CHINA'S CIVIL AVIATION INDUSTRY

VISHAL NIGAM

The Civil Aviation Administration of China (CAAC) was formed after the civil war on the lines of Aeroflot. Though its main function was to manage the civil aviation sector, it functioned under the direct control of the People's Liberation Army Air Force (PLAAF) along with its assets and, therefore, operated more like a paramilitary organisation. The sector was typically governed by a chain of command consisting of the CAAC; 6 regional civil aviation bureaus; 23 provincial civil aviation bureaus and 78 civil aviation stations; and CAAC functioned both as a regulator and an operator[1]. The system was highly centralised and, therefore, most decisions emanated from the top, leaving very limited margin for flexibility at the lowest level in the chain of command. The changes started to take shape after Deng's economic reforms when CAAC took the initiative of **'corporatising'** the sector by bringing in path-breaking reforms. However, the major structural changes in CAAC took place after the industrial restructuring in China;[2] change in the sovereignty of Hong Kong and, finally, as a result of China's entry into the World Trade Organisation (WTO).

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1. Chen Hongmin, "Evolution of China's Air Transport Development and Policy Towards International Liberalisation," *Transportation Journal*, March 22, 2003, accessed at www.thefreelibrary.com/Evolution+of+China's+air+transport+development+and+policy+towards…-a0105916570, on February 14, 2011.
2. Between 1995 and 2000, the number of state owned enterprises fell from 118,000 to 53,489 as part of industrial restructuring and, as a result, 35 million state workers were laid off.

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CAAC as a regulator decentralised the airline sector and made it independent of the PLAAF. It passed on greater autonomy to the six regional civil aviation bureaus and enabled them to not only take operational decisions but also become responsible for their balance sheets. The next logical step was to separate the dual function of CAAC which until now had functioned both as a regulator and an operator. Therefore, whilst CAAC retained its primary role as a regulator, the functional control was transferred to the six regional civil aviation bureaus. Hence, what emerged on the drawing board was a two-level chain of command instead of the earlier four levels and the six regional civil aviation bureaus became six independent state-owned airlines. By 1993, the number of local carriers had proliferated, and as a result there were 41 airlines in China, of which 28 provided both passenger and cargo services. The industry became unwieldy with too many small airlines unable to manage their economies of scale, resulting in losses, and, eventually, many of them either had to be further subsidised or were forced to shut down.

CAAC once again restrategised its approach from the earlier policy of encouraging competition to one of consolidation. Small non-profit making airlines were made to merge into three primary airlines, led by Air China, China Eastern and China Southern. They became operators with rights not only to buy/lease aircraft but also became entities vested with greater financial and administrative autonomy[3]. CAAC, on the other hand, divested a large part of its ownership responsibility to become a single regulator, controlling the civil aviation sector in China. However, it continued to hold stakes in airports located at major cities in the coastal areas and the Tibet Autonomous Region (TAR). The aim of consolidation was to improve global competitiveness and enhance the internal regulatory mechanisms of the airlines. The effects of these changes became visible by year 2000, when private capital and foreign investment started to flow in and Chinese airlines also became a part of code-sharing with major international airlines. By

3. n. 1.

2010, China started to record double digit growth in air travel, investments on fixed assets soared to $2.5 billion and passenger volumes surged to 126 million, which was expected to quadruple by 2020.[4] The reforms were gradually taking shape and domestic airlines started to get into partnerships not only with the foreign airlines but also manufacturing biggies like Boeing, Sikorsky, Embraer and Airbus. The growing economy, along with the surge in air passenger travel, created a boom in the market for aircraft manufacturers who wanted to set up shop and derive benefits from the growing commercial jetliner market in China.[5]

In 2005, CAAC also opened up civil aviation to domestic investors, thus, breaking the age old monopoly of CAAC and promoting fair competition and a level playing field in the sector.

REFORMS SINCE 2000

The new millennium witnessed CAAC gradually dissolving its ownership rights, change in the sovereignty of Hong Kong and China's entry into the WTO, eventually resulting in a series of reforms in China's civil aviation industry. The Chinese leadership started to believe that protection was not the *mantra* and growth had to be embedded in the process of market transition coupled with liberalisation. CAAC brought in a number of amendments in the policy framework, leading to an 'open sky' policy which would offer better opportunity for overseas as well as domestic operators. To galvanise the process, CAAC formulated guidelines to encourage foreign investment in airlines, airports and airport management systems; and joint ventures in aircraft maintenance and the manufacturing sector. It redefined the existing norms of ownership and capital investment from foreign airlines was raised from 35 percent to 49 percent. In 2005, CAAC also opened up civil aviation to domestic investors, thus, breaking the age old monopoly of CAAC and promoting fair competition and a level playing field in the sector. As a

