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“China’s Emergent Military Aerospace and Commercial Aviation Capabilities”

Chairman Bartholomew, members of the Commission, I thank you for the opportunity to discuss China’s commercial aviation capabilities with you. I am appearing here today in my capacity as an aerospace and aviation analyst and not as a representative of the U.S. International Trade Commission. Any remarks I make are my own, and in no way represent the views of the U.S. International Trade Commission.

China’s desire to create and maintain a viable commercial aviation manufacturing industry is similar to our nation’s desire to land on the moon. It’s a driving obsession which has been codified in China’s 5-year plans, and is bearing fruit today. Three major aspects in this testimony include an overview of China’s aircraft manufacturing industry, including their strengths and weaknesses, two models of industry development used by China, and China’s strategy in developing this industry, including its policies and the results of its policies. Other issues discussed include the ability of China to meet its domestic air transport needs and the likely success of its current civil passenger transport aircraft programs.

1. Provide a brief net assessment of China’s aviation manufacturing industries, and explain any significant recent changes. What are the industries’ strengths and weaknesses?

China’s Central Government, through its 5-year plans, mandated industry reorganization aimed at both developing a domestic civil transport aircraft to Western standards and attracting investment by Western suppliers to augment and/or develop China’s domestic industry. Through a series of consolidations, reorganizations, and redirection of industry goals, China has created a civil aircraft manufacturing industry actively engaged in developing civil aircraft to be certified to U.S. Federal Aviation Administration (FAA) or the European Aviation Safety Agency (EASA) standards.

On May 11, 2008, China undertook a major reorganization of its aircraft manufacturing enterprises by establishing the Commercial Aircraft Corporation of China, Ltd. (COMAC) within AVIC-I to oversee the design and development of a domestic large civil aircraft (LCA).² Headquartered in Shanghai, it was initially capitalized with 19 billion renminbi (RMB) (\$2.72 billion).³ This new corporate entity also included AVIC-I Commercial Aircraft Co. Ltd. (ACAC).

In October 2008, the Central Government merged China’s two large aerospace entities, AVIC-I and AVIC-II, creating one business unit with ten aerospace subsidiary companies.⁴ The new company retained the name AVIC, and maintained its status as a shareholder of COMAC and ACAC, the developer

¹ The author is with the Office of Industries of the U.S. International Trade Commission (USITC). His testimony is the result of his ongoing professional research and solely represents his own opinions and findings. This testimony does not represent the views of the USITC or any of its individual Commissioners or in any way suggest the Commission might decide in future matters before it.

² enAvBuyer.com, “General Introduction of Commercial Aircraft Corporation of China, Ltd.” May 20, 2008, <http://www.avbuyer.com.cn/e/2008/24316.html>.

³ Major shareholders in COMAC include the State Assets Supervision and Administration Commission (6 billion RMB), the Shanghai municipal government (5 billion RMB), former AVIC I, ACAC, and Shanghai Aircraft Manufacturing Factory (4 billion RMB total), and 1 billion RMB each from Baosteel, Group, Chinalco, and Sonochem. *Jane’s All the World’s Aircraft, 2009-2010*, 106. Foreign exchange rate calculated using Oanda.com information for May 11, 2008, <http://www.oanda.com/currency/historical-rates>.

⁴ enAvBuyer.com, “China’s New Aviation Giant Targets 1 trln RMB Revenues by 2017 – Official,” November 13, 2008, <http://www.avbuyer.com.cn/e/2008/30511.html>.

of the ARJ-21, China's first regional jet. From late 2008 through early 2009, enterprises dedicated to aircraft engines, helicopters, composites, and general aviation were also announced or rumored. A strategic agreement on specialized steel for LCA was signed between Baosteel (China's largest steel producer and a COMAC shareholder) and COMAC in January 2009.

Major strengths:

1. The Central Government has made the development of the civil aircraft industry a national priority. To that end, the Central Government has reconfigured the industry, separating some military production activities from civil enabling Chinese companies to deal with Western suppliers without national security issues arising.
2. Globally, new civil aircraft programs are introduced by manufacturers about once a decade, and successful ones mean 30-40 years of work for associated suppliers. Therefore, global aerospace suppliers must consider bidding on every new program. If their in-house evaluation of a proposed program predicts that the program is likely to be a success, the supplier will pursue a contract on the new program.
3. The Boeing Company has projected China's 20-year domestic market to need 3,770 new LCA by 2028, 70 percent of which (2,639) will be narrow-bodied single-aisle (NBSA) LCA. If the projections are correct, China's fleet of NBSA will grow by 227 percent. In comparison, the U.S. fleet is projected to grow by 85 percent during the same two decades. By 2028, Boeing estimates that China will account for 42 percent (\$400 billion) of total LCA deliveries to the Asia Pacific region.⁵

Major weaknesses:

1. China has not built commercial or civil aircraft in any numbers that are certified by international organizations such as the FAA or EASA. It has petitioned the FAA for certification of its regional jet, the ARJ-21, which would be the first Chinese-built civil jet aircraft so certified. FAA or EASA certification is essential for an aircraft to be used internationally.
2. China's research and development institutes have struggled to produce commercial aircraft avionics, engines, and systems to Western standards. Because China has traditionally purchased completed LCA, there was no local demand for such components. Therefore, the local supplier industry is nascent. China must 'catch up' with the West and has implemented policies to accomplish this.
3. In the past, China suffered from a lack of trained pilots, airports capable of accommodating LCA, and airspace restrictions. All of these shortcomings are being addressed, but will take time to complete.⁶

2. Does China have a national strategy for the development of the aviation industry? If so, does it appear successful?

China has a national strategy for the development of its aircraft and parts manufacturing industry. The strategy consists of directed governmental investment and reorganization of its industry, and policies designed to attract foreign partners as well as foreign direct investment (FDI) in the aircraft and parts manufacturing industry sector.⁷

⁵ The Boeing Company, *Current Market Outlook 2009-2028: China*, <http://www.boeing.com/commercial/cmo/china.html>.

