8 billion in 2014; and has

provided more than 19,500 job opportunity;

- The investment value in the aerospace industry for the five year duration from 2010 to 2014 reached RM4.2 billion compared to only RM1.6 billion for a twenty years duration before the introduction of the special incentive package; and

- There are at present more than 150 active companies established in the country - an increase of 3 folds compared to 1998.

Regionally, Malaysia is at number two behind Singapore compared to the rest of South East

Asia countries. This is based on the 20% regional market capture in the MRO subsector worth of USD8.5 billion, and the 24% regional market capture of aero-manufacturing worth of USD3.4 billion in 2013 (Table 2.3).

**Table 2.2: Malaysian Aerospace Industry Comparison between 1998 and 2014**

	1998	2014
Revenue (RM billion)	0.9	11.8
Export (RM billion)	N/A	2.130
Investment (RM billion)	N/A	4.2
Number of Companies	50	150
Workforce	6,800	19,500

Source: MIGHT, Department of Standard (DoS), MIDA

**Table 2.3: Position of Countries in South East Asia**

Country	Maintenance, Repair and Overhaul		Aero-Manufacturing	
	USD (billion)	RM (billion)	USD (billion)	RM (billion)
Singapore	3.50	12.25	1.00	3.50
Malaysia	1.50	5.25	0.82	2.87
Thailand	1.00	3.50	0.80	2.80
Indonesia	1.00	3.50	0.36	1.26
Phillipines	0.50	1.75	0.38	1.33

Source: MIGHT

## CONCLUSION

Seventeen years after the nation adopted the Blueprint 1997, Malaysia successfully realized the blueprint’s aspiration. Today, Malaysia not only has an internationally recognized aerospace industry, but also attained a respected position amongst the South East Asia countries.

The well-structured industry eco-system today is the result of ideas that were put together by the stakeholders back in 1997 (Figure 2.5).

With a strong national-level Steering Body (outcome of recommendation 2) driving the industry agenda, Malaysia now has;

- an industry-led R&T platform (outcome of recommendation 12);
- a larger vendor base to serve the 1<sup>st</sup> Tier (outcome of recommendation 25);

- a platform to benefit the Military MRO players as the nation develop the defence sector (outcome of recommendation 35);
- several strategic investments in “systems integration” (outcome of recommendations 9, 17 & 29);
- a few aerospace technology institutes certified as DCA Part-145 Approved Training Organization (outcome of recommendation 15); and
- special clusters to house the various industry activities (outcome of recommendation 11).



Figure 2.6: Aerospace Industry Players in Malaysia

The industry has also witness a growing number of aerospace players since 1997, which has dramatically altered the landscape of the Malaysian aerospace industry (Figure 2.6).

## Chapter 3 - AEROSPACE INDUSTRY IN MALAYSIA

Regional dynamics especially the rapid growth of the commercial aviation sector in South East Asia has enabled the aerospace industry in Malaysia to grow and contribute to the nation's high-income economy. In 2014, the industry recorded a turnover of RM11.8 billion involving 159 companies and employed 19,500 strong workforce (Figure 3.1). There has been substantial investment from both domestic and foreign investors which in 2014 alone recorded RM642 million (Figure 3.2), while export is valued at RM2.9 billion.

In terms of size, MRO remains the largest contributor to the aerospace industry revenue which accounts for 55%. This is followed by aero-manufacturing which made up of 33% of the industry revenue (Figure 3.3).

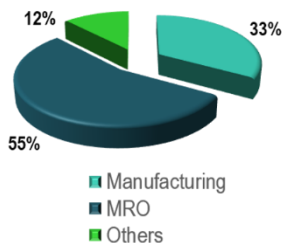


Figure 3.3: Subsector Percentage

### SUBSECTOR STATUS

#### MRO

The MRO subsector is currently worth RM5.3 billion. Although this amounts to 20% of South East Asia market capture, the value is still below the 5% global market share set as a target for 2015 (Figure 3.4). In growing the MRO subsector, EPP 1 of

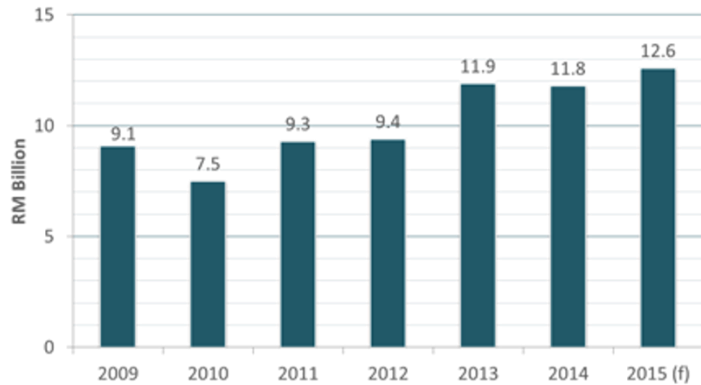


Figure 3.1: Total Revenue of Aerospace Industry in Malaysia

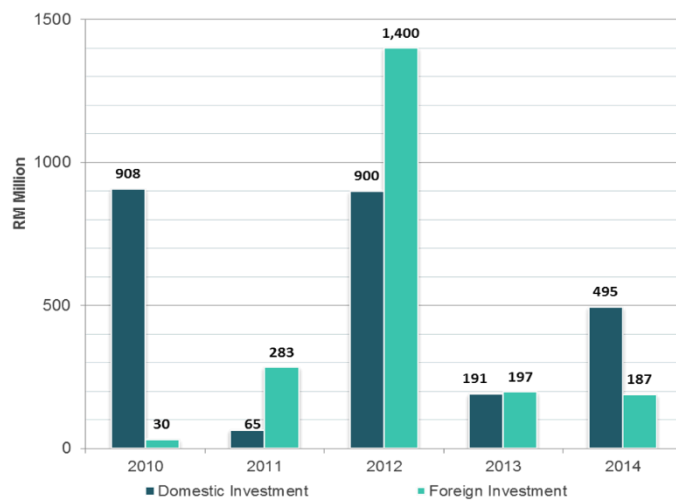


Figure 3.2: Domestic & Foreign Investments<sup>4</sup>

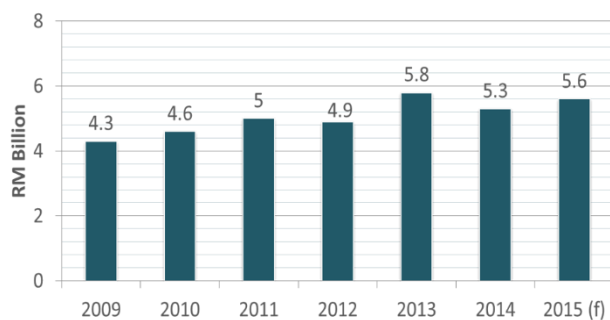


Figure 3.4: MRO Subsector Turnover

Business Services NKEA has set a target of RM13.4 billion and employment of 20,700 by 2020. Based on the current growth rate, this target will not be achievable unless appropriate measures are taken to accelerate the growth.

Malaysia must consider other alternatives to expand its MRO market share. This include encouraging new investments in activities that can enable the nation to offer “nose to tail” services and better turnaround time. Malaysia should also capitalize on the presence of

foreign players so that the local players can effectively collaborate and enhance their service offerings.

The recent Airbus and SR Technics investments are welcomed to speed up the needed growth especially in the Components and Modifications market segments. With the anticipated growth of air traffic in the region, the MRO industry players (Figure 3.5) can prepare and position themselves accordingly towards a more exciting future.



Figure 3.5: MRO Subsector Industry Players

### Aero-Manufacturing

While starting off as one of the smaller subsectors, it has registered rapid growth over the past five years. In 2006 it chalked up only RM400 million in turnover, while in 2014, the figure had escalated to RM4 billion (Figure 3.6). The main reason for this jump is the contribution of two major foreign direct investments (FDIs) namely Spirit Aerosystems and Honeywell Aerospace Avionics. Based on the 24% market capture in South East Asia and the number of players there is today, the goal of the 1997 Blueprint for Malaysia to be in the global supply chain of aerospace parts and components manufacturing market has clearly been met.

The aerostructure manufacturing continues to be the fastest growing segment through

2014. The strategy to bring quality investments into the country has resulted in more than 100% growth in terms of turnover from RM600 million in 2009 to about RM1.76 billion in 2014. Aerostructure manufacturing is expected to continue its growth trend over the next several years because Malaysia is heavily

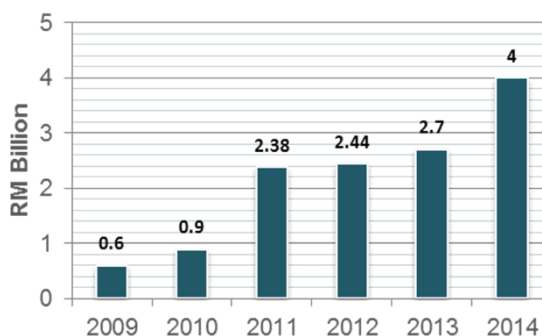


Figure 3.6: Aero-Manufacturing Subsector Turnover



involved in the lucrative narrow-body programmes, which are expected to have extensive sales and deliveries for years to come. Since the local Malaysian companies are at Tier 2 or below, there is opportunity to move to higher tiers, which will provide higher value added content and better financial returns.

Honeywell is leading the avionics manufacturing segment in Malaysia. Honeywell's presence in Penang has positioned Malaysia as one of the main producers of avionics components for the global market. Currently, the company is supported by other multi-national corporations invested in Malaysia such as Celestica and Plexus. More opportunities are to be created to allow local electronics industry players to be in the global supply chain through Honeywell.

Another aerospace manufacturing segment in which Malaysia aspires to develop a stronger footprint is the engine parts and components manufacturing. Recent investments by SAM

Group through its subsidiary, Aviatron Sdn Bhd, have paved the way towards achieving this intention. This investment has made Aviatron a major nacelle machined assembly supplier with the first component successfully delivered in 2012.

Apart from assisting the major players, Malaysia is also facilitating its own indigenous small and medium enterprises (SME) to establish capabilities at Tier 3 and 4 of the supply chain. As an example, taking advantage of Rolls-Royce's presence in Singapore, local SMEs are encouraged to undertake detailed parts manufacturing for supply to Rolls-Royce. Alternatively, this can also be accomplished by promoting foreign SMEs to invest in Malaysia or establish partnerships with Malaysian SMEs.

Among the foreign SMEs that have already established their operations in Malaysia are All Metal Services, Gandtrack Asia, Aerotech Malaysia and Composites Testing Laboratory Asia. Figure 3.7 shows the aero-manufacturing subsector industry players according to their position in the supply chain.



Figure 3.7: Aero-Manufacturing Subsector Industry Players

### Systems Integration

Capability in systems integration is critical to Malaysia especially in supporting the defence and national security needs. There are still many gaps in this area, which will be addressed

later in the blueprint. As of today, Figure 3.8 shows the system integration industry players together with the relevant Government organizations indirectly supporting the growth

of this subsector through their operational needs.

Malaysia is well established in terms of capability in integrating UAVs, Simulators and Spacecraft. A number of these systems are already deployed and operationally proven in-service. Malaysia however need to further invest in developing its own capability to upgrade avionics systems of its military aircraft so that its dependence on foreign-developed solutions can be reduced. This is necessary when it involves tactical systems that employ sensitive and

restricted information and technologies. Moving forward, Malaysian high-tech companies are encouraged to collaborate with foreign technology partners so as to intensify application of high technology within aerospace industry.



