

**The American Boeing and the European Airbus: Competition for  
aviation technology and markets. A comprehensive analysis\***

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## **Abstract**

There is a long-running rivalry between Boeing and Airbus which has only been increasing in intensity over the past few years. This paper asserts that Airbus has in the past few years taken the top spot in the industry from Boeing, but Boeing is currently poised to retake that position in the coming years.

This paper will:

- Summarize the histories of both companies
- Summarize Boeing and Airbus commercial aircraft models in use
- Compare and contrast similar Boeing and Airbus aircraft families competing for similar markets
- Examine other future aircraft
- Examine additional technology being developed and implemented by Boeing and Airbus
- Examine sales data
- Analyze the factors involved in aircraft sales and their implications
- Examine the current World Trade Organization (WTO) dispute in detail
- Examine all the previous factors as a whole and consider the implications

This paper finds that Airbus currently controls the market formerly covered by Boeing's 717, 737, and 757 families. Additionally, the A330/340 families have been especially effective in the widebody market. These findings support the claim that Airbus has recently taken the dominant position previously held by Boeing in this market. This paper

also finds that the entrance of the A380 will not have a substantial effect on the market and it will not be as successful as Airbus originally predicted. Boeing's 787, however, will be much more successful and lucrative. The success of the 787 will be a major factor involved if Boeing does indeed reclaim its leading spot in the industry, as it seems likely to do. Another crucial factor is the ongoing WTO dispute, about which this paper concludes that although both Boeing and Airbus would prefer to negotiate over bilateral agreements, as it would be in their best interests, such minimal progress has been made in this respect that it seems more likely that the dispute will ultimately be arbitrated by the WTO.

## **1 Introduction**

Until quite recently, Boeing had been the traditional leader in the aviation industry, with Airbus always lagging behind. However, in the past few years Airbus has overtaken its old archrival by consecutively exceeding it in orders since 2001 and exceeding it in deliveries since 2003. However, the next few years will represent a pivotal moment in the clash between the two aerospace giants. At this point it is still possible for either company to emerge as the victor, but the odds seem to be swaying toward Boeing's favor.

This paper will provide an in-depth comparison of the competition between Airbus and Boeing in a wide array of technological and market aspects. The goal of this analysis is to determine which company controls which markets and technologies, to consider each company's current state of affairs, and to arrive at a general hypothesis concerning the fate of Airbus and Boeing in the near future.

Based on the evidence presented henceforth, it seems likely that, despite Airbus's current supremacy, Boeing will in the coming years hold a larger market share and exert more market power than Airbus.

## **2 History**

In order to understand the competition between Boeing and Airbus today, it is essential to understand their individual histories. This will provide the background necessary to form opinions on the matter and to understand the context that the facts in the later sections are presented in.

### **2.1 Boeing**

Boeing is currently divided into two primary departments: Boeing Integrated Defense Systems (IDS) and Boeing Commercial Airplanes (BCA). IDS is the military and space division, whereas BCA is the civil and commercial airliner division. This paper focuses on the BCA division.

Boeing was founded by William E. Boeing and George Conrad Westervelt on July 15, 1916 under the name Pacific Aero Products Company. The first plane they developed, the foundation for their company, was a twin-float seaplane called the B&W, named after the developers' initials.<sup>1</sup> The company's first commercial aircraft, used to fly mail for the U.S. Postal Service, came in 1927 with the Model 40. World War II was a revolutionary period for aviation technology; aircraft production surged and jet

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<sup>1</sup> Neville, P. (2004). *The Boeing-Airbus Duopoly: Origins and Trade Disputes*, [http://www.geocities.com/paul\\_neville/writing\\_gu\\_Boeing.htm](http://www.geocities.com/paul_neville/writing_gu_Boeing.htm), Internet accessed October 7, 2005

propulsion technology was further advanced and refined. Boeing's first commercial jet airliner, the 707, came into service in 1958. The following decade saw the development of the 727, the 737 (for short-range travel), and the 747 jumbo jet (for long-range, high passenger or high payload flights). By 1996, Boeing's family had expanded to include the 757, the 767, and the 777, as well as updated versions of all its previous planes. In December 1996 Boeing merged with Rockwell International Corporation's aerospace and defense units and in 1997, less than a year later, it merged with McDonnell Douglas Corporation. Boeing is currently developing or testing the 787, the 777-200LR, the 747 Advanced, the 777 Freighter, and the 737-900ER. The now Chicago-based aerospace giant employs workers in more than 60 countries, has customers in 145 countries, and has operations in 26 states.<sup>2</sup>

