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MiGHT
Malaysian Industry-Government Group for High Technology

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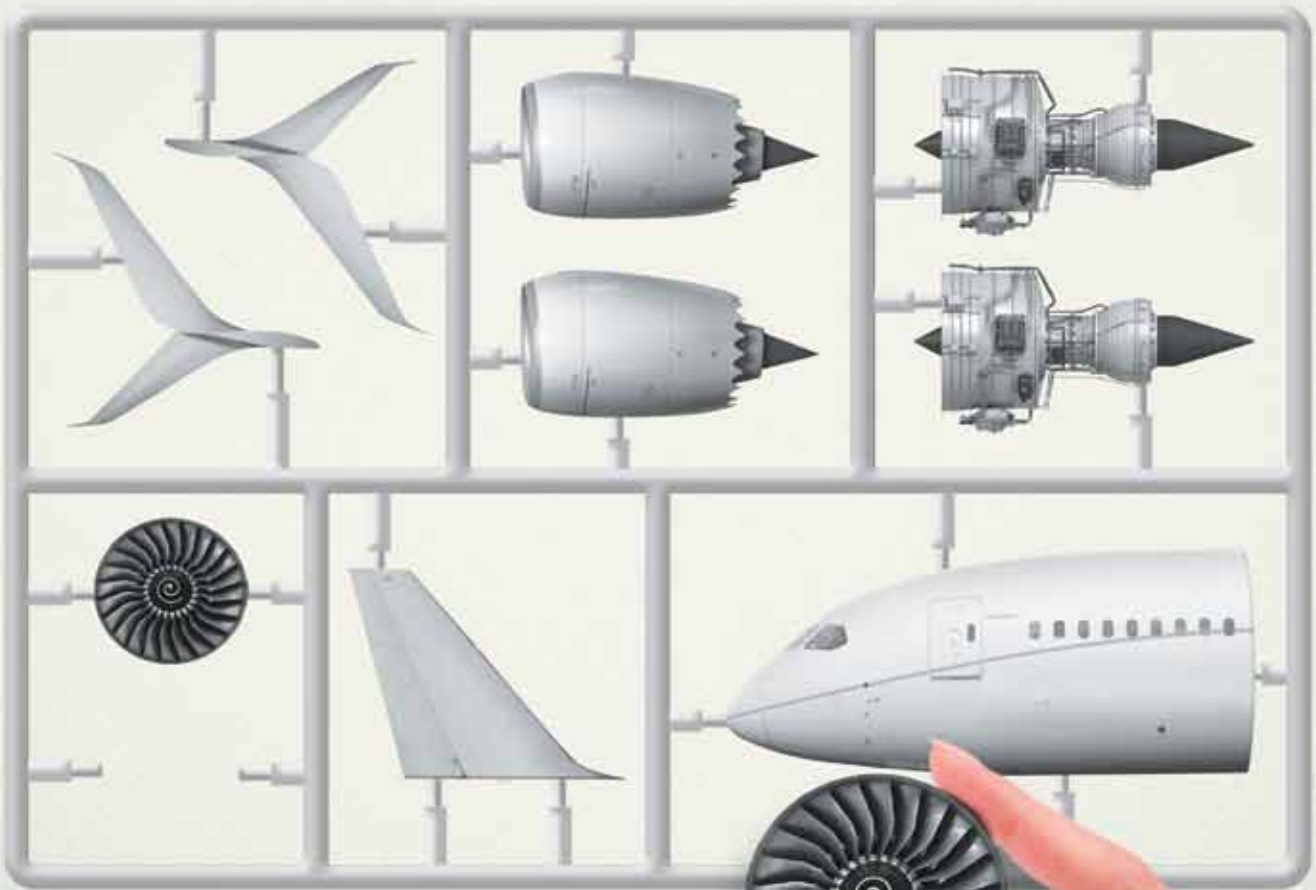

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Malaysian Aerospace Industry
Through Research & Technology (R&T)

In conjunction of:

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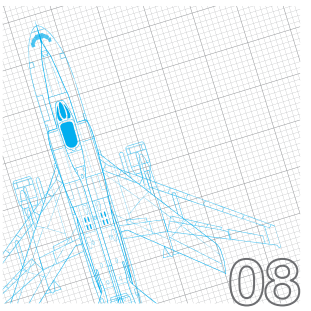

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myForesight is a pioneering national level initiative dedicated to the prospecting of technology for business through the field of Foresight. It provides a common Malaysian based platform for the Government, Industry and Academia to share experiences, insights and expertise on the strategic futures issues, both at the loyal and global levels.

Its key components to its mission are intelligence, research, competency and community. myForesight® raison d'etre is to accomplish the following:

1. Shaping Malaysia's future possibilities;
2. Promoting and mainstreaming of foresighting in national, sectoral and corporate planning;
3. Identification of key technologies to support sectoral development;
4. Identification of key and potential industries from technology perspective.

editor's note

All these points to the fact that the intensification of Science & Technology (S&T) activities is required to drive industry forward. This is precisely what Science to Action (S2A) agenda is all about since it requires the whole nation to take up the challenge for all of us to work unanimously towards achieving our goals through exploitation of S&T.

Greetings & Salutation,

Time really flies! We are now almost entering the second quarter of 2015 and works are already piling up. Function and conference rooms are fully booked for March onwards. We at myForesight® are working frantically towards achieving the deadlines and fulfilling KPIs.

Langkawi International Maritime & Aerospace Exhibition (LIMA) is here again and I can see our colleagues rushing and going through reports and logistic matters. Then it occurs to me that it has been almost 18 years ago, MIGHT launched the first National Aerospace Industry Blueprint. MIGHT, as a consensus building organization can proudly state that 80% of the recommendations from the blueprint has been implemented and undertaken. This was achieved through collaborations and partnership with various ministries, government agencies, institutions of higher learning, academicians as well as the private sector; all sharing the vision and mission in trying to drive the industry forward. The industry since has evolved tremendously by leaps and bounds and through advancements of technology, opportunities are aplenty. It is projected that the industry will generate future revenue of more than RM35 billion, this will definitely give birth to more employment opportunities. We are looking at more than 32,000 skilled workforces. Nonetheless, let's not forget that there are still more room for improvement and it is timely for us to revisit and update the direction of the industry if we wish to remain as an integral part of the aerospace industry ecosystem. These may include many more hard works which includes acquisition of advanced technology as well as conducting industry-led research.

Interview with Datuk Ir. Kamarulzaman Zainal on his take of the sector as well as more

by RUSHDI ABDUL RAHIM
Director
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Initial Thoughts

viewpoints from multiple stakeholders and players of the aerospace industry provides us with the current and future scenarios of this sector.

As for the maritime industries, the ship building ship repair (SBSR) industry aims to generate approximately RM6.35 billion in the Gross National Income (GNI) and provide 55,000 jobs. In 2013 the industry recorded revenue of RM8.36 billion with employability of 35,000 and it has been growing ever since. It's is a known fact that the marine industry is the backbone of the Oil & Gas sector as it contributes greatly on the transportation, exploration and production activities. We can expect more growth from this sector with further development from the O&G sector. We foresee that Malaysia has the potential to emerge as the hub for building and repairing high value-added vessels and assets such as drilling ships, floating production storage and offloading (FPSO), floating liquefied natural gas (FLNG), jack-up rigs, mobile offshore production unit (MOPU) and LNG-powered vessels. This could be done through the enhancement and advancement of local design and implementation of new technologies.

All this points to the fact that the intensification of Science & Technology (S&T) activities is required to drive industry forward. This is precisely what Science to Action (S2A) agenda is all about since it requires the whole nation to take up the challenge for all of us to work unanimously towards achieving our goals through exploitation of S&T.

The Trent 900 Offset Programme is one of the successful efforts in harmonizing the S&T and industry development. It is the first of its kind commercial offset program which was triggered from an engine procurement program from Rolls-Royce to be fitted on the new Airbus A380 aircraft used by Malaysian Airlines (MAS).

I end this issue with best wishes to all our readers out there and hope that you'll enjoy the new look we presented. As always, we welcome any inputs, opinions and article contribution. Thank you.

leader's insight

in person with...

DATUK IR. KAMARULZAMAN ZAINAL

Senior Vice President, Industry Intelligence Malaysian Industry-Government Group for High Technology (MIGHT)

Airbus would further develop its presence in Malaysia by expanding its joint-venture maintenance unit, Sepang Aircraft Engineering (SAE), and setting up its new wholly-owned Airbus Customer Services Centre adjacent to the SAE facility at KLIA.

National Aerospace Industry: how it's started and where it's headed to?

The first National Aerospace Industry Blueprint which was launched in 1997, have provided us a foundation to be a serious player in the aerospace industry since the past 17 years. Through continuous efforts from multiple players and stakeholders, we have achieved significant percentage of what lies in the blueprint. Along with the rapidly growing industry, we already left the infant phase and are now ready to dwell into more complex and sophisticated activities. We should focus and invest more in technology related activities and application of science in the industry instead of just on revenue generating activities.

80% of the recommendations in the previous Blueprint was successfully implemented due to its suitability. However, the remaining 20% are not pursued due to reasons such as unsuitable or irrelevant to the then industry, the recommendation was not supported by the decision makers; and lack of appropriateness due to some concerns and issues faced by the industry.
Generally, our main target to be a regional player in aerospace industry is achieved, although the percentage of implementation of each recommendations may vary from one to another. Among the achievements are including the success of bringing in renowned players such as Airbus, Spirit Aerosystems and Honeywell to do their business and investment here in Malaysia. There are also local companies that are recognised and actively involved in the global supply chain as a result of foreign investment. As of today, the industry has contributed RM11.2 billion to the country's GDP.

We added some new flavours in the new blueprint in terms of the activities and scope of work which created a paradigm shift for Malaysian aerospace

Through investment, sharing risk with OEMs and, participate in new programmes - will secure us a spot and ensure continuous incoming lucrative businesses. Bear in mind that the cycle might be as long as 50 years, that surely will secure employability for half generation of workforces!.

ecosystem: (1) we now need to be more focused and selective. We want to add value to the current activities by involving in the early phases of aircraft lifecycle and looking in depth on the technicalities, (2) emphasis should be given to the revenue and number of high income employment to be created by 2030, (3) engineering and design services as the new areas of opportunities for the white collars professionals to venture in.

In general, the Blueprint 2030 aim to triple the industry's sub sectors size and close monitoring will be given on the implementation plan to ensure the industry is on track and synchronised with the action plan timeframe. We highlighted again the importance of establishing a dedicated entity to coordinate the overall implementation plan and monitor the development of the industry. This specific body will act as the secretariat and will be reporting to the Malaysian Aerospace Council (MAC) who is responsible to steer the aerospace industry in Malaysia. Perhaps, MIGHT could expand its role after this.

As the industry matures, there is a tendency for the government to no longer intervene. How do you see this…fame or shame to the industry?

In Malaysia, government intervention is required for strategic industry such as aerospace. Therefore, to reduce the burden to the government, establishment of the earlier mentioned entity will assist to provide effective coordination works of implementation of the recommendations as well as positioning the private sectors and businesses in a wholesome manner. This new business approach will be able to enhance the industry power, and poise it as one big smart partnership team where everyone can share the big cake.

Markedly, the government will intervene and control on the future and policy direction in critical areas such as award of contracts in government purchases and offset management. We need to ensure that our local players are growing and advancing further, but at the same time we still require smooth operation in dealing with the B to G and G to G business with foreign and more advanced companies. These kind of decisions will provide balance to the industry to remain competitive in the long run.

Positioning Malaysia at the Global Arena

The Malaysian aerospace industry has a lot of potential; we need to have a different mindset and attitudes; both the end clients as well as the service providers. The locals or end users have to trust and support local innovation. Past records showed that the end users, be it the military or commercial sectors, have preferences towards foreign solutions and products. We have little trust on our local capability and this should change!

Let's learn from the UAV case back in 2007, when the government put faith in consortium of three companies - CTRM, Ikramatik and Sys Consultancy Service (SCS), to produce national UAVs. The products were deployed, on operational basis with the aim to undertake surveillance task to curb the infiltration of illegal immigrants from neighbouring countries into Sabah. Providing that kind of chance to the local products, not only to assist and cater niche area in defence and enforcement activities, but also to act as a platform to prove the capability of the local products and solutions. Once we have trust from our own users on our own indigenously developed technologies, products and solutions; the route to global market should be easier. After all, taking more risk is a challenge to any high technology industry.

Many did not realise that we are exporting significant local talents to Singapore and the Middle East. Global community have recognised our talents and professionals, and human capital development is no issue for the aerospace industry in Malaysia.

With the new generation aircraft to come, we should be in position to participate and invest in potential international aircraft programmes to secure incoming business. We have

done it once through the purchase of A400M transport aircraft for the military. We played an important role as a programme partner with Airbus in producing certain parts of the aircraft, and it took almost 10 years since the launching of the programme until the first A400M being produced.

Through investment, sharing risk with OEMs and, participate in new programmes - will secure us a spot and ensure continuous incoming lucrative businesses. Bear in mind that the cycle might be as long as 50 years, that surely will secure employability for half generation of workforces!.

The Future

Tripling the revenue generated will not promise to triple the number of employment in the industry. Is it a threat? Well, in the future, level of complexity and sophistication of works will cause introduction and familiarisation of automation and reducing demand for manual labours. On the other hand, there will be more opportunities for players to become more competitive and strategic in terms of cost, quality and delivery. The future landscape is expected to attract more engineering and design services, manufacturing activities and inviting more airlines to Malaysia for MRO. The future will be exciting for the youth and young people to be part of this industry.

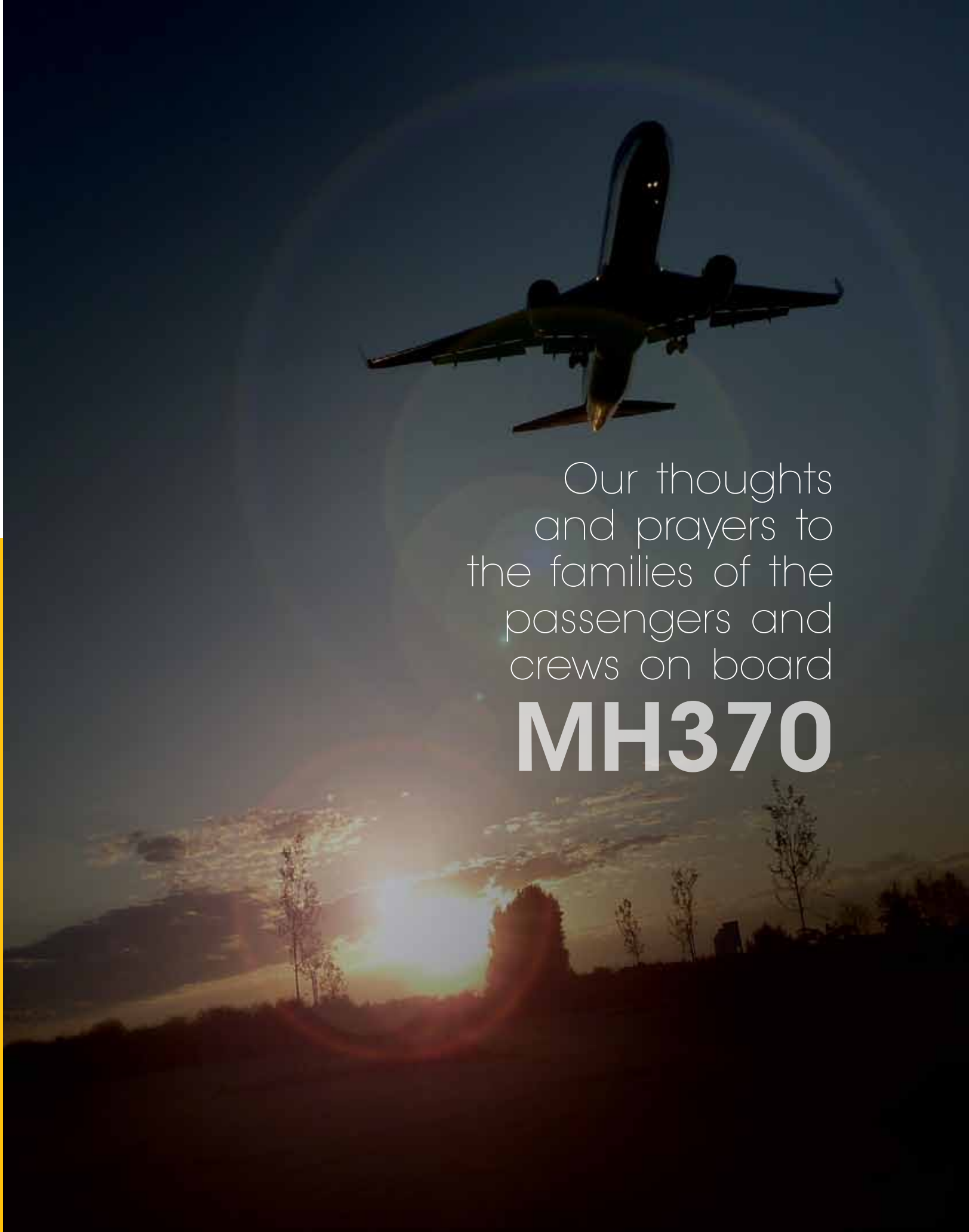
To be a global player is not an overnight process. We make mistakes and learn from it, we take risk by investing in it. We might lose the bet. Economically we might lose but we gain new experiences, new lessons. The previous Blueprint have brought us where we are now, and the next 15 years will definitely be much more challenging.

Markedly, the government will intervene and control on the future and policy direction in critical areas such as award of contracts in government purchases and offset management. We need to ensure that our local players are growing and advancing further, but at the same time we still require smooth operation in dealing with the B to G and G to G business with foreign and more advanced companies. These kind of decisions will provide balance to the industry to remain competitive in the long run.

Datuk Ir. Kamarulzaman Zainal has vast experience and has significantly contributed to the development of the national aerospace industry through Malaysian Aerospace Council (MAC). Recently, myForesight® has had the opportunity to interview him on the future landscape of the local aerospace industry and the new Malaysia Aerospace Industry Blueprint 2030.

He previously served the Royal Malaysian Air Force (RMAF) from 1985, performing various technical duties in the areas of aircraft maintenance, repair and overhaul (MRO); weapon systems logistics management; design & development as well as airworthiness regulation and retired after 21 years of military service at the rank of Lieutenant Colonel RMAF.

Since September 2002 to date, Kamarulzaman has been with the Malaysian Industry-Government Group for High Technology (MIGHT) and is currently the Senior Vice President (Industry Intelligence) and responsible for the development of aerospace, maritime and rail industries.


Our thoughts
and prayers to
the families of the
passengers and
crews on board
MH370

cover story

by **SHAMSUL KAMAR ABU SAMAH**
Chief Executive Officer,
Aerospace Malaysia Innovation Centre (AMIC)

Advancing Malaysian Aerospace Industry

Through Research & Technology (R&T)

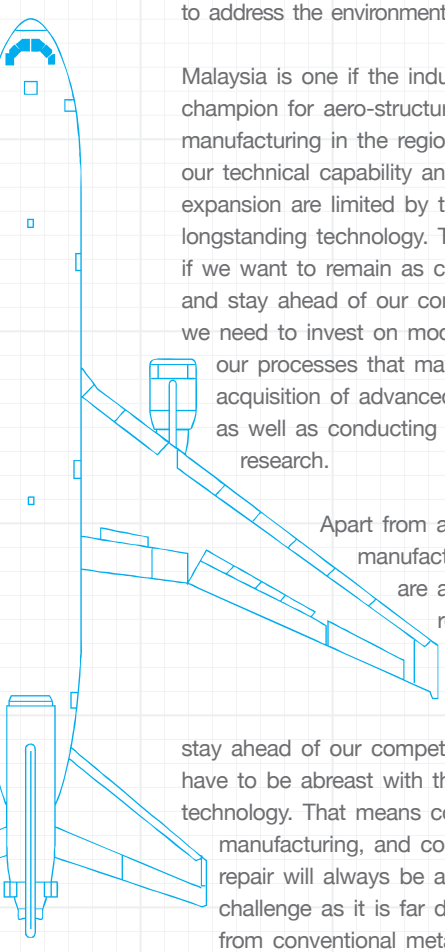
The newly developed Malaysian Aerospace Industry Blueprint 2030 is a manifestation of Malaysia in becoming a regional champion by year 2030. The blueprint outlined strategic approaches by all stakeholders involving Government agencies, industry players, research institutes and academia. Targeting to generate more than RM35 billion industry revenue with 32,000 workforces; the plans require a robust facilitation by all stakeholders covering among others industry policies, institutional framework, investments, talent development, capturing new market and research & technology (R&T).

The evolution of aerospace technology has been tremendous and the potential for future growth is enormous. The advancements of technology have taken the industry to many new levels of opportunities. In order to survive in this business as well as to sustain our competitiveness at the global arena, we have to enrich the industry through adoption of advanced technologies. One of the key success factors is to further accelerate industry-led R&T activities by modernizing our technology and processes; especially in aerospace manufacturing and MRO.

Future aircraft are expected to utilize more advanced material and technologies. This is a clear indication of changes in the future aircraft production and MRO activities. Therefore, we need to look into latest technology related to innovative manufacturing, robotic, automation, composite repair, analysis, redesign and so on. It is anticipated that more composite materials are likely to be used in the new aircraft. Even today, more than 50% of A350, 30% in A400M and 25% of A380 are composite parts. Utilisation of composite materials is among the

potential areas being explored by the OEMs to reduce the weight of the aircraft and to increase efficiency that would lead to minimal fuel consumption to address the environment concern.

