http://dx.doi.org/10.18778/7525-935-3.10

Martin Grančay (University of Economics in Bratislava)

China's Civil Aviation at the Beginning of the 21st Century – Can Europe Remain Competitive?

1. Introduction

International civil aviation is one of the most important sectors of the world economy. Its economic impact is enormous. It transports more than 2.3 billion passengers and 45 million tons of cargo annually. The 2,000 airlines in the world operate a fleet of more than 25,000 aircraft, generate 32 million jobs and contribute to the world GDP in the amount of 7.5 per cent. Moreover, air transportation is vital for tourism, transporting more than 40 per cent of international tourists (ICAOData, 2012).

International civil aviation is also one of the most protectionist sectors of the world economy. It is based on a system of bilateral intergovernmental air service agreements. To operate regular air services between Slovakia and Russia a bilateral agreement between the governments of these two countries has to be in place. This agreement sets all rules of air transportation between the countries such as, the number and names of airlines permitted, a list of accessible airports, approved aircraft types, number of weekly flights etc. Considering there are approximately 200 countries in the world, a network of 19,900 agreements is needed for worldwide civil aviation relations (Currently, the number is much lower, as not all countries have established mutual relations). To make things even more complicated, some of the agreements are liberal, while others are protectionist. Therefore, the operating environment for airlines is very complicated and confusing.

Since the birth of international civil aviation in the beginning of the 20th century, two continents have dominated the sky: North America and Europe. They had the highest number of large airlines and airports, and were the leaders in research and development. However, in recent years the market structure has begun to change. Two major players have propelled the fast rise of Asia: the United Arab Emirates and China. While the former has taken advantage of its favourable geographical position between the three continents, the latter constitutes a huge market with untapped potential. The goal of this paper is to provide a brief overview of the state of aviation in China and to compare it with Europe. It will address

the question whether Europe's airlines, airports and aircraft manufacturers can remain competitive in the upcoming century of China.

The paper is divided into six sections. After a brief introduction it provides a simple statistical comparison of selected civil aviation indicators in China and in the USA. The next three sections deal with the state of the three pillars of aviation in China; that is airports, airlines and aircraft production, as compared to the European Union. The final section provides conclusions about whether and how the European air transportation sector can remain competitive.

2. Aviation statistics in China and the USA – a comparison

The beginning of the 21st century has been marked by the rise of China in all spheres of economic life. What once was the cheap factory of the world, China has gradually changed into a powerful economic giant with an ambitious space program, a huge modern army and an extensive network of high-speed railways. One of the most striking examples of the extent of modernization China has gone through is its civil aviation sector. Its output has increased several times over the last decade. Still, the market is far from being saturated (table 1).

Table 1. Selected aviation statistics – China vs. USA

	World	China	Share	USA	Share
GDP (PPP, billion USD, 2010)	76,288	10,085	13 %	14,582	19 %
Population (million)	7,020	1,350	19 %	314	4 %
Land area (million square km)	148.940	9.597	6 %	9.162	6 %
No. ofpax. transported by air	2.3 billion	290 mil.	13 %	720 mil.	31 %
Pax. / squarekilometres of land	15 pax	30 pax	-	79 pax.	-
Total number of airports	43,000	502	1 %	15,079	35 %
Airports with paved rw> 3km	1,009	63	6 %	189	19 %
Square km of land for 1 airport	3,464	19,117	-	608	-
Airline net profits (USD)	7.9 billion	4.1 bil.	52 %	0.4 bil.	5 %

Note: All data for 2011 unless indicated otherwise.

Source: "Gross Domestic Product 2010," World Bank, accessed August 20, 2012, http://siteresources.worldbank.org/DATASTATISTICS/Resources/GDP_PPP.pdf and "China", "United States" and "World," Central Intelligence Agency URL:, https://www.cia.gov/library/publications/the-world-factbook/geos/us.html [accessed August 20, 2012].

While China's population constitutes 19 % of total world population, it has only 1 % of the total number of airports. While in USA there is one airport for every 600 square kilometres of land, in China there is only one airport for every 19,000 square kilometres. The Chinese aviation market represented 13 % of world passenger traffic in 2010. In the USA, the share was 31 %. China's aviation

statistics lags far behind US and EU statistics in almost every indicator, except for airline net profits.

Airbus Global Market Forecast 2011-2030 clearly shows that along with India, China will be the fastest growing aviation market in the next 20 years. Between 2000 and 2010 domestic air traffic in China increased by 300 %. International traffic to/out of China increased by 212 %; in some regions the increase was more than 30-fold![6] For the next two decades Airbus forecasts that domestic air traffic in China will grow at an annual rate of 7.2 %, which will make it one of the biggest markets in the world by 2025 (second only to USA). International traffic growth will be impressive as well, with an annual average of 6 %.

