16/09/1998

Reaching for the sky

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IN 1995, the global turnover for the aerospace and aviation industry stood at a whopping US$300 billion and the industry was growing at a rate of between eight and 10 per cent annually.

Big names like Airbus, Boeing, AlliedSignal, Honeywell, Sextant Avionique, Hughes, Aerospatiale, Smiths Industries and Thomson CSF had plenty to smile about. Aerospace and aviation was their business. And business was definitely good.

That year, Prime Minister Datuk Seri Dr Mahathir Mohamad announced the formulation of a blueprint for the aerospace industry. The goal was simple: to make Malaysia a key regional player in the sector. The benefits would be enormous, both technologically and financially. But that announcement was met with scepticism and incredulity. This was not going to be a walk in the park, some observers commented. The odds are certainly stacked against us. For a long time, Malaysia's involvement in the aerospace sector has been plagued by numerous false starts, uncertainty and a lack of clear direction.

Once the dust settled, there was a flurry of suggestions on how to get the job done. Some quarters advocated going the `Indonesian way' - `designing' and manufacturing aircraft (in Indonesia's case, actually license-building CASA of Spain's CN-212 and CN-235 utility and light transports) - claiming that it was the clearest and quickest course to stamping our mark as a regional player in the field.

`The trouble with that is you become just another assembler,' says a Hong Kong-based aviation analyst. `That may be okay for some but it doesn't do much for the transfer of related technologies. Second, you might have problems, as Indonesia has, of selling your aircraft. In the aerospace business, reputation is everything.` (See accompanying story).

Others lobbied for a more pragmatic approach, one which may seem conservative in the short term, but given the embryonic state of our aerospace industry, is actually the most realistic and virtually guarantees maximum returns in the long term.

Instead of competing head to head with the bigger international players, this approach advocates a more holistic view of the industry and covers both the military and civil side. It calls for the systematic development and progression in areas such as avionics, systems integration, aircraft maintenance, repair, overhaul, upgrades, and the manufacture of components - key areas which Malaysia already has experience with. Eventually, the expertise would encompass the manufacture of airframes, satellites, missiles and space vehicles.

Also identified as an integral part of the programme are the ancillary elements - airports, research and development centres and eventually, launch pads for rockets. The long-term goal would be to design and build Malaysia's own launch vehicle and spaceport that will serve the Asean region, along the lines of the European Space Agency.

The Malaysia Industry-Government Group for High Technology (MIGHT) had been launched in February 1993, and registered as a non-profit company limited by guarantee in October the next year. Essentially, it is a `meeting of the best minds in government and business'.

Under the joint chairmanship of Tan Sri Dr Omar Abdul Rahman, the Science Adviser to the Prime Minister, and Malaysia Airlines executive chairman Tan Sri Tajudin Ramli, MIGHT was given the enormous

responsibility of charting out the nation's competency in high technology. It does this through consultations, forums, business networking and more importantly, the creation of MIGs or MIGHT Interest Groups which deal in different areas: pharmaceuticals, aviation and aerospace, motorsports, and housing and construction.

MIGHT chief executive Dr Ahmed Tasir Lope Pihie says the first order of business was to set up a high-level direction and policy structure for the industry and the institutionalisation of a coordinating and management body.

In the area of aviation and aerospace, a `sub-working group' called the MIGHT Interest Group (MIG) Aerospace was established under the chairmanship of Tajudin to carry out `prospecting activities' for the aerospace industry and to formulate a national strategy for the aerospace industry to achieve global competitiveness.

`MIGHT has always stressed equal government-industry participation,' Dr Ahmed says. MIG Aerospace then undertook a `purely in-house, inter-industry kind of participation' to get the consensus on the proposed blueprint as opposed to engaging foreign consultants to undertake the task.

That work seems to have paid off. The National Aerospace Blueprint emerged as a mature, well-thought-out document which identifies Malaysia's strengths while not downplaying its weaknesses. `We can't compete with the big players who have competitive advantage in technological know-how, skilled labour and virtually unlimited financial backing. The other thing they have that we don't is reputation,' says a MIGHT spokesman. `But what we can do is concentrate our limited resources on key areas - sub-sectors we consider strategically important and which we are good at.' The five key areas are manufacturing, general aviation, space, systems and commercial aviation.

Manufacturing, where work is currently done on parts and components (primarily by Airod), will be expanded to push Malaysia into being a leader in upgrades and re-manufacturing activities. `The potential here alone is enormous,' says the Hong Kong-based analyst. `Let's look at the military side, for example. Most air forces around the world, especially those in Latin America and a number of Asian countries, maintain a fleet that is between 15 and 20 years' old. They're a bit long in the tooth and with dwindling finances, upgrades are the only real option open to them. Over the last decade or so, it has become a "legitimate" business of sorts because it has always been looked upon as an outcast. The only countries doing it and doing it successfully are Israel and Singapore.'