Figure 3.8: System Integration Subsector Industry Players

### Education and Training

It is well recognized that Malaysia’s education and training institutions produces trained workforce and graduates not only to support the needs of the local industry, but also the neighbouring countries. According to Boeing, there were 3637 skilled workers supplied in South East Asia in 2014 of which Malaysia produced 1964 or 54% of all skilled workers for the region (Figure 3.9). Malaysia churned out over 300 graduate engineers annually, along with over 2000 para-professionals (not all are included in the Boeing report).

Malaysians have successfully been employed all around the world; many trained MRO licensed engineers and technicians are employed in Singapore and UAE, while graduate aerospace engineers are employed in Singapore, United States as well as Europe.

Malaysia’s education and training providers that support the aerospace industry are well

positioned to advance to the next level (Figure 3.10). The players need to improve their bachelor’s degree programmes by aligning with the latest technology and industry trends and facilitate bridging programmes to fast track employment. In the area of para-

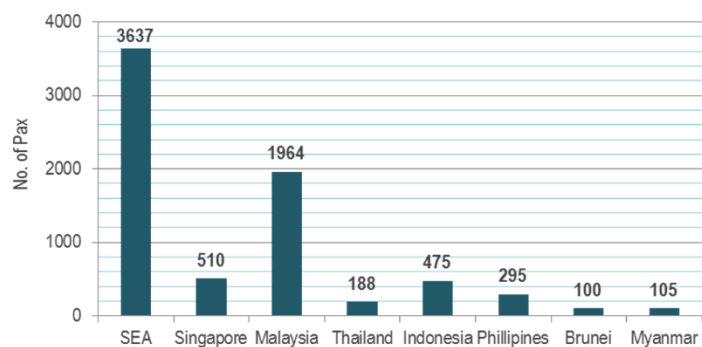


Figure 3.9: Skilled Workforce Produce in SEA in 2014<sup>5</sup>

professionals, there is a serious shortage of supply in the aerostructure manufacturing subsector which require further investment by the institutions.



Figure 3.10: Education & Training Providers in Malaysia

### INDUSTRY STATUS REVIEW

The aerospace industry in Malaysia, made up of the various subsectors, has significantly progressed since the start of the 1997 Blueprint. Even though the percentage of market captured by Malaysian players in the region is reasonably good, the absolute value of the aerospace industry is still very small compared to the size of the global market. With the presence of international players in the country such as Airbus, General Electric (GE), Honeywell, Spirit Aerosystems, SAFRAN Messier-Bugati, SR Technics, Singapore Aerospace Manufacturing (SAM), THALES, Hamilton Sundstrand and many others, the prospect for Malaysia to improve its position and capture bigger market is promising.

In terms of content, although the industry has moved to a new level, the high-tech elements and sophistication of MRO, aero-manufacturing and system integration activities that are currently undertaken in

Malaysia are still “unimpressive”. As most activities are at the tail end of aircraft life cycle, work needs to be done to migrate Malaysia from the low-tech, high labour content activities to high-tech design, manufacturing and maintenance activities found at the front

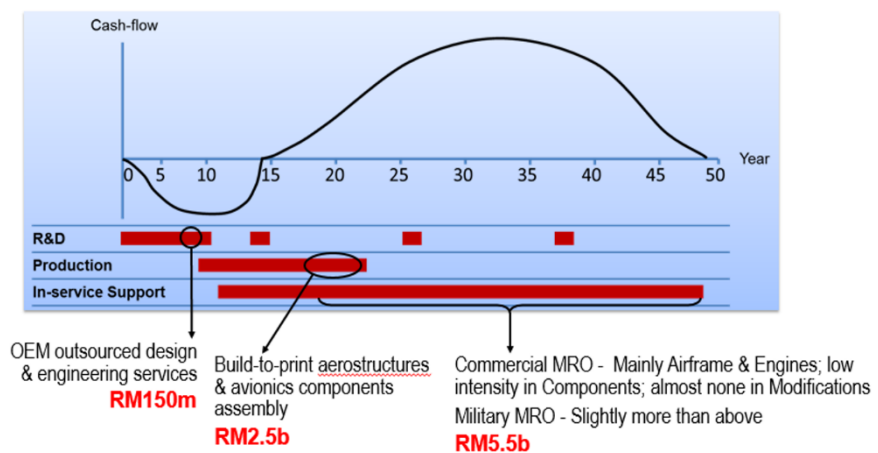


Figure 3.11: Malaysia's Aerospace Activities with Respect to Aircraft Lifecycle

end of aircraft life cycle (Figure 3.11).

Moving forward, MRO activities in Malaysia that mainly involve scheduled and unscheduled maintenance tasks must be further deepened especially in the areas of Components and Engines MRO. In addition, upstream activities such as maintenance engineering analysis and logistics support analysis for Through Life Support should also

be an important part of the future MRO. During the in-service phase of aircraft life cycle, design of aircraft upgrades and modifications including systems integration and manufacturing of modification kits are the key activities that Malaysian industries should be involved in with the aim to reduce dependency on foreign solutions.

In the case of parts and components manufacturing, Malaysia must find its way to participate in future international aircraft development programmes so that it can enter the market early. This critical move is essential for Malaysia to secure “design and build” work packages hence, become risk sharing partner with the Primes from the early stages of aircraft life cycle. Future parts and components manufacturing activities should also involve manufacturing and assembly of airframe equipment as well as engines sub-systems.

## Chapter 4 - MARKET AND GAP ANALYSIS

The aerospace market is changing and growing rapidly with Asia-Pacific leading the growth. More commercial aircraft are being produced annually than any time in history based on Boeing announced plan to deliver 900 new aircraft per year, with Airbus at the same or faster pace. The largest percentage of these new aircraft are to fill orders for Asian countries.

There are abundant opportunities for the Malaysian aerospace industry to grow. In order to take advantage of the future market scenario, Malaysia must look at the areas in which growth will occur and examine its capabilities in these areas. This chapter will first look at the global and regional market trends, and subsequently examine the shortcomings or gaps that affect or influence the subsectors' potential to expand as the market grows.

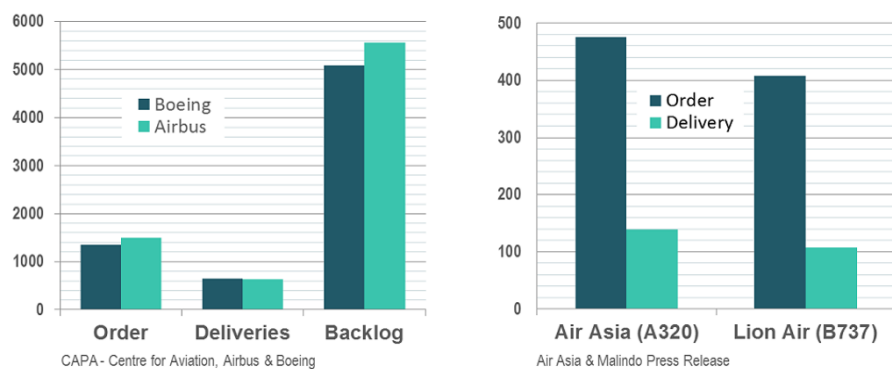
### MARKET ANALYSIS

The expanding world air traffic, large aircraft orders by airlines and backlog faced by the Primes (Boeing and Airbus) (Figure 4.1), indicate the aerospace industry's long term growth potential and strength. Based on the current trend of increasing number of aircraft operating in the world especially in South East Asia, where large numbers of new aircraft are

being ordered by Air Asia and Lion Air (Figure 4.1), the growth of the aerospace industry will be influenced as follows:

- The tendency of Low Cost Carriers (LCC) to use narrow body aircraft namely A320 and B737 is expected to spur MRO activities in the region. This is mainly driven by the pressure for airlines to reduce operating cost by having MRO to be conducted by capable providers within the region;
- The tendency of the Primes and Tier 1 companies such as United Technologies Corporation (UTC), Spirit Aerosystems, GKN Aerospace, Sonaca, SAFRAN, Mitsubishi Heavy Industry (MHI) and others to off-load parts and components manufacturing to low cost countries is expected to open up new opportunities to many industry players in Malaysia and the region.

**Figure 4.1: Order, Deliveries & Backlog for Boeing and Airbus in 2014<sup>7</sup> and Order & Delivery for Air Asia and Lion Air in 2014<sup>8</sup>**



<sup>7</sup> CAPA – Centre for Aviation, Airbus & Boeing

<sup>8</sup> Air Asia and Malindo Press Release

MRO Market

It is forecasted that by 2031, Asia-Pacific will be the biggest airline market in the world, receiving nearly a third of all new jet deliveries. Asia-Pacific MRO spending is forecasted to grow at a rate of 5.3% Compound Average Growth Rate (CAGR), which is well above the global average of 3.9%. With this growth rate, it is projected that by 2030, the global market share for MRO subsector is worth US\$116 billion. This has been driven by strong growth of the fleet in the last decade. Figure 4.2 shows the world-wide MRO demand in 2014.

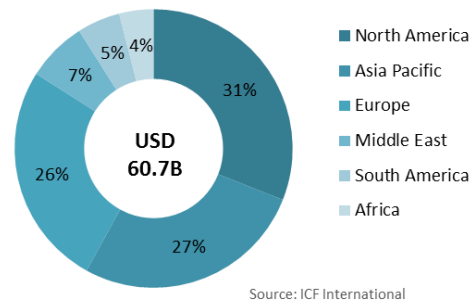
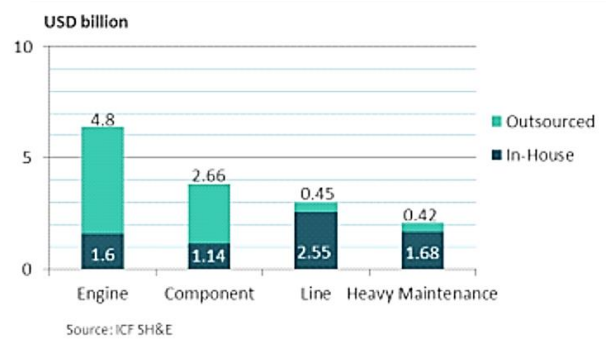


Figure 4.2: Global MRO Demand in 2014<sup>9</sup>

Within Asia-Pacific, 3<sup>rd</sup> party MRO market is mainly dominated by Engines and Components MRO market segments due to the fact that airlines tend to keep line and heavy maintenance work in-house (Figure 4.3). More investments on Engines and Components MRO are therefore needed to cater for the current and future needs of the airlines as well as to bring-in 3rd party Airframe MRO into Malaysia.



4.3: Asia Pacific MRO Spending in 2013<sup>10</sup>

Position-wise, Malaysia is at No. 2 after Singapore in South East Asia for MRO (Figure 4.4). With the new markets emerging, the race to capture new businesses is still on going for the regional players. Although Malaysia captured 20% of SEA market in 2013, to increase the market share, Malaysian MRO providers must not only be competitive in satisfying the airlines' need for turn-around time and cost, but also increase their capacity to cater for the larger number of aircraft owned by the national carriers and LCCs.