4. Xinhua News Agency, "China Civil Aviation Industry Up By 31.7% in H1," *China Daily*, November 9, 2010.
5. Alan Williams, *Contemporary Issues Shaping China's Civil Aviation Policy: Balancing International with Domestic Priorities* (Ashgate Publisher, 2009).

result, almost a dozen private airlines acquired licences, a majority of which were Low Cost Carriers (LCCs) like the Spring Airlines. The philosophy of LCCs was based on a single type of aircraft operating short distance routes, with high aircraft utilisation, efficient operations in a robust network environment augmented by efficient travel agencies.[6]

Along with an increase in passenger trips, there was also an increase in the demand for small aircraft and helicopters generated by the growing requirement to travel between the cities and islands in China. This was a result of the spectacular growth story of the Chinese economy and an astronomical rise in the 'millionaire' population. The increased requirement for small aircraft and helicopters also became a good business opportunity for the aviation industry in the small aircraft segment. However, to energise this section of the sector, CAAC had to carry out air space reforms and open the low level air space (below 1,000 metres) for general aviation other than the military, which in the future could also be utilised for Search and Rescue (SAR), off-shore exploration, aerial photography as well as short hop aerial transportation within and outside city limits[7]. The Shanghai Securities News Agency had reported that the control zones of Shenyang and Guangzhou were identified for trials of low-altitude air space and, if feasible, would also be replicated in other control zones. CAAC also divested its ownership from a large number of local airports and partnered with foreign investors as per the guidelines on deepening civil aviation reforms. As a result, a number of airports, large and small, started to sprout and major airlines set up hubs to operate freely to destinations across China. A booming economy and reforms in the air space triggered a demand in the small aircraft segment as well as in the airline industry, which started to show signs of operating in a market oriented economy. China in the new millennium was witnessing an all round growth in the civil aviation sector

6. Anming Zhang, "Low Cost Carriers in Asia: Deregulation, Regional Liberalisation and Secondary Airports," *Research in Transport Economics Sauder School of Business, UBC*, Vol. 17, February 2009, accessed at www.hamburg-aviation-conference.de/pdf/present2009/Session-II-Anming-Zhang.pdf, on February 15, 2011.
7. Xinhua News Agency, "China to Open Low-Altitude Airspace for Private Planes," *China Daily*, November 15, 2010.

EU-CHINA SYNERGY

The civil aviation sector, on an average has grown at an annual rate of 17 percent since the 1980s and the trend appears to be on the rise ever since.

The European Union (EU) too recognised the huge potential in the future Chinese aviation market and, hence, was ready to go that extra mile rather than watch it grow from the sidelines. The passenger traffic had soared from a meagre 2,75,000 in 1990 to a bounteous six million in 2004 and was expected to outpour to 500 million by 2020! The EU and China, at the aviation summit held at Beijing in July 2005, signed a joint declaration and agreed to synergise key stakeholders and forge closer ties in areas of mutual interest like infrastructure; aviation safety and security policy; regulatory cooperation and convergence; and air traffic management. The declaration chalked out a roadmap, bringing together 250 leading representatives from airlines, aerospace industries and different service providers. The two sides agreed to gradually open their aviation sectors by increasing capacity entitlements in relation to market access and through regulatory mechanisms to facilitate airline operations. This, in turn, would then provide significant benefits to passengers and opportunities to operators in both China and the EU[8]. They also allocated a budget of $10.5 million to pursue research focussed on sharing and developing technologies for cleaner, less polluting and safer aircraft to be carried out by the European Commission and China's Ministry of Industry and Information Technology (MIIT).

Paul Valery, a French philosopher of the 20th century had said that the "trouble with our times is that the future is not what it used to be" and the future for the Chinese aviation industry at large appears to be heading in a direction very different from its past! The civil aviation sector, on an average, has grown at an annual rate of 17 percent since the 1980s and the trend appears to be on the rise ever since. The strategy for the next 20 years would, therefore, be to capitalise on this growth and if the trends are anything

8. Joint Declaration on EU-China Cooperation in Civil Aviation signed on the occasion of the EU-China Aviation Summit, Beijing, June 29-July 01, 2005, by Mr Yang Yuanyuan, Minister of Civil Aviation in China and Mr Jacques Barrot, Vice President of the European Union on EU-China Cooperation.

to go by, CAAC estimates a whopping 1.5 billion passenger trips by 2030 when China will emerge as the largest air transport market in the world — a future very different from its past, which not even a prognosticator could have predicted in the 1980s![9] The only downside to this prognosis being that air travel in China is almost six times more expensive than rail and other conventional methods of travel. It is being further challenged by an increasing network of high speed railway lines which are expected to cover 13,000 km by 2012. Therefore, the strategy for the aviation sector in China will have to be to induct LCCs, improve efficiency through punctuality and better management practices and, thus, enhance passenger confidence. However, to be perceived as an alternative to the conventional and much cheaper modes of transportation, the aviation sector has no choice but to make the fares more competitive as compared to surface transport.