The analyst adds that the former has virtually `written the book' on upgrades and has an impressive list of clients from all over the world. In 1997, Israel's premier aviation concern, Israel Aircraft Industries Ltd (IAI), recorded for the first time in five years a profit of US$24.3 million on sales of US$1.69 billion. Upgrading commercial aircraft makes up roughly 40 per cent of its business. The company's resume is impressive: it has the ability to work on a variety of airframes, like the Boeing 707, 747 and Airbus Industrie's A310.

On the flip side, its Lahav division (Military Aircraft Group) handles the military aspect, which constitutes 10 per cent of IAI's business. But that is fast changing. Work which the company did on the Hey'l a' Avir's (Israeli Air Force) McDonnell F-4 Phantom (essentially re-designing and re-building it with new systems and features and turning it into the Phantom 2000) has not gone unnoticed.

Just last year, 54 Turkish Air Force F-4 Phantoms arrived for a US$600 million upgrade programme which covers avionics (undertaken by Elbit Systems Ltd), the addition of an EL/M203 multi-mode fire-control radar (by

Elta) and a new wide-angle head-up-display (HUD) by El Op Electro Optics Industries Ltd, as well as the integration of an electronic-warfare system by Elisra Electronic Systems Ltd.

Also included in the programme are air data computers by Astronautics CA Ltd, the provision for the Popeye stand-off missiles by Rafael Armament Development Authority and internal communication systems by Orbit Avionic and Communication Systems Ltd.

Israel's capability now extends not only to aircraft operated by the Israeli Defence Force but also other makes like the Mikoyan Gurevich MiG-21, the Pilatus PC-9 trainer and the French Mirage series.

What started out as small, `backyard tinkering' catering solely to the needs of the air force has spurred the growth of numerous related industries, generating income for the beleaguered state and more importantly, making it totally self-reliant. `You have to give it to them,' says the analyst. `They're providing total integration with all the elements obtained in-house. It's not something that was achieved overnight, but over the last decade or so, there's been a tremendous surge in capability. That's their core business and they are very good at it.'

Singapore has also built a reputation as a dependable contractor specialising on the A-4 Skyhawk and Northrop Grumman's F-5 fighters. Singapore Aerospace, a division of Singapore Technologies, recently completed a major upgrade programme on the republic's fleet of A-4s and F-5s.

It has refurbished 60 of the republic's ageing A-4SU Skyhawks, adding a non-afterburning General Electric F404-100D turbofan engine (giving it a thrust increase of about 40 per cent), a Litton LN-93 Inertial Navigation System (INS) and a Ferrant 4510 Head-Up-Display (HUD).

Flight International recently reported that Singapore Aerospace, together with IAI and Elbit as subcontractors, was actively bidding for the upgrade contract for the Turkish air force's F-5s.

`Malaysia's Airod is in a unique position to be a leader in this area but for too long, it has been sidelined, left on its own,' says the analyst. `Maybe things will change with the blueprint. In this game, being a niche player pays off.'

Eventually, the analyst adds, the experience gathered by Malaysian companies in the area would allow it to undertake major programmes like Australia's Aerospace Technologies of Australia (ASTA), which makes rudders for the Boeing 777.

`You could also produce airplanes under licence, like what the Chinese are doing with the ATR-42. But you have to remember to get your priorities right. There's no sense in building an airplane purely for nationalistic pride when it doesn't make economic sense.'

Already, tentative steps have been taken towards this end. In 1996, John Leahy, Airbus Industrie's senior vice president (commercial), said the company is ready to seriously study the possibility for increased involvement by Malaysian companies in its programmes in conjunction with future aircraft sales. Leahy added that this could lead to the production of related components in the country.

`Both sides would benefit from such a move, with Airbus Industrie being able to source top-quality components at competitive prices and Malaysian companies gaining valuable technological know-how, which would not only reduce import levels but would also increase wider export potential for the country,' he said.

That year, Dr Mahathir asked MAS Aerotechnologies Sdn Bhd to venture into the manufacturing of seats, aircraft interior and eventually avionics and airframe components. `I suggest that MAS Aerotechnologies start importing "green" or bare aircraft and build the interior to reduce cost,

in line with the government's efforts to reduce imports,' he was reported as saying. Already, companies like Rolls Royce and General Electric have made `overtures', providing the Malaysian aerospace industry a wider spectrum to develop its potential.

