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**The emergence of Japan as a subsidized competitor
in the commercial aircraft sector: the New Trade War.**

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Abstract

This paper examines Japan's emerging industrial and international trade potential within the commercial aerospace sector. We argue that the decades of industrial offset agreements between Boeing and Japanese subcontractors have endowed Japan with the technological fundamentals required to build commercial passenger jets. These offset agreements were designed to secure sales of Boeing aircraft to Japan, and often involved critical streams of knowledge-transfer from Boeing to Japanese suppliers. By now, Japan has acquired virtually all of the technological know-how to enter the commercial aircraft market on an internationally competitive basis. The implications for Western producers are presumably not bright, as Japan's unit costs are subsidized by the Japanese government. Further, it is clear that Japan's first regional jet (70-90 seat aircraft) has been designed to compete against Embraer's 170/190 (Brazil) and Bombardier's CRJ700/900/1000 series (Canada). Looking to the future, we argue that Japan will eventually move into the over 100 seat range category with a strategic alliance with Boeing to completely assembly the lower seating range replacement model for the Boeing 737 which will challenge Embraer's 195 (110 seats), the Airbus's A319, and Bombardier's proposed CSeries (110-140 seats). Japan's government subsidies will not only allow their domestic commercial aircraft industry to supply Boeing a 737 lower seat capacity replacement, but will also allow Boeing to compete with lower cost composite wings for all 737 replacement models with the technology transfers that Boeing gave the Japanese on the 767, 777 and 787 programs.

I. Introduction

In a recent article published in *Futures*, MacPherson and Pritchard (2003) predicted that Boeing would exit the business of commercial aircraft manufacturing by 2012. Veteran aviation analysts and the national business press had a good laugh at this prediction, as did Boeing. But some of our critics must not have read our 2003 article very carefully, as the prediction was for a Boeing exit from the business of commercial aircraft *manufacturing* – not the business of airframe design, development, or assembly. By now, anybody that has been following the progress of the Boeing 787 program can realize that Boeing has indeed divorced itself from the manufacturing side of the business (see Bowen, 2007). Close to 90% of the manufacturing work for the 787 has been outsourced to risk-sharing partners such as Alenia (Italy), Mitsubishi (Japan), and Global Aeronautica (Italy/USA). Boeing's strategy for collaborating globally was finding expertise per David McKenna, an executive in Boeing's airplane-production global strategy unit. McKenna said back in 2006, "We want to have the best partners in the world in our new aircraft program...whether they're from Italy, Sweden, France, Korea, Japan, China (or) the United States" (Flynn Vencat, 2006). Since that time, Boeing has delayed delivery of the new 787 aircraft by over 2 years to some customers because they are incurring major issues in design and production within their new global supply chain. One has to question the strategy of Boeing importing from countries like Japan, where production and logistic costs are higher than that in the United States (though Boeing benefits from very competitive long term fixed price dollar contracts).

For systems integrators such as Boeing, major industrial offsets at the international level have increasingly been accompanied by risk-sharing agreements. Systems integration is a cost-driven strategy that involves extensive subcontracting for parts production. The systems integrator has

minimal involvement in *manufacturing* (e.g. Boeing's 787 3 days in final assembly). Under risk-sharing, the systems integrator no longer subcontracts on a build-to-print arrangement. Rather, the risk-sharing partner is expected to design, develop, and manufacture the sub-assembly in question – using its own funds.

From a financial standpoint, this is a clever strategy because it dramatically reduces launch costs for new aircraft programs among systems integrators. However, the downside is that risk-sharing partners must receive infusions of tacit knowledge from the prime contractors. Inside the aircraft industry, this knowledge is commonly labeled as 'tribal knowledge'. Not surprisingly, engineers, design specialists, R&D workers and other skilled technicians that work for Boeing have become increasingly concerned about the outsourcing of high-end work to risk-sharing partners and other subcontractors. Moreover as Hart-Smith (1998) points out, outsourcing production can also involve *outsourcing profit*. It is no surprise that the US Bureau of Labor Research predicted a 23% drop in design-related employment in the US aerospace sector by 2020.

In the article published in *Journal of Labor Research*, MacPherson and Pritchard (2007) drew attention to Japanese government subsidies for their commercial aircraft industry and Boeing's transfer of critical technologies on the 767, 777 and 787, that endowed Japan with key design and manufacturing capabilities to enter the regional jet market. In March of 2008, Mitsubishi (MHI) announced the launch of its MRJ (*Mitsubishi Regional Jet*) with the order from Japan's ANA airlines. Although this jet will not be production-ready for several years, the prototype will be designed and manufactured with a composite wing and advanced assembly technologies that will emulate the Boeing 787.