GENERAL AVIATION

The rapid economic rise also had an impact on the sociological factors and the internal dynamics in China. There was a sudden increase in the number of entrepreneurs and a country once acclaimed to have the most egalitarian society and income distribution was now witnessing an end to 'Mao's Socialism' and China was fast becoming the world's most 'unequal society'. The manifestation of these sociological changes had led to an increase in the number of millionaires with assets greater than $1.5 million, whose life style was naturally shifting gears, and time for them was money.[10] Naturally, many of these opulent and ambitious Chinese had the inherent desire to own their business jets and, hence, the new millennium witnessed an increase in the demand for private air services as well as small, medium private business jets and helicopters. China presently has under 1,000 small aircraft (which include both business jets and low-end fixed-wing aircraft used for forestry and agricultural purposes) as compared with 220,000 in the United States and 330,000 in the world.[11] The Chinese economy has been

9. Xin Dingding, "China's Civil Aviation Fleet Set to Double," *China Daily*, October 29, 2010.
10. Wang Qiang and Xin Dingding, "Golden Decade Takes-off for Aviation", *China Daily*, October 16, 2010.
11. Wang Ying, "Aviation Sector Set to Take-off," *China Daily*, November 16, 2010.

vibrant and the market has sufficient capacity to absorb a greater number of small and medium business jets as well as helicopters; however, the present demand has been dampened by the country's slow processes and the slow pace of aviation reforms.

Further reforms and opening low-level air space in China for use by private operators will energise the general aviation industry and boost the demand for small and medium aircraft. Yang Xiaonong, a private plane consultant, in an interview to *China Daily* mentioned that the present guidelines to operate these aircraft are stringent and do not clearly elaborate China's aviation policy. Many potential buyers are, therefore, sceptical about the complex and time-consuming approval procedures and high cost of operations and maintenance. An open sky regime augmented with technology would help remove the fog of uncertainty, invigorate demand for small aircraft, push up the requirement for aviation services, exploit the unexplored market worth $150 billion and finally provide the aviation industry an opportunity to bridge the existing gap between demand and supply for this category of aircraft. According to a report in *China Daily*, a village in east China's Jiangsu province announced plans to buy 20 aircraft for pilot training and tourism after the government announced its intentions to open low-altitude air space for general aviation. Huaxi, the richest village in China, spread in an area less than one square kilometre, home to the steel and textiles industries, and also the first village to generate close to $2 billion in revenue in 2003, expressed its desire to own a fleet of aircraft in the next five years with the aim of establishing a pilot training base as well as boosting tourism once the low altitude air space opens up in China.[12]The potential for growth in the civil aviation sector is unprecedented and the industry is eagerly waiting to absorb the multi-billion dollars from the market, and sharpen the competitive edge in the coming decade to establish a foothold in the air transport industry in China.

12. Xinhua News Agency, "Wealthiest Village to Purchase 20 Aircraft in 5 Years," *China Daily*, November 23, 2010.

CIVIL AVIATION INDUSTRY

The growth in the sector had to naturally be multi-dimensional and, therefore, other than energising the airline industry, it was also imperative to include plans for the construction of new airports, work on the expansion of the existing ones, create large and medium hubs for new airlines, along with maintenance and training centres, and ensure adequate availability of pilots and skilled technicians to overhaul the aircraft. According to rough estimates, it has been projected that by 2020, China's civil aviation sector alone will require more than 50,000 pilots! At the end, the strategy had to be centred on availability of aircraft and, therefore, the Chinese aviation industry had to generate adequate capacity either through partnerships or joint ventures to produce the required number of aircraft in order to meet the demand.

The global recession of 2008 had slowed down the development process and some of the world's richest economies had started to shrink; according to the International Monetary Fund (IMF), the global economy had shrunk by 0.9 percent in 2009. The recession was showing effects and most of the major airplane manufacturers based in these countries were feeling the heat. At the same time, China was recording a staggering 9 percent rate of growth and the aviation sector too was growing at a double digit rate. The Chinese aviation market was expected to generate sales of over $450 billion in the next two decades and every airplane manufacturer in the world was ready to play the role of either a partner or a competitor. Airbus, in a joint venture with the Aviation Industry Corporation of China (AVIC), invested over a billion dollars to set up an Airbus 320 plant in the Tianjin aerospace industrial park to manufacture 300 aircraft by 2016. AVIC also had signed a multi-billion dollar deal with Boeing to manufacture parts for the Boeing 747 and its other variants at the same plant. AVIC had invested close to half a billion dollars to manufacture helicopters not only for its growing domestic demand but also to cater for the international market. In a recent report that appeared in the *Global Times*, AVIC, along with United States Aerospace (USAE) had been trying to bid its 13-tonne AC-313 medium lift