Malaysia is one if the industry champion for aero-structure manufacturing in the region. However, our technical capability and business expansion are limited by the longstanding technology. Therefore, if we want to remain as champion and stay ahead of our competitors, we need to invest on modernizing our processes that may include acquisition of advanced technology as well as conducting industry-led research.



Apart from aero-structure manufacturing, we are also the regional leader for aerospace MRO. To stay ahead of our competitors we have to be abreast with the latest technology. That means composite manufacturing, and composite repair will always be a big challenge as it is far different from conventional metal repair. Therefore, development and adaption of new technology are critical to sustain the business. At the same time, we need to train workers who understand and have the capability to utilize the new technology.

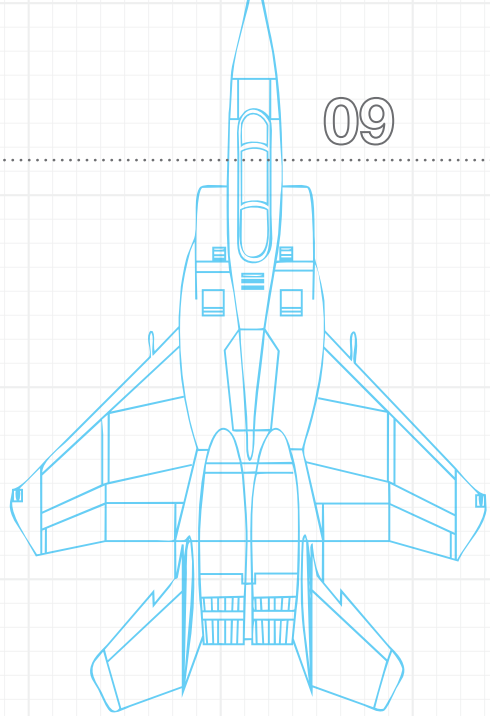
Aerospace technology is developing and evolving fast. We have to keep pace with the development and evolution in order to retain our competitive edge in the global market. We need to identify what are the areas that we need to improve, evaluating new technologies relevant to our vision and developing plans to elevate our technical workforce to a higher level.

To implement the aerospace industry development initiatives effectively, it is necessary to leverage and further expand on the smart Public-Private Partnership (PPP) approach. In this respect, AMIC is taking the lead of industry-led aerospace R&T development through consultation with its industrial lead members, namely Airbus Group, Rolls-Royce and CTRM.

Under the smart collaboration, AMIC addresses the need for industrial labs that are missing in our research structure whilst the industrial lead members share their expectations on the future of the industry. Subsequently, the team discusses the formula to escalate industry's competitiveness through R&T and initiatives to alleviate our researchers' capability to undertake global level projects.

In a recent development, AMIC establish partnership with M-Aerotech to develop aerospace R&T capability within Asia Aerospace City (AAC) as well as to further strengthen the nation's human capital capacity in aerospace manufacturing industry. M-Aerotech will be focusing on the World Class Tailor Made Infrastructure providing areas for engineering services, design, stress analysis; and Professional Development to cater for the continuous development of human capital, whilst AMIC will take the lead in the Industrial R&T.

The establishment of AAC is expected to be accessible and beneficial to the local and global aerospace communities. Leveraging



on AMIC technical network, we plan to bring local and international experts namely Airbus Group, University of Malaya (UM), STRAND Aerospace and University of Nottingham Malaysia Campus (UNMC) to AAC.

Moving on, we need to capture more complex work packages, explore new technologies, develop new sustainable materials, and adopt advanced processes in our manufacturing and MRO activities. The main ingredients to sustain the aerospace industry will be the focus on industry-led R&T activities. However, R&T need to be complemented with the right infrastructure and highly competent workforce.

Close collaborations and smart partnerships between the industry players, universities and research institutes are the key success factors to develop a vibrant eco-system for Malaysian aerospace industry. It is expected that under various initiatives to be promoted under the Malaysian Aerospace Blueprint 2015-2030, the ties between the respective parties will become stronger so that we could become a world class aerospace research community.

by **MAJ. IR. KANDIAH PADMANATHAN (RTD)**
Chief Operating Officer, SkyPark RAC Sdn Bhd

Malaysia's MRO OPPORTUNITY

Since the official launch of Malaysia's first Aerospace Industry Blueprint during LIMA 1997 in Langkawi, the Maintenance, Repair & Overhaul (MRO) segment of the Aerospace Industry has expanded significantly by recording RM5.5 billion in revenue for the year ending 2013. However, this is still below the 5% global MRO market share target that was set for 2015.

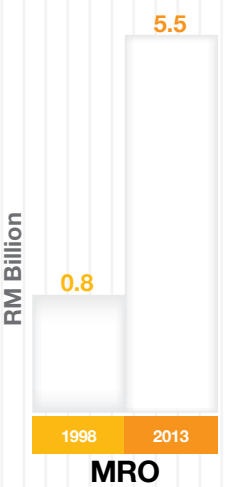


Figure 1: Malaysian MRO segment turnover in 1998 vs 2013

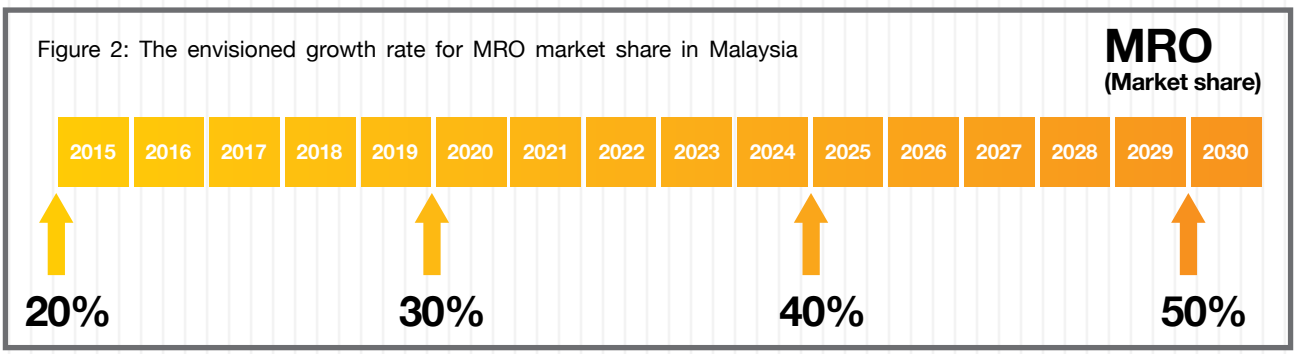
The focus of MRO activities in the country is predominantly on airframe and engine related services while less attention is given to opportunities in component MRO and aircraft modification. This leaves the Malaysia's MRO segment very vulnerable to competition, from not only mature markets such as Singapore, but also emerging markets like Vietnam and Thailand.

The growth of Asia Pacific as the biggest airline market in the world spearheaded by projected aircraft delivery of 13,400 by 2031 (based on Airbus and Boeing projection on aircraft deliveries) presents a fantastic window of opportunity for Malaysia's MRO industry players to capture a bigger chunk of the anticipated narrow body aircraft MRO spend in the coming years.

In the new Malaysian Aerospace Industry Blueprint 2030, the focus for Malaysia's MRO segment is to catapult itself from its present No. 2 position behind the leading country; Singapore in South East Asia (SEA). The rise to the pinnacle is envisaged to be achieved by capturing 50% of the SEA MRO market share by assigning Key Performance Index (KPI) with specific milestones i.e. from 20% market share in 2015 to 50% market share in 2030, at a growth rate of 10% every 5 years.

The MRO activities that are earmarked as focus area or promoted activities in Blueprint 2030 are narrow body aircraft airframe, engine and component maintenance with a strong drive towards aircraft modification. In addition, Blueprint 2030 also plans to position the Malaysian MRO industry to take leadership in MRO business for Ground Systems, namely air traffic control and air defence systems, simulators and ground support equipment.

Figure 2: The envisioned growth rate for MRO market share in Malaysia



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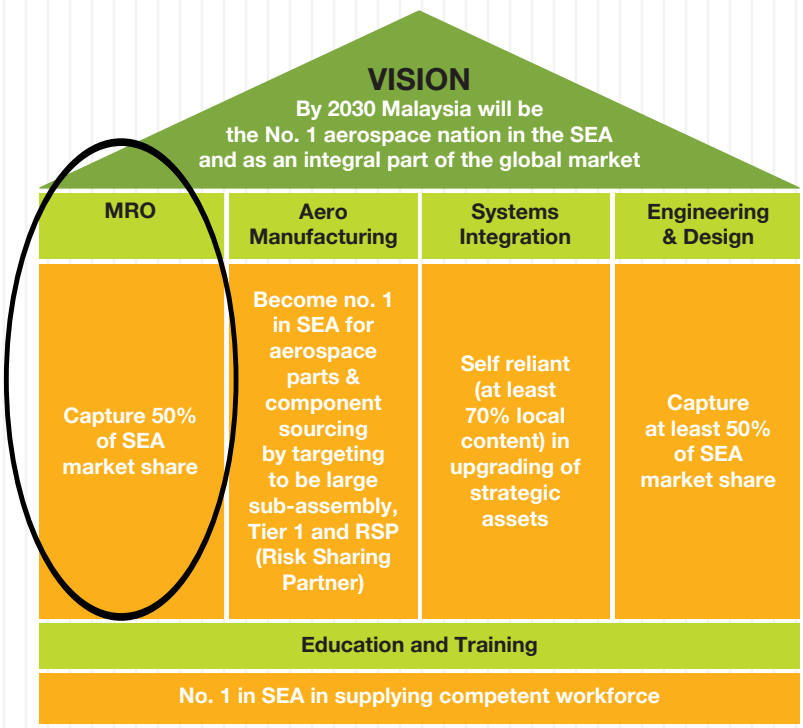

Figure 3: Vision for Malaysian MRO Segment by 2030

The vision or 'end state' for Malaysia's Aerospace Industry that is championed by Blueprint 2030 is to position the industry as No. 1 in SEA by virtue of the MRO segment capturing 50% of the SEA market share.

viewpoints

AEROSPACE EDUCATION & TRAINING DEMAND AND SUPPLY IN MALAYSIA

by **IR. DR. ABD. RAHIM ABU TALIB**
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by **NUR FARHANA HELME**
MIGHT-METEOR Advanced Manufacturing Sdn. Bhd.

The aerospace industry in Malaysia has grown rapidly since the introduction of the first National Aerospace Blueprint in 1997. However, there is still considerable room for further growth as, despite the fact that the industry has seen rapid growth; most of the activities that Malaysia's aerospace industries are involved with are in the maintenance, repair and overhaul industry along with build to specification manufacturing. These activities do not facilitate the transfer of technology and are mostly labour intensive.

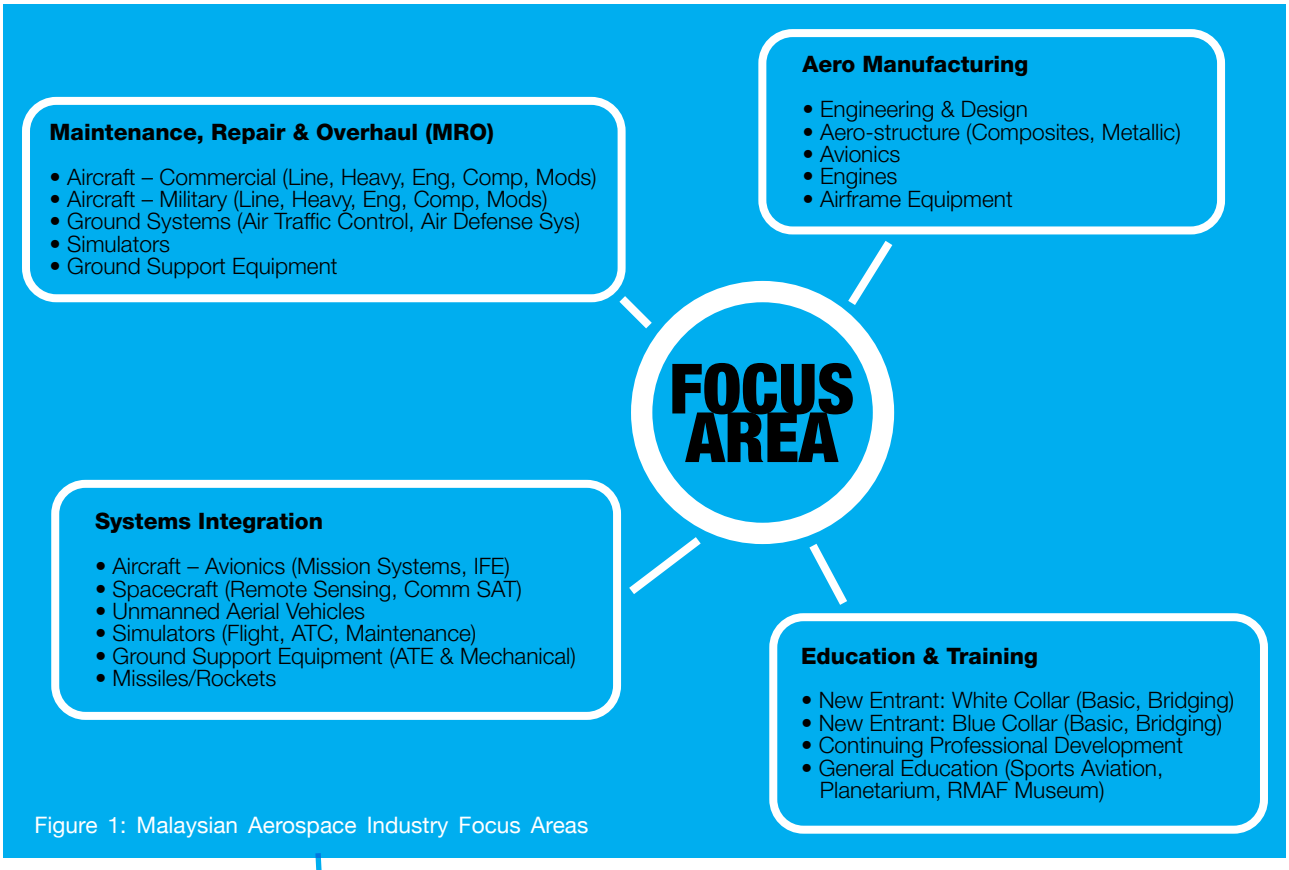

Figure 1: Malaysian Aerospace Industry Focus Areas

In Malaysian context, the definition of the Aerospace industry covers activities that relates to design, development, manufacturing, construction, maintenance and disposal of aircraft, spacecraft, missiles and rockets. It includes enablers to the above activities such as regulatory of civil and military aviation, talent development education and training, and infrastructures such as airports, fix based operators (FBO) and technology parks. It excludes the "operation" of aircraft, spacecraft, and missile and rockets (i.e commercial, general and military aviation). Further breakdown of Malaysia's aerospace industry, based on the four focus areas defined in 2001 by the Malaysian Aerospace Council (MAC), is shown in Figure 1

Regional industry dynamics has enabled the aerospace industry in Malaysia to grow and contribute to the nation's high income economy. In the most recent year (2014) the industry had a turnover of RM11.8 billion, and there are 159 companies employing 19,500 workforce. There have also been substantial investments from both domestic and foreign investors. The total investment in 2013 was recorded at RM387 million and the export value for the year was RM2.4 billion. Currently, the largest aerospace industry (outside of aviation) is the MRO sub-sector. This sector accounts for 55% of the industry. This is followed by the aerospace manufacturing sub-sector, which has 33% of the industry. In general, the MRO ecosystem consists of eight (8) end-to-end services as shown below.

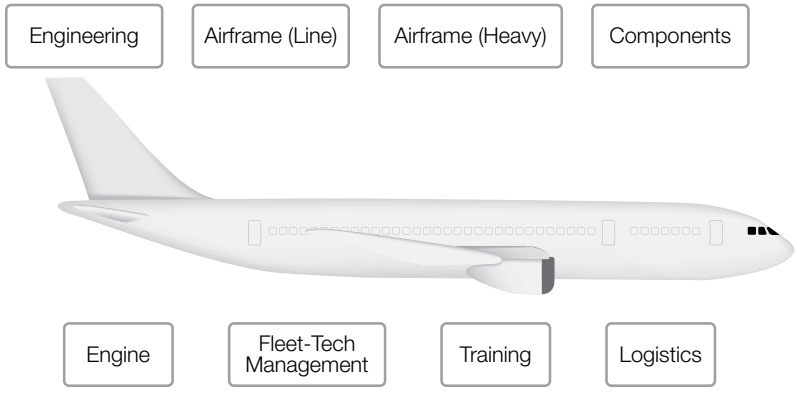

Figure 2: Typical MRO Market Segment

The aerospace market is changing rapidly, especially in Asia. This industry is growing very rapidly with Asia leading the growth.More commercial aircraft are being produced annually today than at any time in history. Recently, Boeing announced plans to produce 900 new airliners per year, and Airbus is producing aircraft at the same or faster pace. A large number of these new airliners are to fill orders from Asian countries. This creates many opportunities for growth for the Malaysia's Aerospace Industry. In order to take advantage of this growth, the Malaysia's Aerospace Industry players must look at the areas in which this growth will occur, and examine the capabilities to support this growth.

The growing world air traffic, large aircraft orders by airlines and backlog faced by the Primes (OEM aircraft manufacturers, in particular Boeing and Airbus) indicate the industry's long term growth potential and strength. Narrow body operation will generate a vibrant MRO industry in the South East Asia (SEA) region. Order backlog is expected to increase off-loading of aero-structure manufacturing activity into the region (Figure 3a and 3b).

To keep abreast with, and to take advantage of, the global growth of the aerospace industry, Malaysia needs to look into the preparation of human capitals – the current Aerospace Education and Training; and the shortcomings or gaps in supporting growth in these areas.

Aerospace Education & Training in Malaysia

Currently, Malaysia does not only produce adequate graduates to support the needs of local industry, but is also able to export them to neighbouring countries.

According to Boeing, there are more than 3,500 skilled workers available in South East Asia of which Malaysia produces more than 1,900, or 54% of all skilled workers for the region (Figure 4).

Every year, up to 300 graduate engineers and over 2,000 para-professionals are being produced locally. However, industry players reported that there is a need to align our current education and training programmes for both white and blue collars with the latest technology and industry trends, and that bridging programmes are needed to fast track employment. There is a shortage of para-professionals workers in the area of aero-manufacturing.

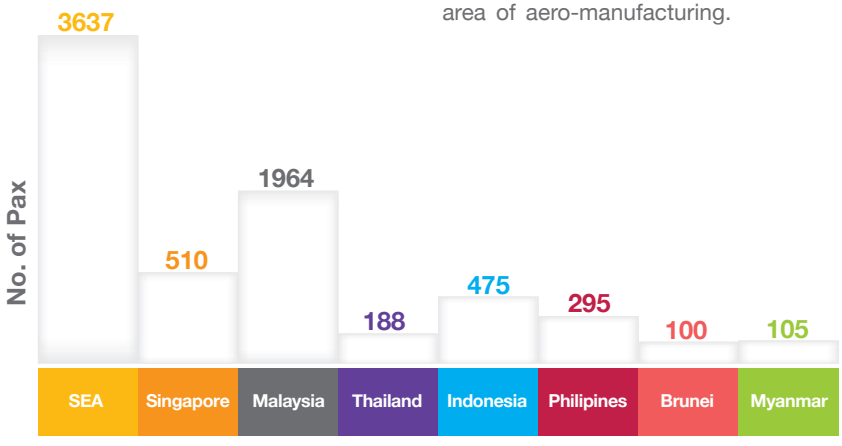

Figure 4: Skilled workforce produce in SEA in 2014

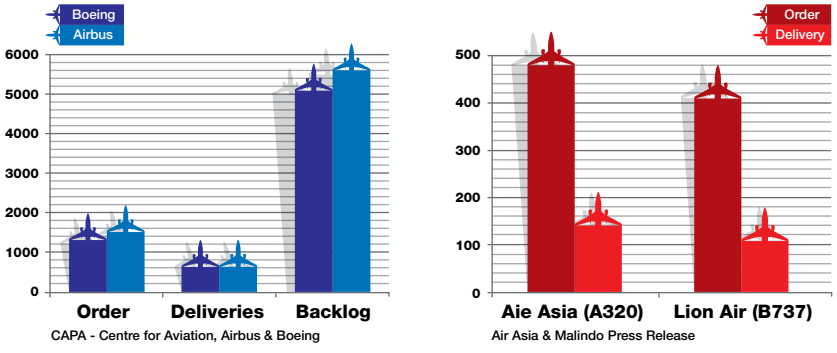

Figure 3: (A) Order, deliveries & backlog for Boeing and Airbus in 2014
(B) Order & delivery for Air Asia and Lion Air in 2014

Workers from Malaysia are being successfully been employed all over the world. Many Malaysian trained MRO licensed technicians and engineers are currently employed in Singapore, UAE and elsewhere. Graduate aerospace engineers are being employed in Singapore, US, and Europe. Table 1 shows the current education and training providers for graduate engineers and para-professionals in Malaysia.

Currently, there are 66 education and training providers in aerospace related programmes in Malaysia comprising 11 DCA approved training organizations (ATO) which impart the training of licensed aircraft maintenance technicians and licensed aircraft maintenance engineers; 11 licensed flying schools for pilot training; 2 Cabin Crew Training Centres; 27 institutions of higher learning that offers bachelor of aerospace, aeronautical, avionics engineering programmes, and diplomas in aircraft maintenance technology, helicopter maintenance, avionics maintenance and composite repair; and 15 technical training academies. Figure 5 shows the total number of education and training providers in South East Asia.