Even though the forecasts might seem a bit overrated, no one doubts that they will come to be. Unlike in other countries, the Chinese government supports aviation by building new airports, establishing new airlines with local government funding and investing in the development of modern airliners.

3. Airports in China

Out of the 290 million passengers transported by air in China in 2010, more than a half departed from or arrived at one of the three main airports – Beijing Capital, Guangzhou Baiyun and Shanghai Pudong. These three airports constitute the vertices of China's Golden Triangle. The triangle connects the three main economic and political centres of China: Beijing, the Yangtze River Delta and the Pearl River Delta. While the largest airport is Beijing Capital with 77 million annual passengers (see table 2), the Pearl River Delta and Yangtze River Delta are actually clusters of airports. The combined volume of traffic in each of these clusters is higher than 100 million passengers. The Pearl River Delta cluster of airports is the third largest in the world with more than 130 million passengers annually, and within 10 years it will most likely become the largest one.[7]

Table 2. Largest airports in China by number of passengers (2011)

Airport	Pax (1000s)	Seats/week intercont.	Seats/week regional	Largest airline (share)
Beijing	77,404	15.1%	84.9%	Air China (40%)
Guangzhou	45,400	13.5%	86.5%	China Southern (53%)

[6] China-Middle East: 3,590 %, Chinese-Asian Subcontinent: 1,096 %, China-CIS: 293 %, China-Pacific: 214 %, China-North America: 205 %, China-Europe: 183 %, China-Asia: 173 %. See Airbus Global Market Forecast 2011-2030.

[7] Currently, the largest cluster of airports is the Washington-Baltimore-Philadelphia-New York-Boston cluster with more than 210 million annual passengers. London airports (Heathrow, Gatwick, Stansted, Luton, City) come second with a combined traffic of 134 million passengers. The two Tokyo airports (Narita and Haneda) serve 90 million passengers.

Table 2. (cont.)

Shanghai-Pudong	41,450	22.9%	77.1%	China Eastern (35%)
Shanghai-Hongqiao	33,112	0.0%	100.0%	China Eastern (32%)
Chengdu	29,074	2.7%	97.3%	Air China (31%)
Shenzhen	28,246	1.6%	98.4%	Shenzen airlines (32%)
Kunming	22,273	3.4%	96.6%	China Eastern (45%)
Hangzhou	17,512	4.2%	95.8%	Xiamen airlines (20%)
Xiamen	15,753	4.0%	96.0%	Xiamen airlines (41%)
Nanjing	13,074	n/a	n/a	n/a

Note: n/a – data not available.
Source: Flightglobal Insight, "The World's Top Airports": 42-46.

All of these Chinese airports have seen an incredible growth in number of passengers in the last decade. In the year 2000, Beijing Capital airport served 22 million passengers and was ranked as the 42nd largest airport in the world. Today it serves almost 80 million passengers annually and is the 2nd largest airport behind Atlanta Hartsfield Jackson. Guangzhou Baiyunhad 13 million and Shanghai-Hongqiao 6 million passengers back in 2000. (Lu, 2012) Shanghai-Hongqiao is the largest airport in the world that offers no intercontinental flights.

An impressive number of Chinese airports offer direct flights to Europe: Beijing, Chengdu, Chongqing, Guangzhou, Hangzhou, Nanjing, Qingdao, Shanghai, Shenyang, Wuhan and Xiamen all have direct flights to the EU countries; in addition, Sanya and Urumqi are directly connected to Moscow. Other primary airports (such as Shenzhen, Xian or Kunming) are expected to open direct Euro-Asian routes in the coming years.

Chinese airports, in contrast to the European ones, enjoy various advantages. Firstly, they have an obvious advantage of a fast growing market with a population of more than 1.3 billion people. Stable economic growth is a guarantee of a permanent increase in the demand for air transportation. Secondly, there are no capacity issues in the majority of airports. They are new, modern and ready for a China of the 21st century, unlike the old capacity-stricken European airports, such as London-Heathrow, Paris-Charles de Gaulle or Frankfurt. The only major issue is that the largest airport in China (Beijing Capital), which even though is new, already operates beyond its intended capacity. Thirdly, the construction of new airports is sponsored by state and local governments. The central government plans to build 55 new airports over the next four years, including a new airport for Beijing that would be able to handle 140 million passengers annually. The new Beijing-Daxing airport should begin operations in 2017. Today, it would be by far the biggest airport in the world. However, Istanbul plans to build an airport of a similar size and other huge airports are under construction in Dubai and in Doha. Finally, as Chinese airports are quite modern, they use state-of-the

art technologies and have a modern infrastructure. Consequently, their operating costs tend to be lower than the operating costs of their European counterparts.