helicopter for the US Navy's VXX helicopter programme[13]. China is working its way up and cooperating as well as collaborating with majors like the Canadian Bombardier, Boeing, Embraer, Eurocopter Group and Augusta Westland as it strives for leadership in the world's aerospace sector. Thomas Enders, Airbus President, has mentioned that the Chinese are "**very eager and very ambitious"** and likely to catch up with the Western level of efficiency at the Airbus sites in China. He was comparing the Broughton plant in the UK as a supplier with the plant at Tianjin, after the first 'Made in China' Airbus was delivered to Sichuan Airlines. It is said that the Airbus plant at Tianjin, which has cranked up at a breathtaking pace is almost a replica of the hangar at Hamburg, producing one aircraft a month and expected to rise to four a month by 2011. Efficiency, high quality infrastructure, strategic partnerships, joint ventures and Foreign Direct Investment (FDI) in the civil aviation industry have been key enablers to bridge the gap for future demand for a medium size passenger aircraft in China.

The market transition as a result of industrial restructuring in China permitted foreign investors to get into a strategic partnership with the domestic players.

The market transition, as a result of industrial restructuring in China permitted foreign investors to get into a strategic partnership with the domestic players and participate in this huge **'Chinese Dream'**. Foreign companies started to pour into China through the route of FDI, set up Maintenance, Repair and Overhaul (MRO) facilities and large aviation parks. The technology infusion as a result of growth in the civil aviation sector would naturally have a cascading effect on the aviation industry, which was getting energised to prepare itself as a leading player in the world's aerospace industry. There were a few global players who saw technology transfer to China as a potential risk while others saw it as an opportunity and a win-win situation. One such example comprised the Airbus plants at Beijing and Tianjin which have been developing carbon composite

13. Fu Wen, "Hopes for First Ever Military Export to West," *Global Times,* January 28, 2011.

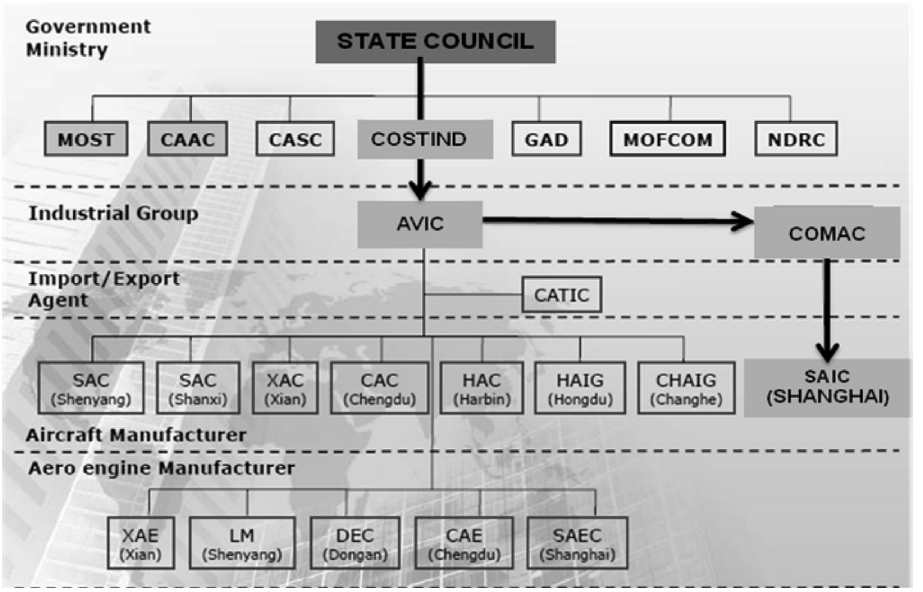
The reforms in the aviation sector had been an ongoing process since the time Deng opened the economy.

technology for their next generation Airbus 350XWB and, thus, intruding into what was once the sole domain of Airbus UK. This particular case was turning out to be a win-win situation for both China and Airbus; whilst, on the one hand, China was getting the technology knowhow, on the other, Airbus was smartly trying to leverage funding from the UK as a bargaining tool for its Airbus 350 and Airbus 400 military transport aircraft, citing China as an alternative location. Beyond doubt, all global players were aware that Western technology transfer will help Chinese play catch-up in military aviation but, at the same time, also acknowledged that at a time of recession, this was the price for the ticket most of them were ready to pay to get entry into the Chinese aerospace market.