The main focus is on human capital development where training and education plays a big role in developing the industry across the region. Boeing has projected that in the year 2032, the estimated demand for technicians (MRO) and pilots and in SEA will be of 50,300 and 48,100 respectively, from the projected annual growth of 5% rate for technician, graduates and cabin crew, and 7% for pilot.

Malaysia is the leading producer and provider of skilled workforce in the SEA region and is on the right track to remain so for the foreseeable future. It is projected that by the year 2030, Malaysia will be able to produce 50,751 technicians and 15,556 graduates, and 16,746 pilots. Figure 6 shows the current regional education and training providers in the aerospace field.

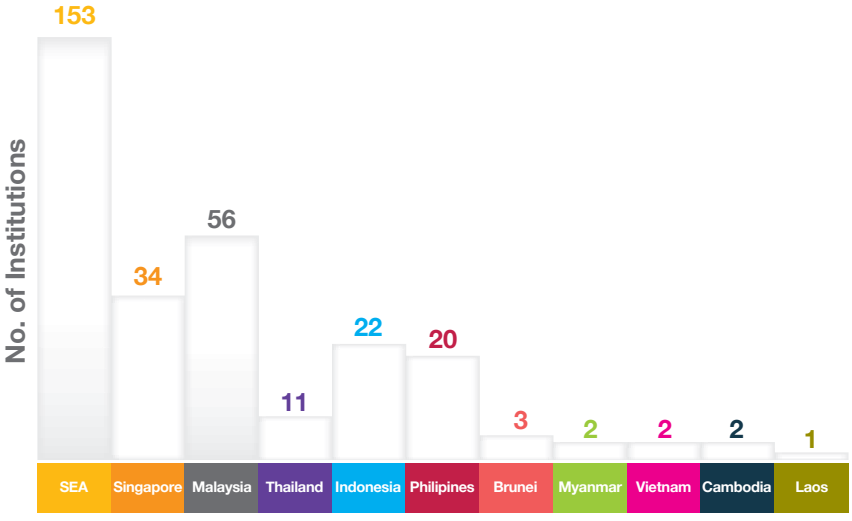

Figure 5: Number of aerospace related education and training providers in SEA

Capability of the Current Education and Training

The capability in Education and Training is gauge through the analysis of the Capability Matrix – the workforce's competency, certification, technology and capacity. MIGHT has been engaged with parties from the educational institutions and industry where massive data was collected to derive these capability matrixes for the position of white collars, blue collars, and Continuous Professional Development (CPD).

The competency of Malaysia's training providers in teaching and binding the training needs for our local talents is very encouraging as the country has managed to produce quality graduate engineers, air traffic controllers (ATC), licensed aircraft maintenance technician (LAT) and licensed aircraft

Graduate Engineers	Para-professionals
• >300 / year • bachelor's programme to align with latest technology trend & industry needs • "bridging programmes" to fast track employment	• >2000 / year • need few institutions to specialize in aero-manufacturing training • require "tailored programmes" to satisfy sudden surge in demand

Table 1: Education and training providers in Malaysia

Figure 6: Regional education training centre that produces technical and engineers in the aerospace field

maintenance engineer (LAE). Our training providers has played an important role in supporting the industry growth, especially in MRO, by educating more trainers that would be licensed. These licensed trainers would be able to impart their knowledge to our local talents through special courses.

The certification by Malaysia's training institutions is recognised internationally. This has made Malaysia the centre of aerospace education for South East Asia. To date, we have endorsed certification for graduate engineer, technologist, ATCs, technicians, LAT, LAE and Design Approved Engineers. Currently we are able to produce 380 trained and certified blue collar workers and 675 graduates annually. By 2030, Malaysia will be capable to produce talents to cater for the Asian market.

As a whole, Malaysia has medium capacity in terms of training and education. We are at best in technology proficiency for ATC, LAT and LAE. The machineries for training drill in the aerospace sector are furnished with latest gears best suited for our local skill development. However, we have not sustained the maximum growth of talents as required and projected by the OEMs. The full capability matrix for aerospace education and training in Malaysia as shown in Table 2.

Way Forward

Malaysia has been able to make the aerospace sector an important economic entity. In the year 2013, we were able to create 19,500 job opportunities in the sector. The vision is to create 32,000 job opportunities by the year 2030. Malaysia also aims to be the number one aerospace education and training hub in the South East Asia. To achieve these, the followings would have to be emphasized and implemented:

i. **Collaborative net and partnership** between government agencies, institutions and private sectors in producing more quality talents. (Through merging of supply chain between suppliers and foreign companies. Training and education should be part of the business);

ii. Promote a **conducive platform to gather experts** from relevant sectors, mainly in Aero-manufacturing and aviation to achieve the mission established by 2030. Recognize, retrieve, merge and transfer of knowledge among local experts and and train new talents. This will boost our chain of experts;

iii. **Develop holistic training and education programmes** that could sow the seed of aerospace career in a wider context;

New Entrants – White Collar				
Position	**Competency**	**Certification**	**Technology**	**Capacity**
Graduate Engineer				
Graduate Technologist				
Air Traffic Controller				
Researchers				

New Entrants – Blue Collar				
Position	**Competency**	**Certification**	**Technology**	**Capacity**
Semi-Skilled				
Mechanics				
Technicians				
Licensed Aircraft Maintenance Technician				
Licensed Aircraft Maintenance Engineer				

Continuous Professional Development (CPD)				
Position	**Competency**	**Certification**	**Technology**	**Capacity**
Up-skilling				
Re-skilling				
Design Approved Engineers				
Professional Engineers				

Full Partial Not applicable

Table 2: Capability matrix for education & training in Malaysia

iv. **Enhance the effectiveness of institutions** that have direct influence on the growth of the industry;

v. **Create opportunities for talents** to encourage them to advance their skill and career while excite them in their pursuit of achieving high income;

vi. Embed positive strides on **technological advancement through funds** for innovative efforts in MRO and modification business;

vii. **Increase number of Design Engineers with signatory status** for future design & build projects;

viii. Incur **"apprenticeship programs"** to fast track employment. The knowledge transfer from industry are best to be developed from early age of education; and

ix. **Invest in R&T** to develop new capabilities and enhance industry competitiveness.

Industry players reported that there is a need to align our current education and training programmes for both white and blue collars with the latest technology and industry trends, and that bridging programmes are needed to fast track employment.

Malaysia has the potential to become the hub of aerospace training and education if we strive to bridge the gaps and meet the needs of the industry. If the nation remains dedicated, we may definitely grow and contribute towards the future progression of the global aerospace arena.

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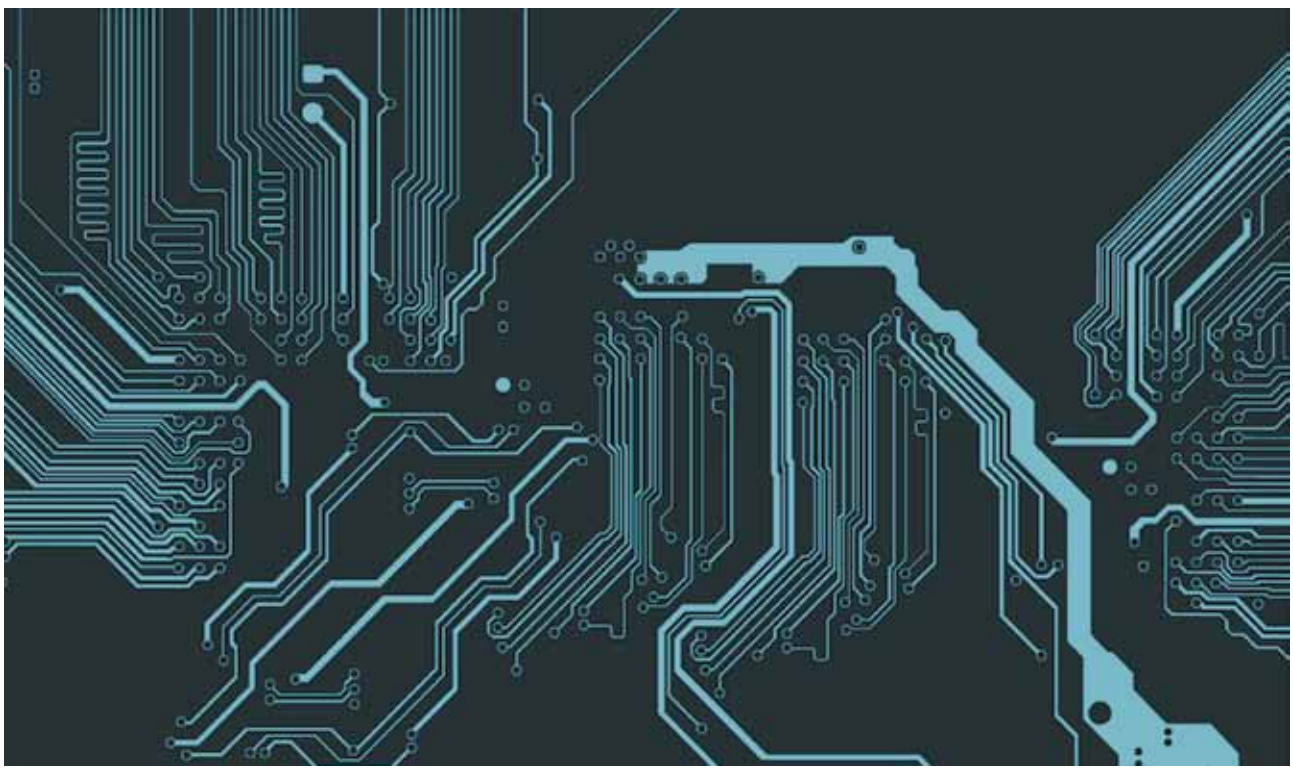
by **LT. COL. IR. ABDUL NAIM BIN ABDUL AZIZ RMAF**
CTRM Systems Integration Sdn. Bhd.

SYSTEMS INTEGRATION:

Increasingly Complex as Technology Advances



From the simplest of components to cutting edge technologies, systems are becoming inherently more complex. With the growing trend in the aerospace industry to develop system software that manages much of the mission workload on aircrafts, processes will need to advance in order to stay compliant and to ensure systems and instrument are wholly reliable and safe.

The Malaysia Aerospace Industry Blueprint 2030 will be launched this year as the forward plan for the industry to grow for the next fifteen years. One of the identified areas that will elevate the local aerospace industry into greater height is Systems Integration (SI).

As recommended by the Blueprint, there is a need for the nation to develop an industrial base involving avionics and systems integration. CTRM Systems Integration Sdn Bhd (CTRM SI), a member of DRB-HICOM, has been mandated to spearhead the local capability on SI.

A lot of people tend to generalise SI with avionics only. In actual fact, SI covers wider topics, including avionics, simulators, air traffic system, and space vehicle. Not limited to the above, SI also applies in land vehicles and automated industrial machines.

Aerospace systems integration is one of the most demanding disciplines in the industry. It has to go through very stringent tests during its development process to ensure adherence to strict safety standards. Systems are becoming increasingly complex as technology advances. The certification process itself may take many years to complete. Aerospace systems integration just adds another layer of the complexity and requires the most professional partner to complete it successfully.

Malaysia has set a foot print in this area. We are building up our capability and there are a lot of challenges to face before we can be amongst the champions in SI. In the new Blueprint, Malaysia aims to have 70 % of its content contributed locally by home grown companies and skilled workers by 2030.

Towards a more complex system

Today, significant amounts of civil and military flight crew training are being carried out using flight simulators, utilising computers to create the illusion of flight. Flight simulation has radically changed flight training methods, reducing training risk and improving training quality. It has also resulted in significant improvements in flight safety, alleviating airborne congestion, and reducing the impact of aviation on the environment and cost of training. These trends are likely to continue for the foreseeable future.

Currently, Malaysia is a known player in simulation development and it is possible for us to fully leverage on this advantage to leap frog our position and refine our capabilities, especially in the System Design.

Why System Design?

We are in the situation where technology proprietorship is critical and many established players are not willing to share or provide this to our end. Having our own capability in system design and integration would reduce dependency on foreign expertise and, at the same time, enhance our skills in this area.

Aerospace Systems Design involves the knowledge and intelligence of methods and techniques necessary for the design of the broad systems in aerospace and their components. Apart from being able to perform, these systems need to comply with the demand security and safety, and of consistent quality. Rigorous requirements process and the need to deliver scalable innovation at a faster rate requires the ability to produce a secure and traceable product. These abilities will allow us not only to build our own system, but also integrate and enhance the current available system.

In order to move forward and excel in systems integration, Malaysia needs to harvest the skills of the available professional workers to address the interdisciplinary nature of the aerospace systems.

The previous Blueprint has successfully provide a strong foundation in developing skilled workers for the aerospace industry in the areas of Composite Manufacturing and Maintenance Repair and Overhaul (MRO). As a result of the nation's industrialisation initiatives, we have produced a significant number of engineers competent in hardware and software engineering and operating systems. However, in order to move forward and excel in systems integration, we need a concerted effort to harvest the skills of these professional workers to address the interdisciplinary nature of the aerospace systems.

A small step, a giant leap

There are challenges that the industry has to overcome in the SI context

before we can achieve the target of 2030. As mentioned earlier, Malaysia is still an infant in SI. However, this should not be an excuse for the industry not to actively grow.

Perhaps there should be a different approach that is more suitable for the SI players to work and grow together. Like a consortium, we should be complimenting rather than competing with each other. It is a small cake after all, and there is a saying, 'No one can whistle a symphony. It takes an orchestra to play it.' Every player should play his role so that we can be more focused and specialised. Instead of having players with duplicating roles and trying to monopolise the whole value chain, we should harmonise our resources. The key here is sharing so that each company can be the local expert in its respective area. By doing this, everyone can mark their presence and claim their area of expertise in this challenging global business.

In every agenda, be it at national or organisational level, true commitment from a 'champion' is critical. Change in leadership and lack of buy-ins from the crowd could be a threat for an orchestrated and concerted effort. Through strong leadership and continued aspiration from various stakeholders, predicaments such as financial, future plans and implementations could be managed smartly and strategically.

Currently, as a result of previous Blueprint on talent development, we have substantial numbers of local workforce that are capable of producing a significant amount of local products. Bear in mind that these local talents are demanded globally and are being paid handsomely abroad. According to the World Bank, in 2011

Malaysia is a known player in simulation development and it is possible for us to fully leverage on this advantage to leap frog our position and refine our capabilities, especially in the System Design.

almost one million Malaysian experts are working outside the country (source: Talent Corporation). The question is: What pushed them to go abroad? The answer will fall back to the perception and trust from our own people towards our own local products. This must change; otherwise valuable talents will keep shying away from working in the local industry. It took two world wars and many post cold war conflicts for the western countries to build their defence industries to what they are today, and they did it by relying and trusting their own talents and products.

Would we be able to export our aviation systems integration?

We have successfully export other locally produced systems abroad. One such case is the System Control and Data Acquisition (SCADA) which is locally produced and being used by Tenaga National Berhad (TNB) that has been exported to West Asia and Eastern Europe. Another is the Total Airport Management System (TAMS) which is produced locally and being used by the Kuala Lumpur International Airport (KLIA). TAMS has been exported to various airports worldwide, including Orlando Airport in the United States. In the simulation technology, the PC7 MK 1 flight training simulator that is being used by local bodies such as the Royal Malaysian Air Force (RMAF) and the Police Air Unit is recognized by foreign companies such as Pilatus, CAe and Eurocopter. The same could be realized in aviation systems integration if we all, as a nation, believe in it.

In the case of aviation industry, we could learn from our neighbour, Indonesia. The PT Dirgantara Indonesia (PTDI) has opened up opportunities to their local talents by providing support and encouraging the young to be involved in the Systems Integration. Similar model can be applied to Malaysia with considerable provisions to suit our industrial atmosphere.

As for education and training, some institutions of higher learning in USA and Europe have specific faculties to support the aircraft manufacturing industry. In the United Kingdom, there is a system engineering school at Loughborough University and Cranfield that produce Systems and Maintenance Engineers. In the United States, AIRBUS Americas Engineering works with University of California, Los Angeles (UCLA), and North Carolina State University Mechanical and Aerospace Engineering. In France there is SUPAERO which caters for Airbus. SUPAERO – École nationale supérieure de l'aéronautique et de l'espace ® ("SUPAERO", translated as "National Higher School of Aeronautics and Space") – founded in 1909, is one of the most prestigious and selective higher education centre in France. It is the world's first aerospace

Through strong leadership and continued aspiration from various stakeholders, predicaments such as financial, future plans and implementations could be managed smartly and strategically.

engineering school and is considered to be one of the best in Europe in that field. There are also the ISTIA - Institut des Sciences et Techniques de l'Ingénieur d'Angers at Université d'Angers and Institut National des Sciences Appliquées de Toulouse that focus on Systems Engineering. There are 13 other schools and university faculties in Europe that offer studies in Systems Integration, mostly producing post graduate students on SI and are equipped with knowledge and skills and groomed to readily service the industry immediately after graduating.

Apart from producing the present discipline of engineering graduates, Malaysia's national higher education system needs to expand its scope further into specialized Systems Engineering and Integration.

SI in 2030

We have marked our presence in the SI areas, and there is still plenty of room for us to expand in the business. Guided by the previous Blueprint, we have succeeded to negotiate the hard years. We are moving forward, and SI is expected to provide more robust applications in the provision of the national defence and security. SI is also expected to grow in strategic areas of avionics, battle management system (BMS), air traffic systems integration, UAV, spacecraft, simulator and rockets in order to enhance local content in integration and upgrade capability of strategic assets.

The Malaysia Aerospace Industry Blueprint 2030 has mapped strategic plans and identified various parties to work together towards the success of the industry. It will ensure the survival of the players and stakeholders, and sustainability of the industry as a whole. However, the challenge now is the smooth execution of the plans and strategies that has been outlined in the Blueprint.

Again, a 'champion' is needed to create a synergistic relationship that ensures the implementation part of the Blueprint and everyone involved is on board. The Malaysian Aerospace Council (MAC), chaired by the Honourable Prime Minister, should be this 'champion'. MAC is the best platform to boost Malaysian SI capability among the global players.

Moving forward, SI, as in the Blueprint, is expected to generate a lot of benefits to the country in terms of upgrading and modifying the critical components as well as integrating and qualifying electronic instrumentations. Since SI is a platform technology, the country will need to have the ability to perform upgrades and modernization of airborne, land and maritime systems for both civil and security application. The vision of Blueprint 2030 is to have local capability in this strategic areas.

Self-reliance is benchmarked through 70 % of our National procurement content to be contributed locally by home grown companies and skilled workers. The Blueprint also envisioned the built-up of sufficient domestic market for locals to prepare themselves for the bigger regional market in future.

Our national higher education system needs to expand its scope into specialized Systems Engineering and Integration.

by **DATUK ZULKARNAIN MOHAMED**
Spirit Aerosystem

MALAYSIA'S AEROSPACE MANUFACTURING:
Today, Tomorrow and Beyond

The advent of new manufacturing techniques, advanced metallic and ceramic materials, and the increasing use of composites will mean that the aircraft factories of the coming decades will be very different from the ones we see today: and that will affect not only the way the aircraft they produce look and operate, but also the type of skills that people who work there.

Malaysian aerospace industry was focused on airline operations and maintenance services until the first serious breakthrough for aerospace manufacturing in the early 1990's with the introduction of aircraft production such as Eagle Aircraft, MD3 and later the Lancair aircraft. Using the experience from MRO, the capability that we have in engineering and technical skills was then brought up to thrust the industry into aerospace manufacturing.
The three aircraft ventures produced mixed successes. It did open up the door for commercial aircraft component manufacturing which is now one of the main pillars for aerospace industry in Malaysia.

Taking the impetus from the success, the first National Aerospace Industry Blueprint was launched in 1997. It paved the way, or as the theme of the blueprint suggested, 'taking off' to further develop and grow the aerospace manufacturing sector.

In recent years, aerospace manufacturing has become one of the fastest growing sub-sectors in the Malaysian aerospace industry. Spirit Aerosystems, SMEA, Upeca and CTRM are among strong players of aerospace manufacturing in Malaysia, and the ongoing initiatives are actively pursued to develop the local supply chain and vendors and establish local capabilities at tier 2 and tier 3. While encouraging local players to expand their capability and capacity, Malaysia is aggressively promoting global players to invest in the country or to establish partnership with local companies. By having more major 'anchor' company, the industry can start to grow out from these foundation companies.

The aerospace manufacturing in Malaysia today is based on both metallic and composites details, and assemblies. The participating companies have established and gained trust and recognition from the customers in understanding the nature and requirements of aerospace industry, and producing high quality products. Consistencies in Quality, Cost and Deliveries are crucial to gain the trust of the OEMs and ensure continuous incoming business.

Malaysia is practically involved in most of the important commercial and military transport program for both Airbus and Boeing. Current programs includes the high rate single aisle A320 and B737, Long range and twin aisle B767, B777, B787 and A350, the largest commercial aircraft A380, and the latest military transport aircraft A400M. Components include details and assemblies of flat panels to highly complex ribs and fan cowls.

Competition

While we are still strengthening our presence in the global supply chain, there are competitions from both developing and developed countries. Developing countries are aggressively pursuing the aerospace business, offering lower cost manufacturing; whilst developed countries are actively pursuing technology to compensate for the high cost.

The aerospace industry in Malaysia needs to propel itself to a level where there is a balance of technology and labour content. The industry should drive Technology and Labour to converge, and offer a value for money solution that is attractive for the OEM and tier 1.

Advancing Technology through R&T

To achieve the balance, the local industry needs to be engaged in advanced material and processes technologies. New technology and methods in machining, treatment processes, automated assembly and composites manufacturing are available and should be advanced further in the country with the assistances from agencies and institutions. Agency such as AMIC with R&T capability should be fully utilised to engage the right technology partners.