⁶ Andersen, *China's Growing Market for Large Civil Aircraft*, February 2008, http://www.usitc.gov/publications/332/working_papers/chinalca2-14-2008final.pdf.

⁷ Industrial development policy can be defined as the government's use of policies to directly or indirectly channel resources into specific activities that the government deems important for growth and development. Brander, "Rationales for Strategic Trade and Industrial Policy," in Paul R. Krugman, *Strategic Trade Policy and the New International Economics*, (Cambridge, MA: MIT Press, 1986), 23-46.

Under Central Government mandate, articulated in the December 2006 State-owned Assets Supervision and Administration Commission of the State Council (SASAC) directive,⁸ civil aviation is considered to be a strategic industry and thus each company is subject to substantial (at least 50 percent) government control. Nevertheless, the Central Government⁹ has made a portion of corporatized state-owned enterprises (SOEs) available for outside (foreign or domestic) ownership, acknowledging the benefit of attracting a diversity of skills.

While China has used a variety of policies to develop its civil aircraft industry, the most important ones are the direct guidance by the Central Government through successive five-year plans (China's 10th (2001–05) and 11th (2006–10)). Other important policies include preferential tax policies and the reorganization and segmentation of its aircraft manufacturing industry into largely separate civil and military organizations. The net result is the creation of a civil aircraft industry infrastructure that has attracted major Western suppliers to establish assembly sites in China and individual aircraft manufacturers' ownership of some airlines.

The 10th and 11th Five-Year Plans

One of the most important policies implemented by China to assist its civil aircraft and parts manufacturing industry was embodied in China's 10th Five-Year Plan (2001–05). This plan, which called for the promotion of science and technology, specifically emphasized high-tech research and specified that efforts should be concentrated on making breakthroughs in key fields, including aerospace and aviation.¹⁰ This plan classified civil aircraft as one of the five newly emerging industries to be developed. As a result, the AVIC-I Commercial Aircraft Co., Ltd. (ACAC) was formed in 2002 with the express goal of producing a regional jet aircraft. ACAC was created from parts of AVIC-I and fifteen other SOEs and institutes.¹¹

The 11th Five-Year Plan (2006–10) sought to build on earlier government direction and China's lessons learned in design, management, and support of its ARJ-21 regional jet. This new plan specifically stated the Central Government's goal of producing LCA, helicopters, and general aviation aircraft, with an aim to improve China's knowledge and skill base. The Central Government has allocated 50 to 60 billion RMB (US\$ 6.45 billion to US\$ 7.74 billion) for this purpose,¹² and in April 2008, announced the formation of an enterprise to design and build China's new LCA, the China Commercial Aircraft Company (CCAC), renamed a month later as the Commercial Aircraft Corporation of China, Ltd. (COMAC).¹³

Preferential Tax Policies

China has deemed civil aviation a high-technology sector, one which will continue to receive a preferential tax rate of 15 percent, in spite of the 2008 tax law abolishing preferential rates. China's Economic and Social Development Plan submitted by the National Development and Reform

⁸U.S. International Trade Commission, *China: Description of Selected Government Practices and Policies Affecting Decision Making in the Economy*, Inv. no. 332-492, Pub. 3978, (December 2007), 26. <http://www.usitc.gov/publications/332/pub3978.pdf>.

⁹There are also SOEs owned by provincial and other local governments, to be distinguished from the ones mentioned here.

¹⁰Ministry of Science and Technology of the People's Republic of China, *National High-tech R&D Program (863 Program)*, <http://www.most.gov.cn/eng/programmes1/>.

¹¹AVIC-I Commercial Aircraft Company, "About ACAC," http://www.acac.com.cn/site_en/about.asp.

¹²*Caijing*, "China Spreads Its Wings with New Aircraft Project," <http://english.caijing.com.cn/2007-03-22/110030156.html>

¹³State-Owned Asset Supervision and Administration Commission (SASAC), "Guiding Opinion on Promoting the Adjustment of State-Owned Capital and the Reorganization of State-Owned Enterprises," in Chinese at Jinan city SASAC Web site. Translated and summarized by ITC staff, <http://www.jngzw.gov.cn/Article/ShowArticle.asp?ArticleID=448> and Li, Rongrong, "SASAC: The State-Owned Economy Ought to Maintain Absolute Control Over Seven Industries," December 18, 2006, http://www.gov.cn/jzgz/2006-12/18/content_472256.htm. Web site of the Central Government of PRC, in Chinese. Translated and compiled by USITC staff.

Commission (NDRC) stipulates that China will make a strong start on “major state projects” such as building LCA.¹⁴ However, no road map for implementation of these goals exists. The NDRC also stated, in a circular presented March 8, 2008, it would establish high-technology industrial bases, some of which are to deal with civil aviation.¹⁵ All of these pronouncements appear to support China’s plan to build LCA.