COMAC

The reforms in the aviation sector had been an ongoing process since the time Deng opened the economy. China continued to make changes, many of which were based on the experiences of major global players. The leadership too was sensitive and allocated funds for the development of a passenger aircraft in the 11th and 12th Five-Year Plans. AVIC was reorganised to look into core areas like type of aircraft, engines and systems. Similarly, the civil aviation sector too was restructured into main businesses like air transport, helicopters, engines and aircraft systems. Hence, the model was structured along the lines of the state providing ***'state-of-the-art'*** infrastructure to attract foreign investors either through joint ventures or FDI to create centres of excellence. The Commercial Aircraft Corporation of China (COMAC) was one such centre of excellence, which functioned under the Commission of Science Technology and Industry for National Defence (COSTIND) and AVIC for developing 70 and 150-seat passenger commercial aircraft. (Fig 1)

Fig 1



MOST	Ministry of Science and Technology
CAAC	Civil Aviation Administration of China
CASC	China Aerospace Corporation
COSTIND	Commission of Science Technology and Industry for National Defence
GAD	General Armament Department
MOFCOM	Ministry of Commerce
NDRC	National Development and Reform Commission
COMAC	Commercial Aircraft Corporation of China
CATIC	China Aviation Technology Import Export Corporation

COMAC was established in May 2008 with registered capital of under $3 billion. Being located at Shanghai gave it the dual advantage of, first, being financially supported by the cash rich Shanghai local government and, second, easy accessibility for foreign partners keen on setting up a joint venture in China. COMAC, therefore, became a consortium consisting of the local Shanghai government, AVIC's Commercial Aircraft Corporation,

Shanghai Aircraft Industrial Corporation (SAIC) and the Xian-based design institute also called the First Aircraft Institute (FAI) which had a branch in Shanghai. Though AVIC had much larger assets, in the pecking order, COMAC was ranked higher which was evident from its leadership and the chain of command. A former Minister, Zhang Qingwei and Vice Minister Jin Zhuanglong of COSTIND were appointed as Chairman and President of COMAC; not surprisingly, both were members of the Standing Committee of the Communist Party of China. The major stakeholders of COMAC were the state owned Assets Supervision and Administration Commission to which it reported and had assets close to a billion dollars,[14] AVIC, Shanghai government, along with the Aluminium Corporation and Baosteel Group Company of China.[15]

COMAC, after the 11th Plan, had two major civil aircraft development projects on hand; one was the 70-seat single aisle ARJ 21 and the other, the 150 seat-single aisle C919 passenger aircraft. The C919 is expected to take to the skies by 2016 and is also being projected as a future replacement and potential competitor to Boeing 737 and Airbus 320. However, some experts have tried to downplay this development plan, calling it "mumbo jumbo" as they feel that in the absence of technology to manufacture an aeroengine, no country can claim the 'high ground' to possess the capability to manufacture an aircraft. This is true to a large extent, but the Chinese, as we know, are experts in defying basic laws and, according to some reports, have already signed an order to sell 100 C919 to their state-owned airlines — Air China, China Southern and China Eastern. It is believed that the ARJ 21 has a backlog order for 240 aircraft not only from domestic airlines but also foreign companies like GE Capital Aviation services as well as Lao Airlines.[16] The Chinese market is expected to grow at a double digit rate and by 2020, require more than 4,000 aircraft; business valued at over $450 billion and, hence, sufficient capacity for the ARJ21-700 and C919 to do business in the domestic market. However, CATIC is also looking at exploiting

14. Xinhua News Agency, "COMAC gets Order for 100 C919 Jumbo Jets," *China Daily*, February 15, 2011.
15. Leithen Francis, "China Restructures Its Aerospace Sector," *Flight International*, October 28, 2010.
16. "China's COMAC Sign Deals for 100 Aircraft Orders," *The Economic Times*, November 16, 2010.

the foreign markets through exports of these aircraft and, therefore, CAAC has been working closely with the Federal Aviation Agency (FAA) and European Aviation Safety Agency for certification which would then provide CATIC greater flexibility to export these machines.

COMAC is the main agency vested with the responsibility of manufacturing passenger aircraft in China.

C919

COMAC is the main agency vested with the responsibility of manufacturing passenger aircraft in China and in the coming years, is expected to compete with Boeing and Airbus to gain a foothold in the aerospace sector. China is probably the only other country with the national will to replicate the fairy tale story of the European and American passenger aircraft industry. The President and CEO of Honeywell China and India had, in an interview to *China Daily*, said that **"China is going to build the third leg of the aerospace industry after North America and Europe" —** recognition from a potential competitor which not only reinforces the confidence but also the conviction of the Chinese leadership in its civil aerospace sector. COMAC subsequently unveiled its first home grown 17 metres long, 3.96 metres wide and 5.6 metres tall **'Chinese beauty'** called C919 at the 8th International Aviation and Aerospace exhibition held in Zhuhai on November 16, 2010. The C919 is expected to make its maiden flight in 2014 and be ready to be delivered by 2016 after certification. COMAC has also established many joint ventures and is working closely with half a dozen domestic and over a dozen international suppliers for the development of a fuselage for the C919. It expects a future order of 2,000 aircraft and strives to occupy the same status in China as Boeing did in America and Airbus in Europe. It also aims to become a preferential brand and the mainstay of China's passenger aircraft manufacturer which in the next two decades should have the capacity to absorb almost 4,000 aircraft consisting of both large and medium size jets, along with 800 additional regional jets.[17]