On the other hand, the main issue for some Chinese airports, one that European airports are unfamiliar with, is competition from high-speed rail. Some short-haul routes have already been closed as a result of this competition. In the future, even longer routes may be endangered. Chinese airports and airlines are losing lucrative clientele on major trunk routes, such as Beijing-Shanghai. The fastest trains cover the 1,300 km distance between Beijing and Shanghai in less than 5 hours. The price of a one-way ticket (555 yuan) is approximately the same as the airfare, but given the higher level of comfort associated with Chinese high-speed trains, many travellers prefer this mode of travel. The high daily capacity of the Beijing-Shanghai railway line (170,000 passengers) further deteriorates the situation. Once the full network of high-speed railways is built in the whole country, many airports and airlines will lose a part of their business. However, taking into account the high economic growth in China and her inhabitants' rising purchasing power, there is enough space for both high-speed railways and airports to prosper.

4. Airlines in China

Until the late 1980s there was only one airline in China – Civil Aviation Administration of China (CAAC). In 1988, amongst a nationwide initiative of reforms in all sectors of the economy, CAAC was broken into several smaller companies – Air China, China Eastern, China Southern, China Southwest, China Northwest and China Northern. As some of these airlines did not prove efficient, the Chinese government started a major wave of mergers in 2002. As a result, three main public airlines have emerged – China Southern, China Eastern and Air China. The era of consolidation and of hub development has begun.

China Southern is currently the world's fifth largest airline by number of passengers (80 million in 2011) and the largest airline that is not based in the USA. China Eastern (70 million) and Air China (50 million passengers) also belong to the top 20 largest airlines in the world. Hainan airlines, a private company based in the holiday city of Haikou, is the fourth largest airline in China (20 million passengers). It is famous for their high quality service and its official ranking as one of the six 5-star airlines in the world. The aviation landscape of China also includes several regional airlines (such as Shenzhen Airlines, Shandong Airlines or Xiamen Airlines), the majority of which is owned by either one of the three large public airlines, regional development banks and local governments. The only low-cost carrier operating in China is Spring Airlines based in Shanghai.

After the wave of airline mergers in 2002-2004, three main trends emerged among Chinese airlines: 1. *Launching regional subsidiaries* – while the market

for air transportation in the Shanghai and Beijing regions might be close to saturation, the rest of China represents huge opportunities for growth. Consequently, the three big players in Chinese aviation have been following a strategy of launching regional airlines in underdeveloped regions, such as China's west, north and northeast. Air China has launched Dalian Airlines, Shandong Airlines, Shenzhen Airlines, Beijing Airlines, Kunming Airlines, Henan Airlines, Tibet Air and recently Air China Inner Mongolia. China Eastern owns Shanghai Airlines; China Southern owns Xiamen Airlines, Chongqing Airlines, Sichuan Airlines, etc. Local governments politically and financially support the whole process. The potential of Northern and Western China is clearly visible from the chart no 1.

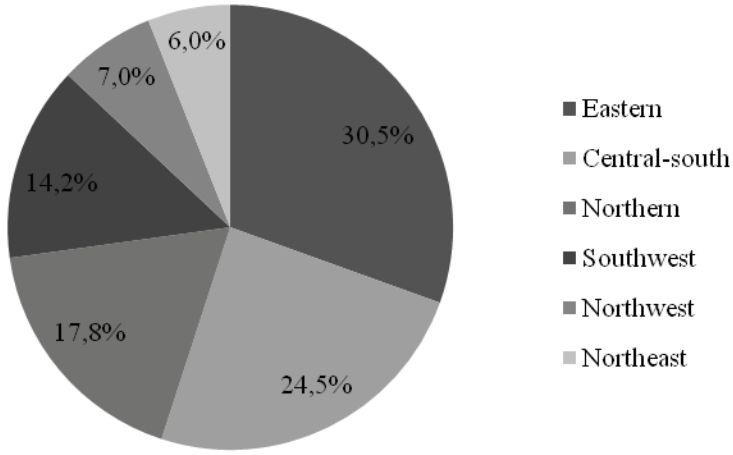

Chart 1. 2010 passengers by China region
Source: Airline Business Top 200 traffic rankings