Trade Policies

The State Council’s Interim Regulations (2005) also have an impact on China’s trade in high-technology goods by conferring preferential treatment for them. China’s processing trade policies grant exemptions from duties on imported inputs, and may also grant rebates of value added tax (VAT) upon export to some firms involved in processing exports. Additional incentives are given to foreign-invested enterprises located in certain incentive zones and involved in processing trade.¹⁶ This scheme can be beneficial to aircraft manufacturers sourcing foreign-produced parts for their domestic product.

The *State Council Opinions on the Revitalization of the Industrial Machinery Industries*, issued in June 2006, identify 16 equipment manufacturing sectors, including civilian aircraft and aircraft engines, that receive policy support to “promote, develop, and expand” the market share of domestic companies producing these goods.¹⁷ Government incentives include favorable import duties on aircraft parts and materials needed for research and development activities, funds for domestic firms to obtain capital market financing, and “encouragement” to procure major technical equipment from domestic sources.

Other Policies

The State Council has included aircraft in the “encouraged” category,¹⁸ which is defined as including industries that generate domestic R&D,¹⁹ show high expected demand growth, are technology intensive, meet the requirements for environmentally sustainable development, reflect China’s comparative advantage, and increase employment opportunities. On November 22, 2007, China published the

¹⁴ National Development and Reform Commission (NDRC), “2007 Plan for National Economic and Social Development and on the 2008 Draft Plan for National Economic and Social Development,”

<http://en.chinaelections.org/NewsInfo.asp?NewsID=16512>.

¹⁵ These industrial bases are to be located in Beijing, Shanghai, Tianjin, Shenzhen, Xi’an, Zhuzhou and Xiangtan regions (Hunan Province). China Elections & Governance, “China to Set Up 30 High-tech Industrial Bases,” March 7, 2008, <http://en.chinaelections.org/newsinfo.asp?newsid=16180>.

¹⁶ The effectiveness of some of these policies as incentives over the last ten years is likely to have been limited by nonuniform treatment across firms and products, rebate rate reductions, recurring significant payment arrears, multiple selective withdrawals of rebate privileges across products and over time, and across the board reductions in rebate rates in 2001 and 2004. World Trade Organization, Trade Policy Review Body, *Trade Policy Review, Report by the Secretariat: People’s Republic of China*. WT/TPR/S/161/Rev. 1, June 26, 2006, 100–102. For a quantitative analysis, see Chen, Chien-Hsun, Mai Chao-Cheng, and Yu Hui-Chuan, “The Effect of Export Tax Rebates on Export Performance: Theory and Evidence from China,” *China Economic Review*, 17: 226–35 (2006), 226–235; Ministry of Finance of the People’s Republic of China, “Report on the Implementation of the Central and Local Budgets for 2006 and on the Draft Central and Local Budgets for 2007,” Fifth Session of the Tenth National People’s Congress, March 5, 2007, http://english.peopledaily.com.cn/docs/2007_budget_plan.pdf; State Council, “Report on the Work of the Government 2006,” 2007, http://english.gov.cn/official/2007-03/16/content_552995.htm.

¹⁷ U.S. Trade Representative, *2009 Report to Congress on China’s WTO Compliance*, http://www.ustr.gov/webfm_send/1572, 66.

¹⁸ Industry classifications were revised in the December 2005 Interim Regulation, and the supplementary *Guiding Catalog for the Adjustment of Industrial Structure*. The NDRC stated that both these documents were important measures in meeting China’s current needs to upgrade its industrial structure and to achieve the goals in the 11th Five-Year Plan (2006–2010). The Interim Regulation “identifies the targets, principles, direction and priorities of the adjustment of industrial structure, and it also provides the categorizing principles for the *Guiding Catalog*.” NDRC, “Major Measures to Promote the Adjustment of Industrial Structure,” NDRC News, December 22, 2005, http://en.ndrc.gov.cn/newsrelease/t20051222_54289.htm; NDRC News, December 22, 2005, http://en.ndrc.gov.cn/newsrelease/t20051222_54289.htm; State Council (China), “Interim Regulation on Promoting the Adjustment of Industrial Structure,” 2005, http://www.ndrc.gov.cn/zcfb/zcfbqt/zcfb2005/t20051222_54302.htm.

¹⁹ China’s R&D practices and policies are described in chap. 4 of U.S. International Trade Commission, *China: Description of Selected Government Practices and Policies Affecting Decision Making in the Economy*, <http://www.usitc.gov/publications/332/pub3978.pdf>.

Catalogue of Encouraged Hi-tech Products for Foreign Investment (Amended in 2007), which encouraged FDI in several areas of aircraft manufacturing, including investments in LCA and general aviation aircraft, and engines and parts for both.²⁰ China's *Catalogue of Encouraged Foreign Investment Industries* lists several areas of aircraft manufacturing as encouraged industries (box 1).²¹ The State Council stipulates that financial institutions are to grant loans to support investment projects in the "encouraged" category that are in line with credit granting principles.²² China provides credit guidance (also referred to as indicative, or directed, lending) to carry out its industrial development policies. Investment in encouraged enterprises are perceived by banks to have less risk than nonencouraged industries, making banks eager to supply loans.²³

BOX 1 China's Ministry of Commerce published a list of encouraged industries open to foreign direct investment (FDI) in the aerospace sector, as follows:

- Design, manufacturing and maintenance of civil aircraft for domestic airlines (Chinese partners shall hold the majority of shares) and general aviation aircraft (limited to joint ventures or contractual joint ventures)
- Production and maintenance of spare parts for civil aircraft
- Design and manufacturing of civil helicopters: for those over three tons, the Chinese partner shall hold the majority of shares; under three tons are limited to equity joint ventures or contractual joint ventures
- Production of spare parts for civil helicopters
- Manufacturing of wing-in-ground-effect aircraft (Chinese partner shall hold the majority of shares)
- Design, manufacture, and maintenance of an unmanned aerial vehicle and aerostat [lighter-than-air aircraft] (Chinese partner shall hold the majority of shares)
- Design, manufacture and maintenance of aircraft engines and spare parts as well as aircraft systems (limited to equity joint ventures or contractual joint ventures)
- Design and manufacture of civil air-borne equipment (limited to equity joint ventures or contractual joint ventures)
- Design and manufacture of civil rocket launcher (Chinese partner shall hold the majority of shares)
- Manufacturing of flight ground equipment: civil airfield facilities, support equipment for civil airfield work, ground equipment for flight test, flight simulators, equipment for aeronautic testing and measuring, equipment for aeronautic ground testing, comprehensive testing equipment for machines, special equipment for aeronautic manufacturing, equipment for manufacturing pilot aeronautic materials, ground receiving and applying equipment for civil aircraft, ground testing equipment for rocket launcher, and equipment for dynamic and environmental experience for rocket launcher
- Manufacturing of mechanical and electrical products for aircraft, including temperature control products, test equipment, and structure and organization products
- Manufacturing of light gas-turbine engine

Source: Ministry of Commerce, *Catalogue of Encouraged Foreign Investment Industries*, Decree of the State Development and Reform Commission, No. 57, May 11, 2010.

<http://english.mofcom.gov.cn/aarticle/policyrelease/announcement/200711/20071105241195.html>.

Another important policy promoting the aircraft sector is China's "Medium- and Long-Term National Science and Technology Development Program (2006–20)," a 15-year plan that delineates the industries in which China will focus its efforts in science and technology; LCA is noted as an area for development.²⁴

Aircraft manufacturers' ownership of airlines

As stated, in the past China has not produced civil passenger transport aircraft in large numbers. The reorganization of China's aircraft industry has led to new ideas about creating a market for their products

²⁰ Ministry of Commerce of the People's Republic of China, *Decree of the State Development and Reform Commission, no.57, Catalogue of Encouraged Foreign Investment Industries*, October 31, 2007.

<http://english.mofcom.gov.cn/aarticle/policyrelease/announcement/200711/20071105241195.html>.

²¹ Ibid.

²² State Council (China). "Interim Regulation on Promoting the Adjustment of Industrial Structure," 2005, http://www.ndrc.gov.cn/zcfb/zcfbqt/zcfb2005/t20051222_54302.htm

²³ Industry official, interview with Commission staff, China, January 2008.

²⁴ The Levin Institute, "Industrial Innovation in China," Appendix, <http://www.levin.suny.edu/pdf/ChinaInnovationPub.pdf>.

by creating end-users. A total of three airlines were formed to use only domestically-produced civil transport aircraft.

Happy Airlines, a regional airline formed in February 2008 by AVIC-I (60 percent)²⁵ and China Eastern Airlines (40 percent), was the first such airline.²⁶ AVIC-I will supply the aircraft, while China Eastern will provide personnel and maintenance. China's Central Government had mandated that no new airlines will be formed before 2010 unless they fly domestically produced aircraft.²⁷

In April 2008, AVIC-I and China Eastern Airlines created another airline, Joy Air, which began operations with three Xi'an-built MA-60 turboprops. The airline has ordered a total of 47 more, along with 50 orders for the ARJ-21, part of AVIC-I's Managing Director's (Lin Zuoming) plan to support their aircraft.²⁸

A third new airline can be traced to October 2009, when the Sichuan Airlines Group sold a 48 percent share in United Eagle Airlines to COMAC.²⁹ Subsequently, the airline (renamed Chengdu Aviation Company Limited in early 2010) ordered 30 ARJ-21s for their fleet.³⁰

Has China's Strategy Been Successful?

China's aircraft and parts manufacturing industry has been successful in selected industry segments with the help of governmental policies. For example, China now competes with some tier-2 and tier-3 U.S. and European aerostructures manufacturers of doors, wing parts, tail assemblies, and interior panels, and with certain U.S. and foreign producers of selected parts for aircraft turbine engines. China intends to develop a globally competitive domestic LCA and parts industry. It expects to gain valuable experience and skills during the development of two new civil aircraft programs, the ARJ-21 and the joint venture with Airbus to assemble one of its narrow-bodied LCA models, culminating in the ability to produce China's new NBSA LCA, the C-919.

3. Assess China's ability to produce both fixed and rotary wing aircraft. Are these aircraft competitive with those produced in the West?

China's military aircraft manufacturing industry builds both fixed and rotary wing aircraft from both former Soviet Union designs and indigenous designs. However, it has not built civil aircraft in any numbers. Currently, it builds two regional turboprop passenger aircraft for export, the 19-seat Yunshuji-12 (Y-12) and a larger, updated version, the 50-60 seat Modern Ark 60 (MA-60). China's industry also builds piston-engined aircraft used in crop spraying, cargo transport, and training pilots for domestic consumption. The only Chinese-built passenger transport aircraft receiving FAA approval is the Y12 (IV), which was approved in 1995 and has received an FAA type certificate.³¹

²⁵ China Economic Review, "China Eastern to set up Happy Airlines," February 22, 2008, <http://www.chinaeconomicreview.com/airtravel/2008/02/22/china-eastern-to-set-up-happy-airlines/>.