The goal of this paper is to update our 2007 narrative by looking at the current and prospective state of Japan's commercial aircraft sector and how the continued Japanese government subsidies directly benefit Boeing by lowering their production cost, giving the Japanese aircraft industry the capability of entering the commercial aircraft market which poses a long term threat to both Embraer (Brazil) and Bombardier (Canada). The commercial aircraft segment of the market is currently dominated by Airbus, Boeing, Embraer and Bombardier but this may not persist indefinitely. Our argument is based on Japan's increasing ability to harvest advanced aerospace technology via inward investment, international production-sharing agreements, and various types of industrial offsets. The net result, we contend, is an end to the Western-dominated commercial aircraft (foursome) by the mid-2010s. A shift to the east appears to be forming on the long-range radar sweep. No doubt the business press will have a good laugh at this prediction too! As we write, however, the tide of expert opinion seems to be slowly turning (see Hamilton, 2008).

II. Economic Context

Japan's entry into the commercial aircraft market comes after several decades of knowledge transfer from Boeing to Japanese suppliers. In order to sell passenger jets to Japan, Boeing has long relied upon industrial offset agreements that allocate at least part of the production sequence to Japanese subcontractors (e.g. fuselage sections for Boeing 767s). These industrial offset and production-sharing arrangements serve the financial interests of Boeing remarkably well. However, over the long run a potential downside is that such agreements entail technology transfer (De Bruijn and Steenhuis, 2004). More specifically, the cumulative effect of myriads of small production-sharing contracts is that the importing nation eventually gains full capability in

terms of airframe design, development, and production. In short, former production-sharing partners can become future competitors (see MacPherson and Pritchard, 2003).

We contend that these production-sharing contracts have paved the way for the emergence of a new and potentially powerful competitor in the commercial aircraft industry. New international trade frictions are likely to arise in the near future because the commercial aircraft sector is an infant industry in Japan. As such, this industry requires public subsidies as well as direct or indirect forms of import protection. Note that Japan's airlines are not state-owned, but the state can influence national purchasing policy (e.g. buy Boeing). Japan has a vested interest in promoting the commercial aircraft sector as a national project within the rubric of strategic trade policy. Within 10 years from now, we expect that Japan will emerge as a formidable challenger to existing producers of regional jets (e.g. Bombardier/Canada, Embraer/Brazil) – as well as Airbus and Bombardier in the Large Commercial Aircraft (LCA) segment of the market.

Even with infant industry status, there is good reason to suspect that Japan's commercial aerospace sector will become internationally competitive in a relatively short space of time (i.e. 10 years or less). There are several reasons for this. First, Japan's composite technologies in material production (Toray) and manufacturing processes (MHI 787 wing and Honda's Jet) rival European capabilities on the A380. This is especially important in light of the change of direction in airframe production processes from metal labor-intensive to composite automated technologies. Second, Japan will be starting its production effort with state-of-the-art machine tools, fixtures, materials handling processes, design software, and engineering procedures. In effect, the first fully operational set of Japanese production facilities will technologically leapfrog comparable facilities in the West. Third, the Japanese government has the investment capital and political determination required for massive and sustained industry support. Fourth,

Western components are readily available to install on Japanese airframes -- engines, avionics, hydraulics, fly-by-wire systems. The result will be Japanese aircraft that are endowed with proven Western systems, advanced airframe technologies, and performance characteristics that will be designed and manufactured under US Federal Aviation Authority (FAA) standards. Finally, Japan will be able to pump-prime its domestic aerospace industry by encouraging its airlines to buy domestic. This would represent a non-tariff trade barrier, which will have major repercussions at the global level. Pulling these five strands together, it would appear that Japan will soon be in a position to serve both domestic and international markets. Eventually, Western airlines will find it hard to ignore Japanese aircraft that are fully FAA compliant – especially if they operate at 20% cost per seat mile below Western alternatives.