At the component sub-assemblies and assemblies, some level of

Currently the Malaysian industry is a technology recipients who built-to-print, where the manufacturer produces products, equipment, or components according to the customer's (OEMs) exact specifications.

automation is necessary. But we still need to leverage on our labour cost advantage. Semi automation may provide flexibility whilst ensuring quality and integrity of components assembled.

Composites have become indispensable in aircraft construction and their importance is growing in the aerospace industry. The processing of composites generally places high requirements on technology development.

One of the major challenges in composites manufacturing is to reduce the dependencies on autoclave processing. Autoclaves are expensive and recognised as one of the main restrains for new companies to start in composites manufacturing due to the high initial investment required.

Several out of autoclave processes such as Resin Transfer Moulding and Vacuum Assisted processes have been introduced, but not enough resources and money has been spent to further develop and make them successful alternatives to autoclave processing.

Moving forward

To move forward, we need to create capacity, capability and resources. Malaysia aims to be the number one in aerospace manufacturing in this region by 2030. To achieve that goal, we need to double the volume and attract more high value packages.

Malaysia can be very competitive in providing solutions at the sub-assemblies and assemblies level if our industry players can consolidate and form a consortium with strength provided by each entity to create a value proposal to the OEM and tier 1.

Several out of autoclave processes such as Resin Transfer Moulding and Vacuum Assisted processes have been introduced, but not enough resources and money has been spent to further develop and make them successful alternatives to autoclave processing.

How much are we willing to invest in creating new capabilities and additional capacities? How much initial government support is available?

Through the Malaysian Aerospace Council (MAC), coordination of the industry allows the players to talk to each other, sharing a bigger cake instead of slicing it smaller. Direction as provided in the new Blueprint should be used as a guide for the industry.

The industry needs to create and nurture more tier 3 companies with capacity to provide strong support for the upper tiers. It should not be seen as a competition to the upper tiers, viewed as the supporting structure to grow bigger.

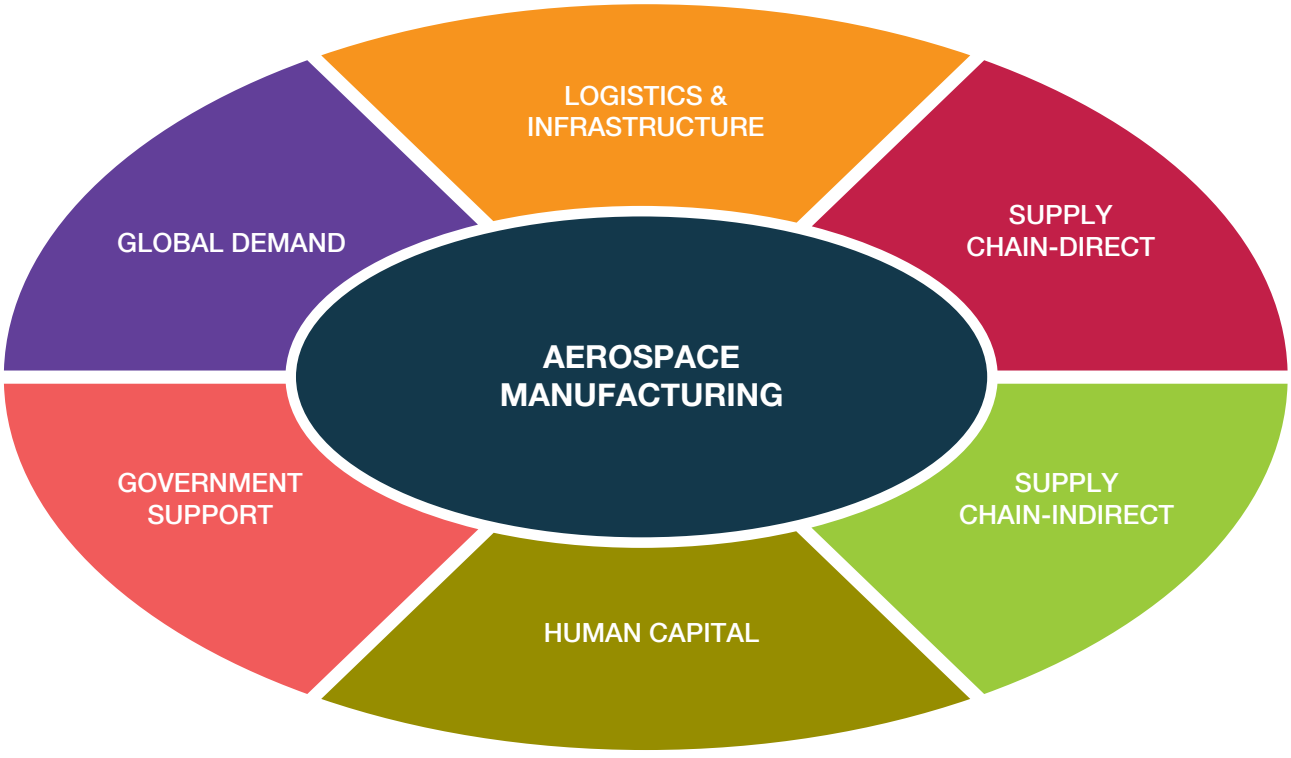
The global industry target is to reduce the manufacturing cost. Local companies should take this challenge and realise that the contracts, when awarded, are for long period; and commitment is mandatory to remain competitive. To start a business in aerospace might be challenging due to high investment with long payback time but, in the long run, being in the game creates the perception of quality and reliability which open more doors to other businesses.

As for human resources, we have produced enough talents for the aerospace industry. The previous Blueprint has successfully promoted the training and education areas, and provides ample high class infrastructures and facilities. Annually, around 50 to 100 aerospace engineers graduated from the local universities. However, do we have enough opportunities for these graduates to serve in this industry? The current situation where the cycle of hiring fresh engineers for (at least) every 3 years has caused those new talents to either serve in other industries or work abroad.

At the same time, the industry requires more technicians. Therefore, institutions such as MLVK, ADTECH and MARA are important to provide training and apprenticeship.

The industry has an ample number of professional talents for the current work load but these talents, especially design and process engineers, require more exposures and experience.

Currently the Malaysian industry is a technology recipients who built-to-print, where the manufacturer produces products, equipment, or components according to the customer's (OEMs) exact specifications. That is why R&T requires more drive and push



towards commercialisation so the industry can be elevated to an OEM environment where we own the design and Intellectual Property.

Malaysian Aerospace Manufacturing: the next 15 years

The new Malaysian Aerospace Industry Blueprint 2030 targets Malaysia to lead the Aerospace Manufacturing sector in this region. This is achievable through close knitted cooperation between Government Ministries, Agencies and, importantly, the industry.

The Government has introduced initiative such as the new Entry Point Project (EPP), known as Growing Large Pure Play Engineering Services, to create an aerospace engineering services company that is globally competitive and able to attract more high-value engineering services work to Malaysia. It is believed that the EPP has the potential to contribute an additional RM1.75 billion of GNI and create approximately 5,750 jobs in 2020. Another EPP introduced is the creation of SME industry to support the aerospace manufacturing.

Capacity and Capability build up, together with the engineering development, is essential in attracting new and large work packages. Equally as important is creating the ecosystem to fuel and sustain the growth. A support system in managing the supply chain, logistics and infrastructure, and human capital needs to be strong.

Securing work in the next generation aircrafts is simply a must for the industry to grow and sustain in Malaysia. New aircrafts programs to replace the current design should be starting in the early 2020, and our aerospace industry has five years or to grow, develop, and to be ready.

The Government has introduced initiative to create an aerospace engineering services company that is globally competitive and able to attract more high-value engineering services work to Malaysia.

viewpoints

Securing Malaysia's Sustainable Aviation

by **DR. LIEW KAN-ERN**
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Aerospace Malaysia Innovation Centre (AMIC)

Air transport has brought the world together and redefined words such as “far” and “long distance”. The aviation industry has made the world a smaller place, providing a platform of rapid global transport for passengers and goods, enabling globalisation of businesses and communities - and impact is still continuing. The world today relies heavily on the aviation industry. In 2013 alone, the aviation industry transported over 3 billion passengers and over 40 million tonnes of cargo, such an economic impact accounts for roughly USD 2.4 trillion globally. Simply put, if the aviation industry was a country, it would rank in term of gross domestic product (GDP) as the 21st in the world, accounting for USD 606 billion GDP per year. A feat that is larger than some members of the G20, and it is estimated that in 2026 the aviation industry will contribute USD 1 trillion to the world’s GDP. The industry has become an integral part of today’s world, and as it grows, it brings together with it an increased sense of responsibility to make certain that its environmental impact is minimal. Currently, aviation industry contributes to around 2% of global CO2 emissions, or 705 million tonnes out of 36 billion tonnes emitted globally. A considerably

low contribution when compared to other industry and transportation means, nevertheless, the aviation industry has committed itself through representative bodies such as the Air Transport Action Group (ATAG) and International Air Transport Association (IATA) to tackle the industry's climate change impacts.

Tackling Climate Change

At the Aviation and Environment Summit organised by ATAG in 2008, aviation leaders embarked on an unprecedented commitment, which gave rise to the industry's long-term plan to tackle its climate change impacts. The result of this commitment is the Aviation CO2 Roadmap that pledges the industry to:

- To improve fuel efficiency by 1.5% per year, on average, from 2009 to 2020
- Achieve carbon neutral growth (CNG) from 2020
- To reduce net emissions by 50 % by 2050, from 2005 levels.

The aviation industry has a solid record in reducing its emission, with 70% reduction in CO2 emissions, 90% NOx (mono-nitrogen oxides), and 75% reduction in noise over the past 40 years. These reductions were achieved through four pillars of innovation:

- Product Technology
- Sustainable Fuel
- Operations and Infrastructure
- Economic Measures

These pillars are guidelines to promote and support innovative research and development in the aviation industry for new technology, new pathways for sustainable fuels, and improved operational efficiencies. Aircraft manufacturers are developing regional strategies and partnerships through value-chains, integrated services and to encourage best practises, such as the "Perfect Flight". A Perfect Flight is known as utilizing the most efficient aircraft technology, optimized Air Traffic Management (ATM), optimized aircraft operations, and the use of air worthy sustainable alternative jet fuel. To date, Airbus has known to have achieved two Perfect Flights, the first is a short-range commercial route with Air France from Toulouse to Paris - which achieved a 50% reduction in CO2 emissions; the second is a long-ranged commercial route with Air Canada, which achieved a 40% reduction in CO2, when compared to regular flights. These two accomplishments prove that substantial reductions in emission are possible with the proper innovator, catalyst and with strategic partners.

Aviation Innovation

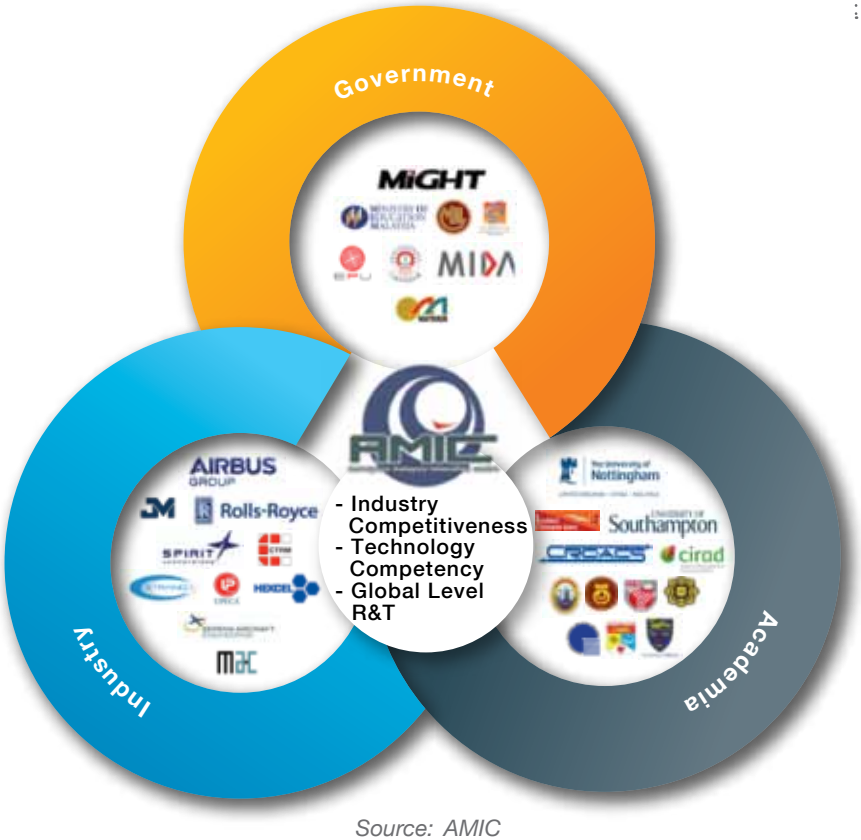
Out of the four pillars of innovation, the product technology and sustainable fuel pillars are the industry's best bet in reaching the goals set out in the Aviation CO2 Roadmap. Examples of product technology improvements can be seen in the new generation of aircrafts with better fuel efficient, quieter and cleaner aircraft that is being ushered into service today. From Airbus, these are the A380s, A350 XWBs, and the A320 neo, which boast better aerodynamic efficiency, advance systems, and new generation of materials that are lighter. For sustainable fuel, these are drop-in aviation fuels which are produced from sustainable renewable resources. Sustainable fuel has the potential to reduce up to 80% of CO2 emissions per tonne of fuel, however, finding a suitable source with sufficient quantities to meet commercial aviation demands is still in progress. In parallel to the search, test flights with sustainable fuel blends are being performed to provide confidence and to validate its usage for certification and commercialization. To date, over 1,500 commercial flights have been flown with sustainable fuel, from processes which has been certified (Fischer-Tropsch, HEFA, and DSHC).

Malaysia's Aviation Innovation

In 2011, Aerospace Malaysia Innovation Centre (AMIC) was inaugurated by the Malaysian Prime Minister to foster aviation research and technology capabilities in Malaysia. As an industrially led non-profit organization that operates in collaboration with strategic industrial, universities and governmental partners, AMIC has two core research and technology focus, Sustainable Aviation and Factory of the Future. The two topics complements each other in driving the country's innovation capabilities, and contribute to the global movement of aviation advancement. Factory of the Future focuses on new technologies and processes that will catapult today's manufacturing plants to the future, these are technologies on virtual reality, digital technologies, 3D printing, and robotic automation.

The Sustainable Aviation activities in AMIC are part of the global network of Airbus Group and Airbus action worldwide on Sustainable Aviation, with particular attention on the sustainable fuel activities. Sustainable Aviation activities in AMIC has two main columns, sustainable fuel and bio-sourcing of materials for aviation. There are currently four on-going research initiatives under the sustainable fuel umbrella, covering aspect of aviation fuel production from sustainable feedstock such as micro-algae and increasing its lipid/ oil yield, transforming waste to fuel, techno-economic analysis of the entire value chain from feedstock to fuel, and investigation of multiple feedstock options and conversion. These researches heighten the bio-aviation fuel development status of Malaysia, and are essential pieces to a puzzle that leads to the process of gaining accreditation, certification, and implementation. In addition, there are several new projects in discussion, which complements on-going studies, and advances the global efforts in the search for the solution for affordable, sustainable aviation fuel.

The introduction of bio-sourced material into the aviation industry will pave the way for green and recyclable materials, thus improving the industry's sustainability and environmental impact, or the end-of-life of an aircraft. This column is part of a greater innovative drive to increase the eco-efficiency of aviation industry, its aircraft and the entire value chain. AMIC has placed key research projects in motion to develop bio-sourced composites and materials to validate the potential of such materials in the aviation industry. Not only is the source, treatment and development of



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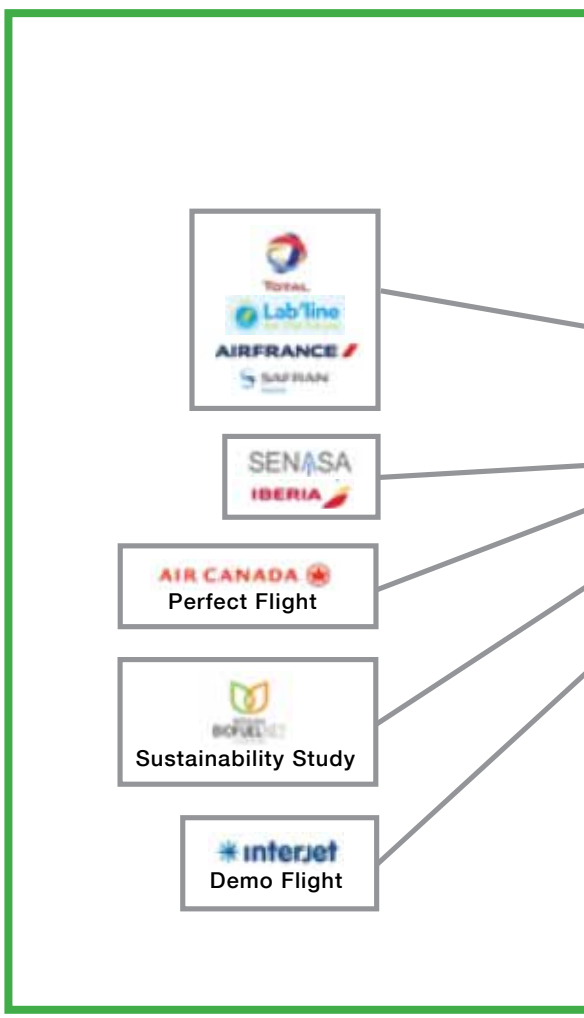

the bio-source material important, but equally, the testing, stressing and validation of these bio-parts for aviation applications. New technology developments are long and complex, undergoing several development cycles before reaching a level of usable maturity. Bio-sourced materials for aviation is no exception, and it is hoped that one day the majority of aviation parts are able to be grown, processed and manufactured.

Closing

The Sustainable Aviation movement in Malaysia is championed by AMIC, whose mandate is to enable and drive Malaysia's aviation research and development potentials. The on-going R&D activities have yielded encouraging results, and have provided Malaysia with a platform to contribute to the global movement and in achieving the aviation industry's commitment towards Sustainable Aviation.