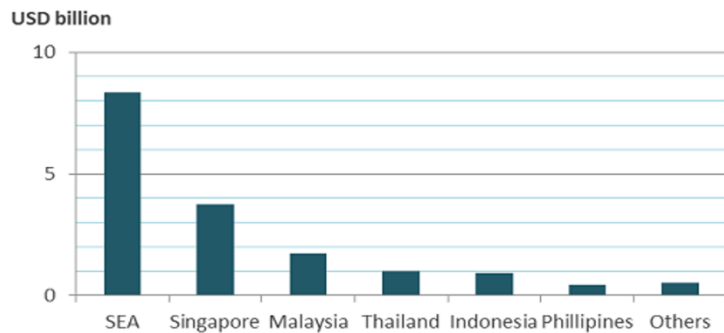


Figure 4.4: South East Asia Market Share in 2013

<sup>9</sup> ICF SH&E (2014) "Aerospace Globalization: The Wave".

<sup>10</sup> ICF SH&E (2013) "MRO Market Forecast & Industry Dynamics"

3<sup>rd</sup> party Airframe MRO services is not expected to grow as fast as Engines and Components MRO. During the period where

military aircraft MRO, the ASEAN market has to be aggressively penetrated in order for this segment to grow much faster.



Figure 4.5: MRO Players in South East Asia

aircraft are still new, airlines will be able to handle most of the required maintenance in-house. However, as the aircraft begin to age and the MRO needs exceed the airlines' resources, there will be more 3<sup>rd</sup> party MRO opportunities for the regional players (Figure 4.5).

In the Military MRO segment, the growth trend has been relatively flat in the last few years. Although demand is growing as Malaysia acquires new assets for the defence, enforcement and security agencies, Military MRO is strictly dependent on the local market. As owner of more than 270 aircraft, and spending more than RM500 million annually on MRO and spare parts, the Government is the primary driver of the Military MRO sector (Figure 4.6). However, since Malaysia is not among the leading countries in terms of

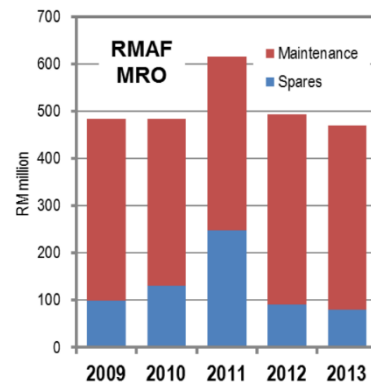


Figure 4.6: Royal Malaysian Air Force MRO Expenditure

Aero-Manufacturing Market

The large backlog faced by the Primes today signify the positive outlook of the aerospace parts and components manufacturing market. Presently within the region, Singapore is the leading aero-manufacturing hub with Malaysia holding second largest market share (Figure 4.7). The growth potential of aero-manufacturing market is strong as the Primes and first tier suppliers are consistently increasing the amount of work that needs to be outsourced in order to reduce costs as well as to focus on their own core business and speed up the production to meet the Primes' demand.

One of the obvious trends in aerospace manufacturing is horizontal specialization which is now spurring an emerging cluster in Asia. Aerospace suppliers who were concentrated in North America and Europe are shifting their manufacturing clusters eastward by creating risk-sharing partnerships. Until recently, China was considered the best location for low-cost manufacturing. However, in recent years, the cost of doing business in China has risen to the point that it's almost the same as producing in the US (Figure 4.8).

In order to cope with the Primes' demand and remain competitive in the business, Malaysian companies must place emphasis on quality, cost and delivery as the main strategy to compete in the region. As such, the readiness of Malaysian companies to expand their capacity for detailed parts manufacturing to cater for the increased aircraft production rate and the backing of a strong supporting industries (i.e local raw material suppliers, AGS

Stockiest and Secondary Processes shared facility) are the key agenda in the coming years.

In 2014, there are only fourteen NADCAP certified companies in Malaysia mainly on chemical processing and Non-Destructive Testing (NDT) with only one certified for heat treatment (Figure 4.9). Overall in South East Asia, Singapore has the most number of NADCAP certified companies with 10 heat treatment and 12 Non-Destructive Testing (NDT) facilities (Figure 4.10).

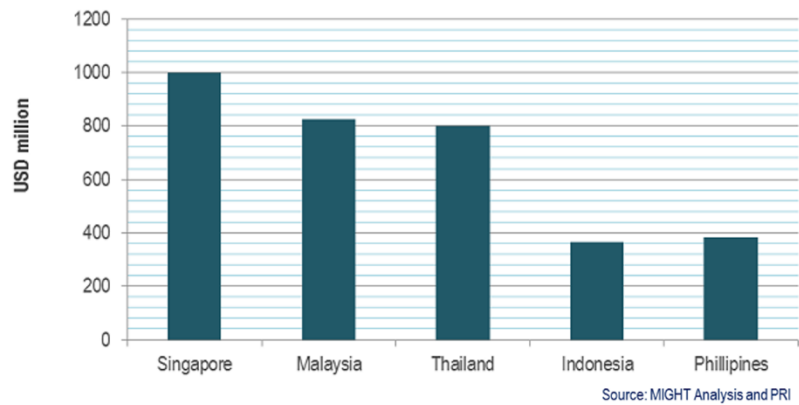


Figure 4.7: Aero-Manufacturing Market Share in SEA, 2013

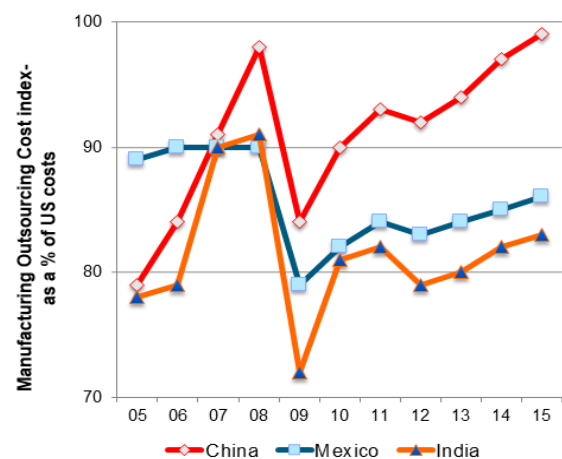


Figure 4.2: Manufacturing Outsourcing Cost Index as a % of US Costs<sup>11</sup>

<sup>11</sup> The Economist (2013)



For Malaysia to increase its market capture, appropriate initiatives have to be put in place especially to assist the small and medium enterprises to be AS9100 and NADCAP certified hence, enabling them to support those who are already in the global supply chain.

Since parts and components manufacturing contracts are mostly long term and involve high non-recurring costs, Malaysia must positioned itself very early in the supply chain by participating in international aircraft development programmes. The next major programmes that Malaysia must make an effort to participate are the Airbus and Boeing all-new single-aisle aircraft programmes.

Referring to Malaysia’s experience in the A400M international aircraft development programme, several single source “design & build” work packages were secured, valid throughout the life of the aircraft. Since Boeing is projecting a total of 24,670 new aircraft single-aisle to be delivered over the next 20 years mainly to operators around Asia-Pacific, Malaysian aero-manufacturers must position themselves to be part of this lucrative, high production rate aircraft programme.

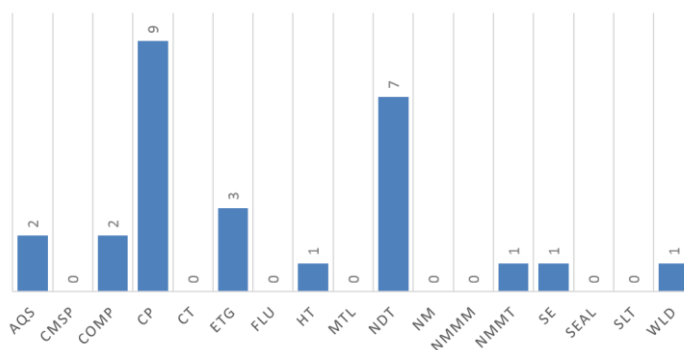


Figure 4.3: NADCAP Certification Available in Malaysia, 2014<sup>12</sup>

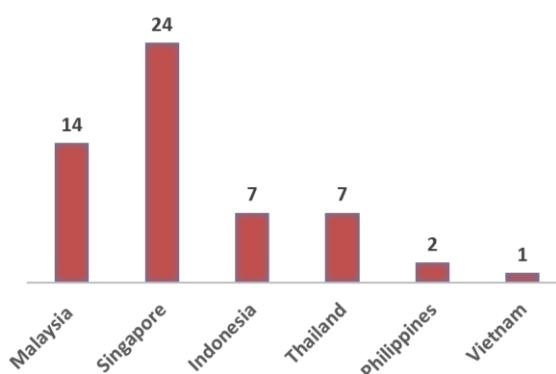


Figure 4.10: Number of NADCAP Certification in SEA, 2014

### Systems Integration Market

The market for Systems Integration (SI) subsector in Malaysia is expected to be mainly driven by the local market. In order to further develop this focus area, the local players should be encouraged to design, develop and integrate avionics upgrades, major aircraft structural modification, ground electronic systems, simulators and UAVs, not only from the perspective of market capture, but also

increasing local content in the area of advanced engineering.

Although there is limited “commercial” justification for SI compared to other focus areas, this subsector must be taken into account seriously due to its “strategic” nature especially for the purpose of national capability development that involve restricted dual-use high technology. Furthermore,

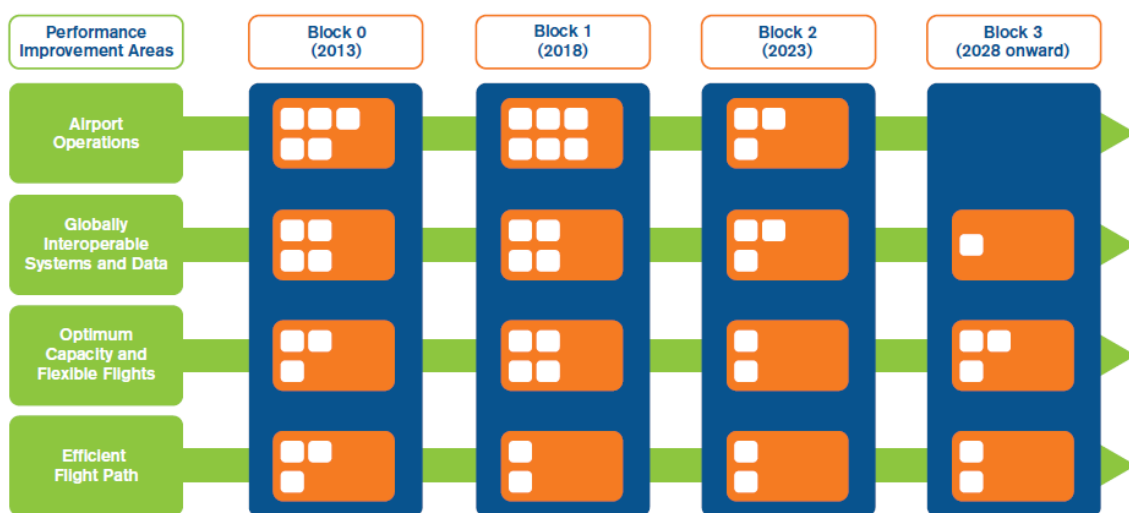
<sup>12</sup> Reproduce from PRI – Performance Review Institute

Malaysia must continue to support SI activities in order to maintain mission capability of its strategic assets, lower the cost of ownership and prolong the service life of a rising number of aging aircraft which require avionics upgrades, adaptation of defence systems in accordance with the country’s unique needs and priorities, as well as achieving the long-term goal of becoming supplier of “Advanced Systems” in the future. Apart from retaining Malaysian Ringgit within Malaysian shores, SI activities contracted to local players will enhance local content in modification and upgrades of strategic defence assets for the nation to move a few steps forward in terms of the complexity of aerospace activities.