²⁶ [Forbes.com](http://www.forbes.com), "To Showcase Chinese-Made Planes, Fly Happy!" February 29, 2008, http://www.forbes.com/2008/02/29/happy-airlines-avic-markets-equity-cx_jc_0229markets06.html. China Eastern subsequently sold 75 percent of its initial share to AVIC-I in January 2009.

²⁷ Ibid.

²⁸ ChinaTravelDepot.com. "Joy Airlines." <http://www.chinatraveldepot.com/Joy-air>; Air Transport World, "China Eastern, AVIC-I Launch Joy Air," <http://atwonline.com/aircraftenginescomponents/news/china-eastern-avic-i-launch-joy-air-0309-0>.

²⁹ United Eagle Airlines, the first private airline in China, had financial difficulties that led to a takeover by Sichuan Airlines Group in May 2009. FlightGlobal.com, "China's Sichuan Airlines Group Swallows United Eagle," March 18, 2009, <http://www.flightglobal.com/articles/2009/03/18/323982/chinas-sichuan-airlines-group-swallows-united-eagle.html>. After COMAC invested in the airline, its capitalization rose from 300 million RMB to 6.8 billion RMB. Chengdu Airlines Co., Ltd., "About Us," <http://translate.google.com/translate?u=http%3A%2F%2Fwww.ueair.com%2F&sl=zh-CN&tl=en&hl=&ie=UTF-8>

³⁰ Francis, "China's United Eagle Renamed Chengdu Airlines," FlightGlobal.com, January 20, 2010, <http://www.flightglobal.com/articles/2010/01/20/337344/chinas-united-eagle-renamed-chengdu-airlines.html>.

³¹ U.S. Government official, e-mail message to USITC, May 10, 2010.

Because few have flown in commercial service, it remains to be seen whether Chinese fixed and rotary wing aircraft are competitive with Western aircraft. China has exported its Y-12, with 170 deliveries claimed between 1987 and 2009,³² and its MA-60, a high-wing turboprop aircraft (34 in service),³³ primarily to non-Western countries.³⁴ Anecdotal information suggests China's current civil aircraft programs may be competitive with further development. While aircraft engines and systems are by and large sourced from the West, the design and construction of the aircraft is Chinese.

4. How has China developed its aviation industry: through foreign technology transfer, indigenous innovation, or a mix?

China has employed two distinct development models to advance its civil aircraft manufacturing abilities. Currently, it is achieving success in attracting both FDI and some level of technology transfer, though indigenous innovation is a work in progress.

The first development model linked technology transfers for its strategic industries to market access.³⁵ This system requires the transfer of scientific and technical knowledge from facilities typically located in Western countries to jointly owned or state-owned facilities in China. In the past, Beijing favored technology transfers, particularly those considered to be involved with higher value-added activities, as a means to create jobs and generate profits.³⁶ Under this system, China's strong market demand for Western LCA was advantageous in negotiating the terms of these arrangements with Boeing and Airbus.³⁷

The second model represents a shift on the part of China which now sees system integration as a promising way to develop and produce civil aircraft. This type of system has been embraced by Boeing, Airbus, Bombardier, and other Western aircraft manufacturers since the late 1980s.³⁸ It has allowed the procurement of parts and systems through open (global) bidding for engines, electronic systems, and various parts of the airframe for China's regional jet program from 8 domestic and 19 foreign suppliers.³⁹ Although this approach does not raise the capabilities of the Chinese suppliers, it does enable China to produce an aircraft in a shorter period of time, and increases the chances for international sales through the use of Western systems on the aircraft. China imports nearly 40 percent (by value) of the parts and systems for its ARJ-21 for these reasons. This system integration paradigm also has the potential to save money, largely through lower labor costs,⁴⁰ as key components and subassemblies are designed and produced by suppliers rather than the aircraft manufacturer.⁴¹

A drawback of this approach for China is that it contradicts China's stated goal of indigenous innovation stipulated in the five-year plans. However, it will allow expertise to be developed domestically in

³² Endres, "Slow Burners," FlightGlobal.com, November 11, 2009, <http://www.flightglobal.com/articles/2009/11/02/334211/slow-burners.html>.

³³ CH-Aviation.com, Search results for MA-60 fleet in service, http://www.ch-aviation.ch/aircraft.php?&search=search&operator=AND&ac_model=MA-60&start=0.

³⁴ Airlines in Bolivia, Congo, Fiji, Indonesia, Laos, Philippines, and Zimbabwe operate the MA-60. Ibid.

³⁵ Fingleton, *In the Jaws of the Dragon: America's Fate in the Coming Era of Chinese Hegemony*, (New York: St. Martin's Press, 2008), 66.

³⁶ Som and Poutrel, "Airbus and Boeing in China: Risk of Technology Transfer?" ESSEC Business School, 2006, 11, <http://www.asiacase.com/case/southAsia/essecAs-airbus.html>.

³⁷ E-mail from aircraft industry representative, April 10, 2008. The link between market access to China's growing market for aircraft and technology transfers is not always clear, however, and global producers are reluctant to discuss either technology transfers or linkages between hi-tech job creation in China and sales of aircraft.