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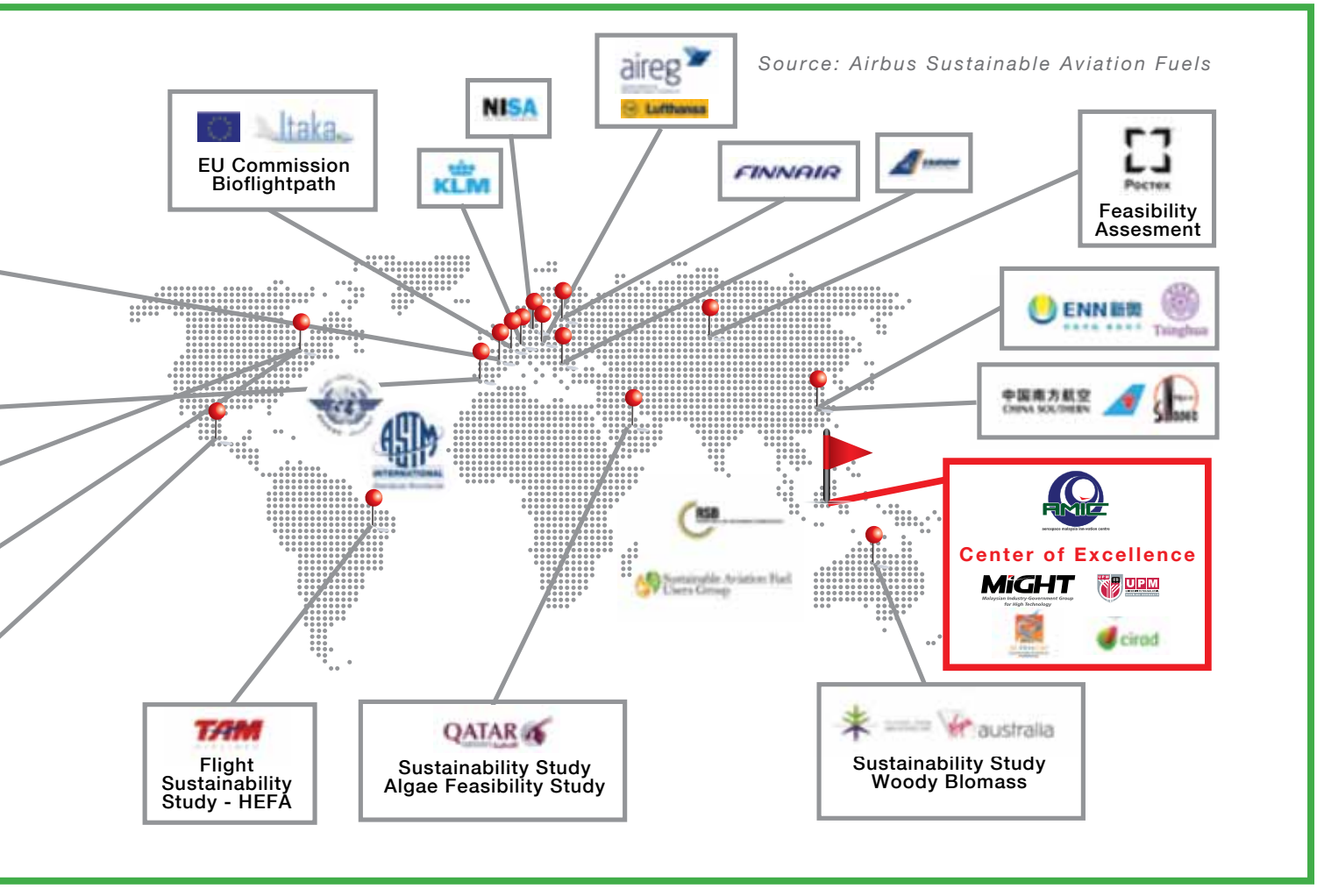
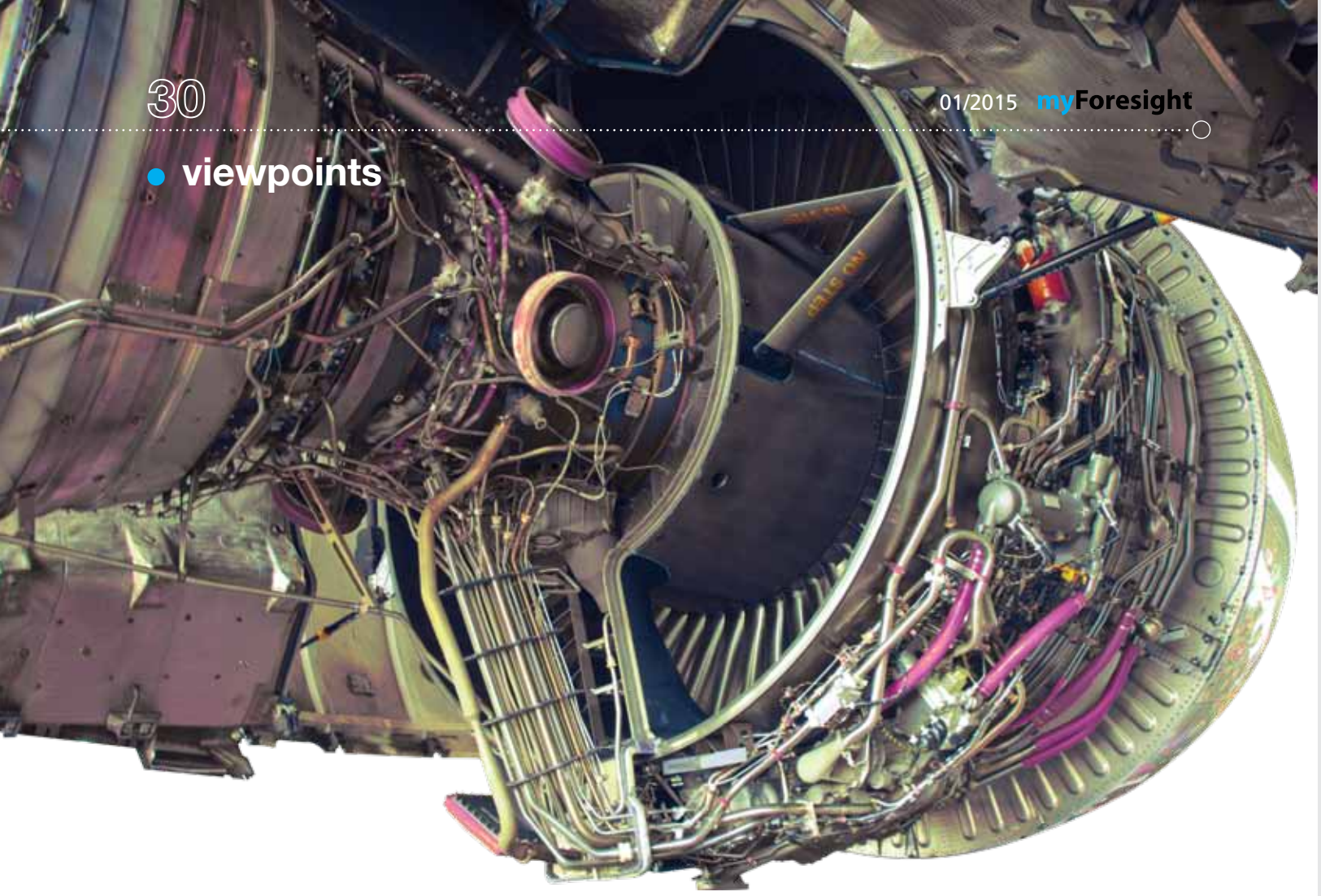




Engineering the Future of Aerospace Services in Malaysia

by **ADDI FAIZ ADNAN**
Head of Business Development
Strand Aerospace Malaysia Sdn Bhd

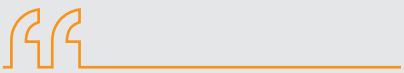
The Current Scenario

The inaugural National Aerospace Industry Blueprint was launched in 1997 at LIMA by the then- Prime Minister of Malaysia as Chairman of the Malaysian Aerospace Council, the national level steering body that charts the direction for the development of the aerospace industry. This year marks the culmination of the objectives set out in the National Aerospace Blueprint (v1.0) for Malaysia to be a global player in the aerospace industry in the following verticals:

- Maintenance, Repair and Overhaul (MRO)
- Manufacturing
- Systems Integration
- Training and Education

Today, Malaysia is a key element in the global aerospace supply chain. CTRM is the fifth largest supplier of composite structures globally for Airbus and manufactures wing components for flagship aircraft development programs like the A380 and the new A350XWB. Spirit Aerosystems Malaysia is a key component supplier and assembler for Airbus and is also among the largest aircraft component manufacturers in the world. Strand Aerospace Malaysia (Strand) provides pure-play engineering services to the aerospace industry (and beyond). Strand's work is focused on design and structural analysis and is the only company of its kind in Malaysia providing pure-play engineering services to global Original Equipment Manufacturers (OEMs).

Malaysia is also fast becoming an aerospace hub for OEMs for the region, with the nexus being the new Asia Aerospace City development in Subang. In 2013, it was announced



Malaysia is also fast becoming an aerospace hub for OEMs for the region, with the nexus being the new Asia Aerospace City development in Subang.

that Airbus would further develop its presence in Malaysia by expanding its joint-venture maintenance unit, Sepang Aircraft Engineering (SAE), and setting up its new wholly-owned Airbus Customer Services Centre adjacent to the SAE facility at KLIA. Messier-Bugatti-Dowty (Safran) the world's leading supplier of carbon brakes for commercial airplanes, opened their new carbon disc brake factory in Sendayan, Negeri Sembilan this year. The factory aims to produce carbon disc brakes for 20% of the global market, covering single aisle aircraft (Boeing 737 and Airbus A320).

The Next National Aerospace Blueprint : Adding the Fifth Vertical

As we embark on the next phase of the National Aerospace Blueprint (2015-2030), the focus will now be to capitalise on the emerging technologies in materials, processes and methods so as to remain competitive and, more importantly, relevant when the next generation aircraft is launched in the next decade. Key to this will not only be a strong and technologically driven manufacturing and MRO industry (downstream activities) as well as

Malaysian Airlines has six A380s and the first of the RMAF's four A400M's will be received this year. Air Asia is one of the largest customers for the A320 and the biggest Asian customer for Airbus in general.

Strand Aerospace Malaysia provides engineering services (structural analysis) for **all** of these aircrafts to **Airbus** and is also involved with other OEMs as well.

A350XWB

The composite components on the wing leading edge are made in Melaka by **CTRM** and assembled in Subang by **Spirit Aerosystems Malaysia**

A400M

A320 NEO

Major wing components are made in Malaysia before being shipped to Europe for final assembly.

A380

The composite panels on the wing are manufactured by CTRM in Melaka.

Figure 1: Aerospace Footprint In Malaysia – Major Highlights

Engineering Services, or sometimes referred to as Pure-Play Engineering, comprises a myriad of consulting, engineering and analytical services to support and solve complex issues and problems that arise in today's global supply chain environment.

highly-skilled human capital, but also increasingly being at the fore-front of the product development and design itself from the onset.

Commercial aircraft development programs can take up to ten years before metal is cut, i.e. before component production begins. It is during this stage that tacit knowledge of the product is developed, covering not only its inherent design, strength justification and certification, but also methods and processes for the component's manufacture and assembly, including even the maintenance and repair manuals that are used by the airlines and operators. Therefore for Malaysia to be an integral cornerstone of the next generation aircraft supply chain (as per the new National Aerospace Blueprint (v2.0)), it is paramount that Malaysian industry is prevalent across the complete engineering design lifecycle of the aircraft. As such, a fifth vertical has been added to the National Aerospace Industry Blueprint 2030 – Engineering Services.

Design and Engineering Services

By 2020, the global engineering services industry is forecasted to grow up to RM3 trillion. In Malaysia, pure-play engineering companies could be generating up to RM3.5 billion at the same time. Up to 11,500 jobs are projected to be created by 2020 in pure-play engineering, mostly in high income and in high-value engineering sectors like aerospace, where Strand Aerospace Malaysia is spear-heading this growth via Entry Point Project 5 (EPP5) as part of the national Economic Transformation Program (ETP) under the Business Services National Key Economic Areas (NKEA).

Engineering Services, or sometimes referred to as Pure-Play Engineering, comprises a myriad of consulting, engineering and analytical services to support and solve the complex issues and problems that arise in today's global supply chain environment. Its activities cut across the full product lifecycle spectrum and involve multiple engineering disciplines from mechanical, electrical, civil to highly specialised areas such as aerospace engineering.

Engineering Services in the Development of Commercial Aircraft

Before a commercial aircraft is formally launched to the market for airlines and operators, significant amount of effort (and money) is spent by aircraft OEMs to understand the market segment that this new aircraft will serve, as this will ultimately lead to the number of aircraft that can be sold. An example is when Airbus decided to launch the A380 super-jumbo in the 1990s (initially dubbed the A3XX). The A3XX aimed to tap into the 500 and above seat market, using the latest technological advances, lower fuel-burn and emissions and more range, while at the same time improving comfort of passengers of its nearest competitor. At that time the reigning 'queen of the skies' was the Boeing 747 which had been dominating the large twin-aisle aircraft segment since the 1960s. Some of the early interesting concepts of the A3XX included a single deck aircraft which would have seated 12 abreast with twin vertical tail planes. Many more concept or trade studies were conducted, leading to the final configuration of the current twin-deck A380 which formally entered service in 2007; all involving engineering services to determine the optimal configuration (overall) and aircraft concept (preliminary design) covering multiple disciplines including (but not limited to) aerodynamics, requirements engineering, systems architecture and structural analysis.

At the end of the preliminary (concept, market and development) phase, the major components and interfaces (at aircraft level) such as the overall wing shape and the number of primary moveable surfaces (flaps, spoilers, ailerons) including the main materials to be used are frozen.

Next, the detailed design phase begins. The engineering teams begin to mature the concept leading up to a final design. At component or assembly level, this involved detailing the individual elements (thicknesses, lengths, heights, etc.) for each component. The design

"It is during this detailed design phase that the bulk of the engineering development work is performed, involving engineering disciplines including, but not limited to, stress analysis, fatigue and damage tolerance, finite element analysis, computer aided design (CAD e.g. CATIA based activities), manufacturing engineering and systems engineering to name a few. Ironically, some of the design engineers in the supply chain are often working for years on end to develop a wing component that will eventually be made and fitted onto the aircraft, but never actually see or handle the component itself.

process is iterative by nature, owing to the constant changes (or loops) in order to optimised design. In the case of a wing, it not only has to be strong (to carry the loads generated during take-off, flight and landing) but also lightweight (to save fuel) while still has the flexibility to bend or twist. It is during this detailed design phase that the bulk of the engineering development work is performed, involving engineering disciplines including, but not limited to, stress analysis, fatigue and damage tolerance, finite element analysis, computer aided design (CAD e.g. CATIA based activities), manufacturing engineering and systems engineering to name a few. Ironically, some of the design engineers in the supply chain are often working for years on end to develop a wing component that will eventually be made and fitted onto the aircraft, but never actually see or handle the component itself.

Once the component design is finalised, the drawing is then released to the manufacturer. However, the manufacturing process actually begins much earlier, i.e. during the design phase when the material is chosen and its ability to be manufactured and/or assembled as the finished article is included as part of the design consideration. During the manufacturing process itself, engineering services elements are present, even in the component factory or final assembly line. For example, in CAD-CAM (Computer Aided Design – Computer Aided Manufacturing) for Computer Numerical Control (CNC) machines, design and engineering of jigs and tooling, Geometric Dimensioning and Tolerancing (GD&T) to Material Review Board (MRB) activities involving shop floor concessions. Once the aircraft undergoes final assembly, it is then fitted with interiors, systems and painted before undergoing flight tests.

Safety Is Paramount

Safety within the Aerospace industry is paramount; therefore the industry is one of the most highly-regulated. Prior to the aircraft being allowed to begin test flights (or commercial flights for that matter), it has to attain its 'type certificate' from airworthiness regulatory bodies such as EASA (European Aviation Safety Agency) and the FAA (Federal Aviation Administration). As part of the process certification, documents containing, amongst others, justification that the aircraft has met all the necessary safety and strength requirements are required to be presented to the authorities. This often involves an independent check of the calculations and analysis performed during the detailed design phase. It is during this period that the engineering teams develop maintenance and repair manuals that would be used later during the aircraft's inspection by the airlines and operators.

Ensuring the aircraft's airworthiness, i.e. the evaluation of an aircraft's suitability for continued safe flight, is an essential obligation for any airline or operator. Depending on the aircraft's

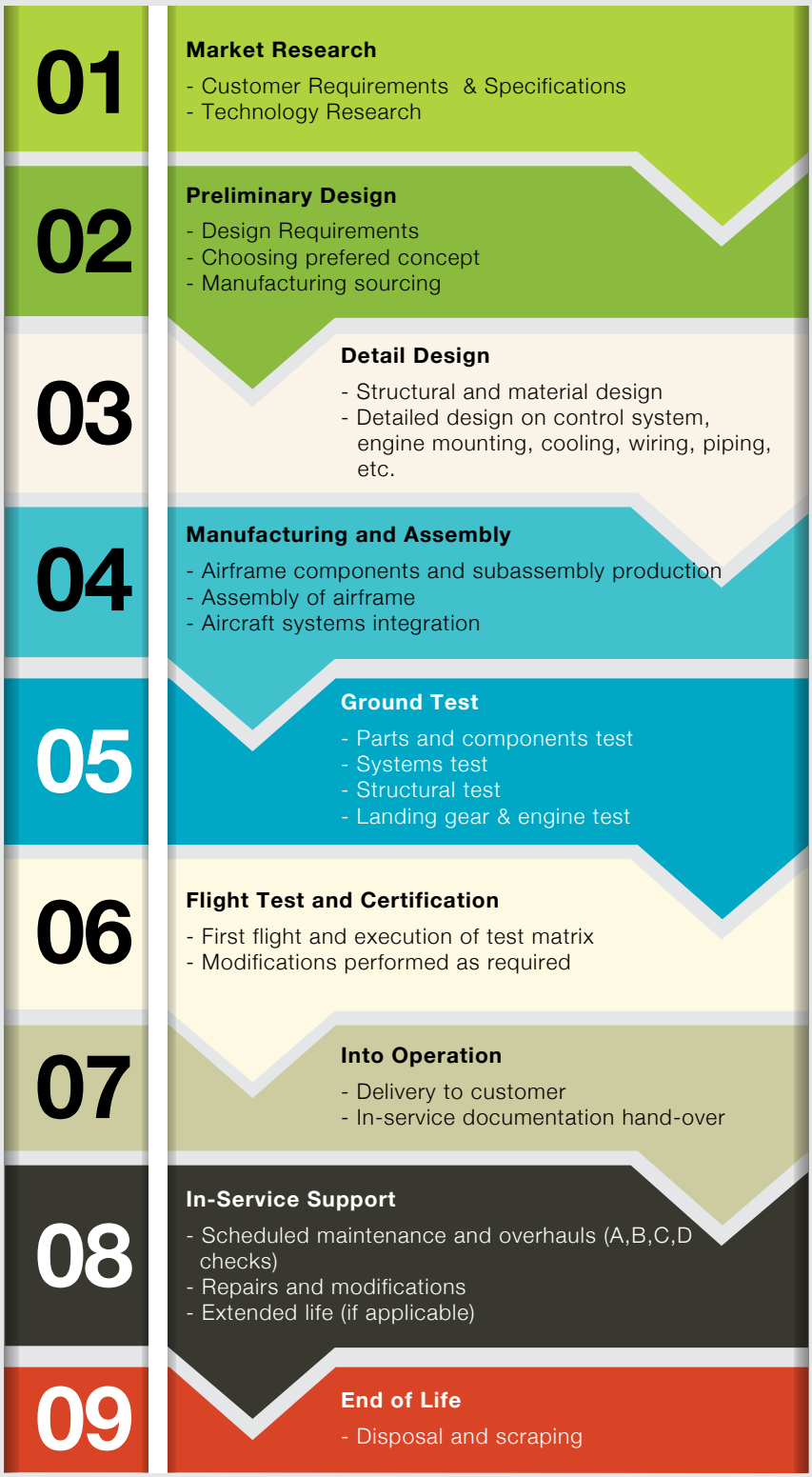


Figure 2: Aircraft Development Cycle

Asia, especially South Asia and Asia Pacific, is considered a key region to support offshoring activities because of the availability of skilled human capital at competitive wages compared to those in Europe or America.

flight hours, it will need to undergo scheduled maintenance checks as part of the Maintenance, Repair and Overhaul (MRO) activity. Should an aircraft be damaged, a repair scheme will need to be proposed if the damage falls outside of the repair manual's limits. For most airlines and operators, this type of activity is managed within their Technical Services department – another engineering services example. At the end of the aircraft's life or lease, it will undergo a rigorous check (often stripped down to its bare structure) for safety inspections. If the aircraft is to be re-sold then its airworthiness will need to be reassured. If the aircraft is to be dismantled, there may still be serviceable parts that can be used but will need further justification.

The commercial aircraft development phases described thus far only presents a general overview. It is by no means comprehensive as there are other facets including, but not limited to, flight planning and logistics, systems and software development, as well

The Asia Aerospace City stands for the global standard in connecting aerospace players worldwide with the opportunity for growth in Asia. AAC offers a complete business ecosystem through its high-quality engineering services, industry-relevant human capital, iconic infrastructure, and government support. To the largest Original Equipment Manufacturers (OEMs) in the world, it is a competitive hub for industrial talent, cost efficiency, connectivity and resources.

as modifications and activities concerning airport operations – all have an engineering services element embedded in the daily operations – that has not been touched. There is also the military aircraft development and maintainability, including Aircraft Structural Integrity (ASI), that also requires engineering support.

Human Capital Development

Engineering services within the aerospace industry do not only play a vital role in supporting OEMs but also meet the constantly challenging cost competitiveness targets through offshoring. Asia, especially South Asia and Asia Pacific, is considered a key region to support offshoring activities because of the availability of skilled human capital at competitive wages compared to those in Europe or America. As an example, up to 20% of the Airbus product development activities have been offshored to India over the last decade. In terms of future growth, aircraft purchases in Asia Pacific will represent 40% of the order books of Airbus and Boeing by 2020. Today, Airbus and Boeing are manufacturing more than 40 single aisle aircraft such as the A320 and 737 per month. They are increasing production up to 50 units per month, but are still short of the global demand for these aircrafts. This is driving the supply chain to increase capacity and the OEM's to search for new companies including engineering services.

Increasingly, due to the consultancy nature of the job, engineers are also required to be able to deal with client facing situation. Therefore, to be a successful engineer, particularly in the aerospace industry, an individual need to have:

- Sound technical knowledge and knowing how it is applied;
- Good communication skills (verbal and written) in English;
- An aptitude for solving problems, often employing 'out-of-the-box' solutions.

Malaysians have the ability and capacity to succeed as, in some regards, we are globally competitive in terms of education and command of international language (English). Malaysia is the leading producer and provider of skilled workforce in the SEA region and is on the right track to remain so for the foreseeable future. It is projected that by the year 2030, Malaysia education and training institutions will be able to produce 50,751 technicians and 15,556 graduate engineers. Thus, we should look to capitalise on this as we look to become the gateway for engineering services for the region, congruent with the ETP (Entry Point Projects) for Aerospace as underlined by the new National Aerospace Blueprint.