17. Wang Zhouqiong, "Big Jets Take-off with 100 Orders," *China Daily,* November 23, 2010.

ARJ21

The ARJ21 is a regional jet manufactured by COMAC's SAIC. The aircraft is powered by the GE CF 34-10A high bypass ratio turbo fan engine to meet the diverse and demanding conditions to operate across the western regions in China. The engines are pod mounted at the rear of the fuselage, forward of the swept T-tail, and equipped with Full Authority Digital Engine Control (FADEC). The powerful engines mounted on the ARJ21-700 will give it a better climb performance and enable operations from short runways at high altitudes. The final assembly of this aircraft was completed in March 2007; the first ARJ21-700 took to the skies in November 2008 and the certification was completed in 2009, ready to be delivered by end 2011.[18]

The aircraft is the result of teamwork between COMAC and different units under AVIC like Xian, Chengdu and Shenyang, along with foreign investors in joint venture partnerships. Chengdu manufactured the nose section; Shenyang assisted in the empennage; Xian Aircraft Design and Research Institute assisted in designing; and the final assembly was carried out by Shanghai directly under COMAC. Subsequently, COMAC also launched the development plan to manufacture the ARJ 21-900 along with Bombardier Aerospace in the 90-149 seat commercial aircraft category which is expected to roll out by the end of 2011. The other versions include the freighter carrier ARJ21F and the business class of aircraft, the ARJ21B.

The ARJ21-700 cockpit is equipped with state-of-the-art avionics consisting of an integrated Rockwell Collins high resolution flat panel Liquid Crystal Display (LCD) with Electric Flight Control Systems (EFCS). Honeywell is supplying them with the fly-by-wire flight control system along with the VHF-4000 voice and data receiver with data link communications. It has a Rockwell Collins FMS 4200, Flight Management System (FMS) which provides multiple waypoint navigation; fuel planning; and Standard Instrument Departure (SID), along with standard terminal approach and arrivals. It also has a fully integrated Engine Indication and Crew Alerting System (EICAS) along with the Rockwell Collins AHS-3000 solid state weather radar, Traffic Collision and Avoidance System (TCAS)

18. http://www.acac.com.cn/site_en/product04.asp, assessed on February 23, 2011.

and an Air Data Computer (ADC). Eaton Corporation is providing the cockpit panel lighting, while Sagem is providing the flight deck control system which has an interface with the fly-by-wire system.[19]

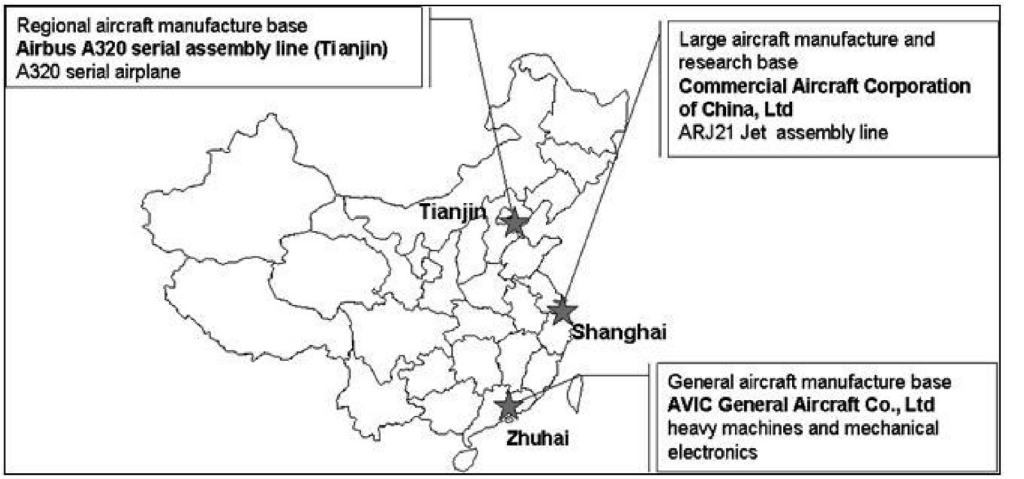
Formation of COMAC was part of a vision to create infrastructure for China's aviation industry.