³⁸ University of Pennsylvania, Wharton School of Business. "China's Large Aircraft Program Gains Momentum: When Will It Take Off?" <http://www.knowledgeatwharton.com.cn/index.cfm?fa=viewfeature&articleid=1604&languageid=1>.

³⁹ Ibid.

⁴⁰ Bedier, et al. "The growing role of emerging markets in aerospace," *The McKinsey Quarterly*, (Paris, April 2008), 2.

⁴¹ Pritchard, "Extent of the Government's Control of China's Economy, and its Impact on the United States," Testimony before the U.S.-China Economic & Security Review Commission," May 25, 2007, http://www.uscc.gov/hearings/2007hearings/written_testimonies/07_05_24_25wrts/07_05_24_25_pritchard_statement.pdf.

manufacturing processes and managing an international supply chain, two critical areas for China to master if it wants to become a globally-competitive industry.

China's leverage with LCA producers may continue as it is projected to become the world's largest LCA market by 2028, with demand approaching 3,770 aircraft worth an estimated \$400 billion.⁴² China will likely be the largest single market for aircraft sales over that time period, and Western aircraft manufacturers appear willing to work with the Chinese industry to gain further access to the market.⁴³

History

During the 1980s through early 1990s, China's development model was based on exchanging market for technology transfer to gain expertise in aircraft design, manufacturing and program management through joint ventures. The first joint venture was with McDonnell Douglas in 1985 to produce a limited number of the MD-80 series of aircraft from kits exclusively for China's domestic market.⁴⁴ In 1992, a second joint venture between McDonnell Douglas and two Chinese companies followed, aimed at producing the newer MD-90 aircraft.⁴⁵ This plan was amended in 1994 in favor of a plan whereby the Shanghai Aircraft Manufacturing Factory (SAMF) would produce 20 of the so-called Trunkliner aircraft independently of McDonnell Douglas. While the MD-80 program was successful, domestic airlines refused to buy the MD-90,⁴⁶ with a total of only 3 produced.⁴⁷ After the program ended, China had failed to gain the core technology transfer it sought in areas such as aerodynamic design, composite materials, avionics, and engine design.⁴⁸

China subsequently approached two European aircraft manufacturers with hopes of forming a joint venture, eventually linking up with Airbus and Singapore Technologies in 1996.⁴⁹ The venture was to initially build a 100-seat aircraft in China, followed by a 180-seat aircraft. After some time, Airbus pulled out of the venture, as it felt it was economically unviable.⁵⁰ China subsequently abandoned the project as well, lacking the research and technology base and technical personnel to complete the program.⁵¹

In April 2005, China approached Airbus seeking an Airbus final assembly line to be located somewhere in China.⁵² In December of that year, China placed an order for 150 Airbus A320s worth almost

⁴² Boeing, *Current Market Outlook, 2009-2028: China*, 10, <http://www.boeing.com/commercial/cmo/china.html>.

⁴³ Som and Poutrel, "Airbus and Boeing in China: Risk of Technology Transfer?" ESSEC Business School, 2006, 11, <http://www.asiacase.com/case/southAsia/essecAs-airbus.html>.

⁴⁴ The maiden flight of the first Chinese-made MD-82 took place in 1987; 35 were produced. U.S. International Trade Commission, *The Changing Structure of the Global Large Civil Aircraft Industry and Market*, 5-9. <http://www.usitc.gov/publications/docs/pubs/332/pub3143.pdf>.

⁴⁵ The two Chinese companies were the China National Aero-Technology Import and Export Corporation Group (CATIC - now known as AVIC International) and the Aviation Industries Corporation of China (AVIC).

⁴⁶ Airlines initially felt they were being coerced into accepting an aircraft type they did not need. Francis, "China Special: Opening Doors - China's Growing Market for Aircraft," FlightGlobal.com, October 24, 2006, <http://www.flightglobal.com/articles/2006/10/24/210063/china-special-opening-doors-chinas-growing-market-for-aircraft.html>; "The Long March," <http://www.flightglobal.com/articles/2007/03/27/212865/the-long-march.html>. China's domestic airlines bought the aircraft from McDonnell Douglas, with 31 in its fleet at year-end 2007. Jet Information Services, *World Jet Inventory, Year-end 2007*.

⁴⁷ U.S. International Trade Commission, *The Changing Structure of the Global Large Civil Aircraft Industry and Market*, <http://www.usitc.gov/publications/docs/pubs/332/pub3143.pdf>.

⁴⁸ University of Pennsylvania, Wharton School of Business. "China's Large Aircraft Program Gains Momentum: When Will It Take Off?" <http://www.knowledgeatwharton.com.cn/index.cfm?fa=viewfeature&articleid=1604&languageid=1>. Mr. Eamonn Fingleton disputes this, indicating that China has "extorted technologies from rival nations." He believes that China has received key production technologies. Fingleton, *In the Jaws of the Dragon*, (New York: St. Martin's Press, 2008), 66.

⁴⁹ The other discussion was with German producers, centering on a regional jet, the MPC-75 program.

⁵⁰ FlugRevue.com, "Airbus/AVIC AE31X," September 11, 1998, <http://www.flug-revue.rotor.com/frtypen/FRAE31X.htm>.

⁵¹ ChinaDaily.com.cn, "Flying High with Independent R&D," http://www.chinadaily.com.cn/business/2006-11/23/content_741224.htm.