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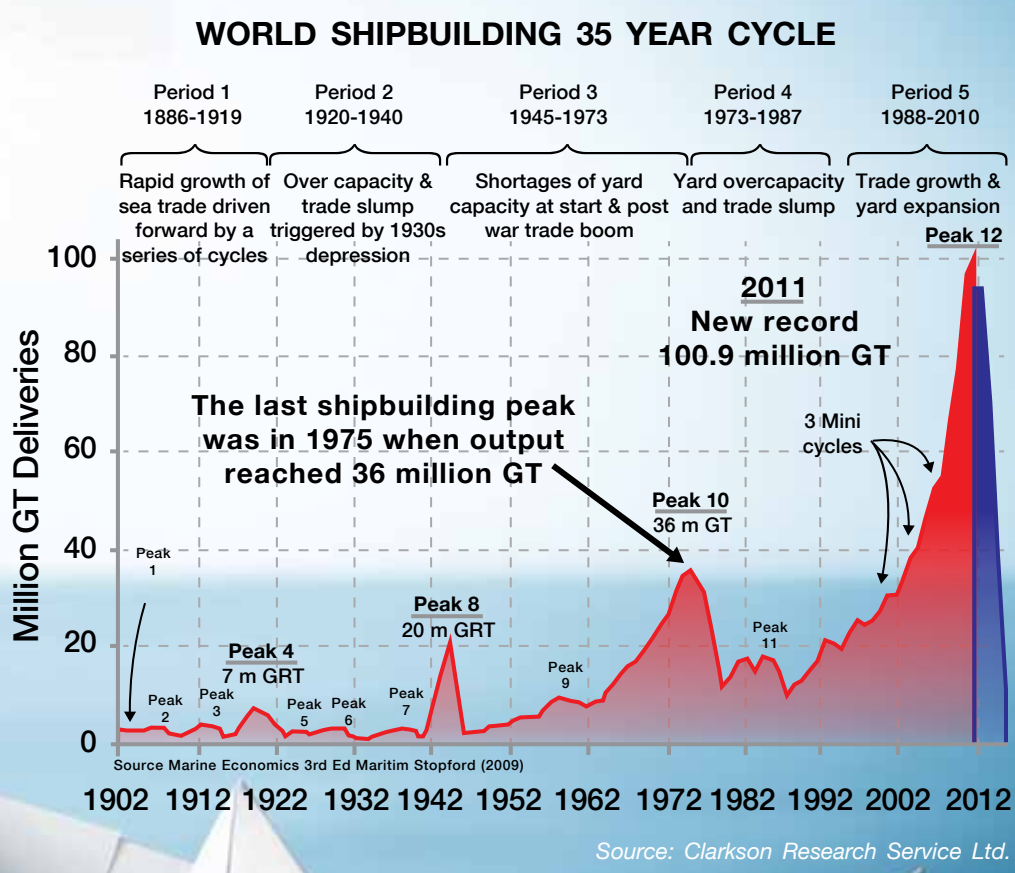
MALAYSIAN SBSR-

Charting the Right Course

The first road map for shipbuilding & ship repair (SBSR) industry called 'Malaysian Shipbuilding/ Ship repair Industry Strategic Plan 2020' (SBSR 2020) was launched in 2011 by the Prime Minister of Malaysia, Dato' Sri Mohd Najib Tun Abdul Razak. The road map is to guide the SBSR industry's development and strategically propel Malaysia into becoming a high-income and developed nation. With strategic targets sets in the SBSR 2020, the industry aims to generate RM6.35 billion in the Gross National Income (GNI) and provide 55,000 jobs through growth that is both sustainable and inclusive. The targets set may appear ambitious but they are reasonable. They play up to the strength of Malaysian shipyards which are competent in building small and medium size vessels - some of which like offshore support vessels (OSV), passenger ferries and leisure crafts - are even coveted abroad. The targets also reveal the huge opportunities for local shipyard operators to reap the potential in the SBSR industry.

In realizing the aims, several strategies have been put forth which include strengthening the institutional framework, establishing business friendly policies that support the industry growth and reinforcing regulatory frameworks to assure that the integrity of SBSR companies and the quality of their products continue to improve. In term of human capital development, an adequate and capable workforce must be provided and at the same time develop our design capability that adopt new SBSR technologies. Inward investments are also being actively sought through improved financial and incentive packages. The industry's level of sophistication as well as its competency needs to be upgraded for optimum results. The SBSR industry is influenced by many internal and external drivers that affect its development and direction and the strategies of shipyards and ship owners alike. These drivers encompass a host of areas such as policies, environment, economics, technology, financing, consumption, logistics and even geo-strategic developments. They affect how ships are built, owned, financed, deployed and eventually scrapped. Beginning mid-2014, the fluctuation of the oil price has relatively determined the path of the local SBSR industry. The drastic dropped in oil price towards end 2014 and beginning 2015 have risen concerned among the shipyard operators. PETRONAS recently had announced to defer its Capital Expenditure (CAPEX) and reduce its Operational Expenditure (OPEX) in response to the recent steep 60% decline in oil prices. The deferments would reflect the change of environment in the global O&G industry to ensure its resilience through the low oil price period.



Source: Clarkson Research Service Ltd.

Figure 1: Demand cycle for new vessel

It is a known fact that the strength of O&G sector has been one of the key factor that determining the local SBSR market force. Shipyard that have diversified their business focus into O&G offshore engineering and fabrication from the usual building and servicing vessel during the O& peak cycle, might be the one being affected most. Despite the turmoil, it is noted that the local demand for OSV type vessel remained stable while there was a significant drop in orders for other types of vessel after having reached its peak in 2012. In general, the demand cycle for new vessel is shown in Figure 1.

Since the launching of SBSR 2020, several initiatives as recommended have been implemented though some of them were unable to progress further amid various reasons, including the unfavorable policies that are already in place. In response to the growing expectations for the government to support the SBSR industry, it is imperative to align the government development plans with the needs of industry. Leading to the right direction, Ministry of Industrial Development, Sarawak had responded positively on the issues raised and realized business potential that can be tapped from the SBSR activity with focus in Miri and Sibu. Henceforth, the industry players need to continue to work closely with the state Government to further develop the industry so that each party can play a strategic role in contributing to Sarawak economy.

It is a known fact that, Malaysia has been one of the vessel exporters to Middle East countries such as UAE and Qatar. The demand of offshore vessels type by these countries is due to their rapid growth in exploration and production on the O&G sector. As such, a continuous effort that spearheaded by Malaysia External Trade Development Corporation (MATRADE) to intensify global marketing is definitely be the right move they made. Through its specialized marketing mission, the aims is to expand business opportunities in the targeted market focusing on marine products such as new build vessel, marine equipment, maritime training and in engineering services.

The development of the SBSR industry must also taking into consideration the development of its workforce capability. As such, an appropriate modules and subjects that applicable to SBSR industry with emphasis on problem solving, multi skilling and safety consciousness must be laid down. Engagement with experts as well as those who are hands-on on that particular job would be the best approach in coming out the best training modules. The objective is to flood the industry with Malaysian talent thus phasing out our dependency on foreign workers. On another initiative, a skilled worker will be developed under a customized bridging programme whereby these peoples will immediately absorb by industry upon completion their training programme.

One of the key strategies to spur the development of the industry under the SBSR 2020 is by applying local design and adopting new technologies. Currently, most of the designs used for new build in Malaysia are imported from other countries; mostly from across the causeway. Boustead Heavy Industries Corporation Berhad (BHIC), has taken up the challenge by embarking a project under the Economic Transformation Programme (ETP). The project of developing local OSV design arises with the objective to increase Malaysian share in shipbuilding while increasing the local content and develop local vendors. The ability to own the design data would enable future upgrading and modification to be carried out locally. This would, in turn, encourage research and development activities and lead to innovation in generating new designs.

The high technology industries such as SBSR can be further developed by injecting foreign expertise that allows for knowledge and technology sharing in niche areas. To improve efficiency particularly in ship repair project, BN Shipyard (BNS) has engaged Korean expert to provide an advisory services. The objective is to further enhance the shipyard potential by injecting foreign expertise that allows for knowledge and increase productivity. With the engagement, BNS is able to acquire the appropriate shipyard practices in improving their delivery time. Based on the success of this initiative, the same module will be emulated to others SMEs thus provide them a wide exposure on the South Korean best practices.

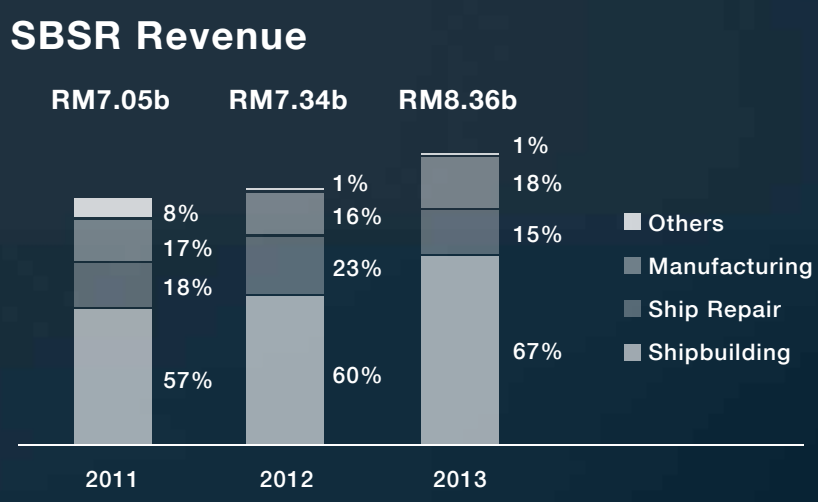
In accordance to the world environmental protection on air and water, the newly imposed rules and regulations by the International Maritime Organization (IMO) had indirectly given impact to the vessel

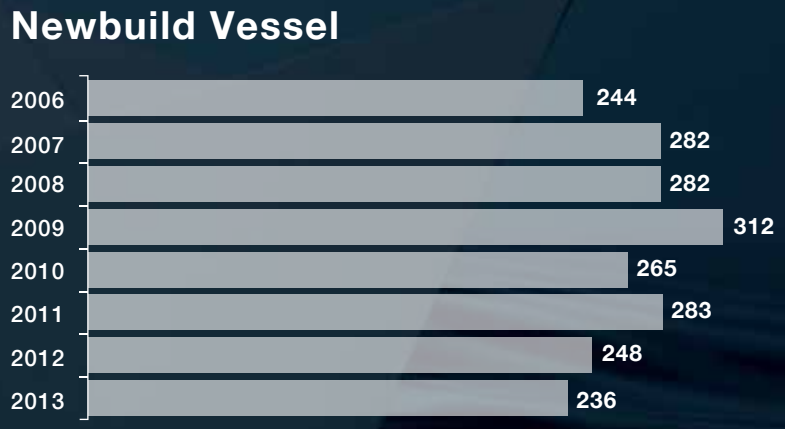
production in Malaysia thus raise the operational cost to the ship owner. The requirement of latest technology, for example on the main propulsion system that complies with the new IMO regulation on gas emission will force the ship owner to revise their investment plan for new vessel. The infusion of green features onboard ships have exerted demand on naval architects, marine engineers and shipyard operators to accommodate the need to design environmentally friendly ships. This entails investing in state of the art equipment and technologies and also introducing innovative solutions to build eco-friendly, fuel efficient and economically viable vessels that comply with regulatory requirements and operate efficiently.

Industry Performance

Since 2010 until mid-2014, the O&G sector remains favorable after experiencing a lows cycle in 2008/ 2009 underpinned by high oil prices and major projects by local and international players. O&G sector is one of the strongest driving forces for the local SBSR industry. Due to this fact, shipyards have enthused to diversify their business operation apart from SBSR into activities that support offshore requirements such as structure fabrication, ship conversion (i.e. Floating Production Storage and Offloading, Floating Storage Offloading etc.), rig building, platform repair and maintenance and even ship chartering.

In overall, Malaysian SBSR industry stayed strong with 2013 revenue recorded at RM8.36 billion; an increment of 14% compared to 2012. The figure is commensurate well with the total number of workforce in the industry, which estimated at 35,000 employees. It should be noted that the number of workforce is exclude subcontractors for works that being outsourced by shipyards. Therefore, the actual number of total manpower in this industry could be higher.

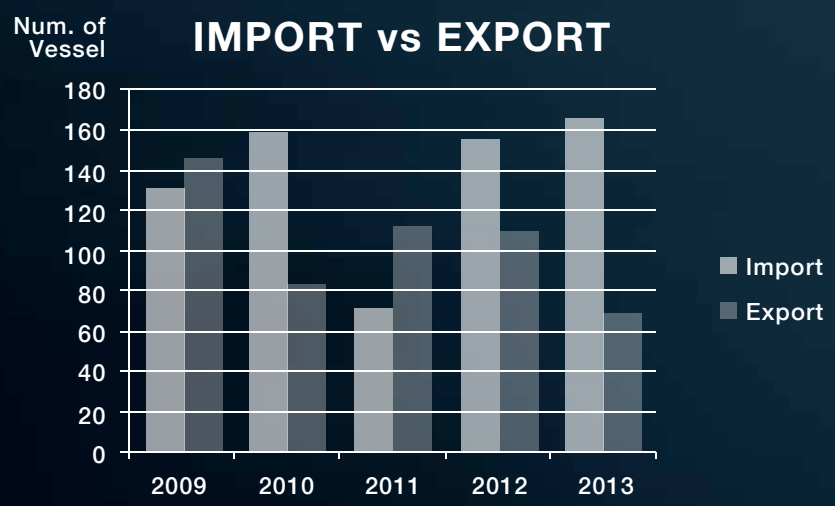




It is an alarming fact that the number of imported vessels continues to increase which had reached to more than 100 per cent, based on calculation made for 2011 to 2013. Surprisingly, most of the imported vessels are of near coastal types which are less complicated, low in value and within local shipyards capability. As a result, local shipyards managed to capture only 50 per cent of local market needs compared to 70 per cent in 2011. The inability of local shipyards to meet the requirement of delivery period and offering competitive price were believed to be the key factors in the high number of vessels being imported. Although imported vessels are comparatively cheaper,

they are often of lesser quality. In some cases, these vessels that uses lower quality material and products is compromised by the ship owner's even it only give them a short term advantage in term of cash flow. Attractive financing terms offered by overseas lenders is also a contributing element for ship owners to prefer acquiring vessels from the foreign yard.

Export wise, the year under review also recorded a drastic dropped from 113 vessels exported in 2011 down to 70 vessels in 2013 though the total of gross tonnage (GRT) remains unchanged. The downtrend in number of exports clearly indicated a lower demand as well as stiff competition from other shipbuilders in this region.



Low freight rates that consecutively it becomes uneconomical to operate a vessel continue to weigh down the ship repair market. Revenue gained in the ship repair was largely from activities that involved in servicing bigger and special purpose vessels such as LNG carriers, containers, tankers and bulk carriers undertaken by MMHE in Johore.

Although the ship repair sector provides a steady business flow, there is a huge need to upgrade shipyard facilities and provide better quality in services in order to capture the local and international market. The current capacity of docking facility available at Peninsular Malaysia is at the range of 300 to 10,000 GRT and mostly located along the west coast. With these capacities, it should not give any problem to dock a vessel of small to medium size, the size that currently dominating the Malaysian waters. East Malaysia has the potential to become a regional hub for ship repair in term of number shipyard available. However its geographical constraints such as shallow river depth and strong river currents are some of the major challenges that need to be resolved first in order for it to be easily accessible by vessel.

In 2013, marine equipment manufacturing contributed about 18% of SBSR industry revenue worth RM1.5 billion; figure that populated from 26 companies. Most of the companies involved in producing electrical and electronic parts and component, auxiliary equipment and deck machineries.

Consist of raw material and subcomponent in Tier 4 up to Prime Contractor which represented mainly by shipyards. Except for marine grade steel plate, the current manufacturers in Tier 4 have no issue to provide raw material used in shipbuilding.

Comparing to other players in this region, our marine manufacturer can also produce a high quality and reliable products at a very competitive price. Some of these manufacturers even export their products to international market. Nevertheless, the opportunity for a bigger market share is there to reap if the players can upgrade most of their products into marine grade or standard. Some of the non-high tech auxiliary equipment that manufactured locally are not being certified by the international classification body which limits their ability to penetrate global market. In sub-system equipment manufacturing, the number of local players are quite limited in area of electrical and electronics specifically in navigation, communication and control and monitoring system. These systems usually come with the equipment that is normally imported in a complete assembled form, directly from OEM or through its regional authorized dealer.

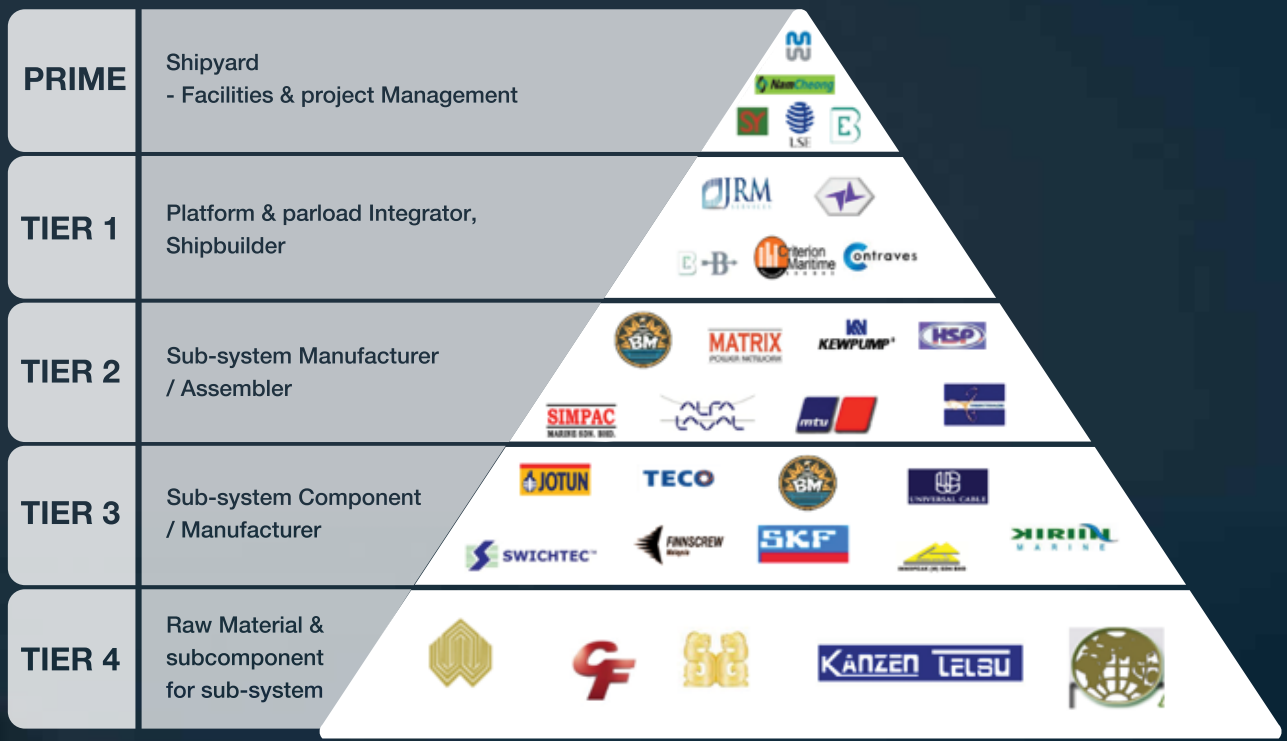


Figure 2: The local SBSR industry supply chain

Opportunities and Challenges

The changing dynamics in the SBSR industry arising from key trends and developments are profoundly shaping the landscape of the industry. They influence the way ships are financed, designed, built, operated, serviced and even decommissioned. Demand on several types of OSV vessels is predicted to rise in 2015 and 2016. OSV Owners Association Malaysia had projected that around 200 OSVs will be required to facilitate the activities of Petronas and major oil companies and the other oil major companies operating in Malaysia water for the next five years. These present huge opportunities for local shipyards to meet the needs and match their investment.

On the other hand, industry performance for 2015 and 2016 as a whole might also remain stagnant due to the recent instability of oil prices. If the prices keep in low trend for the next couple of years, the global economy is then expected to experience a slow growth and will consequently affects the number of new build order as predicted earlier. Local shipyards are strained to offer vessels at the lowest profit margin in order to ensure continuous project in hands. 'Build-to-stock' business model is seen to provide better returns during these critical years, although it may contribute to oversupply of vessels. However, instead of keeping the vessel as a liability, shipyards or ship operators can bid the vessels, generally at a very low rate.

The local SBSR industry is also dependent on O&G development projects from regional players like India, China, Vietnam and Indonesia and their shipping policies. Effective from 2015, Indonesia's Cabotage Policy will start to restrict foreign vessels to operate in their waters especially to those that involved in O&G sector. The country is also in the process of formulating policy of cially hiilt' under their Beyond Cabotage Program. This would reduce the new number of order book from Indonesian customers. The number of local production and export will indirectly decrease as well.

On average, more than 50 per cent of vessels in the world are 20 years and above which creates high potential for newer vessel to replace the timeworn ones. Apart from lowering operating cost with newer vessels, ship operators are also looking for more sophisticated vessels for usage. The industry must also comply with stringent maritime safety and security regulations. Tightened environmental standards require shipyards to produce more environmental friendly and greener, fuel-efficient vessels or eco-tonnage vessel. This creates opportunities for cleaner, safer and more efficient products in the industry. In the O&G sector, limiting the vessel age to less than 10 years only and the tendency by major oil companies to use vessel that can perform a multi-function task will certainly create an opportunities for the shipyard in meeting the new demand.

These trends and developments present many challenges for industry players to overcome and adjust to but also exciting opportunities to reap. To thrive in the fast changing SBSR industry, shipyard operators must put in place adequate resources, infrastructures, capability and support services. In addition, policymakers must be in tune with the trends affecting the SBSR industry in order to be responsive to the changes they bring. This is crucial given that the SBSR industry is important to the well-being of nations and that shipyards can only flourish in this capital-intensive and challenging business landscape with strong policy support and incentives from governments.

Sailing Ahead

Moving forward, the SBSR industry in Malaysia will continually grow based on the recommended systematic changes as tabled in SBSR 2020, which includes commitment by the local shipyards to improve their productivity, efficiency and upgrade in technological capability. As Malaysian SBSR industry is part of the country ETP, it should continue to receive strong governmental support in propelling the industry to the next level. Several strategies have been put forth as part of the national agenda through 11th Malaysia Plan 2016-2020. The main focus is to develop on niche market and migrate from traditional way in SBSR and component manufacturing activities into using high technology equipment and method and produce higher value added products.

It is also crucial for the private as well as public sector to start investing in developing and nurturing the manpower to cater the high-end, specialized and revenue generating activities instead of continue engaging foreign expertise. Building our capacity and capability in Maintenance Repair Overhaul (MRO) activities on high value component e.g. for main propulsion system, navigation system, electronic control and monitoring as well as systems integration must be encouraged.