Within the ground electronics systems domain, experience from MH370 tragedy requires

Malaysia to keep pace with the development of Air Traffic Management System planned under International Civil Aviation Organization (ICAO) Air Navigation Block Upgrades (Figure 4.11). While the Government has committed to the upgrade plan, Malaysian companies should be party to it throughout the development cycle so that critical system know-how are retained in-country. Outright purchase of Air Traffic Control (ATC) systems from foreign sources will not enable Malaysia to fully understand how we control our own aerodrome and relieve Malaysia’s dependence on foreign solutions for future upgrades or repairs.

Figure 4.4: ICAO Air Navigation Block Upgrade for Air Traffic Management System<sup>13</sup>



South East Asia is now among the top defence spenders in the world importing defence-related equipment worth US\$5.25 billion in 2013 (Figure 4.12). Based on this trend, local systems integrators must prepare themselves to capture the regional market. To pave the way, it is expected that the development expenditure for aerospace and defence will provide sufficient domestic market for the local players to prove their capabilities and subsequently venture abroad.

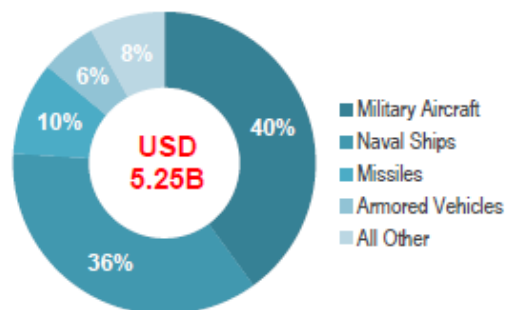


Figure 4.5: Imports by Type of Defence Equipment<sup>14</sup>

<sup>13</sup> ICAO – International Civil Aviation Organization

<sup>14</sup> ICF International

Engineering and Design Services Market

Large engineering and design services (E&D) companies have been growing rapidly in Europe, America and Asia. Based on this trend, the Economic Transformation Program (ETP) has identified Pure Play Engineering Services as a game changing industry and has incorporated it in the Business Services NKEA, Entry Point Project 5 (EPP 5) to cater to its development.

Within the context of aerospace industry development, this new focus area will contribute not only to the growth of aerospace revenue, but also support Malaysia’s intent to be involved in higher value, upstream activities of aircraft life cycle. Under EPP 5, E&D services is projected to contribute RM1.8 billion in Gross National Income (GNI) by 2030 (Figure 4.13) and subsequently enable E&D players to grow and create approximately 9200 job opportunities.

The global aerospace market is expected to grow to US\$352.5 billion by 2030 and the market share of E&D services is expected to worth at least 35% of the global aerospace value<sup>15</sup>. India alone has captured at least 30% of E&D market share in 2011 as reported by Quest Global Engineering. For Malaysia to excel amongst the major players in E&D services in South East Asia region (Figure 4.14), the nation must strive to participate in the new single-aisle programme that is estimated to offer US\$100 billion worth of contracts.

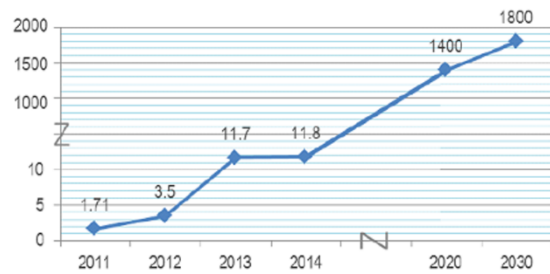


Figure 4.13: Projected GNI in E&D Services



Figure 4.14: Engineering & Design Services Players in South East Asia

<sup>15</sup> Lucintel – Global Management Consulting & Market Research, (www.lucintel.com)

Education and Training Market

Education and Training (E&T) is the cross-cutting segment that supports the entire aerospace industry dealing with talent development. Currently in South East Asia, Malaysia leads in terms of producing the number of skilled workforce with competent expertise in different levels of technical proficiency for the aerospace industry. This commensurate with the number of training providers that Malaysia has compared to the rest in the region. Capacity-wise, Malaysia has in total 53 education and training providers in aerospace related programmes made up of 27 higher learning institutions, 15 technical training academies, and 11 DCA Part-145 approved training organizations (ATO). Through these players, Malaysia produces all five competencies totalling 2,566 in year 2014 (Figure 4.15).

Based on the market projected by Boeing, SEA will experience 7% year-on-year growth for graduate engineers and 5% for technicians by 2032. With the

opening of ASEAN, the market size for Malaysia's aerospace E&T providers is relatively large. The E&T players are in position to satisfy this demand based on Malaysia accumulative capacity of churning 50,751 technicians, and 15,556 graduates engineer by the year 2030. However moving towards 2030, the local E&T providers will still have to compete with other strong regional players (Figure 4.16) in supplying competent workforce for the MRO, systems integration, engineering and design services, and aero-manufacturing subsectors.

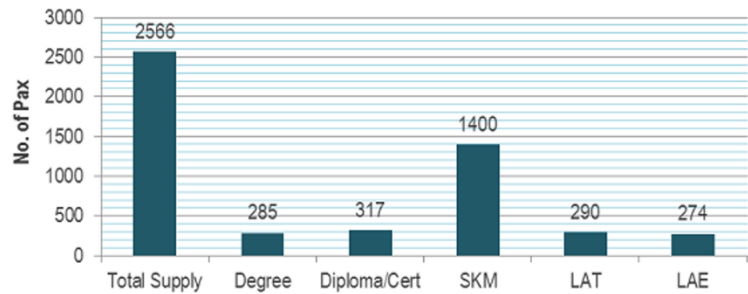


Figure 4.15: Breakdown aerospace workforce produce per year in Malaysia



Figure 4.16: Education & Training Providers in South East Asia

### GAP ANALYSIS

Analysis of the local gap involve five key areas that can affect or influence the aerospace industry from the perspective of policy & governance, institutional & regulatory frameworks, research & technology, talent development, and investment & funding.

#### Policy and Governance

The role of Governments in developing its aerospace industry is undeniably crucial. This is due to the strategic nature of the industry that deals with most complex core technologies which have application in many other industries. Since the introduction of 1997 Blueprint, the Malaysian Government has shown its commitment in developing the industry through markets in which Malaysia has full control. As such, in many acquisitions of new aerospace systems as well as acquisition of MRO services of in-service systems (air and ground systems), the Government gives due consideration to the interests of the local players.

Subsequent to the promulgation of an offset policy several years ago, the local aerospace industry has tremendously benefited through the opportunity to gain market access and technology transfer. However unlike offsets, major aerospace acquisitions have not been fully utilized to influence and shape the landscape of the industry as follows:

##### *New Acquisitions*

The current acquisition policy has not been able to promote local content through the main acquisition contract since the requirement for local content is normally specified as direct offset. In order to enable Government acquisitions to directly influence the growth of the aerospace industry, the acquisition policy must allow local

content to be made mandatory in the main contract. In addition, localization programme is almost impossible if the Government keep acquiring small quantities of too many different types of systems.

A change in attitude is required to enable new acquisitions to be undertaken through “developmental project” involving the local industry. Although buying off the shelf saves time and is normally cheaper, it blocks the opportunity to develop local technology and capability. In the long run, spending money on local development of complex systems will not only increase the capabilities of local companies to compete in the international market place, but also retain high value upstream activities in the country.

##### *In-service Support Acquisitions*

As Malaysia open its door to FDIs, many local MRO companies felt threatened by the presence of foreign MRO players. Within the market that the Government has direct control, the policy on the award of MRO contracts to maintain Government aircraft has to be clarified. Through this policy, priority should also be given to capable local design and engineering companies to be considered in aircraft and systems upgrade projects since upgrades mainly involve design activities (apart from modification kit installation). Most importantly, the policy for acquisition of MRO services must not only allow the Government to maximize the availability of its asset, but also influence the behaviour of industry players hence, control their performance on a long term basis.

### Institutional and Regulatory Framework

Bringing together the distinct functions of the various Ministries and agencies is critical to the development of the aerospace industry. Institutions that have direct influence on industry development must execute their role appropriately so that they become truly “strong promoters” of the aerospace industry. Among the gaps within institutional and regulatory frameworks are as follows:

#### *Buyer*

An effort must be made to streamline and standardize the “buying” practices in procuring Ministries so that the opportunity to develop the local industry players is not wasted. This is necessary to create critical mass of the small local market that is mainly made up of the defence, enforcement and security agencies. By streamlining the buying function, the industry players will be able to seriously invest in developing specific capability while at the same time attain specialization in certain product range.

#### *Regulator*

The transformation of the Department of Civil Aviation (DCA) into Malaysian Aviation Authority (MAA) has yet to be realized under this blueprint. Although DCA has proven its capability in regulating the commercial aviation sector as demonstrated in the MH370 and MH17 accidents, DCA’s effectiveness in influencing and driving the growth of the aerospace industry can be further improved especially in its capacity to issue aircraft maintenance engineers licenses as well as its involvement in regulating aero-manufacturing and engineering and design subsectors.

Too “OEM dependent” on design changes to be incorporated on in-service aircraft and ground systems is an issue that needs to be addressed. Within DCA and DGTA (Directorate General Technical Airworthiness), more locally designed design changes should be encouraged in order to promote innovation within the industry. The willingness to facilitate and promote local solutions is the desired culture to avoid regulators becoming too rigid in the future.

#### *Industry Developer*

The strong commitment of the Ministry of International Trade & Industry (MITI) and its agencies namely MIDA, SME Corp and MATRADE to fully undertake aerospace industry development function is most welcomed. Through this function, a more coordinated approach can be employed to develop a strong supply chain within the aerospace industry in Malaysia as aspired by this blueprint.

### Research & Technology

The current aerospace activities in Malaysia is not sophisticated and complex enough, making Malaysia highly dependent on foreign R&D. However, as Malaysia becomes involved in more intense upstream activities in the earlier part of aircraft life cycle, the nation has to be able to create new technologies and develop new problem solving techniques to remain competitive. As such, efforts need to be intensified in advancing technological capability and embed science and technology (S&T) in the aerospace industry. The gaps that relates to R&T and the Centre of Excellence are as follows:

### *R&T*

Most aerospace R&D activities in the country are not focused and lacking key themes hence, the projects are not well defined and coordinated at the national level. The establishment of Aerospace Malaysia Innovation Center (AMIC) in 2011 was an effort to improve aerospace R&D so that it is industry-led. However, the commitment of the local players in supporting collaborative R&D organized under AMIC is yet to be seen. Not investing in R&D means Malaysian companies are not advancing their own capabilities.

The other main gap to be addressed is the allocation of R&D funding for defence. It is a known fact that aerospace and defence R&D are the main drivers for technological development in many developed countries. Unless this is resolved, the opportunity for Malaysia to progress technologically will be very unlikely.

### *Centre of Excellence*

The potential of specialized research institutions such as the Central Aerospace Engineering Services Establishment (CAESE) under the Royal Malaysian Air Force and the Science & Technology Research Institute for Defence (STRIDE) under the Ministry of Defence have not been fully optimized to facilitate aerospace and defence related R&T activities. This is unfortunate since both institutions are key Centres of Excellence for mission systems, sensor integrations, electronic warfare (EW), and weapons clearance as well as aircraft structural integrity research. The expertise from all research universities in the country should be invited to collaboratively work with these institutions to expand

strategic aerospace and defence R&T activities.