III. Japan's Strategic Plan

Japan has a long-term commitment to develop a commercial aircraft that will meet Western certification standards, which will then allow Japan to spread and consolidate its global footprint in this strategic sector. With the vision of becoming more competitive with higher quality and better productivity, the Japanese commercial aircraft industry has decided to take advantage of its “centers of competence” from decades of industrial cooperation with Boeing. This strategic alliance will allow the Japanese to develop leaner cost structures than their Western competitors. Japan's aircraft industry is interested in learning to better manage, coordinate, and synchronize within and across such areas as customer relations (e.g. marketing, sales, service), product development (e.g. innovation, engineering, testing, development, deployment), and supply chain management (e.g. planning, sourcing, manufacturing, distribution) which will be supported by

Toyota's investment in the program. Developing these assets is the key to Japan's future competitiveness and long-term economic viability in this sector.

It is often argued in the business press that Japan is decades away from developing a competitive commercial aircraft, and that Japan lacks the technological capability to enter this market in the near future. We opt to examine this perspective in light of the sheer volume of investment capital that the region's government can throw at its infant aircraft industry. As an example, the Japanese Air Self Defense Force awarded Kawasaki a contract to design and produce CX/PX military/patrol transport aircraft (Roll-out ceremony was in 2007). This Japanese government funded program has design centers that are equipped with Western engineering software platforms that could be used to design commercial aircraft. The CX/PX airframe size and metal technologies/processes are similar to those used on the Airbus A319 and Embraer 195 aircraft. Perhaps more important though, is the fact that Japan has openly declared its intention to develop an indigenous commercial aircraft sector as part of a strategic economic plan. This intention should be treated seriously by trade policy analysts because the Japanese have already entered markets that were once viewed as exclusively Western (e.g. automobiles). It would be unwise to dismiss Japan as a potential player in the LCA or regional jet markets simply because it took other players a long time to establish a credible foothold in this industry.

IV. The New Trade War

Boeing's long term strategy could be to cede Japan's single-aisle aircraft market to Japanese aircraft, but in doing so they are creating a new competitor for their emerging LCA rivals Bombardier and Embraer while maintaining domination for market share in Japan for the wide-body aircraft requirements. It should come as no surprise that the recently launched MRJ

program will need at least \$1 billion in launch funding, which will include Japanese government subsidies. The Japanese government's international funding schemes for the Boeing 767 and 777 (pre-dated the 1994 World Trade Organization (WTO) Agreement) aircraft programs would today be ruled illegal under the 1994 WTO Agreement on Subsidies and Countervailing Measures (SCM Agreement). Japan's repayable launch investment works differently than Europe's on Airbus A320, A330, A340 and A380 aircraft. For example, in Europe Airbus pays back royalties to the European governments for each aircraft delivered (est. \$1m per A320). In Japan, the repayable portion of aircraft subsidies on the 767, 777 and now 787 go back to a fund for investing in future programs, so in reality the Japanese government never really gets its money back. It has been estimated that the Japanese government will be funding over \$1.5 billion in subsidies to support the 787 program, consisting of 30% non-repayable grants and 70% in repayable loans.

The New Trade War against Japanese aircraft subsidies could likely be initiated by several countries. Japan's aircraft subsidies directly affect Airbus by lowering Boeing production cost on the 767, 777 and 787 by having the Japanese heavies supplying Boeing very competitive prices in long term fixed-price dollar contracts. This scenario is a win-win between Boeing (not the US economy) and Japan because Boeing foregoes upfront launch investments and lower production costs, whereas Japan receives the latest aircraft technologies. The current trade dispute between the US and EU on Airbus and Boeing aircraft subsidies has other negative long term effects on Airbus as well as Boeing. The filings in the current WTO case have "exposed" sensitive financial and costing information to third parties (Canada, Brazil, Korea, Australia, Japan, and China). This information will no doubt be used by these country's aircraft companies to find a way to manipulate the WTO rules in their favor to receive government assistance and develop

new sourcing strategies to lower the launch cost of new aircraft programs. But with Airbus desire to increase their single digit market share in Japan, their quest to sell their A380s to Japan, having similar aircraft launch investment schemes as Japan and other geopolitical considerations in Europe, a WTO filing by the EU is unlikely.