Take the example of the north eastern region, which is densely populated and includes several huge cities such as, Harbin, Shenyang, Changchun or Dalian. Moreover, it is one of the regions in China with the highest economic growth. Still, in 2010 it constituted only 6 % of passenger air traffic in China. As a result, both China Southern and Air China have been adding frequencies to north-eastern cities and Air China has launched the Dalian Airlines subsidiary. A similar situation can be seen in the regions of Inner Mongolia and Xinjiang. 2. *Joining global alliances* – with the strong exception of Middle-Eastern carriers, almost all major airlines are members *o*f one of three alliances – Star Alliance, Sky Team or One world. Chinese airlines are no exception. China Southern and China Eastern have joined Skyteam. Air China is a member of Star Alliance. Shenzen airlines are expected to join the same alliance in late 2012. Alliance membership brings benefits

of an extended network through code-sharing agreements and significant cost reductions from common sales and maintenance. The only major airline in China that has so far not expressed interest in joining an alliance is Hainan. 3. *Increasing the quality of service* – Asian airlines have a tradition of high quality service. Nevertheless, three decades of socialism and the monopoly of CAAC left a negative impact on Chinese aviation. However, the quality has been increasing since the beginning of the 21st century. Hainan airlines became the first Chinese carrier to achieve a 5-star status. Air China and China Southern enjoy a 4-star ranking.

The size of the domestic market is a great opportunity for Chinese airlines to expand their international services and go global. So far Chinese airlines seem to be following a smart "wait-and-learn" strategy. They are not yet fully competitive and use domestic expansion to learn how to increase efficiency. It might seem somewhat unexpected, but the cost base of Chinese carriers is higher than that of many US airlines; standard CASM (cost per available seat mile) for the industry is around 15-20 US cents. Surprisingly, the CASM of Chinese airlines tends to be equal or higher than this benchmark. This can be explained by over employment, shorter average flight segments of Chinese airlines and lower overall efficiency.

However, while Chinese airlines have not yet been able to take full advantage of their potentially low cost base, their competitiveness is strengthened by other factors. Firstly, the airline industry is supported by the central and local governments. Secondly, kerosene prices are regulated by the central government, and thirdly, the untapped market of western and northern China is a guarantee of sustainable growth for a decade or two.

On the other hand, Chinese airlines, especially China Southern, face a fierce competition from high-speed rail (see final paragraph of section 3 for a more detailed analysis of this topic). Although certainly a threat, this competition might eventually lead to an increased efficiency and a higher quality of service.

5. Aircraft production in China

Since the 1980s the airliner market has been dominated by two Western companies – Airbus and Boeing. However, the duopoly might be coming to an end. The beginning of the 21st century has seen several new manufacturers launch aircraft projects. Brazilian Embraer and Canadian Bombardier are already well-established producers of regional jets. In 2011 the Russian company Sukhoi introduced its Superjet 100. Another Russian entity, the Irkut Corporation, presented plans to produce an airliner dubbed MS-21; an aircraft of the same category as Boeing 737 and Airbus 320. Japanese company Mitsubishi has launched the development of Mitsubishi Regional Jet. Obviously, China cannot stay behind and the government approved the development of two new airliners, the ARJ21 and C919.

In 1985 US manufacturer McDonnell Douglas formed a joint venture with Chinese companies in Shanghai, Xian, Chengdu and Shenyang and started producing the MD-82 in China. After a total number of 35 aircraft built, another joint venture was formed in 1992 to manufacture a new aircraft - the MD-90. Originally 40 planes were planned to be built, however, the program failed because the US government did not allow McDonnell Douglas to export the machines necessary for the production of the aircraft. The consequent merger between McDonnell Douglas and Boeing resulted in the termination of the contract.

In the beginning of the 21st century, European manufacturer Airbus began exploring possibilities of opening a production facility in China. It established a joint venture with Chinese partners and opened a factory in Tianjin. The factory produces A320s for the Chinese domestic market. The first one flew in 2009 and until today, more than 80 aircraft have been delivered. Airbus' interest in China is understandable. According to Airbus Global Market Forecast 2011-2030 the country will need more than four thousand new aircraft in the next two decades, worth more than 540 billion US dollars (table 3). It will be the most important market for airliners; hence Airbus wants to establish a strong foothold in the country.

Table 3. Top 10 countries in 20-year new passenger aircraft deliveries (2011-2030)

No.	Country	Pieces
1.	USA	5,389
2.	China	4,041
3.	Germany	1,038
4.	India	1,019
5.	United Kingdom	938
6.	United Arab Emirates	813
7.	Brazil	701
8.	Russia	689
9.	Australia	609
10.	Ireland	588

No.	Country	Bil. USD
1.	China	545.1
2.	USA	495.5
3.	United Arab Emirates	177.0
4.	India	141.4
5.	Germany	132.7
6.	United Kingdom	119.6
7.	Japan	91.5
8.	Brazil	82.3
9.	Australia	80.2
10.	Russia	72.8

Source: Airbus Global Market Forecast 2011-2030.