With regard to composites technology, R&D related to composites is much disintegrated although it is strategic to aerostructures manufacturing sector. A designated Centre of Excellence is therefore required to enable better coordination of technology development related to composites.

### Talent Development

There are numerous unresolved issues involving human capital competency, as well as its supply and demand. In order to ensure the aerospace industry grow as an important high-tech industry in Malaysia, appropriate and adequate training across the board is paramount importance. Key gaps relating to talent include:

- No proper exposure is provided to Government personnel who are involved in aerospace related procurement on “Through-life Support”. Without understanding the principles of through-life support, these personnel will not be able to effectively influence the development of the industry from the perspective of the Government market.
- The education and training programmes are not well addressed to resolve the mismatch between academia & industry which resulted in institutions not producing workforce with the right calibre. Some form of coordination is therefore required to improve industry-university relationship.
- There is little effort made to increase the number of Design Engineers with signatory status for future design and build projects which can jeopardise Malaysia’s chance to

in the next generation aircraft programme. Although there are 14 Aeronautical and 7 Aerospace Professional Engineers registered with the Board of Engineers Malaysia, without the right opportunity, they will never be recognized as Boeing or Airbus signatories.

- Despite its strategic importance, there has not been any attempt made to increase the capacity of training institutions to train aerostructure manufacturing workforce. This will not help the growth of the subsector which is severely affected by high attrition rate at the shop floor (Figure 4.17). In addition, although there are current re-skilling programmes under PERHEBAT, the transition of highly disciplined well-trained retired military personnel into the civil sector can still be further improved.

services abroad. Even within the region, no visible milestone has been achieved to open up the defence market within ASEAN countries. In this case, the Government intervention is necessary either through bi-lateral or multi-lateral initiatives to expose Malaysian aerospace industry to new and larger markets.

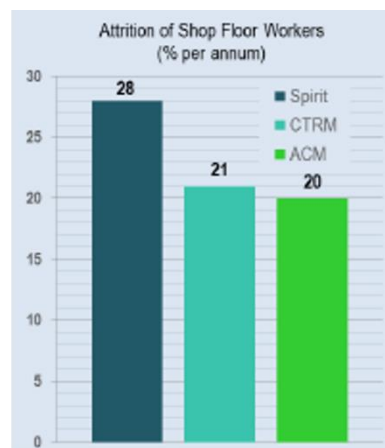


Figure 4.17: Attrition of Shop Floor Workers (% per annum) in Aero-Manufacturing Subsector

### Investment and Funding

Further enhancement is required on the nation’s effort to strengthen the local industry supply chain. In terms of filling the gaps in the aerostructure manufacturing supply chain, Malaysia must continue to promote strategic investments from raw material suppliers and Aircraft General Supplies (AGC) companies, while at the same time, assist more SMEs to enter the supply chain. Facilitation and support to aerospace SMEs are critical since the current number of SMEs at Tier 3 and 4 with AS9100 and NADCAP certifications is still a handful. In addition, investment on an independent Central Secondary Process facility will speed up the process of increasing the number of metal SMEs in the global supply chain.

Throughout the past blueprint period, export oriented initiatives has not been fully explored to market Malaysia’s aerospace products and



## Chapter 5 - THE PLAN

Malaysia has the potential to be a strong and successful aerospace nation based on its track record in implementing the previous blueprint and subsequently arrived at the state it is today. The commitment shown by the Government and the dedication of all stakeholders have proven the ‘Malaysia Boleh’ slogan and are the main ingredients for the nation to forge ahead.

Moving forward, the future landscape of the Malaysian aerospace industry in 2030 will be different from what it is presently. As concluded in Chapter 3, Malaysian aerospace industry have to undergo an ‘upgrade’ from the current low tech, high labour content activities to highly complex and sophisticated upstream activities found at the front end of aircraft life cycle. Figure 5.1 graphically describe the kind of work and activities that future Malaysian aerospace business should be involved in.

If the above is the desired end state that the industry aspires to be at, Malaysia’s aerospace industry has to undergo a paradigm shift by

being more gutsy and bold to climb to the next level, as Malaysia becomes a developed nation beyond 2020. This means, within the next 15 years, the nation must:

- Upgrade local players competitiveness to qualify them for future major projects;
- Change attitude from technology user to technology supplier by seriously investing in R&T;
- Increase Malaysia’s content in aircraft and be part of the upstream market early by participating in international aircraft development programmes;
- Reduce dependency on foreign designs for military aircraft upgrades by giving higher priority to local design & engineering solutions; and
- Remain ahead of regional competitors by developing a strong comparative advantage in the identified focus areas.

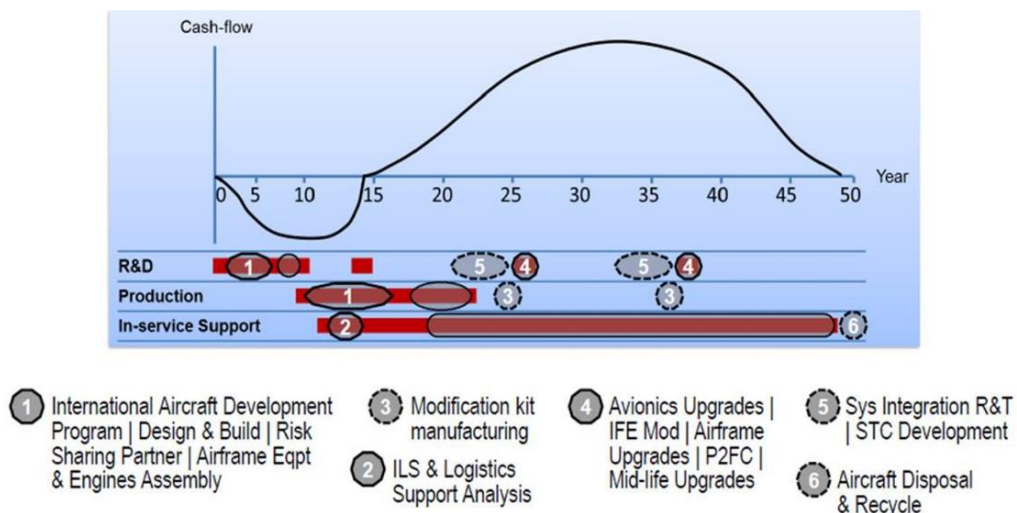


Figure 5.1: Future Activities of Malaysian Aerospace Business

## AEROSPACE VISION 2030

The desired scenario of Malaysian aerospace industry in 2030 stated above can be condensed into a statement that describes where the nation is heading. Based on industry trends and the abundant opportunities discussed in Chapter 4, the Malaysian aerospace industry stakeholders consensually agreed on the following shared vision:

***“By 2030, Malaysia will be the number 1 aerospace nation in South East Asia and be an integral part of the global market”***

The above vision provides the summarised picture of the state of the industry at the end of the blueprint period. This picture can be further broken down into five specific objectives to be achieved by each of the focus areas identified in the blueprint that will collectively contribute towards the attainment of the vision. The specific objectives are shown in Table 5.1:

*Table 5.1: Aerospace Focus Area Specific Objectives*

Maintenance, Repair and Overhaul	Capture at least 5% of global market share
Aero-Manufacturing	Become no. 1 in SEA for aerospace parts and component sourcing by targeting to be large sub-assembly, Tier-1 and Risk Sharing Partner (RSP)
Systems Integration	Self-reliant (at least 70% local content) in integration and upgrading of strategic assets
Engineering and Design Services	Capture at least 3.5% of global market share
Education and Training	No.1 in South East Asia in supplying competent workforce

Based on the above targets, the projected revenue for the respective focus areas market share that will be attained by the Malaysian aerospace industry in 2030 are RM20.4 billion for MRO, RM21.2 billion for aero-manufacturing and RM13.6 billion for engineering and design services.

## STRATEGIES

The approach to be taken by the nation to achieve the above specific objectives is critical to the success of arriving at the future state of the industry. Seven strategies have been identified to steer the aerospace industry in the next 15 years covering the essential aspects of policy & governance, institutional & regulatory, research & technology, talent development, funding & incentives, and market enhancement.

In general, the strategies emphasis on the need for Malaysian aerospace industry to leap forward to a higher plane not only in terms of revenue, but also in terms of value adding which can only be materialized through involvement in upstream activities, having high value advanced science and

technology elements, and employing high productivity skilled workforce. The long flight to be embarked by the aerospace industry to arrive at the desired 2030 destination will be guided by adopting the following Strategies.

- Strategy 1: Apply policies that will impact the future landscape of the industry
- Strategy 2: Enhance the effectiveness of institutions that have direct influence on the growth of the industry
- Strategy 3: Harmonize civil and military regulations and promote green practices
- Strategy 4: Invest in R&T to develop new capabilities and enhance industry competitiveness
- Strategy 5: Promote aerospace investments through incentives and matching funding
- Strategy 6: Attract and prepare the workforce of tomorrow for Malaysia and the region
- Strategy 7: Capture new market and strengthen local supply chain

If the whole nation give our commitment to implement this blueprint, its impact can be significant in terms of economy and national capability. It is expected that by 2030, the Malaysian aerospace industry will contribute a total revenue of RM55.2 billion and provide high income skilled jobs to more than 32,000 Malaysians. This estimation has taken into consideration the uptrend of gross industry output, the current industry issues, Malaysia’s involvement in the next generation single aisle aircraft programme and the establishment of a dedicated body to coordinate the implementation of the blueprint. Table 5.2 shows the link between the proposed growth levers and expected impact.

Table 5.2: Growth Levers to Capture Market Share and Stakeholders Facilitation by 2030

Growth Levers	Undertakings	Impact
Capture market share	Regional MRO market share	Revenue in 2030 RM55.2 B*
	High value manufacturing market	
	Regional engineering & design market share	
	Local upgrading and integration market	
	Education & training hub	
Stakeholders Facilitation	Apply policies that will impact the future landscape of the industry	Jobs in 2030 32,000*
	Enhance the effectiveness of institutions that have direct influence on the growth of the industry	
	Harmonize civil and military regulations and promote green practices	
	Invest in R&T to develop new capabilities and enhance industry competitiveness	
	Promote aerospace investments through incentives and matching funding	
	Attract and prepare the workforce of tomorrow for Malaysia and the region	
	Capture new market and strengthen local supply chain	

## KEY INITIATIVES

The strategies, which were identified earlier, will be engaged through the implementation of key initiatives. These initiatives are statement of ‘what to do’ as guideline for further deliberation via specific proposals and shall be detailed out by the related parties, which may result in the formulation of a specific programme. The number of initiatives may later increase to accommodate the dynamic nature of the industry and the urgency of need of relevant stakeholders, throughout the implementation period until 2030.

### STRATEGY 1: Apply Policies that will Impact the Future Landscape of the Industry

Procurement Policy, Industry Collaboration Program & Space Policy are key in shaping the future landscape of the industry. Strategy 1 will be implemented as follows:

Initiative 1.1 - Formulate guidelines that will address local industry participation in strategic acquisition projects.

Initiative 1.2 - Formulate clear policy on acquisition of MRO services for Government aircraft emphasizing on “performance” of the MRO provider.

Initiative 1.3 - Encourage capable local Design/Engineering & Systems Integration companies to participate in upgrades and modification contracts.

Initiative 1.4 - Acquire systems that can be developed by local industry (i.e. UAV, Simulators & Ground Systems) from local sources.