Rolls-Royce spokesman Robin Baiden of Star Public Relations says a prime beneficiary of the British powerplant-manufacturing giant will be Malaysia Airlines through MAS Aerotechnologies, its wholly-owned subsidiary. MAS selected Rolls Royce Trent engines for its fleet of 15 Boeing 777s, plus two options. Each B777 will be powered by two Trent 892 turbofans with a maximum thrust rating of 92,000 pounds. Baiden adds that Rolls-Royce is now working on a wide range of new opportunities with different Malaysian companies.

`These include meeting military engine requirements of the Royal Malaysian Air Force's Rolls Royce Adour-powered Hawk and its operation of Viper-powered Aermacchi MB339 jets,' Baiden says. The Royal Malaysian Navy uses Rolls-Royce Nimbus engines for its Wasp helicopters as well.

Malaysia Airlines Bhd also signed a memorandum of understanding (MOU) in 1996 with General Electric Engines Services, enabling MAS Airfoil Services to undertake jet engine repair on GE commercial jet engines.

Under the five-year programme outlined in the MOU, GE Aviation Service Operation (GEASO) Pte Ltd designated MAS Airfoil Services as its sole source for the repair of low pressure turbine blades on large GE commercial jet engines. GE's Singapore service shop became the sole provider of component repairs of the CFM-56-3 engines that power the Boeing 737s operated by Malaysia Airlines. MAS owns 51 per cent of Airfoil Services through MAS Aerotechnologies. The remaining 49 per cent is held by MTU Maintenance Gmbh of Germany.

Insiders say the new set-up has saved MAS between 12 and 15 per cent of its total repair bill. They add that negotiations are being conducted with manufacturers for the overhaul and repair of various components, with the aim of taking part in joint ventures with original equipment manufacturers.

So far, MAS Aerotechnologies has undertaken heavy maintenance work for MAS Boeing 747s, a task previously handled by Air France. This has translated into a cost-saving of two-thirds the bill for servicing and maintenance done overseas, which is on average RM21 million.

Recently, design firm SME Aviation Sdn Bhd and engineering company Excelnet Sdn Bhd managed a coup of sorts when they won a contract to design and build parts and components for British Aerospace's (BAe's) range of military and commercial aircraft.

Under the terms of the deal, initial design operations will be carried out by SMEA and Excelnet's facility located within the Multimedia Super Corridor. BAe will appoint a chief designer to be stationed there to co-ordinate and manage the electronic transfer of conceptual design data from the United Kingdom to Malaysia.

It is understood that Excelnet has already been given the first batch of work totalling STG500,000, which will be completed in 18 months. This package represents roughly 20 per cent of the work to design a military aircraft.

Carl Jackson, BAe's director of Export Programmes says Malaysia is the first country in Asia to be given the designing contract, `reflecting the capabilities of Malaysian designers'. During the signing ceremony on July 9, Jackson also handed out BAe's Design Quality Approval certificates to SMEA and Excelnet. SMEA has been rated `preferred supplier' by British Aerospace as well.

The second key area identified for special focus is general aviation. The goal is to make Malaysia a major player in the manufacture of light

sports, utility and recreational aircraft. Already there are signs of its potential, seen especially in the development of the all-composite Eagle XTS by Composite Technology Research Malaysia (CTRM) and SME Aerospace's MD3-160 Aerotiga trainer.

But because of Malaysia's population of only 20 million people, the domestic market is limited to the Royal Malaysian Air Force (which bought a number of MD3-160s for primary flight training) and the Royal Selangor Flying Club (which recently acquired two Eagle XTSes).

`Type certification is a hurdle that has to be overcome,' says a transport analyst, who adds that both aircraft are still awaiting certification from the US Federal Aviation Administration (FAA). The main certification authorities are the FAA and the Joint Airworthiness Authority, whose purview is Europe. `With experience in flight dynamics, airworthiness and air traffic control of more than 80 years behind them, people listen to their recommendations,' says the analyst. `So it's imperative that Malaysian aircraft get their approval if we're to go anywhere.'

The analyst says the recent proposal to upgrade the Department of Civil Aviation and set up a Civil Aviation Authority is a step in the right direction. `You have to upgrade the DCA to enable it to meet future challenges. It's been sluggish for far too long.' The proposed Civil Aviation Authority, he explains, will have monitoring as well as regulatory functions in the area of air worthiness, air traffic control and aerospace product and services.