Seeing the enormous size of the market, the Chinese government is not willing to give it all to foreign aircraft manufacturers. Therefore, one of the key elements of the 10th 5-year plan was to develop an indigenous Chinese regional jet. Dubbed ARJ21, the aircraft has been undergoing certification tests since 2008 and is currently expected to enter commercial service in late 2013. More than 300 ARJ21s are on order by mostly Chinese airlines. The Commercial Aircraft Corporation of China (COMAC) is also responsible for another aircraft project - the C919. It should be the largest aircraft to be built by China since the Shanghai

Y-10 and a direct competitor for the Airbus A320 and Boeing 737. The first flight is expected to take place in 2014. Currently, more than 200 C919s are on order.

In contrast to airports and airlines, Chinese aircraft producers have only few advantages over their European and US counterparts. Most importantly, it is the fast growth of government-owned Chinese airlines, whose orders of aircraft can be practically seen as guaranteed. They also have an advantage of a "clean sheet of paper", i.e. they start with a completely new design; hence the aircraft has no hidden errors inherited from previous models.

On the other hand, Chinese aircraft manufacturers face many hurdles. Firstly, the aviation industry has a very steep learning curve. It is virtually impossible for the Chinese to build a 100-per-cent Chinese aircraft. They have already established co-operation with tens of western companies, including Honeywell (known for their fly-by-wire technology) and General Electric. The ARJ21 and C919 will therefore be as international as Boeings or Airbuses are, and not at all Chinese. However, in the minds of Western passengers, they will always be Chinese aircraft and they may dislike flying in them (Note that many Americans do not trust Airbuses; it is difficult to see how they might trust Chinese aircraft). Secondly, as was already noted, other manufacturers from Russia and Japan are trying to enter the business. The competition will be fierce and not all of the manufacturers will prove successful. So far, the specifications of the Chinese aircraft have not outperformed US and EU aircraft. Thirdly, Airbus and Boeing have a huge advantage in the form of their know-how, gained over many decades of experience. If they do not make a series of serious mistakes, their duopoly will most likely not be endangered. History shows that it took Airbus 30 years to outperform Boeing and it was only possible due to Boeing's own mistakes. While probably not becoming competitive on a large scale within the next 20 years, Chinese aircraft might challenge Airbus' dominance in China's domestic market and might force Airbus to build a new wide-body airliner specifically designed for Chinese market.

6. Conclusion

After analysing the state of all of the three main pillars of international civil aviation in China, the following conclusions regarding competitive position of European players seem logical: 1. Chinese airports are not a threat for European airports and will probably never be one. Simply put, they are too far way from the European market. Unlike airports in Istanbul, Dubai, Doha and Abu Dhabi, Chinese airlines will not be able to divert transfer passengers from Europe to their airports. However, they might increase the pressure on modernization efforts in European airports. As a result of this indirect competition, the passenger will be the main beneficiary. 2. Chinese aircraft are not an immediate threat to Airbus, but might become one in 20 years. It took Airbus 30 years to become fully

competitive. If Boeing and Airbus do not make any serious mistakes, it is difficult to see a successful Chinese competitor within the next 10-20 years. Passengers from western countries will initially be very unwilling to board a Chinese aircraft. However, as China's power rises and its products become more associated with quality and durability, this behaviour will change. Until then, the main market for Chinese aircraft will be Africa and some Asian countries. 3. Chinese airlines are bound to become a significant threat to European airlines, second only to the Middle-Eastern mega-carriers (Emirates, Etihad and Qatar). If they continue increasing their standards of on-board services and flying western aircraft, they will soon become the largest international airlines in the world and will be able to overflow any market with capacity and buy competing airlines. Therefore, it is likely that the European Union will never fully liberalize air transport rules with China.

Apart from the obvious solution of maintaining the protectionist status quo, European governments should take further action to secure the European airlines' competitiveness from the long-term perspective. Examples of measures to be taken include: revocation of the unilateral EU Emissions Trading Scheme, abolition of high departure taxes, construction of new airports, completion of the Single European Sky, etc. Otherwise, sooner or later China will come to dominate the skies. As Richard Quest, an analyst for CNN put it: "When it comes to China, it's a bit like asking where the 500-pound gorilla fits – the answer is wherever it wants."

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