Aviation Parks

The stakes are high and China wants the whole nine yards in the huge Chinese aviation market. Formation of COMAC was part of a vision to create infrastructure for China's aviation industry and the vision document consisted of setting up a research and training base at Pudong along with an assembly line plant in Baoshan, Shanghai prefecture (Fig 2). Similar parks were also set up in partnership between the Tianjin government and CAAC to build infrastructure for China's civil aviation technology (Fig 2). Tianjin Aviation Park eventually became a base for the Airbus 320 assembly line and the manufacturing hub for China's civil helicopters. The future plan is, however, to set up a global aviation industrial city with a technical advisory service, manufacturing hub and research training centre. The Tianjin municipal government, along with AVIC, is also building China's helicopter industrial base in the Binhai region in Tianjin, with an investment of nearly $3 billion (Fig 2). Around the same time, AVIC General Aircraft Corporation Limited, a joint venture between the Zhuhai government and AVIC, with investments close to $3 billion, set up a general aircraft industrial base at Zhuhai (Fig 2). The infrastructure at the park had sections for aircraft designing, manufacturing, flight testing, and air traffic management and airport operations.[20] These global parks will eventually promote development of large and small passenger aircraft, helicopters and executive jets, and the technology used on these platforms will finally 'spin-in' to the military aviation industry in China.

19. www.aerospace-technology.com/projects/arj21/, accessed on February 23, 2011.
20. CCID Consulting, "China's Aviation Industry: Aeroengine Starts" (Published by CCID management consultant), July 27, 2009, http://en.ccidconsulting.com/en/io/mr/mr/cs/webinfo/2010/04/1272329397066742.htm, accessed on February 21, 2011.

Fig 2



Source: CCID Consulting, January 2009

The Western companies have been partnering with the Chinese companies since the mid-1980s. McDonnell Douglas had signed an agreement with the Shanghai Aviation Factory in 1985 to manufacture 25 MD82/83. In 1995, Sikorsky selected Changhe as its business partner to manufacture the empennage for S-92 and, in 1997, a consortium was formed among Harbin, Eurocopter and Singapore Aviation Company to manufacture EC-120 helicopters. A joint venture model is not new to China, but what has changed is the strategy and the methodology of implementing these partnerships. The journey has been fruitful and the Chinese aviation industry is fast becoming a part of the global chain, with major participants like GE, Rolls-Royce, Boeing, Airbus, Embraer, Pratt & Whitney Canada, Honeywell and Collins, all vying for a piece of the pie in the growing civil aviation market in China.

China is also becoming an emerging destination for the MRO business, not just regionally but also globally. During the recession, 5 percent of the global aviation fleet was grounded for want of maintenance and the MRO demand was relatively flat, however with evidence building that the worst economic recession is heading towards substantial financial recovery, major airlines are expected to get back to their earlier levels by the end

of 2011. According to Frost and Sullivan, China in 2000 earned 10 percent of the Asia-Pacific MRO revenue and its share in 2010 had increased to 21 percent, almost equalling Singapore. From the long-term perspective, the global revenue in the MRO industry is expected to grow annually at 4 percent to reach a level of $65 billion by 2020 and $90 billion by 2030. However, when it comes to a breakdown of individual countries, India and China are expected to grow annually at almost 9 percent, while Asia-Pacific is at 4 percent, Middle East at 6 percent, Europe at 2 percent and America at 0.2 percent in the MRO business.

China is also becoming an emerging destination for the MRO business, not just regionally but also globally.

Boeing and Airbus are pushing hard for joint ventures to set up MRO facilities in China. Boeing Shanghai Aviation Services is certified and is focussing on 'line maintenance' as well as 'heavy maintenance' and modification work on Boeing 737 NG aircraft. Engine manufacturers like GE, Rolls-Royce, Snecma, CFM international Pratt & Whitney are also actively campaigning to tango in the fast growing MRO industry in China. Ameco Beijing is in a joint venture with Lufthansa Technik and Australia's Quantas for engine overhaul. Taikoo Spirit Aerosystems Composite Company Limited (TAECO) along with HAECO (Hong Kong Aircraft Engineering Company) and a few others have set up overhaul services for composite components, for both narrow and wide bodied aircraft in Jinjiang. While HAECO has opened an extension centre in Hong Kong, TAECO has done the same in Xiamen and together would be able to handle 12 Boeing 747 and five Boeing 737 simultaneously. HAEKO is also expanding its business plans with Taikoo Sichuan Aircraft Engineering Services to carry out heavy checks on the Airbus 320 for Sichuan Airlines based in Chengdu. Other such *'overhaul'* partnerships include Guangzhou Aircraft Maintenance Engineering Company Limited (GAMECO) which sees a huge potential in tapping the future MRO business by becoming a part of the integrated Asia-Pacific Region, along with players from Australia, New Zealand, Singapore and India. It is, therefore, apparent that the core of aerospace activity has shifted towards Asia and in particular China, which in the future, is expected

China is striving to emerge as a leader in the world's aerospace market. It sees its commercial planes some day challenge the best in the world.

to grow at close to double digit year on year.[21]

WINDS OF CHANGE

China is striving to emerge as a leader in the world's aerospace market. It sees its commercial planes some day challenge the best in the world from Boeing, Airbus, Embraer and Bombardier. The Western companies' generosity in helping China pursue its dreams was not without a vested interest and aimed at tapping the potentially huge Chinese aviation markets. The Chinese market has become a lucrative destination for the Western companies, which, in all fairness, are not ready to watch its growth from the sidelines but rather wish to participate in this wonderful 'Alice in Wonderland' like growth story of China's civil aviation sector. However, like the American proverb "there ain't no such thing as a free lunch," the Western companies' participation in the development of the Chinese civil aviation industry also came with the potential risk of helping China play catch-up in military aviation, as was exhibited when the Chinese flew the J-20 prototype on January 11, 2011. At the same time, some Western strategists also believed that China was too far behind in both civil and military airplane technology to cause any real fears and, therefore, brushed such ideas aside, due to the attraction to the multi-billion dollar market as they did not want to miss such a lucrative opportunity.