With all the stakeholders in the industry working in concerted effort, the aim of making Malaysia a significant player in the SBSR industry can be realized sooner than later. There is much promise for the local industry to attain greater heights. Malaysian yards have what it takes to enhance their business and market shares, given that some of them are already undertaking big and sophisticated jobs, especially related to the offshore O&G sector. Greater support from the government and stakeholders such as the shipping community, players in the offshore O&G industry and government linked companies (GLC) will help push the SBSR to greater heights, and help shipyards reap the opportunities presented by the golden era in Malaysia's offshore O&G industry.

viewpoints

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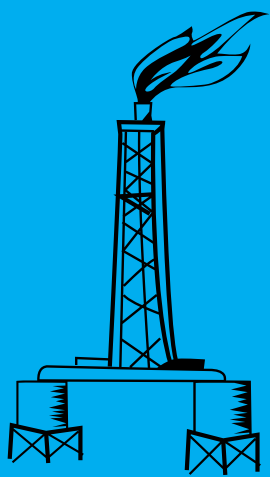
LEVERAGING THE OIL AND GAS SECTOR FOR THE DEVELOPMENT OF MARINE INDUSTRY:

An excerpt from the 3rd National Marine Industries Forum (3NMIF) Forum Report



The oil and gas (O&G) sector is the major contributor to Malaysia's economy. It is noteworthy that, over the past decade, the oil, gas and energy sector contributes about 15% to Malaysia's gross domestic product (GDP) and is expected to contribute up to 20% to the nation's economy by 2020. The demand for these precious hydrocarbons is forecasted to grow in tandem with the increase of world population and the needs like foods, shelter, cloths and etc.

The demand is strong, especially from the transport sector which makes up the bulk of global demand for O&G. As reported in World Oil Outlook 2013 by OPEC, 60% of the global demand for oil in 2012 came from the transport compared to 25% from industrial sector; 10% from residential, commercial and agricultural sectors; and 5% from electricity generation sector.

O&G and the Marine Industry

It is not an exaggeration to say that the marine industry is the backbone of the O&G sector as it requires various vessels and workboats to facilitate and carry out offshore exploration and production (E&P) activities. And, as Malaysia's O&G sector progresses, more local companies are involved in shipbuilding, ship repairing, ship chartering, equipment manufacturing, ship management, crewing and marine surveying. The robust demand for various workboats in the offshore support vessel (OSV) category has seen several shipyards enjoying impressive revenues and healthy order books.

Shipbuilders' role in supporting Malaysia's offshore O&G sector is extremely important. Some of them even cater for the export market where, in 2013, RM193 million worth of offshore type vessels were exported by Malaysian shipyards. It also shows that Malaysian-made

vessels are recognised and accepted worldwide as its quality meets international standards.

For the past few years, several local shipyards have also started to venture into offshore support activities such as structure fabrication, ship conversion (i.e. Floating Production Storage and Offloading, Floating Storage Offloading, Floating Storage Unit), rig building, platform repair and maintenance as well as ship chartering. The approach helps the shipyards to diversify their business and cut their dependency on shipbuilding and ship repair activities as the competition in these areas is increasing and the demand has started to decline.

Increasing E&P Cost

The days of 'easy oil' – oil found in abundance and in accessible areas – is coming to an end. Exploration to find O&G need to be done in farther locations and in tougher conditions which include fields in ultra-deep waters with high contaminants and high temperature that pose enormous technical and physical challenges.

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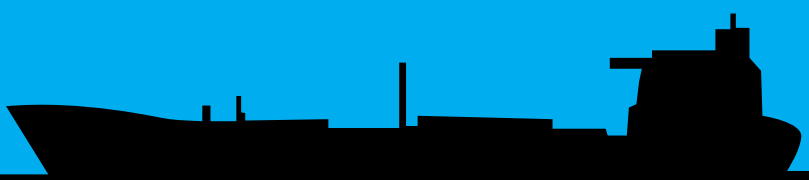
The more challenging demand to find O&G in frontier fields increases the expectations of oil majors for more sophisticated OSV. Such vessels like anchor handlers, fast crew boats, supply vessels, accommodation vessels and various types of floaters have to feature the ability to carry greater volumes of cargos and passengers, have self-propelling ability, and sail at higher speed compared to existing vessels. Additionally, major oil companies are now seeking vessels with all-weather robustness that can help minimize health, safety and environment (HSE) risks and non-productive downtime. Consequently, the cost to carry out E&P activities is getting higher. The average cost of an asset used in the E&P of the sector is currently 300% higher than that of five years ago.

Major oil companies would also want to see shipyards enhancing their competitiveness and efficiency in servicing their vessel to reduce vessel downtime in facilitating E&P activities. In an initiative to reduce



Malaysia's OSV Owners' Association (OSV Malaysia) estimated 12% of OSVs in Malaysia had past their economic life and 21% are still useful but no longer competitive.

carbon footprint, oil majors are eyeing on greener vessels which not only help to protect the environment but also increase operational efficiency.

Malaysia's Marine Industry

Can Malaysia shipbuilders meet these demands?

Malaysia's OSV Owners' Association (OSV Malaysia) estimated 12% of OSVs in Malaysia had past their economic life and 21% are still useful but no longer competitive. On the positive note, this presents a great opportunity for fleet modernization and upgrading to lower the age of OSV.

Korea's marine industry has improved rapidly making her a successful maritime nation. Therefore, it is not wrong to look at Korea as an example to improve our marine industry.

Looking at the Korean Best Practice (KBP) as an example, it is imperative to change the behaviour, mind-set and attitude of shipyard personnel to gear them towards a high performance working culture. The relentless commitment from the industry players must then be complemented by solid regulatory, institutional and organizational framework, and intensive use of technology and operations systems. The industry must work hand-in-hand with the Government and learning institutions for the betterment of the industry.

KBP has shown that one of the key ingredients to become a successful maritime nation is to master the design capability. Attaining in-house design of various types of vessel, especially OSV, will enable us to maximise our local content at the earliest design stages when primary parts, materials and equipment and the basic configuration are being decided. This will enable us to be competitive in terms of price.

Malaysia, apart from being an O&G hub, can also emerge as the hub for building and repairing high value-added vessels/assets such as drilling ships, FPSO, FLNG, jack-up rigs, MOPU and LNG-powered vessels. Taking the opportunity that has come forth, local shipyards should pursue collaboration opportunities with established foreign yards that have proven track records in building/servicing such ships and assets. Local shipbuilders should play a proactive role and position themselves to be at the forefront of shipping instead of 'order takers'. This is achievable if local shipyards manage to become the best solution provider to specific needs of the shipping community.

viewpoints

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SCIENCE to ACTION

BEYOND RHETORIC;

S2A goes basic

Vision 2020: the goal of making Malaysia a developed nation by 2020 has been the focal point of strategic plans and initiatives that have been laid down progressively over the years. To achieve the goal in a more holistic manner invariably includes addressing the quality of life of the people. A deliberate fine-tuning was conducted, and the result is in the current principal plan as laid down by the Economic Planning Unit (EPU). The plan fundamentally consists of realizing the New Economic Model (NEM) through its accompanying policy under the Strategic Reform Initiatives. It is intended to propel Malaysia towards the goal of becoming a high income, sustainable and inclusive economy by 2020.

In the effort to realize vision 2020, a national level transformation initiative has been lain out and implemented in tandem with the NEM. The initiative is developed and implemented by Performance Management & Delivery Unit (PEMANDU). It contains two outcome and impact centric programmes: the Government Transformation Program (GTP) and the Economic Transformation Program (ETP), each with a set of specified Key Performance Indicators (KPIs) to gauge accomplishment. GTP is developed in accordance with the principles of 1Malaysia: People

First, Performance Now. It details the objectives, outcomes and the initial set of actions – in areas identified as National Key Result Areas (NKRAs) and Ministerial Key Result Areas (MKRAs). ETP, on the other hand, focuses on key growth engines or National Key Economic Areas (NKEAs). It relies heavily on private sector-led growth, describes very specific investments and policy actions required; and has palpable implementation roadmap with strong performance management.

Dwindling Dynamism

All the plans and initiatives are to converge towards 2020. The year is the key deadline in meeting the specified targets for the current initiatives. As the deadline approaches, the sustainability aspect became more apparent and crucial. Structural gaps magnified, compelling the need to have robust fundamentals at the grassroots that can address those gaps and contribute to the advancement of the nation indefinitely.

The most apparent structural gap is the lack of progress, mainly in the areas that concern indigenous-based technology/application. Progress or growth in these areas is important as they are conceived from within, primarily using local capability and capacity that can innovate in the face of dynamic challenges; and overcome existing or anticipated barriers independently. It means that resources, whether it is technology, capability, and/or skills required are available and developed locally to address any issues – shortages, environmental challenges, sustainability aspects, etc. This has to be done in a comprehensive manner where any foreign assistance should only be limited to training or guiding; hence ensuring that the nation can move forward in a more confident self-reliant mode.

Such a faculty however, only comes from having the basic Science and Technology (S&T) development components available and primed; including abundance of qualified and skilled manpower with constructive attributes; well-developed Research, Development, and Commercialization (R, D & C) activities; combined with a vibrant application of Cross-cutting Technologies by practitioners and vendors. Yet, this vital ingredient to national development has unfortunately been overlooked, and gone unfulfilled to a certain degree.

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Realizing a new vigor

To rectify the weaknesses and flaws, close the structural gaps, and meet the requirements that has been identified, a new National Agenda was deliberated by the Prime Minister together with the scientific community and professionals; subsequently giving birth to Science to Action (S2A), where the emphasis for Science, Technology, and Innovation (STI) by planned mechanics; are brought to the fore influencing basically everything we do from within and without. It is neither a novelty nor a new notion, but a well-known approach for viable development that is being given a new drive. Common sense, it may be, to many of us at present. Nevertheless, taking into consideration our inherited vestiges of circumstances and administrative relics, the whole aspect truly need a robust and convincing Change Management, coupled with a fervent common will by all of us to see it through.

Basically, S2A is a comprehensive science transformation agenda formulated to ensure sustainable growth beyond 2020. It is complementary; innately supportive of the various existing initiatives that have already been undertaken by the Government. It is required to ensure the nation maximizes its potential by realizing the use of S&T. In short, as remarked earlier, S2A is needed because the nation has to be able to innovate from within; to do more with less due to the diminishing nature of natural resources; to support the conservation efforts that are currently in place; and to fulfill the need to enhance value added components to secure higher returns independently.

S2A would center on the amplification of S&T capacity build-up primarily through education where technological know-how, engineering capabilities and, most importantly, knowledge are generated and proliferated. All this will be harmonized with the deepening of its application into all areas of industry

development, giving a broader base to create more wholesome and significant opportunities which would invariably result in multiplying positive effects to the economic growth and the well-being of the people, within the scheme of continuous nation building.

Progressing a framework

The S2A working framework will be based on three (3) thrusts:

1. **Science for Governance**

   This cornerstone thrust is to strengthen both public and private sectors' service delivery systems. It is to enhance and fine-tune the foundation of the systems, and to position the Science, Technology, and Industry (STI) ecosystem in a proper place in order to create a harmonious, conducive, and sustainable environment for the development of the nation.

2. **Science for Well-Being**

   The aim is to holistically upgrade the people's standard of living through the usage and mastery of STI. This thrust emphasizes excellence in the national education system, especially in the field of Science, Technology, Engineering and Mathematics (STEM) by giving specific focus on the next generation youths. It also covers the leveraging of biodiversity as source of wealth, including its conservation elements and sustainable management of environment.

3. **Science for Industry**

   The effort here is to establish an innovative culture and strengthen the capabilities of industries to generate new wealth. This includes effort to inculcate the Silicon Valley culture of "Innovate or Perish", "Dare to Fail", and creation of prolific ecosystem for start-ups. Another key area is to encourage the Government-Linked Companies (GLCs) and Small and Medium Enterprises (SMEs) to venture into new potential growth areas whose returns on investments are multi-fold.

A permanence of legacy

The plans to increase the ratio for Science stream vis-à-vis Arts stream students have been done much earlier in our nation's education policy history, dating back to the 1960s, as a precursor to having an S&T driven economy. However, due to similar fated circumstances, we thread the all too familiar terrain of good planning with ambiguous implementation success.

This time however, it is slated to be different because it starts at the top with the Prime Minister, Dato' Sri Mohd Najib Bin Tun Haji Abdul Razak; via his globally prominent Science Advisor, Prof. Tan Sri Zakri Abdul Hamid. The agenda will not be placed in a Ministry as it was done previously, but under a Cabinet Council with executive powers, chaired by the Prime Minister himself. The agenda will be overarching, able to transmute the very governance that is required to fully integrate S&T with all the current plans, initiatives, programmes, schemes, and campaigns.

We have learnt from the past that for an agenda to be truly successful and self-progressing,

S2A is neither a novelty nor a new notion, but a well-known approach for viable development that is being given a new drive.

it needs to be a win-win situation for everyone. It has to start with participatory and contributory stakeholders' consultations, inclusive and not limited to certain parties or groups, complementary and innately supportive and, most importantly, viable to the people with sustainability built-in. Additionally, the agenda and its subsequent implementation would have to be holistic because it encompasses the whole ecosystem and, therefore, should not be conducted piecemeal, selective or in-silo working by the various ministries/agencies earmarked to undertake them.

The whole mechanism will be coordinated by the S2A team under the auspices of the Science Advisor to ensure consistency and uniformity in approach.

To ensure continuity of purpose and engender permanence, the culturalization of the masses has to begin in earnest. It is not written but rather implied that creating an S&T literate society will be an outcome – a consequent to the gaps that are being addressed by S2A.

viewpoints

by myForesight® analytics

MANAGING CRISES AND DISASTERS WITH TECHNOLOGY

The World Economic Forum convened in Davos recently issued its 2015 edition of the Global Risks report which laid out 28 global risks and considered the drivers of those risks in the form of 13 trends. This 10th edition of annual Global Risk Report had named top 4 risks as **interstate conflict, water crises, failure of climate change adaptation and unemployment or underemployment.**

The global risks assessment technique by likelihood and impact is being frequently used in many foresight activities. It is foreseen that the consequences of these risks to the world economy would be serious. Long term implications might affect segments of country's political, social and environmental trajectory. These include the rise of new regulatory and instability risks as well as the emergence of new technologies in managing the crises.

Global crises such as pandemics, food insecurity, financial crisis, cyber risks, natural and/or man-made disasters and social unrest indicate the future of threats in three essential areas: public health, finance and critical infrastructure sectors as transportation, telecommunications and energy. Meanwhile, emerging market economies such as China, India, Indonesia and Malaysia would be facing more environmental challenges in the years ahead if development is not managed sustainably. The economic growth is directly proportionate to the rate of demographic change, urbanization and land-use change phenomenon. As countries increase in economic size, it is inevitable that the economic cost of natural disasters will also increase. Effects of catastrophic events can be limited by reducing the various elements of vulnerability.

2014, was a year of unprecedented weather conditions, not only in Malaysia but also around the region. Dry season, peat fires and open burning activities had worsened the air quality. Satellite images indicated several scattered hotspots in Malaysia and neighbouring countries. The legislative and regulation enforcement alone is not enough to manage, anticipate and mitigate the current and future environmental problems. Technological contributions such as surveillance, monitoring and early warning systems are crucial. The development of a more technology-oriented approach is inevitable.

Social And Economic Impact

Natural disaster can have devastating short and long-term impacts on the society and the economy of any country, adversely affecting progress towards sustainable development. It causes loss of life, social disruption and affects economic activities. It also causes environmental damage such as loss of fertile agricultural land and water contamination, affects urban settlements, and may result in major population displacements. The increase and impact of the natural disasters worldwide is far greater than before, leaving us, the societies, in a very vulnerable situation.

A disaster usually has direct impacts such as damage to infrastructure, crops, population displacements etc., and indirect impacts like loss of revenues, unemployment, market destabilization etc. Centre for Research on the Epidemiology of Disasters (CRED) defines a disaster as "situation or event [which] overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering". According to a report by CRED Annual Disaster Statistical Review 2013; China, the United States, Indonesia, the Philippines and India are the top five countries that are most frequently hit by natural disaster over the last decade. In 2013, China experienced its highest number of natural disasters of the last ten years. The country was affected by a variety of disaster including 17 floods and landslides, 15 storms, seven earthquakes and a mass movement of geological origin, drought and a period of extreme temperature.

In Asia, 18 disasters – eight floods, seven storms, two earthquakes and a drought distressed, at least, more than one million victims each, for a total of 72.8 million or 83% of all Asian victims. 31% of the victims live in China, 29% in the Philippines and 19% in India.

Natural disaster in 2013 left a devastating impact on human society. Worldwide, 330 cases of natural disasters with more than 21,610 casualties, 96.5 million victims, and a record amount of US$118.6 billion of damages were reported. A total of 108 countries were hit by these disasters. A total of US$58.5 billion have been allocated for disaster damages. In China, an earthquake and two floods were allocated US$6.8 billion, US$4.9billion and US$4.6billion respectively. Another US$18.8 billion were allocated for topical cyclones such as Haiyan in Philippines (US$10 billions), Fitow and Utor in China (US$6.7 billion and US$ 2.1 billion respectively.)

How Technology Can Help?

Technology provides governments and engineers with essential feedback, offering a better way to predict the behaviour of the built – or soon to be built environment – during a crisis. In effect, advanced technology provides a proactive method to more effectively create disaster-resistant communities. Innovations appear almost daily in almost every aspect of post disaster period, from robots deployment for search and rescue or demining; to remote surgeries, improvement in vaccine transportation and conservation, water purification or sanitation.

Early warning systems

The importance of timely disaster warning can never be overstated. The international community had doodled in early warning systems since the 1980s but, sadly, serious engagement only happened after the devastating Indian Ocean tsunami in 2004 that killed more than 200,000 people. Since then, the international community had made a significant investment in improving early warning systems, particularly early warning of tsunamis, around the world. In the years that followed, improvements to the quality, timeliness and lead-time of hazard warnings are manifested.

Scientific and technological advances, particularly in computer science and communication technology, have largely driven these improvements. Some technology examples are:

(i) **Satellite-based Weather Warnings**, a system that works through a simple local computer network connected to television, internet, and the local public address system. During times of alert, all weather reports are aired in the local language through multiple loudspeakers, and trough continuous monitoring of the latest weather patterns,

(ii) **Flood Forecasting System and Predictive Analytics**, a system that uses large data collection and analysis enable predictive analytics that combined weather forecast models, satellite observations, river gauges, and new hydrologic modelling techniques to help people prepare for the floods or other natural disasters.

Search and rescue (SAR) of disaster survivors

During disaster, life-threating situation is given the utmost priority in the overall operation. There would be concerted efforts to reduce or avoid potential losses, assure prompt and appropriate assistance to victims, and achieve rapid and effective recovery. The availability of unmanned aerial vehicle (UAV) for search and rescue (SAR) technology would be advantageous during SAR events. UAV is designed to provide responses with critical situational awareness in areas that are too dangerous or difficult for manned aircraft to reach. Its ability to hover provides a great overall picture of situations on the ground, and enables direct aid to where it's needed. UAV can be attached with tools beyond conventional cameras such as thermal-imaging cameras that are able to see through smoke, detect chemical levels, track RFID tags, and measure radiation. In addition, UAV also can be used to provide internet connections to hard-

to-reach places through a network of high-altitude balloons.

Apart from technology, a holistic approach in implementation of proper standard operating procedure (SOP) and the right public policies are required to get maximum impact of SAR technologies in order to reduce vulnerability and mitigate impact on people, property and infrastructure.

Water supply, purification and treatment

Water management is an essential procedure to be implemented as clean water is a prime requisite for victims of disasters. The aftermath of natural disaster caused water supplies to be easily contaminated due to the damage of sewerage and water lines. In some situations, the only water available is contaminated by microorganisms which include bacteria such as E. coli, protozoa, and viruses. In addition to foul odour and bad taste, the contaminated water can cause many diseases such as dysentery cholera, typhoid, and hepatitis.

There are water purification and treatment technologies that can be utilised to ensure the water supply for the survivors are safe to be consumed and also to have sustainable water supply for all the survivors before being rescued. Two of the most commonly used are:

(i) **Ultra-Filtration (UF) Membrane**, a technology that provide water purification without electricity requirement that can be set up in ten minutes in the remote areas with capability to filters out even viruses, and

(ii) **Solar-powered Water Treatment Machine**, a solar cube that is powered by sunlight and wind, and can provide up to 3,500 gallons of clean drinking water per day from polluted or salt water.

Emerging market economies such as China, India, Indonesia and Malaysia would be facing more environmental challenges in the years ahead if development is not managed sustainably.

Medicine and Healthcare

Providing adequate supply of medicines and medical relief is top priority for disaster management personnel. Any delay or laxity in the supply of medicines and appropriate healthcare aid could multiply the number of casualties among the victims. Therefore, technology plays a crucial role in meeting the challenges to provide necessary medicine and healthcare. For example, a mobile medical communication technology that allows a doctor to be 'virtually on board' the ambulance or medi-flight as the patient is being transported to the hospital; or at the scene of an accident; or at a remote location where traditional medical treatment is impractical, would assist in treatments and may save lives. With this kind of technology, medical help can be deployed quickly and efficiently.

A blessing in disguise, maybe?

There are big business opportunities in disaster risk management. The development of space technologies, new integrated telecommunication networks and installation of more disaster resilient infrastructure expands existing and opens up new markets. Technology-based companies realise this and begin to invest in the development of products and services in support of disaster risk management and humanitarian aids.

Prevention is always better than cure. As climate change is identified as one of the main causes of natural disasters, whatever advancement in technology development should not be an excuse for us to take climate change issues lightly. We have seen the effects, be it socially or economically; our mother nature is dying and crying for more our actions. Remember, we do not inherit the earth from our ancestors; we borrow it from our children.