Effort should also be made to promote kit planes and air activities along the lines of the Experimental Aircraft Association gathering at Oshkosh, Wisconsin. The analyst adds that annual gatherings like the Langkawi Air Carnival and the Langkawi Oshkosh East Fly-In convention are a good start. `Ultralights and kit planes, at around RM50,000 to RM100,000, are far more affordable and easy to maintain than a Beech KingAir or an Aerospatiale TB21 Trinidad, which would set you back by a couple of million ringgit.'

Links should also be forged with established companies dealing in kit planes overseas, working up to the possibility of license-building them here, he says. This will help bring down the cost of the airplanes, stimulate local airframe industries, provide a catalyst for the local avionics sector and more importantly, create a `flying culture' among Malaysians. `Companies like the one owned by Burt Rutan, considered by many to be the "guru" of small-scale composite aircraft, have done some cutting-edge work and have a great deal to offer.'

Another often-neglected area of general aviation is unmanned air vehicles, or UAVs. The arguments for venturing into this field are numerous: start-ups are relatively simple and cheap; they do not require a workforce that is super-skilled; they provide an excellent platform to build experience in the basics of aerodynamics, aircraft design, telemetry, communications, remote-controlled operations and payload design; and the UAV market in Asia is virtually untapped.

`The only countries which seem to have realised the potential of UAVs are the United States, Israel, France, South Africa, India and Australia,' says the analyst. UAVs are also amazingly adaptable and cost-effective. They can be configured for a variety of duties, including airborne targets, reconnaissance platforms, remote-sensing platforms, environmental and maritime surveillance, and traffic management.

The third key area is space. The goal here is to become a significant contributor to the utilisation of space for commercial and strategic purposes. This becomes all the more important when you consider that some US$100 billion may flow into the industry between 1995 and 2010 for

commercial satellite ventures worldwide.
The Malaysian Agency for Space Administration (Masa) was set up to strengthen Malaysia's entry into the space sector. It is charged with overseeing the efficient management of space ventures, including the development of a national satellite programme to help the development of industrial and technological capability in the area.
At present, Arianespace, with its stable of Ariane expendable launchers, is the only agency performing this role with considerable success. The only other true competitor is the United States with its reusable space shuttles and a number of one-shot boosters like the Delta and Titan series.
`Taking a ride on the shuttle when you want to launch a satellite may cost upwards of US$75 million a pop,' says an observer. `And for many countries, that's simply too much.' A series of failures has also marred the shuttle's reputation as a satellite deployment option.
In the early 80s, Indonesia's Palapa B satellite and Canada's Anik C failed to reach geosynchronous orbit when their Inertial Upper Stage or IUS (essentially a `kick' motor) failed to ignite. `Arianespace does away with all the "frills". Its approach is simple and well-tried,' says the observer. `That's why they have a reliability rate of over 90 per cent and holds 50 per cent of the market, launching two-thirds of the Western world's telecommunications satellites.'
The task for Malaysia is a daunting one, not only technologically and financially, but also politically. `The United States gets a bit jittery when you talk about rocket technology because that implies that you would indirectly have the capability to launch warheads,' says the analyst. `You could have a peaceful space programme but they'd still categorise you as a threat. India's entry into the space business was blocked when it approached Russia for help in rocket technology.'
There are other hurdles to overcome when tackling the `Final Frontier'. `Apart from the restrictions on rocket technology imposed by the United States and the stiff competition posed by Arianespace,' says an observer, `a number of countries within the region already have their own space programme and we'd have a tough time playing catch up.` The investments involved would be phenomenal since it's not just a simple case of building a rocket, sticking it in the middle of an asphalt surface and firing it. A host of other facilities would have to be built: vehicle tracking, control and telemetry centres; a payload assembly shop; a vehicle assembly building; a vehicle preparation building; administration offices; a spin test facility; a vacuum test chamber; solid and liquid propellant storage facilities; static firing test facilities; launch pads; blockhouses; weather observation towers; a range control centre; a spacecraft checkout building; and an electric power plant. `Finding the right spot could also be tough,' says the observer. `You would want to locate it where population is sparse or you'd risk having flaming debris raining down on some hapless farmer.'
Russia's main spaceport, Baikonur Cosmodrome, is located out in the boondocks - in Tyuratam, east of the Aral Sea. A number of other Russian complexes, like the Volgograd Station and the Northern Cosmodrome, are also sited there. These facilities handle a number of different functions, such as launching scientific Cosmos and Intercosmos satellites.
In China, principal launch activities are handled by the East Wind Centre, on the edge of the Gobi Desert near the town of Shuang-Ch'eng-tzu in Inner Mongolia. After a number of high-profile launch failures, the reliability of the Long March (the staple launch vehicle) appears to have improved considerably. `China has been steadily nibbling away at Arianespace's heels, drawing some business their way and has emerged as a