Initiative 1.5 - Participate in International Aircraft Development program as a risk sharing partner to maximize opportunities to capture design & build work packages.

Initiative 1.6 - Use Industry Collaboration Program (ICP) as the means to enter new market and enable technology transfer.

Initiative 1.7 - Develop a robust space program based on the National Space Policy and Outer Space Treaty.

#### In-service Support Acquisition

Under the purview of the Malaysian Industry Council for Defence, Enforcement and Security (MIDES), a study was undertaken in 2010 to enhance the RMAF Contractorization Program, after more than a decade of implementation. The main recommendation of the study centered on the need for the Government to influence the behavior of the MRO contractors while at the same time empower them through the application of Performance Based Contract (PBC).

PBC is a self-regulating agreement that enable contracts to focus on “results” or performance rather than “efforts”, in this case man-hour and spares. In addition, payment under PBC will be based on performance of the service provider in satisfying the agreed Key Performance Indicators (KPI). Since PBC allows the Government to empower the contractors, the local airframe MRO players will be positioned at Tier 1 who will manage the MRO for the rest of the aircraft’s repairable items.

To date, PBC has been successfully implemented by the Ministry of Housing in 2012 on the Contract for MRO of the Fire & Rescue Department helicopters (Mi-17 & A-109). Work is in progress to apply appropriate performance measures into the Contract for MRO of the Malaysian Maritime Enforcement Agency amphibious aircraft (CL-415).

#### Industry Collaboration Program

The Government, through the Economic Planning Unit, started to implement the Offset Management Framework proposed by MIGHT in 2004. The framework was later tested for the first time in 2005 when Malaysia Airlines purchased the engines for its new A380.

The process started with the issuance of an “Offset Requirement Document” (ORD) specifying Malaysia’s need for indirect offset to 2 bidders. The winning bidder was determined based on how the bidder satisfy the requirements of the ORD. Subsequently in 2006, an “Offset Agreement” was signed between the Government and Rolls-Royce who was selected as the supplier of Trent 900 engine.

Through the offset program, CTRM secured work packages from Goodrich worth RM16 million although having to go through competitive bidding. However, later in 2009, CTRM and Goodrich signed a RM3.5 billion contract (for work up to 2023) which made CTRM the Center of Excellence for Fan Cowl. In addition, the offset enabled AIROD to penetrate the global market by becoming Rolls-Royce Authorized Maintenance Centre (AMC) for T56 engines. AIROD also benefited through discounted fee for the AMC status.

## Chapter 5

### STRATEGY 2: Enhance the Effectiveness of Institutions that have Direct Influence on the Growth of the Industry

Government buyers, industry regulator & SME developer must remain effective in influencing the growth of the industry. Strategy 2 will be implemented as follows:

Initiative 2.1 - Promote awareness amongst the procuring Ministries on the potentials of the industry to participate in Government projects.

Initiative 2.2 - Corporatize DCA to transform it into Malaysian Aviation Authority, enabling it to expand capability in certification of aircraft parts manufactured in Malaysia within EASA framework.

Initiative 2.3 - Expand DGTA to make it capable of regulating more design & engineering activities undertaken by local industry hence, become an important facilitator of industry development.

Initiative 2.4 - Optimize the role of SME Corp in assisting the growth of hi-tech, global SMEs.

### STRATEGY 3: Harmonize Civil and Military Regulations and Promote Green Practices

Civil & military airworthiness regulations must promote and facilitate industry growth as well as green practices. Strategy 3 will be implemented as follows:

Initiative 3.1 - Harmonize civil and military airworthiness regulations / practices to unify industry certification process, simplify workforce licensing and facilitate industry innovation.

Initiative 3.2 - Empower the National Space Agency (ANGKASA) to administer and regulate astronautics related activities and satellite applications.

Initiative 3.3 - Introduce regulations that ensure disposal activities are carried out in accordance with “green” practices & standards, and promote MS ISO 50001 certification to encourage aerospace companies to adopt energy efficiency and subsequently achieve cost-competitiveness.

#### Energy Efficiency

Malaysia adopted ISO 50001 as MS ISO 50001 in October 2011. Certification to this standard is to enable aerospace companies to adopt energy efficiency in their businesses. This is critical as future growth in civil aerospace globally, with continuous drive to reduce costs, makes it necessary for manufacturers to ensure their production is competitive and energy efficient. Capacity building for industry personnel in Energy Management Systems is being provided free of charge by the UNIDO-GEF project Industrial Energy Efficiency for the Malaysian Manufacturing Sector.

### STRATEGY 4: Invest in R&T to Develop New Capabilities and Enhance Industry Competitiveness

S&T application in aerospace has to be intensified to enhance industry competitiveness and develop new capabilities. Strategy 4 will be implemented as follows:

Initiative 4.1 - Develop National Aerospace R&T Roadmap to prioritize industry-led collaborative R&T.

Initiative 4.2 - Focus aerospace R&D in “improvements in MRO processes”; “aircraft structural integrity”; “advanced manufacturing processes” (namely robotics & 3D Printing); and UAV payloads, data link, mission system, launch/retrieve for application in civil & military.

Initiative 4.3 - Invest in capability development programs in avionics, mission systems, sensors integration; Electronic Warfare (EW); Ground Systems; and missiles/rockets development.

Initiative 4.4 - Empower the Central Aerospace Engineering Services Establishment (CAESE) as the national centre for Advanced Systems focusing on avionics & equipment integration and as the national authority for Operational Test & Evaluation, and the Science and Technology Research Institute for Defence (STRIDE) as the national centre for Aircraft Structural Integrity.

Initiative 4.5 - Empower the National Space Agency (ANGKASA) to coordinate R&D in astronautics science and technology as well as satellite applications by optimizing the use of National Space Center in Banting.

Initiative 4.6 - Establish National Composite Centre (NCC), as Centre of Excellence (CoE) for composite R&T focusing on new production technologies, thermoplastics & green composites.

Initiative 4.7 - Invest in automation to reduce labour content in parts & components manufacturing.

#### Aircraft Structural Integrity Program

As part of its role to support the defence agencies, the Science and Technology Research Institute for Defence (STRIDE) has been assisting the RMAF in monitoring the life and managing the airworthiness of the airframes (aircraft structures) for more than a decade. This activity, which is part of the Aircraft Structural Integrity Program (ASIP), involve C-130 Hercules, F/A-18, Hawk 100 & 200 as well as PC-7 Mk II aircraft.

Through ASIP, the structural integrity of the aircraft is established, evaluated and substantiated. From there, the operational usage data are acquired, evaluated and utilized to provide continual assessment of the in-service integrity of individual aircraft. In addition, the program provide the basis for determining logistics and force planning requirements as well as the basis to improve structural criteria and methods of design, evaluation, and substantiation for future aircraft.

#### National Composite Centre

NCC is intended to be the national center that deliver world-class innovation in the design and rapid manufacturing of composites and facilitate their widespread industrial exploitation. The center is the collaborative effort of Majlis Amanah Rakyat (MARA), CIDB Malaysia, BOEING, Hexcel, Universiti Teknikal Malaysia Melaka (UTeM) and MIGHT as the proposed partners that will steer NCC.

Apart from a referral center for composites application in all industrial sectors, NCC will also spearhead the development of composite technology in Malaysia by coordinating all fundamental research and collaborative links with Malaysia universities. NCC will also assist to develop and coordinate training to support the skills base necessary for applying advanced and specialist composite technologies.

### STRATEGY 5: Promote Aerospace Investments through Incentives and Matching Funding

Growth momentum has to be maintained and this requires investments to be promoted via incentives & matching funding. Strategy 5 will be implemented as follows:

Initiative 5.1 - Maintain MRO & Aero-Manufacturing as promoted activities for investment promotion beyond 2020.

Initiative 5.2 - Support the growth of aerospace SMEs through matching funding for purchase of capital equipment; AS9100 / NADCAP certifications and OEM approvals; and participation in international trade shows.

Initiative 5.3 - Promote investments (FDI/DDI) in “Components MRO”; “STC Development”; “Aero-Manufacturing” (especially regional HQ for sourcing), “Aero-Engine module assembly” and other aero-product development activities.

Initiative 5.4 - Attract FDI from raw material supplier to set up warehouse in country and serve the region.

#### Components MRO

SR Technics is a global technical solutions provider in aviation industry, backed by 80 years of operational experience. The company decided to set up a facility in Malaysia in order to create additional capacity, cut costs and provide better access to customers in the Asia-Pacific region.

SR Technics (Malaysia) started its operations on January 2014 at its new Center of Excellence for component maintenance in Shah Alam. The facility covers five main product areas namely Avionics Panel, Hydraulics, Mechanical, Pneumatics and Electrical. The 150,000 sqft facility operates under the EASA, FAA and DCA approvals. The company is expected to be capable of repairing 1,200 components by 2015.

### STRATEGY 6: Attract and Prepare the Workforce of Tomorrow for Malaysia and the Region

Capable white collar and highly skilled blue collars are the workforce of tomorrow for Malaysia and the region. Strategy 6 will be implemented as follows:

Initiative 6.1 - Establish “Centre for Learning, Skill & Employment” for aerospace industry to coordinate all matters between industry & academia relating to education, qualification, Continuing Professional Development (CPD) and job placement.

Initiative 6.2 - Prepare sufficient Design Engineers with signatory status to capture bigger design & build work packages in the next generation single aisle project.

Initiative 6.3 - Establish a structured program & encourage training institution to invest in aero-structure manufacturing & large format machining emphasizing on blue collar workforce productivity.

Initiative 6.4 - Develop a structured program to continuously expose Government personnel involved in strategic Government acquisitions and Through-life Support.

Initiative 6.5 - Use the National Composite Center and CAESE as training centres for composite manufacturing and systems integration respectively, and employ ANGKASA to develop a structured human capital program with the industry and academia.

Initiative 6.6 - Encourage MRO training institutions to invest in B-2 Avionics Licensed Aircraft Engineer (LAE) programme.

Initiative 6.7 - Develop a structured program to migrate retired military workforce into civil sector.

Initiative 6.8 - Employ DCA appointed Independent Aircraft Engineering Assessors (IAEA) to recognize the working experience of new entrants and expedite the aircraft maintenance engineer licensing process.

#### Blue Collar for Composites Aerostructure Manufacturing

In an effort to increase the number of trained personnel in composites manufacturing, CTRM together with KKTM Masjid Tanah developed the Blue Collar Program under industrial attachment for Diploma in Polymer Composite Processing Technology. The 6-month program is based on twice a year intake and a confirmed staff status upon completion of the program.

The first intake in 2013 involved 15 students from KKTM Masjid Tanah and followed by the second intake of 40 students from KKTM Masjid Tanah, KKTM Balik Pulau and MISDEC. As part of the National Composite Center network, KKTM Masjid Tanah will play crucial role in preparing the future workforce for the aerospace industry.

### STRATEGY 7: Capture New Market and Strengthen Local Supply Chain

Expand current business, capture new markets and enhance capacity of local supply chain. Strategy 7 will be implemented as follows:

Initiative 7.1 - Leverage on Bi-Lateral relationships to access bigger defence regional market.

Initiative 7.2 - Offer Fleet Technical Management / Part 21 Design Services<sup>14</sup> to local and regional airlines and aircraft owners.

Initiative 7.3 - Attract OEMs to the Asia Aerospace City (AAC) as their offshore centre for engineering services.