'Chimerica' have been getting more and more intertwined not only economically but lately, also through their strategic partnerships. China, as in December 2010, had $891 billion in holding in the treasury bonds in America, the largest by any country.[22] China is becoming an indispensable power and Brzezinski had floated the concept of the G-2 at the G-20, which would put China and America at the forefront of international affairs. During Obama's first state visit to China in November 2009, Hu and Obama in a joint declaration stated that both were committed to building a **"positive,**

21. Tom Ballantyne, "China, India to Lead MRO Growth," *Orient Aviation*, May 2010.
22. www.treasury.gov/resource-center/data-chart-center/tic/Documents/mfh.txt, accessed on February 28, 2011.

cooperative and comprehensive relationship in the 21st century".[23] During Hu's visit to America in 2011, which has been the most hyped top-level US-China encounter since Deng's historic visit almost three decades earlier, agreements worth $45 billion were signed which included a $19 billion dollar deal for the order of 200 Boeing aircraft. Hu in his speech mentioned that the bilateral trade had exceeded $350 billion and US consumers were annually saving $70 billion by purchasing Chinese made goods![24] The US investments in China had already exceeded $60 billion and China's investment in the US was at $4.4 billion. The significant part of the 4,000 word joint communiqué was that **"China welcomes the US as an Asia-Pacific nation,"** implying China's consent to share the space as well as the US accepting in principle China's shift from being a continental to a maritime power in the region.

The Americans are ready to share technology and many trade secrets with China as part of the strategic partnership. GE, in a joint venture with AVIC, is selling jet engines to Chinese airlines that are buying Boeing and Airbus airplanes, either directly or through partnership with Snecma of France. GE is also in a joint venture with COMAC and sharing technology related to communications, navigation, cockpit displays and controls, and will further contribute its state-of-the-art avionics technology — a high-performance core computer system that operates as the avionics brain of Boeing's new Dreamliner.[25] The other joint ventures in avionics have been with Honeywell, Rockwell Collins, Eaton Corporation and Thales, all competing for the C919 as well as ARJ21-700/900 aircraft. The Chinese government has made it clear that all its partners should be ready to "share technology and knowhow" to make the partnership work.

The risk and concerns that Western technology transfer to the civil aerospace industry would seep into the military aviation sector are genuine

23. "New Development in China-US Relations Bears Strategic Significance," *Peoples Daily* Online, November 19, 2009, http://english.peopledaily.com.cn/90001/90776/90883/6817359.html, accessed on February 28, 2011.
24. Jayadeva Ranade, Distinguished Fellow at the Centre for Air Power Studies, "China-US Summit Wary Co-existence," *National and Defence Aerospace Power*, January 31, 2011.
25. David Barboza, Christopher Drew and Steve Lohr, "GE to Share Jet Technology with China in New Joint Venture," *New York Times*, January 17, 2011.

because of the close ties between China's commercial arm and its military aviation industry (Fig 1). The Chinese too, neither have any intentions of insulating their military aviation industry from the 'spin-in' benefits likely to accrue from the civil aircraft industry. At the same time, technology transfer is an almost 'must have' component in any joint agreement and a gateway to gain access to the Chinese markets. Airbus which set up a joint venture with Harbin Aircraft, ran into bad weather because of technology-transfer in the composite component plant; it became a major sticking point for Airbus, which subsequently had to be forced down. It can only be conjectured that the ARJ21-700, future C919, along with the much hyped J-20 5th Generation stealth fighters would be the prospective beneficiaries from transfer of knowhow in composite technology. The spin-in is also expected from the avionics as a result of joint ventures with Honeywell, Rockwell Collins, Eaton Corporation and Thales through COMAC. The stakes are indeed high; and the question that needs to be answered is whether the companies are trading their future for immediate sales in China? The beneficiary now is China but for how long? Technologies and processes need to be continuously improved but does China have the infrastructure as well as capacity to improvise in the future? If yes, does it have the capacity to improvise faster than its competitors? The reality is that the West is willing to graciously accept **'advantage China'** and considers partnering with China as a **'necessary evil'**. At least for now and some time to come, the immediate beneficiary no doubt is the 'aviation industry of China'.