⁵² FlightGlobal.com, "China May Build Airbus Narrowbodies," December 5, 2005, <http://www.flightglobal.com/articles/2005/12/05/203438/china-may-build-airbus-narrowbodies.html>; *People's Daily Online*,

\$10 billion.⁵³ Though an agreement was not signed, construction on a final assembly line began in May 2007.⁵⁴ Some analysts for the aircraft sector interpreted the announcement as a *quid pro quo*.⁵⁵ An Airbus spokesman confirmed this and “acknowledged that Airbus’ main reason for the plant is to gain greater access to the Chinese market;” however, industry analysts do not see any cost savings for Airbus building A320 aircraft in China, as the aircraft will be assembled from imported parts and assemblies.⁵⁶ Airbus’ final assembly line in Tianjin met its 2009 goal of fabrication and delivering 11 aircraft (A319 and A320, essentially different lengths of the same fuselage, with similar systems installed) for the domestic market.

Both EMBRAER (Brazil) and Cessna (USA) produce aircraft in China. Cessna will sell its aircraft, the 2-seat SkyCatcher, in the United States while EMBRAER is in a joint venture to manufacture its regional jets for China’s domestic market.

5. Will China’s commercial aviation manufacturing industry be able to meet China’s growing demands for aviation products in the near future?

The current state of China’s civil aircraft manufacturing industry is not sufficient to satisfy its civil aircraft needs. China lacks the infrastructure, management, and technical know-how for the design, manufacture, and support of civil aircraft on the scope the domestic market demands. It is for these reasons the Central Government has enacted its ambitious plan to develop the industry. LCA, general aviation aircraft, and helicopters are all in short supply now in China. It is unlikely that any domestic manufacturer in China could fulfill the demand for aircraft for at least the next decade, if not longer. For the period 2000-2009, eighty-five percent of all LCA imports (by units) from Boeing and Airbus were NBSA. This would indicate China’s desire to meet the needs of domestic routes vs. foreign ones, and is further evidence of why China’s first passenger transport aircraft will be a NBSA LCA.

The year-on-year (YoY) passenger demand for air travel in China (as measured by revenue passenger kilometers, or RPKs)⁵⁷ has outstripped global demand over the past decade (figures 1 and 2). While global traffic grew by 36.7 percent, China’s domestic traffic grew by 197 percent, averaging a 22 percent increase each year. Perhaps more significantly, the rise in RPKs YoY during 2003–04 was almost 40 percent in China, while the global average was closer to 15 percent (figure 2). Passenger travel in China remained high during 2005–09, falling only in 2008, while in the United States, passenger travel continued a downward trend (figure 3). The Chinese market appears quite able to support a domestic LCA manufacturer to supplement foreign LCA purchases.

6. Describe China’s attempts to produce large civilian aircraft, such as the ARJ-21 and the C-919. How successful do you anticipate them to be?

For an emerging market to successfully create an indigenous aircraft and/or parts manufacturing sector, Western analysts have noted that the market should have (1) a government that makes the development of the aircraft sector a “significant national priority”; (2) a domestic industry that is structured around a

“Airbus: Details of Tianjin Assembly Line Likely Very Soon,” October 12, 2006,

http://english.peopledaily.com.cn/200610/12/eng20061012_310975.html.

⁵³ Matlack, “Airbus May Hit an Air Pocket over China,” *BusinessWeek*, April 24, 2006,

http://www.businessweek.com/magazine/content/06_17/b3981058.htm.

⁵⁴ *People’s Daily Online*, “Construction Starts on Airbus A320 China Assembly Line,” May 16, 2007,

http://english.peopledaily.com.cn/200705/16/eng20070516_374961.html.

⁵⁵ Lander and Bradsher, “Raising the Bar in the Aircraft Wars,” *New York Times*, March 15, 2006,

http://www.nytimes.com/2006/03/15/business/worldbusiness/15airbus.html?_r=1&pagewanted=2&oref=slogin

⁵⁶ Matlack, *Ibid.* Martin Craigs, President of Aerospace Forum Asia, “An Airplane’s Price Tag Represents Less Than 5 Percent of Its Lifetime Costs, said Craigs. Keeping those costs low requires highly specialized skills that are difficult to obtain.”

Reuters.com, “High Hurdles for China’s Commercial Aviation Ambitions,” September 10, 2009,

<http://www.reuters.com/article/idUSHKG10428120090910>.

⁵⁷ Revenue passenger kilometers (RPKs): the number of revenue passengers carried multiplied by the distance flown. Air New Zealand, “About Us: Investor Centre: Glossary,” April 26, 2010, <http://www.airnewzealand.co.nz/investor-centre-glossary>.

single integrated entity that can achieve scale of development and manufacturing; (3) significant capital resources; (4) the ability to develop aircraft, manage the supply chain, coordinate manufacturing, and assemble the plane; (5) global competitiveness in terms of cost and performance; and (6) state-controlled local market demand.⁵⁸ China has the first three characteristics, which depend on favorable government policies and practices. It is working on developing its ability to design, develop, and manufacture civil aircraft, which involves managing a global supply chain. Whether the aircraft will be globally competitive is unknown, and China's ability to control local market demand is not absolute.