Another country that could file a WTO case against Japan would be Canada, a nation that is no stranger to the intricacies of WTO rules. For example, Canada filed a case under the WTO Agreement on Subsidies and Countervailing Trade Measures (SCM) against Brazil for use of the PROEX program (export financing of Embraer aircraft). Bombardier in the long term could have the most to lose with Japan subsidizing the commercial aircraft industry. The MRJ is a direct competitor to Bombardier's remaining regional jet products (CRJ700/900/1000) since the CRJ200/400 regional jets seating 40-50 seats are now in the process of closing down. If Bombardier fails to launch the CSeries, then the company will only have its business jet product line to fall back on. Currently Bombardier is combing the world for aircraft subsidies to support the launch of the proposed CSeries aircraft. Bombardier already has understandings of financial support (subsidies) from Canada or US (final assembly), China (fuselage production), UK (wing in Belfast plant) and Mexico for small sub assemblies (e.g. wire harnesses). When the CSeries is launched (expected at the Farnborough Air Show 2008) it will be so highly subsidized that the Canadian government will not be in a position to file a WTO case against Japan. This only leaves Brazil to file a case against Japan, since China's (ARJ21 regional jet) and Russia's (Sukhoi Superjet regional jet) new commercial aircraft launches are highly government subsidized programs.

So why should Brazil file a WTO aircraft subsidy case against Japan and not Canada? We need to look at the current market factors of business jets, regional jets and LCAs with respect to

prior WTO-authorized retaliatory trade sanctions to find the answer. First, we need to understand Embraer's market. They are the market leader in business and regional jets with Bombardier as their main competitor. Embraer has introduced many new aircraft models in the past several years ranging from their very light jet Phenom product line (Honda of Japan has entered this sector), business jets with the MSJ models and regional jets with the E Series. Embraer has invested in a stable of new and innovative aircraft that has worldwide acceptance. They are not interested in venturing into the LCA market that Boeing and Airbus dominate (120-170 seats), and would like nothing better than having their main competitor Bombardier spend a majority of its resources on a "failed" CSeries program. Successful or not in the CSeries, Bombardier could be distracted from its business jet market which would be to Embraer's competitive advantage. So for Brazil to file multiple WTO SCM cases against the CSeries'; global aircraft subsidies would be expensive, time-consuming and distract from new aircraft innovations.

The prospect of Brazil filing a WTO case against Japanese aircraft subsidies is a different matter. Embraer has experience in dealing with WTO SCM for commercial aircraft when Canada (Bombardier) filed against Brazil. Canada's filing of WTO SCM was based on the Brazilian government providing preferential financing (interest rate up to 3.8% less market rate) via its PROEX program for Embraer's regional jet contracts (Abdelal, 2003). The WTO arbitration panel found the subsidies to be illegal when Brazil refused to comply with the ruling, and then decided to grant Canada permission to impose tariffs on Brazilian goods. Rather than imposing tariffs on Brazilian goods, Canada decided to offer financing leasing for Bombardier aircraft that would result in the same monthly payments afforded by Brazil's PROEX program (Goldstein, 2004). In response, Brazil appealed to the WTO on Canada's financing subsidies for

Bombardier aircraft and was awarded permission to impose tariffs on Canadian goods. Neither country imposed the retaliatory tariffs granted by the WTO. Today, Brazil (Embraer) is currently compliant with WTO SCM agreements.

Brazil could file a strong WTO SCM case against Japan for aircraft subsidies. Japan acknowledges that government aircraft subsidies exist, but it defends the amount of its subsidies because they are consistent with the terms of the 1992 US-EU deal that allows governments to underwrite up to one-third of development costs (Perrett, 2008). The problem with that argument is that Japan was never a party to the 1992 WTO agreement and the agreement was terminated in 2004 by the US when the USTR filed a case against the EU for aircraft subsidies. But acknowledging that Japanese aircraft subsidies exist is not always clear. In 2004, Boeing's CEO Harry Stonecipher, when questioned regarding the fact that Japan's subsidies for the 787 (then 7E7) were not covered by the 1992 WTO agreement, responded by saying: "So what? I view it as a problem the Japanese have. Go over there and fight it out with them" (Sweetman, 2004). So maybe that day has come. Brazil is playing by the WTO SCM rules and Japan is not. Embraer is competing against a well financed and subsidized Japanese aircraft industry directed by Japan's Ministry for Economy, Trade and Industry (METI) and supported by other companies, including Boeing, Toyota Motor, and the Development Bank of Japan. Another area of concern for the Brazilian government is the introduction by the Japanese government of trade insurance to promote overseas sales of the MRJ. The Japanese government will provide a full debt guarantee for Japanese banks to provide loans to overseas airlines for purchasing the MRJ aircraft (Daily Yomiuri, 2008). Brazil's filing of a WTO case could include challenging METI's funding for developing key technologies through two industry groups, the International Aircraft Development Fund (IADF) and the Japan Aircraft Development Corporation (JADC).