<sup>14</sup> Part 21 - Approved Design Organization by DCA

Initiative 7.4 - Explore new markets in aerospace systems re-manufacturing and end-of-life aircraft disposal.

Initiative 7.5 - Increase the number of certified SMEs at Tier 3 and 4 to undertake detailed parts and tooling/jigs manufacturing, including migrating players from other sectors.

Initiative 7.6 - Set up the Central Secondary Process facility to serve the increasing number of Tier 3 and 4 metal players.

Initiative 7.7 - Expand Malaysia International Aerospace Center (MIAC) role to enable MIAC Subang to be the preferred integrated hub for aviation services and aerospace park; an example to other centres in Senai and Melaka.

**Malaysia International Aerospace Centre**

Lapangan Terbang Sultan Abdul Aziz Shah (LTSAAS) or Subang Airport was transformed into MIAC in 2004. It was following the Malaysian Aerospace Council decision to maximize MRO and GA activities and retain only scheduled operations that use turbo-prop aircraft in Subang.

MIAC houses 6 clusters of activities namely MRO, helicopter center, GA center, aerospace training center, aerospace technology center and commercial support facilities. To date, there are 48 companies operating their businesses in MIAC. Skypark, Spirit Aerosystems and Airbus Helicopters are the main tenants.

**BLUEPRINT IMPLEMENTATION**

In order to ensure the implementation of the blueprint resulted in the desired outcomes, key performance index (KPI) are assigned for each focus area in accordance with the target of the specific objectives. The achievement of the KPIs will be analysed every five years, in line with the Malaysian Plan cycle. Appropriate follow-up actions will be taken either by re-strategizing or modifying or increasing the number of initiatives to ensure the 5-year targets are achievable and on track.

The key initiatives will be implemented in three major timelines namely short-term (less than five years), medium-term (between five to 10 years) and long-term (more than 10 years) as per Table 5.3.

*Table 5.1: Overall Implementation Timeline*

Focus Areas	2015	2020	2025	2030
Maintenance, Repair and Overhaul (Global Market Share)	3.0 %	3.5 %	4.0 %	5.0 %
Aerospace Manufacturing (Position in South East Asia)	No. 2	No. 2	No. 1	No. 1
System Integration (Local Content)	10 %	30 %	50 %	70 %
Engineering and Design Services (Global Market Share)	0.03 %	2 %	3.0 %	3.5 %
Aerospace Training and Education (Position in South East Asia)	-	No. 1	No. 1	No. 1



CLOSING

The Malaysian aerospace industry has set its course for the next 15 years to become the number one aerospace nation in South East Asia. The blueprint has laid out appropriate initiatives based on the strategies adopted to achieve the specified objectives. Graphically, the flight path for the Malaysian aerospace industry for the next 15 years is as shown in Figure 5.2.

The commitment of all stakeholders to implement the initiatives of the blueprint is critical to the success of the industry as well as the nation. With the right attitude, entrepreneurial instinct and political will, the aerospace industry in 2030 will be a strong high technology sector that supports the complete aero-systems life cycle and an important economic activity for Malaysia.

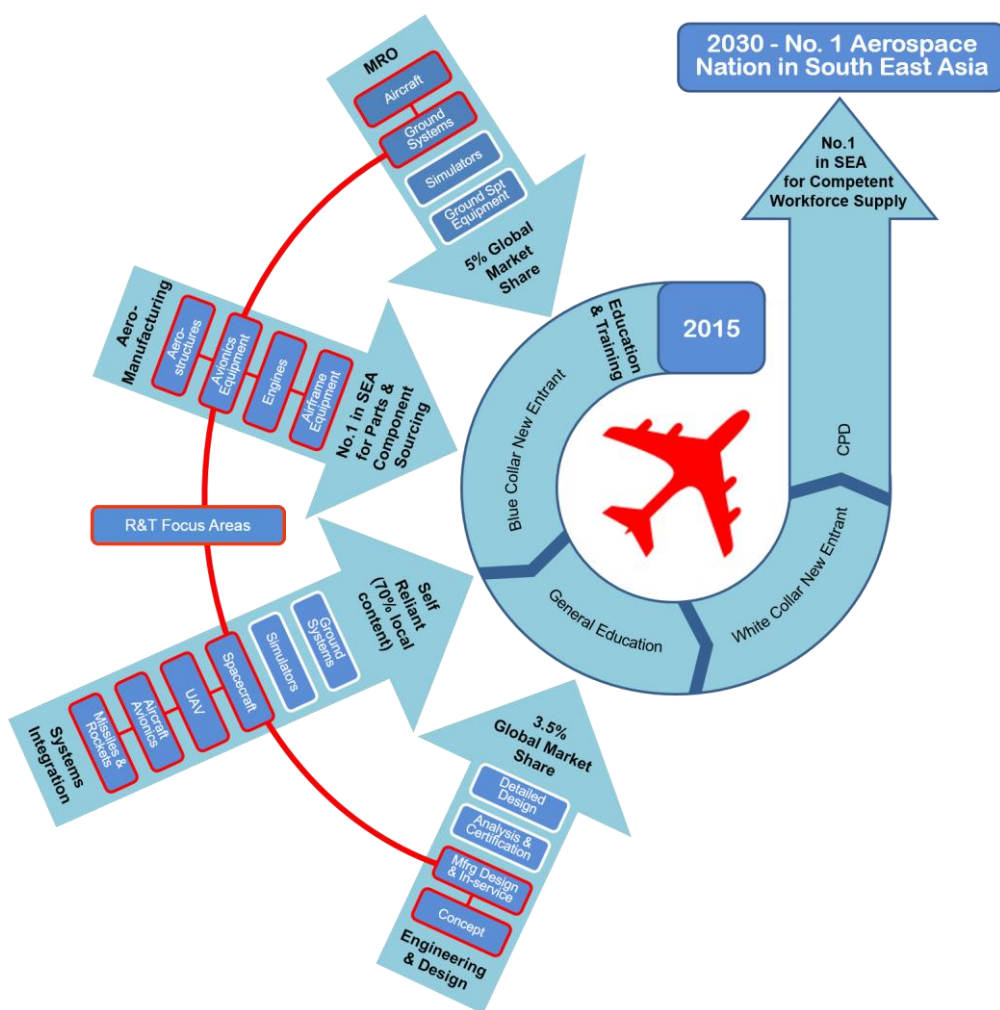


Figure 5.2: Malaysian Aerospace Industry Blueprint 2030

## Blueprint 1997 Implementation Status Summary

No.	Recommendation	Status of Implementation
1.	Government to accept the framework for aerospace industry in Malaysia	The general framework for the Malaysian aerospace industry was accepted by the Cabinet in 1997.
2.	To establish the Malaysian Aerospace Council (MAC)	<ul style="list-style-type: none"> <li>• MAC was officially established on 8<sup>th</sup> May 2001.</li> <li>• To date, the MAC has met 7 times since its 1<sup>st</sup> meeting in 2001 and the last meeting was held on 1<sup>st</sup> Dec 2010.</li> </ul>
3.	To upgrade Department of Civil Aviation (DCA) to Malaysian Aviation Authority (MAA)	<ul style="list-style-type: none"> <li>• DCA has still yet to be upgraded to MAA.</li> <li>• The same initiative is being implemented in the Entry Point Project 1 (EPP1), Business Services NKEA under the Economic Transformation Programme (ETP).</li> </ul>
4.	To establish a National Aerospace Coordinating Body (NACB)	<p>NACB was not institutionalised however, the role is scaled down and carried out by MIGHT as the Secretariat to the MAC. Among its activities include to:</p> <ul style="list-style-type: none"> <li>• conduct industry intelligence &amp; research;</li> <li>• establish &amp; maintain Malaysian aerospace industry database and publish Malaysian Aerospace Industry Report biennially;</li> <li>• conduct specific study on aerospace industry covering MRO, aero-manufacturing, aircraft systems integration, human capital development, research &amp; technology, incentives, aerospace parks and etc.;</li> <li>• (through MIGHT Interest Group (MIG) platform) to consensually prepare proposals, memorandums and industry updates to be presented to the MAC;</li> <li>• monitor implementation of MAC decisions;</li> <li>• coordinate with relevant Government agencies on industry development activities such as promotion of aerospace investment, human capital development program, research &amp; technology development initiative and etc.; and</li> <li>• propose aerospace-related offset program undertaken by the Technology Depository Agency (TDA).</li> </ul>
5.	To undertake an industry inventory exercise	<ul style="list-style-type: none"> <li>• The study was implemented and 1<sup>st</sup> report on aerospace inventory was published by MIGHT in 2001.</li> <li>• MAC Secretariat further developed the inventory to become a comprehensive Malaysian aerospace industry database in 2003.</li> <li>• The database was later made available online in 2007 (<a href="http://www.might.org.my/aironline">www.might.org.my/aironline</a>).</li> </ul>
6.	To establish the National Human Resource Development Programme (NHRDP)	<ul style="list-style-type: none"> <li>• A training program known as Graduate Reskilling Scheme (GRS) was initiated by the Economic Planning Unit (EPU) in 2003. Later in 2005, the GRS program was parked under the Ministry of Finance and renamed as Industrial Skills Enhancement Program (INSEP) with the objective to improve graduates employability, adaptability and marketability by enhancing their skills and knowledge through reskilling program on specific technology/industry. Aircraft Maintenance Engineering (AME) is one of the training programme conducted under INSEP.</li> <li>• Following the investment of Spirit Aerosystems (a Tier 1 aero structure manufacturing company), an Advanced Composite Training Center (ACTC) was established at UniKL-MIAT in 2009. The purpose of this organization is to provide training to Spirit's workforce on aircraft parts sub-assembly skills. ACTC is now offering specific short courses on composites manufacturing and assembly not only to the</li> </ul>

No.	Recommendation	Status of Implementation
		<p>aerospace industry players, but also to the composites industry community.</p> <ul style="list-style-type: none"> <li>A special bridging program known as “Leader in Domain Expertise for Aerospace (LEADER Aerospace)” was launched in 2010. The main objective is to train engineering graduates to become aerospace structures Stress and Design engineers through industry collaboration between SPIRIT Aerosystems Malaysia, CTM and STRAND.</li> </ul>
7.	To rearrange the aerospace industry to form the National Aerospace Industry Structure	The restructuring has been implemented resulted from the decision made by the MAC. The overall structure and focus areas of the Malaysian aerospace industry were defined and rationalised into four (4) focus areas as Maintenance, Repair & Overhaul (MRO); Parts and Components Manufacturing; Avionics & System Integration; and Aerospace Training & Education.
8.	To set a National Technology Capability Targets Timetable (NTCT)	<ul style="list-style-type: none"> <li>NTCT has been developed in the form of a technology database which consists of consolidated information extracted from market intelligence and research activities. The database stores information about the industry sub sector list, application of the technology, name of the technologies, the current status and the prospects. The database also stores information about priority areas, available resources, and market, industry and Government aspirations. In addition, the database holds information about preliminary landscape evaluation and assessment on selected focus areas. The database is dynamic in nature, whereby information is updated continuously.</li> <li>From the database, the stakeholder will be able to identify suitable offset requirements and register their technology needs with Offset Program Management Office on their technology requirement deemed relevant to the capital purchase.</li> </ul>
9.	To initiate Phase 1 of the National Aerospace Development Strategy to focus on aircraft upgrade capability	<ul style="list-style-type: none"> <li>This phase was implemented through contract awarded by the Ministry of Defence to a local company for the F-5 jet fighter avionics system upgrade in 1998. However, the project failed to achieve its intended objective.</li> <li>Development of capabilities to upgrade and modify aircraft was successfully implemented through a contract awarded by the Ministry of Defence to Airod Sdn Bhd for the stretching of C-130 aircraft fuselage.</li> </ul>
10.	To consolidate the National Light Aircraft manufacturers into a single entity called CLAS	Consolidation did not take place based on the Council’s decision in 2001 to focus on parts and components manufacturing only.
11.	To liberalise support services in GA such as fuel supply	<ul style="list-style-type: none"> <li>The liberalisation of this services was implemented subsequent to the 3<sup>rd</sup> MAC meeting in 2004 that approved the plan to develop Malaysia International Aerospace Centre (MIAC) Subang as a hub for General Aviation. <ul style="list-style-type: none"> <li>Skypark Sdn Bhd (Skypark) has developed a Fixed Based Operator (FBO) centre and Regional Aviation Centre under this initiative at old Terminal 3 of Subang Airport; and</li> <li>Another independent FBO in Subang is Aerodome which serves mostly Business and Private Jets owned by Malaysian Corporation and Businessman.</li> </ul> </li> <li>The liberalisation of GA support services also implemented after the establishment of an FBO centre by Senai Airport Terminal Services (SATS) to capture the Southern Region markets including Singapore.</li> </ul>