As SOEs, China's domestic aircraft producers can be forced to merge, expand, restructure, or divest of assets under government orders as the state is the primary shareholder. Examples of the Central Government's industry coordination are the two enterprises created to produce civil aircraft, ACAC and COMAC.⁵⁹

The first project of ACAC, the ARJ-21, was completed and shown to the world in December 2007. As of March 2008, orders for 181 have been booked,⁶⁰ the largest order coming from Kunpeng Airlines Co Ltd, a joint venture between Mesa Airlines (U.S.) and Shenzhen Airlines Co Ltd. (50 firm and 50 options).⁶¹ General Electric's aircraft leasing arm, GE Commercial Aviation Services, placed a firm order for five, with options on 20 additional aircraft.⁶² Currently, the ARJ-21 remains in flight testing.

It is too early to judge the outcome of China's move into the civil aircraft manufacturing arena. However, major components yet to be developed by China's aerospace industry include commercial-grade aircraft avionics, engines, and systems to control the aircraft in flight. U.S. companies that have established business relationships with China's NBSA LCA program (C-919) and/or its regional jet program (ARJ-21) are included in table 1.

⁵⁸ Bedier, et al, "The Growing Role of Emerging Markets in Aerospace," *The McKinsey Quarterly*, (Paris, April 2008), 2.

⁵⁹ Perrett, "China Commercial Aircraft Eyes Boeing, Airbus Turf," *Aviation Week and Space Technology*, April 6, 2008, http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=awst&id=news/aw04078p2.xml&headline=China%20Commercial%20Aircraft%20Eyes%20Boeing.%20Airbus%20Turf. The Central Government, owners of the largest share in CCAC, will provide RMB 6 billion for development, while other partners will provide up to an additional RMB 13 billion.

⁶⁰ Aerospace-technology.com, "ARJ-21 Regional Jet Aircraft, China," <http://www.aerospace-technology.com/projects/arj21/>.
⁶¹ [en.AvBuyer.com.cn](http://www.avbuyer.com.cn), "Kunpeng Airlines Orders 100 ARJ-21 Regional Jets from AVIC I," December 24, 2007, <http://www.avbuyer.com.cn/e/2007/19569.html>; Aerospace-technology.com, "ARJ-21 Regional Jet Aircraft, China," <http://www.aerospace-technology.com/projects/arj21/>. Mesa sold its share to Shenzhen Airlines in April 2009. Centre for Pacific Aviation, "Mesa Bankruptcy a Long Time Coming," January 6, 2010, <http://www.centreforaviation.com/news/2010/01/06/mesa-bankruptcy-a-long-time-coming/page1>.

⁶² AVIC-I Commercial Aircraft Company, "AVIC I Commercial Aircraft Co., Ltd. (ACAC) Announces the Sale of Five ARJ-21-700 Regional Jet Aircraft, Plus Options for 20 Additional Aircraft to GE Commercial Aviation Services," News release, March 28, 2008, <http://www.acac.com.cn/enhtml/News/Message/20080328C163541.html>.

TABLE 1 U.S. aircraft parts suppliers in China

U.S. company	Product	Chinese customer/partner
General Electric Co.	Aircraft engines	Commercial Aviation Company of China (Comac): Purchaser of systems
General Electric Co.	Aircraft avionics	AVIC Systems of China (joint venture)
Goodrich Hella Aerospace Lighting Systems	Major portion of the lighting system on its China's ARJ-21	Commercial Aviation Company of China (Comac): Purchaser of systems
Hamilton Sundstrand, div. United Technologies, Inc.	Electrical power generation and distribution systems	Commercial Aviation Company of China (Comac): Purchaser of systems
Honeywell, Inc.	Auxiliary power unit, model 131-9[C9C]	AVIC Harbin Dongan Engine (Group) Corp.
Parker Aerospace, div. Parker Hannifin Corp.	Provides primary fly-by-wire flight control actuation system; and fuel, inerting, and hydraulic systems for the C-919	China Aviation Industry Systems Co.
Parker Aerospace, div. Parker Hannifin Corp.	Joint development and in-country support of Parker's hydraulic and fuel systems	AVIC Systems
Rockwell-Collins, Inc.	Avionics	AVIC-I Commercial Aircraft Company
Nexcelle, div. of Safran-GE	Engine nacelles	AVIC Aircraft Corp.

Source: Corporate Web sites, May 2010.

Figure 1 China domestic market RPKs, 2000-2008

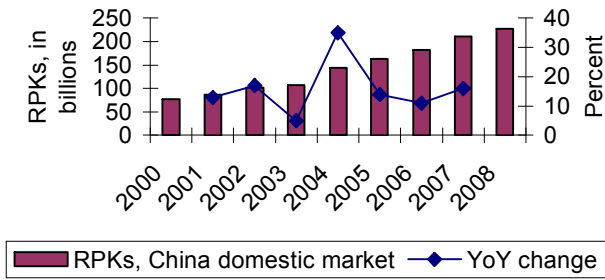


Figure 2 World total RPKs, YoY percent change, 2000-2008

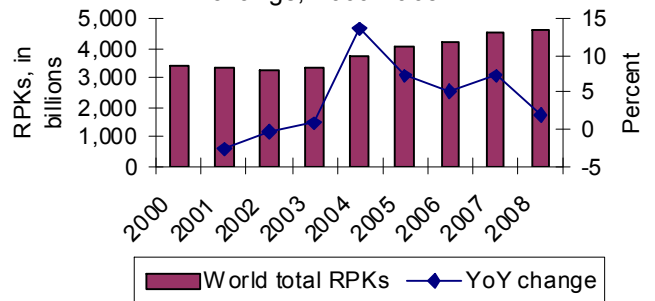


Figure 3 Passenger growth in the United States and China, YoY change, 2000-2009