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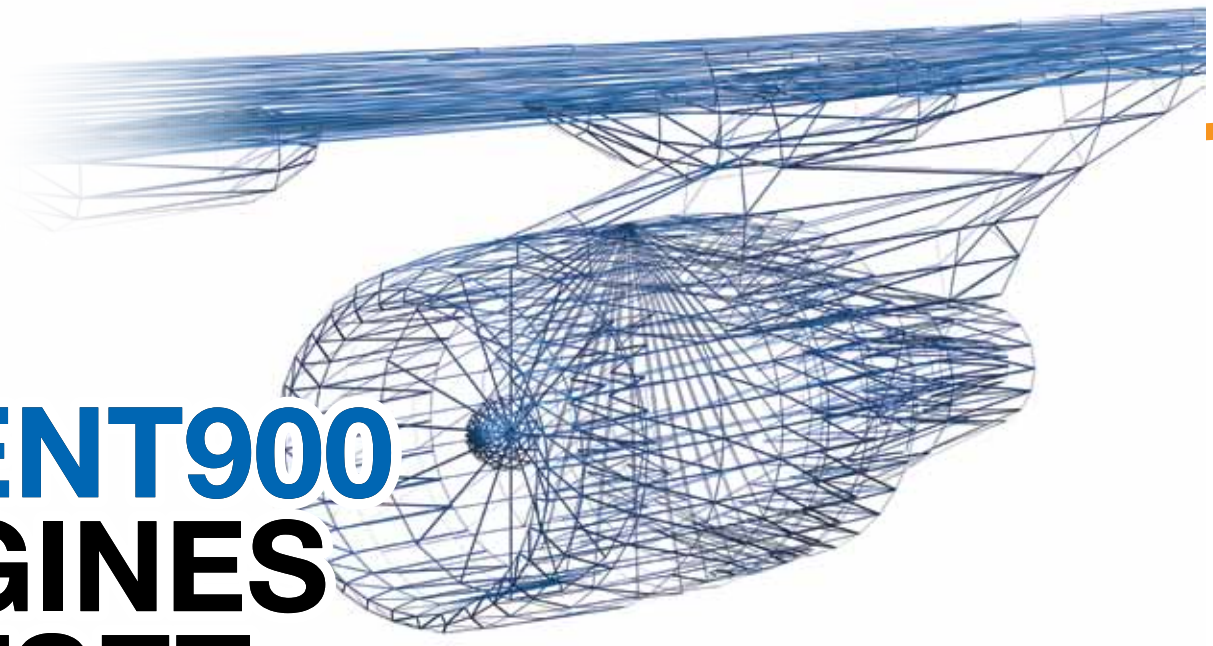

TRENT900 ENGINES OFFSET PROGRAMME:

The Trait of Success

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Trent 900 Offset Programme is the first of its kind commercial offset programme fully managed by the Offset Management Unit (OMU), MIGHT. It was triggered from an engine procurement program from Rolls-Royce to be fitted on the new Airbus A380 aircraft used by Malaysian Airlines (MAS). An Offset Agreement between the Government of Malaysia (represented by MOSTI) and Rolls-Royce was signed on 30th March 2006 for a 5-year implementation period. This initiative is the first offset involving civil aero-engine procurement.

The conclusive goal of the initiative is to provide a platform for the country to generate a positive net revenue from the investment made.

The programme is expected to support the development of Malaysian Aerospace industry; develop capacity and capability through transfer of technology (ToT), research skills and capability development and industrial participation & commercialisation; and create high-income/high skill jobs.

Six (6) offset projects were identified and developed through this Trent 900 offset programme. The initial total offset credit value obligation of the programme was expected to reach RM 920 million. However, only four (4) out of all the identified projects were successfully implemented due to its suitability, which has benefited local industry with a total contribution to economic development at RM 4.4 billion. This include award of high-tech work packages, transfer of technology and human capital development.

Programmes' spin-offs and statuses

Project 1 – T56 Authorized Maintenance Centre (AMC) Certification

The project involved granting of a full Authorised Maintenance Centre (AMC) status for T56 Engine MRO to Airod Turbopower (ATP) Sdn. Bhd. The AMC has boosted the MRO capability in Malaysia and position ATP Sdn Bhd in the global map as the 8th AMC in the world and provide global business segment opportunities worth of RM 350 million.

Certificate of Award Completion to CTRM Aero Composites Sdn Bhd during LIMA'13

Audit visit at UTM

Post Implementation Audit at UTM on Sept 2014

Project 2 – Aerospace Contract Manufacturing

The project involved award work packages to the local aerospace manufacturing companies, CTRM Aero Composite (AC). Goodrich, the supplier for Rolls-Royce has awarded the work packages to CTRM AC worth of more than RM 400 million. The offset arrangement has led a business deal worth RM 3.5 billion until year 2023.

Project 3 – Research on Palm-Oil for Aero Gas Turbine

This project involved development of a database for biofuel combustion properties for turbine engine involving labs from Cambridge University and University Teknologi Malaysia (UTM). Through this arrangement, Cambridge University has shared the combustion fuel expertise and technology; where the Intellectual Property resulted from the collaborative effort belongs to Government of Malaysia.

Project 4 – Establishment of Aerospace Manufacturing and Innovation Centre (AMIC)

AMIC is anticipated to be a research centre dedicated to develop innovative technology solutions for aerostructures in the aspects of design, manufacturing process and material. Through the offset arrangement, Rolls-Royce as the Tier 1 partner provides funding to facilitate its first 5-year operation as well as strategic projects identified and agreed by both parties.

Project 5 – Application of Advanced Material

The project focuses on the application development and commercialization of a readily available Malaysian nanotech product. Malaysia Aerogel and Carbon Nano Tube/Nano Graphene are two advanced material products found to have high commercialization value and are ready to penetrate the market. These products are locally made and have similar characteristic and performance of comparable products produced by international parties. Through the offset program, Rolls-Royce provide a platform for commercialization in a high technology based application such as the jet engines.

Project 6 - Production of Super Grade Tantalum

The project is a collaboration between University of Cambridge, Metalysis UK Ltd and local institutes to perform R&D&C in producing Super Grade Tantalum powder. The project involves research and development in Malaysia between University of Cambridge, Metalysis Ltd and local partners; SIRIM, USM & UKM.

An auditor at the Engine MRO section of ATP facility

A general view of the Airod Group facility at Subang, Selangor D.E.

A display of the main certificates for ATP and Airod Group at the main lobby

Cone Fairing

A general view of the Engine MRO section of ATP facility

The audit team with ATP management headed by Maj. Gen. Dato' Ismail bin Ibrahim (Retired)

Audit verification at the production area

Torque Rings

However, the project has been delayed due to not meeting the technical requirement since year 2011. However, the technical team in Metalysis is still attaining the purity level while both Rolls Royce and MIGHT agree to continue monitor the project.

Offset Program is indeed an initiative by the Government that could be utilised as an effective tool to support national economic development. Based on the overall achievements of the Trent900 Offset Program, the Government of Malaysia has decided to use offset program as one of the platforms to support national economic growth. For instance, the Government has published a new offset policy titled Policy and Guidelines on Industrial Collaboration Programme (ICP) in Government Procurement applied to all government's procurement related to supply, works and services.

The opportunities offered to MIGHT in managing the Trent900 Offset Programme have allowed MIGHT to structure offset programme as a platform for Malaysia to leap frog the industry development not only in the human capital and capability but also in the overall management of the programme. Based on the success of the Trent900 Offset Program, the Government of Malaysia has decided to use offset program as one of the platforms to support national economic growth.

Recently, the Government has published a new offset policy titled Policy and Guidelines on Industrial Collaboration Programme (ICP) in Government Procurement applied to all government's procurement related to supply, works and services. To ensure that offset programs are managed systematically, MIGHT has developed Malaysian Offset Management Framework certified with ISO9001:2008 certification. Currently the operation of Technology Depeository Agency (TDA) is guided by the said framework to ensure the governance and transparencies.

Last but not least, MIGHT as the Trent900 Offset Programme Management Unit would like to take this opportunity to thank and congratulate all the stakeholders that have involved and continuously supporting in this initiative since day one it has been proposed. The trust and believe had flourished and contributed to the development of the industry.

TRENT900 Offset Programme

Celebrating Partnership

Your support and dedication has contributed to the success of this initiative.

Airod Turbopower Sdn Bhd

Aerospace Malaysia Innovation Centre (AMIC)

Cambridge University

Composite Technology Research Malaysia (CTRM) Sdn Bhd

Goodrich Corporation

Malaysia Airlines

Malaysian Industry-Government Group for High Technology (MIGHT)

Malaysian Technology Development Corporation (MTDC)

Metalysis Ltd.

Ministry Of Finance (MOF)

Ministry of Science, Technology and Innovation (MOSTI)

Rolls-Royce

University of Sheffield UK

SME Aviation (SMEA)

SIRIM Berhad

Technology Depository Agency (TDA)

Universiti Kebangsaan Malaysia (UKM)

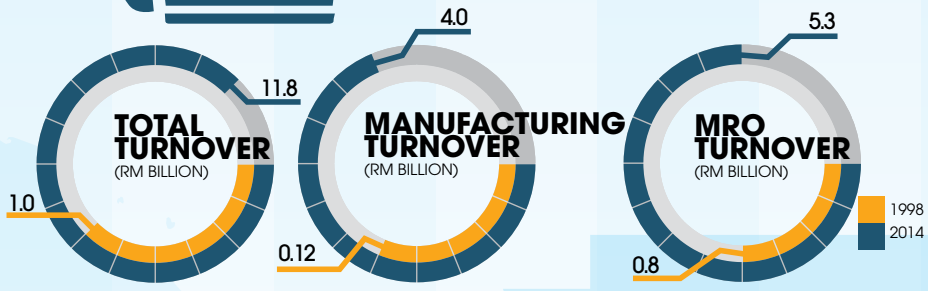
Universiti Sains Malaysia (USM)

Universiti Teknologi Malaysia (UTM)

MALAYSIAN AEROSPACE INDUSTRY

The aerospace industry in Malaysia has grown rapidly since the introduction of "Piloting the Aerospace Industry Take-Off, Blueprint for the Aerospace Industry in Malaysia" in 1997. However, there is still considerable room for further growth in this industry.

Manpower **19,500**



Investment **RM4.2** billion (2010-July 2014)

Export **RM2.1** billion (Jan-Sept 2014)

Import **RM15.1** billion (Jan-Dec 2014)

THE BLUEPRINT 2030

The Malaysian Aerospace Industry Blueprint 2030 focused on developing the aerospace industry in Malaysia and aspires to become the leading aerospace nation within the SEA region by 2030 and beyond.

Pockets of Victories

The first National Aerospace Blueprint launched in 1997, have provided us a foundation to be a serious player in the aerospace industry since the past 17 years. 80% of the recommendations in the previous Blueprint was successfully implemented.

1997

MAC 1

2001
Rationalisation of the Malaysian aerospace industry

Space infrastructure for Malaysia

MAC 2

2002
Realising the aerospace vision through General Aviation

MAC 3

2004
Accelerating the Growth of the MRO Industry

Concept Plan for Subang Airport's Role in the Malaysian Aerospace Industry Development

MAC 4

2006
Development of Malaysia International Aerospace Centre (MIAC)

Strengthening Department of Civil Aviation (DCA)

Capturing Global MRO Market through P2FC (Passenger-to-Freighter Conversion)

MAC 5

2008
Preparing Aerospace Manufacturing Industry for Next Generation Aircraft Program

Locally Developed Unmanned Aerial Vehicle (UAV)

1999
Malaysian Industry Council for Defence, Enforcement & Security (MIDES

2000
Malaysian Institute Of Aviation Technology (MIAT)

2002
Aerospace Composites Malaysia Sdn. Bhd. (ACM)

2004
Technology Depository Agency (TDA)

2005
Malaysia International Aerospace Centre (MIAC)

INSEP - Aviation Maintenance Engineering

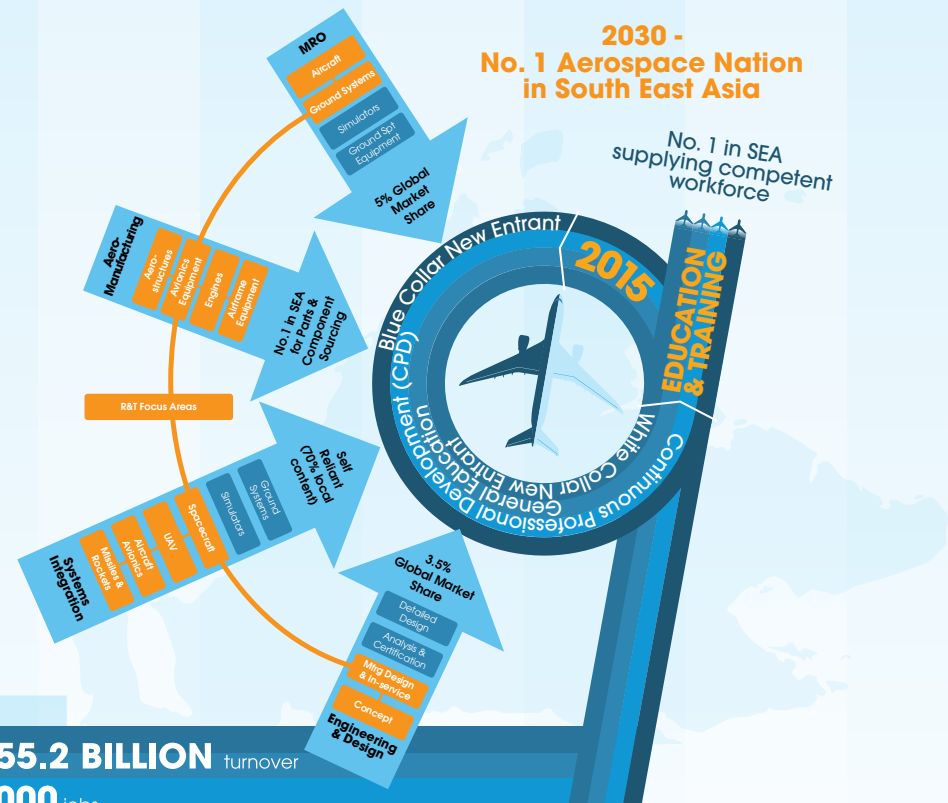
1998
National Aerospace HR Development Study

2003
Study on Aero Parts & Component Manufacturing Industry

2006
Blanket Tax Exemption for MRO

MALAYSIAN AEROSPACE FOCUS AREAS

The introduction of **Engineering & Design** as a new focus area will contribute not only to the growth of aerospace revenue, but also to indicate Malaysia's intent to be involved in higher value, upstream activities of aircraft lifecycle.



Market Share + Stakeholders Facilitation → By 2030 **$ RM55.2 BILLION** turnover, **32,000** jobs

2009
Development of Aircraft Systems Integration Capability

Incentive Package for the Aerospace Industry

Operationalisation of RazakSAT

2010
Sustaining the Competitiveness of the Local Manufacturing Industry through Research & Technology (R&T)

LIMA as an Effective Platform for Promoting and Marketing the Malaysian Aerospace Industry

MAC 6

MAC 7

The Malaysian Aerospace Industry Blueprint 2030

2015 AND BEYOND
The Malaysian Aerospace Industry Blueprint 2030

2009
- Spirit AeroSystems Malaysia Sdn Bhd
- Advanced Composites Training Centre (ACTC)
- Honeywell Aerospace Avionics Malaysia Sdn Bhd

2010
- CTRM Systems Integration Sdn. Bhd. (CSI)
- LEADER Aerospace
- EPP 1
- EPP 5

2010
- Aero Industry Workforce Supply & Demand

2011
- Aerospace Malaysia Innovation Centre (AMIC)

2012
- Advanced Green Composites (AGC) Program
- SAFRAN Messier-Bugatti -Dowty

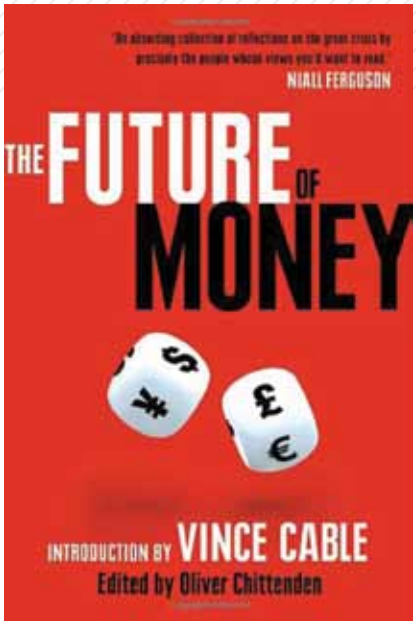
2012
- Performance Based Contract (PBC)

2014
- Singapore Aerospace Manufacturing
- EPP 7

2015
- EPP 8

Recommendations
Materialised recommendations
Study initiatives

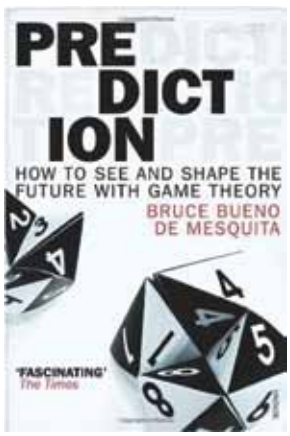
myForesight Book Club



The Future of Money

ISBN-10: 0753522047
ISBN-13: 978-0753522042
Author:
Oliver Chittenden (Editor), Vince Cable
Publisher: Virgin Books

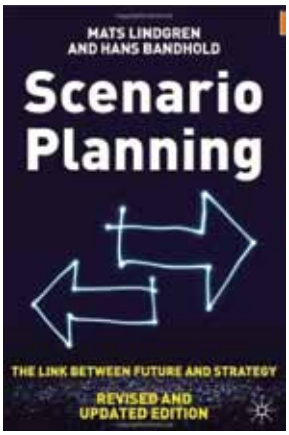
The state of the global economy affects every single one of us. With economic growth threatened by financial regulation and the East and West at competitive odds, the real solutions to global recession can only come through international co-operation. Featuring World leaders, Nobel Prize-winning economists, award-winning writers and opinion formers **The Future of Money** brings together the finest thinking to suggest solutions to this global predicament.



Prediction: How to see and shape the future with Game Theory

ISBN-10: 0099531844
ISBN-13: 978-0099531845
Author:
Bruce Bueno de Mesquita
Publisher: Virgin Books

Bruce Bueno de Mesquita can predict the future. From international terrorism to corporate fraud, from climate change to the Israeli-Palestinian conflict, Bruce Bueno de Mesquita has been predicting the future for decades. Using Game Theory (a theory based on the rationale that everyone acts in their own self-interest) he can foretell and even engineer events. His forecasts, for everyone from the CIA to major international companies, have an extraordinary 90% success rate. In this fascinating and immensely readable book he explains how you can use Game Theory to your own advantage – to win a legal dispute, advance your career and even get the best possible price for your car. Predictioneer will change your understanding of the world – both now and in the future.



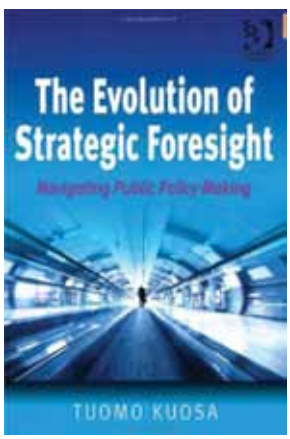
Scenario Planning- Revised and Updated Edition: The Link Between Future and Strategy

ISBN-10: 0230579191
ISBN-13: 978-0230579194
Author:
Mats Lindgren,
Hans Bandhold
Publisher: Palgrave Macmillan

Recent research in the field of business strategy has shown that strategic flexibility can be achieved through a scenario planning perspective for long-term competition and performance. The authors have drawn upon examples and case studies to develop a new model for scenario planning that is closely integrated with strategy and innovation. They argue that the concept of scenario planning is as much an art as a practical management tool.

The first decade of the new millennium has clearly pointed to the need to prepare for the non-preparable. The dangers of failing to do this were shown in the aftermath of the insane race on the world's stock markets in the early 2000s, in the climate wake-up, the race for oil and grain, and in the real estate and financial chaos in the fall of 2008.

Could these events have been foreseen and prepared for, and thus even capitalized on? We believe so. Much of what happened was not unthinkable: it could have and was imagined with the use of scenario planning.
In this book we introduce the thinking behind scenario planning and provide our readers with some concepts, models and tools to take back to their own companies. It is based on almost two decades of experience of scenario planning as a strategic tool, where we as consultants have guided multinationals and medium-sized companies as well as governments and non-governmental organizations in these approaches.



The Evolution of Strategic Foresight- Navigating Public Policy Making

ISBN-10: 1409429865
ISBN-13: 978-1409429869
Author:
Tuomo Kuosa
Publisher: Gower

Embracing the theory and practice of strategic foresight and illuminating how different schools of thought regard its role in policy making, Tuomo Kuosa describes how something not traditionally considered an independent discipline, is steadily becoming one. In "The Evolution of Strategic Foresight" he explains how the practice of strategic foresight has long been closely associated with the military and politics. Linking strategic thinking more broadly to futurology, however, it is quite new. Since strategic foresight refers to the practice of generating analyses of alternative futures and strategies, based on available intelligence and foreknowledge, the practice can and should be applied to companies, business sectors, national and trans-national agencies of all descriptions, and to all aspects of public policy making. The author explains its practice in terms of structure, process, and knowledge domains, and examines its methodologies and systems, along with how strategic foresight can be used to produce better knowledge and be more effectively linked to policy making. Using examples from 30 different countries and with access to interviews and workshops involving key experts, "The Evolution of Strategic Foresight" will be valuable to scholars, educators, students engaged in strategy and future studies, long-range, public policy and urban planners, analysts; risk assessment experts, and consultants, managers and decision makers in many organisations, public and private.

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myForesight team