serious contender to the European agency,' says the analyst.
Japan's space effort is centred round two principal areas - Kagoshima and Tanegashima Island - both of them near the Pacific Ocean. After 50 years, Japan has chalked up a number of space firsts, including the recent fully-automated docking of two unmanned vehicles.
India's space programme is still very much in its infancy and is dogged by restrictions. But work still continues at the Sriharikota Launching Range on the island of Sriharikota in the Nellore district of Andhra Pradesh State. Malaysia's location near the equator can be turned to our advantage. Since most telecommunication satellites hold equatorial orbits, Malaysia would be in a unique position to provide launch profiles that do not require prodigious amounts of fuel and do away with complex systems like the IUS.
The fourth element identified - systems integration - is relatively new. But already work, though minor, has been undertaken locally and the core expertise exists.
Although the scope covers both the military and civil side, it is in the former that more potential lies. Spurred by the modernisation drive which saw the Royal Malaysian Air Force re-equipping (with eight Boeing F/A-18D Hornets and 18 MiG-29N Fulcrums to replace the ageing Northrop Grumman F-5s), systems integration, despite some restrictions imposed by the US State Department, is coming into its own.
Sources say that a joint Airod-Integrated Avionics Sdn Bhd proposal has been submitted to the Ministry of Defence to upgrade and refurbish the F-5s to extend their airframe life by another 15 to 20 years. The programme will also provide the fighters with a state-of-the-art `glass cockpit' with multi-function displays which does away with the conventional dial instruments. Hotas or hands-on-throttle-and-stick features will be added to improve pilots' situational awareness. A helmet-mounted sight has also been proposed as an add-on, depending on the availability of funds. All systems will be tied to a MIL STD-1553 digital databus.
If the go-ahead is given, the programme will promote, among others, the indigenous development of a strategic avionics technology base; the establishment of indigenous technology in weapons clearance and integration; independence from other manufacturers for testing and acceptance of both avionics and weapons systems; savings in non-recurring development costs for future upgrade programmes on other airframes; and the gaining of avionics development know-how and integration capabilities within Malaysia.
The new fighters - the F/A-18s and the MiG-29s - will also provide an ideal platform to put into practice the lessons learnt on the F-5 upgrade programme, enhancing Airod's and Integrated Avionics' capabilities.
Sources also say that the planned acquisition of 12 Denel Rooivalk attack helicopters, now put on hold because of the economic crunch, would have given a tremendous boost in capability in this field. Denel, they say, would have given access to critical areas such as the flight control software, fire control systems, ordnance, target acquisition and tracking systems, and night-vision and infra-red sensors.
The last strategic area identified - commercial aviation - is just starting what promises to be a golden era, with the opening of the Kuala Lumpur International Airport (KLIA). The RM9 billion airport is the first step towards making Malaysia the preferred transportation hub for the region.
In addition to determining the five areas Malaysia should focus on, the National Aerospace Blueprint also outlined 45 recommendations and plans to achieve the goals set. These include the restructuring of the aerospace

industry to form the National Aerospace Industry Structure; consolidating the National Light Aircraft manufacturers into a single entity; expanding and expediting the programme for procuring the services of selected top scientists; establishing the Aerospace Technology Institute of Malaysia; identifying a small number of selected companies as National Defence Contractors; and developing a national defence philosophy which will then influence the role of aerospace development.

Prior to the setting up of the Malaysian Aerospace Council and the National Aerospace Co-ordinating Body, Malaysia did not have a national aerospace policy. Also lacking was a lead agency to advise the government and undertake development programmes in this area.

Compounding the problem is the lack of meaningful local regulatory standards. The main agency is the Department of Civil Aviation, which the blueprint accuses of `showing reluctance, in the past, to adopt new regulations and roles which would allow for innovation in the local aerospace industry'. But there seems to be renewed vigour within the agency and observers cite the recent bilateral airworthiness agreement between the DCA and the FAA, whereby the latter agreed to help the DCA upgrade its supervision of safety standards, as a positive sign.

The report also states that compared to other Asian nations like Japan, Taiwan, China, Indonesia, India and Singapore, Malaysia's aerospace industry has barely made a peep. Singapore, for instance, started its expansion drive in the early 80s and currently has 10,000 employees working in the largest maintenance and overhaul facilities in the region. Being a late bloomer, Malaysia has a lot of catching up to do.

Human resource development is another critical area that needs to be addressed, the report states. The shortage of a skilled and qualified workforce spans across the board - from engineers to machinists and riveters. To overcome this problem, the different government agencies, institutions of higher learning and service operators must formulate and implement policies and programmes now to ensure that the issue is contained.

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