Our future research will measure and compare the competitiveness of Japan's aerospace sector against the Western industrial base. Japan's competitive advantages are strong investments in education and training, endowing Japan with scientific and technical workforces focusing on R&D, along with tapping into global knowledge through direct foreign investment and acquiring leading edge technologies from Western aerospace suppliers. The future development of an all composite business jet product line seems to be a natural progression for Japan after the introduction of the MRJ regional jet, and would be in direct competition to the current products being offered by Bombardier and Embraer. Our intent is to provide Western aerospace sector participants with timely and accurate information that can be used to guide investments, operations, and future directions decisions. It could also provide the interested governments with context regarding the potential development of specific policy that would be assistive to the industry.

V. Conclusions

Backed by major public subsidies and layers of state-sponsored technological support, Japan's aircraft industry is poised to become a serious player in the global market for passenger jets. There is an advantage to being a late entrant to this market, in that production can start with imported technology and state-of-the-art manufacturing procedures (i.e. brand new factories). The question thus arises: why does Boeing continue to donate know-how and tribal knowledge to Japan? The answer, we contend, is that technology-transfer is required to sustain Boeing aircraft sales to Japan, secure Japanese government subsidies on Boeing programs, and develop competitors to Bombardier and Embraer so they are dissuaded from entering Boeing's slice of the LCA market.

Finally, one might ask why Japan would want to enter such a low-margin industry in the first place. After all, profit levels for commercial aircraft programs rarely exceed 10% -- and this has been true for several decades. In Japan's case, however, the use of advanced composite technologies and state-of-the-art assembly processes could improve upon these historical margins by a considerable amount. But a high or above average return on government-assisted investment does not appear to be the driver of Japan's long term interest in commercial aerospace. Instead, we contend that the primary goal is to position Japan as a legitimate player in a strategically important sector that delivers international prestige to the host, as well as possible technological spillovers to other domestic industries (including the military sector). This might not seem like a wise investment from an economic standpoint, but there is little doubt that Japan is heading down this road with considerable vigor.

References

- Abdelal, R. 2003, Bombardier: Canada versus Brazil at the WTO. *Harvard Business School*, paper 9-703-022, May 8, 2003.
- Bowen, J.T. 2007. Global production networks, the developmental state and the articulation of Asia Pacific economies in the commercial aircraft industry. *Asia Pacific Viewpoint*, 48:312-329.
- Daily Yomiuri, 2008. Gov't plans insurance to boost sales of MHI jetliner overseas. *Daily Yomiuri Online*, March 16, 2008.
- De Bruijn, E.J. and Steenhuis, H-J. 2004. Freedom of choice in technology strategy: an analysis of technology strategy in the large commercial aircraft sector. *Technology Analysis & Strategic Management*, 16:381-393.
- Flynn Vencat, E. 2006. A Boeing of Asia? *Newsweek*, May 15, 2006.
- Goldstein, A. 2004. The Political Economy of Strategic Trade Policy and the Brazil-Canada Export Subsidies Saga. *Blackwell Publishing Oxford, UK*.
- Hamilton, S. 2008. Developing a new competitor: 787 technology transfer. Leeham Company LLC, Commentary, April 1, 2008: www.leeham.net (last accessed April 2, 2008).
- Hart-Smith, L.J. 1998. On the adverse consequences of cost-performance metrics usurping the role of goals they were supposed to support. Paper presented to the 21st Congress of the International Council of the Aeronautic Sciences, Melbourne, Australia, September 13-18, 1998 (Boeing Paper MDC 97K0068).
- MacPherson, A. and Pritchard, D. 2003. The global decentralization of US commercial aircraft production: implications for US employment and trade. *Futures*, 35:221-228.
- MacPherson, A. and Pritchard, D. 2007. Boeing's diffusion of commercial aircraft technology to Japan: surrendering the US industry for foreign financial support. *Journal of Labor Research*, 28:301-321.
- Perrett, B. 2008. Glut of Regional-Jet Projects Could Lead to Subsidy Disputes. *Aviation Week & Space Technology*. February 28, 2008.
- Pritchard, D. and MacPherson, A. 2007. Strategic destruction of the Western commercial aircraft sector: implications of systems integration and international risk-sharing business models. *The Aeronautical Journal of the Royal Aeronautical Society* May: 327-334.
- Sweetman, B. 2004. Watch for New Boeing-Airbus Trade War. *Aviation Week ShowNews Farnborough* 2004. July 19, 2004.