No.	Recommendation	Status of Implementation
12.	To ensure that from 1996 onwards, National Research and Development will be industry-led	This recommendation was implemented through the establishment of the Aerospace Malaysia Innovation Centre (AMIC) following the decision of the 7 <sup>th</sup> MAC meeting in 2010. The centre is focussed on research & technology (R&T) and is led by CTRM, Airbus and Rolls-Royce with the participation of other industry players, universities and research institutions.
13.	To expand and expedite the programme for procuring the services of selected top scientists	AMIC implement this recommendation according to the requirements of R&T projects. Airbus has placed a scientist as a permanent staff at AMIC to ensure R&T projects are in accordance with the industry needs.
14.	To establish a National Space Programme (NSP)	<p>The draft National Space Policy has been prepared by the National Space Agency (ANGKASA). The programmes implemented by the agency include:</p> <ul style="list-style-type: none"> <li>• Satellite Development Projects: TiongSAT and Razak-SAT;</li> <li>• Remote sensing satellite applications by ARSM and broadcasting satellite application by MEASAT;</li> <li>• Establishment of National Space Centre in Banting;</li> <li>• Establishment of National Space Observation Centre in Langkawi; &amp;</li> <li>• National Astronauts Programme and Scientific Research at International Space Station (ISS).</li> </ul>
15.	To establish the Aerospace Technology Institute of Malaysia (ASTIM)	Accomplished through the establishment of the Malaysian Institute for Aviation Technology (MIAT) in 2000, now under University Kuala Lumpur (UniKL) governed by MARA.
16.	To identify a very small number of selected companies as National Defence Contractors	The companies were identified through the implementation of the RMAF Contractorisation Program in 1998 after the approval given by the Ministry of Defence and Ministry of Finance.
17.	To establish a large consortium to lead Malaysia's entry into "systems integration"	A consortium of three (3) companies was established in 2005 to develop the unmanned aerial vehicle (UAV) programme. Unmanned System Technology (UST) was incorporated to undertake the national UAV program.
18.	To establish an engineering stream at school level	Technical engineering stream was introduced at vocational colleges & technical schools under the Ministry of Education (MOE). Special contracts also given to private training institutions to train vocational students to qualify for aircraft maintenance license.
19.	To maintain a National Advanced Composites Register	Composites Industry Database was developed by MAC Secretariat in 2008 and continuously updated as part of MIGHT's advanced material initiative.
20.	To establish a National Advanced Composites Advisory Committee (NACAC)	NACAC was established through MIGHT Interest Group (MIG) for Composites Industry to discuss industrial development issues which subsequently lead to the establishment of <i>Persatuan Industri Komposit</i> (PIK) in 2010.
21.	To initiate a Composites Procurement Programme	Programmes to promote the use of composite in other industry than aerospace were conducted through International Conference on Composite Materials and nano-Structures (IC2MS) in 2006 & 2008 and SAMPE Asia Conference in 2010 & 2012. Now it is continued through JEC Composites yearly exhibition in Singapore.
22.	To establish a Regional Aerospace Composites Repair Centre	The centre was established by CTRM Aviation Sdn Bhd to expand its business into composite component repairs. MAS is collaborating with Pratt & Whitney (P&W) to establish Composite Repair Facility for nacelle structures.

No.	Recommendation	Status of Implementation
23.	To expand the number of key domestic players in Advanced Composites	<ul style="list-style-type: none"> <li>• Domestic players in advanced composite are now not only limited to those in aerospace, but also those in other industries such as maritime, defence &amp; security and construction.</li> <li>• The Government also put an effort to increase the number of industry players by acquiring an aircraft composite manufacturer (Lancair) based in Bend, Oregon in 1996. The company was later sold to Cessna in 2008.</li> <li>• Composite City in Melaka which provides specific area for the development of an industry cluster is not only occupied by CTRM (aerospace) but also DK Composites (composites domes, marine craft and architectural structure).</li> </ul>
24.	To establish a National Vendor Development Programme for the aerospace industry	National Vendor Development Program is established through the existing Government procurement policy that is also enforced on Government linked companies.
25.	To build a large vendor base to supply parts and components	<p>A larger vendor base has been successfully built through the following programmes:</p> <ul style="list-style-type: none"> <li>• A400M industrial participation programmes;</li> <li>• Trent 900 Offset Programme;</li> <li>• EC-725 Offset Programme; and</li> <li>• FDI by Spirit Aerosystems (Europe), Honeywell Aerospace Avionics (USA) and Singapore Aerospace Manufacturing (Singapore) – i.e. leveraging on FDIs to localise the supply chain.</li> </ul>
26.	To promote the development of General Aviation (GA)	<ul style="list-style-type: none"> <li>• Development of GA was promoted by the establishment of the Malaysian Sports Aviation Federation (MSAF) in 2003 under the patronage of MIGHT and the Department of Civil Aviation Malaysia (DCA).</li> <li>• New incentive package for aerospace industry announced by the Government in December 2009 included incentive for GA (effective until 31<sup>st</sup> December 2014).</li> <li>• Promotion on GA is carried out by MSAF through air carnivals organised throughout the country.</li> </ul>
27.	To establish a support system to enhance GA in Malaysia	Inculcations of aviation culture among the general population is implemented continuously by MSAF with the support of the Ministry of Youth and Sport and flying clubs all over the country.
28.	To carry out a feasibility study into the development of a spaceport	The study was not undertaken.
29.	To develop and implement satellite applications in defence/civil programmes	Satellite application for remote sensing has been successfully implemented through Tiong-SAT and RazakSAT projects. Application for position determination is using Global Positioning System (GPS) owned by USA, Galileo owned by the European Union and BeiDou Navigation Satellite owned by China.
30.	To establish a National Surveillance Programme using satellite-based technology	The program was implemented employing Sentinel Asia satellite for disaster surveillance and Cospas-Sarsat for management of search and rescue (SAR).
31.	To develop a National Geomatics Satellite to serve Malaysia's civil and military needs	Developed as per recommendation no. 29.

No.	Recommendation	Status of Implementation
32.	All companies classified as Prime National Contractors must establish R&D centres	The recommendation was not successfully implemented although research and development is part of condition for award of long term contracts by the Ministry of Defence.
33.	To establish a National Procurement Policy	The Ministry of Finance (MoF) has implemented and enforced procurement policy that is local product, local services and local technology friendly especially on defence acquisitions, privatisation projects, procurement of spares and mega projects. Revised Policy and Guidelines on Offset Programmes in Government Procurement was undertaken in 2011. The latest Industrial collaboration Programme policy was introduced by MoF in Dec 2014.
34.	To create a pool of Prime Defence/Civil Contractors	To date, there are more than 100 companies involved in aerospace industry either supporting the defence or civil aviation industries in Malaysia.
35.	To develop a National Defence Philosophy which will influence the role of Aerospace Development	<ul style="list-style-type: none"> <li>• The philosophy has been put into practice by the Ministry of Defence through the establishment of the Malaysia Defence Industry Council (MDIC) and Defence Industry Division in 1999 in order to ensure the development of defence sector has influence over the development the aerospace industry.</li> <li>• In 2009, MDIC has increased its scope and subsequently upgraded into Malaysian Industry Council for Defence, Enforcement and Security (MIDES).</li> </ul>
36.	To establish the National Aerospace Technology Acquisition Plan (NATP)	<ul style="list-style-type: none"> <li>• Aerospace technology acquisition activities were implemented in the early 90s when the Government bought foreign companies such as Eagle Aircraft from Australia and Lancair from USA. Through this effort, the national capabilities in advanced composites have been upgraded from “wet lay up” to “pre preg” technology. This later enabled CTRM to enter the global market by supplying composite aircraft parts to Airbus.</li> <li>• Even though the NATP was not drafted, this recommendation was implemented as per recommendation no. 8 and technology acquisition is undertaken on opportunity basis through offset programmes.</li> </ul>
37.	To develop further infrastructure facilities for GA (arenas and airstrips)	<ul style="list-style-type: none"> <li>• Infrastructures were built to promote GA such as small air strips at Sungai Bernam and Sungai Rambai.</li> <li>• To date, two (2) airstrips and three (3) heliports are registered under private aerodromes.</li> </ul>
38.	To vertically integrate vocational schools, polytechnics & technical universities	The integration has been implemented as a resulted of the local institutions offering technology based courses up to degree level. The Government has also established the Malaysian Technical University Network (MTUN) and coordinate all TVET institutions in a centralised manner.
39.	To establish KLIA at Sepang as the region’s Transportation Hub	Kuala Lumpur International Airport (KLIA) has yet to be the region’s transportation hub. However, it’s now Malaysia’s transportation hub for both passenger and cargo.
40.	To establish a Civil Air Patrol and an Air Force Reserve Officer Corps	Not implemented/ established.
41.	To promote the formation of aerospace clubs at school level	Aerospace activities at schools and colleges are actively promoted by the Malaysian Sports Aviation Federation (MSAF), ANGKASA and Space Tourism Society Malaysia Chapter (STS-MC).

## Appendix

No.	Recommendation	Status of Implementation
42.	To establish the Malaysia Agency for Space Administration (MASA)	The National Space Agency (ANGKASA) was established in 2002 to take the leadership and monitor the development of space sector in Malaysia. It is responsible for the development of space science, technology and industry as well as assisting the Government in formulating and executing the National Space Policy.
43.	To create a large Original Equipment Manufacturer (OEM) base	<ul style="list-style-type: none"> <li>• The establishment of local aerospace manufacturer producing product under its own brand was not successful.</li> <li>• This recommendation is no longer relevant due to the success of recommendation no. 25 after Malaysia brought in three (3) Tier 1 OEMs namely Spirit Aerosystems, Honeywell Aerospace Avionics and SAFRAN Messier-Bugatti.</li> </ul>
44.	To establish a National Satellite Programme (NSP)	The National Satellite Programme is implemented based on the National Space Programme (recommendation no. 14)
45.	To develop industrial and technological capability through the NSP	Technology and industry capability has been developed through RazakSAT development contract awarded to Astronautic Technology Sdn Bhd (ATSB).

Source: *MIGHT*