## **2.2 Airbus**

In the mid-1960s the commercial aviation industry was dominated by American firms such as Boeing and McDonnell Douglas. Several minor European firms also existed, but they were incapable of exerting any significant influence on the industry. The European firms understood that in order to acquire any real market power they would have to form a consortium and act cooperatively. Thus in 1970 Airbus Industrie was officially created. It consisted of a consortium between France's Aerospatiale and Germany's Deutsche Airbus. The companies collaborated in creating the A300, the first Airbus aircraft and also the first twin-engine widebody airliner. It was designed to "fill a gap in the market and to challenge American supremacy in the aviation industry."<sup>3</sup> However, buyers were

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<sup>2</sup> <http://boeing.com/history/boeing/planning.html>, Internet accessed October 7, 2005

<sup>3</sup> [http://www.airbus.com/en/corporate/people/Airbus\\_short\\_history.html](http://www.airbus.com/en/corporate/people/Airbus_short_history.html), Internet accessed October 9, 2005

reluctant at first and the company had little success at breaking into the market. CASA, a Spanish aerospace corporation, joined the consortium in 1971 and British Aerospace joined in 1979. By this point, Airbus's power was growing and it was rapidly becoming a major player in the aerospace industry; it already had 81 aircraft in service and orders for 256 aircraft from 32 customers.<sup>4</sup> It was not until the release of the A320 in 1981, however, that Airbus's position as a major industry competitor was secure; the aircraft received over 400 orders before its maiden flight.<sup>5</sup> Over the next two decades, Airbus expanded to include the A300/310 family, the A320 family, and the A330/340 family. In 2001, partially in order to be more efficient, productive, and competitive, and partially to prepare for the development of the A380, Airbus Industrie became a single, private company. More specifically, and under French law, it became a simplified joint stock company (SAS, Société par Actions Simplifiée), thus creating Airbus SAS. The company's shares were divided between the European Aeronautic Defence and Space Company (EADS, 80% of the shares) and BAE Systems, a British aerospace company (20% of the shares). 2003 marked a landmark year for Airbus; for the first time ever it delivered more aircraft than Boeing- 305 as compared to 281.<sup>6</sup> Airbus repeated the feat in 2004 with 320 deliveries as compared to Boeing's 285.<sup>7</sup> Airbus is currently in the final stages of developing its A380 aircraft, a 555 seat double-decker jumbo aircraft which will compete directly with the Boeing 747. Airbus is also in the preliminary stages of developing the A350 which will compete directly with the new Boeing 787.

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<sup>4</sup> <http://news.bbc.co.uk/1/hi/business/802741.stm>, Internet accessed October 9, 2005

<sup>5</sup> <http://en.wikipedia.org/wiki/Airbus>, Internet accessed October 9, 2005

<sup>6</sup> <http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=CurrentModels&cboCurrentModel=777&cboAllModel=&ViewReportF=View+Report>, Internet accessed October 16, 2005

<sup>7</sup> <http://www.thetravelinsider.info/2003/boeing5.htm>, Internet accessed October 16, 2005

## 3 Technology and Competition

### 3.1 Boeing and Airbus families: A brief description and comparison

#### *The B717 vs. the A318*

The 717 is Boeing's aircraft for the 100-seat market. The 717-200, the newest member of the 717 family, seats 106 people in a two-class configuration.<sup>8</sup> It has a cruise speed of 0.77 Mach<sup>9</sup> and a range of 1430 nautical miles (nm) (2645 km).<sup>10</sup> In January 2005, Boeing decided to discontinue 717 production and it will only produce enough aircraft to fulfill its current outstanding orders. The final delivery is scheduled for 2006. Rather than compete in this market segment, Boeing has instead opted to drop out of the “challenging” 100-seat market and focus on its other projects.<sup>11</sup>

The A318 is Airbus's direct competitor to the 717. The A318 is part of the A320 family, which taken as whole also competes with the 737 and 757 families. The A318 is the smallest and newest member of the A320 family, with seating for 107, a range of 3250 nm (6000 km), and a cruise speed of 0.82 Mach.<sup>12</sup>

To compare the two families, the 717 has received 155 orders, whereas the A318 has only received 74.<sup>13</sup> However, the A318 was launched in 1999 while the 717 has been

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<sup>8</sup> <http://boeing.com/commercial/717/background.html>, Internet accessed September 29, 2005

<sup>9</sup> Mach refers to the ratio between the speed of the aircraft and the speed of sound through the air. Because the speed of sound varies with temperature (and temperature varies with altitude), a straightforward Mach to mph or kmph conversion is impossible. Therefore, aircraft speeds are expressed solely as a Mach number (for reference, “at 20,000 feet (6,096 meters) the speed of sound is 660 miles per hour (1,062 kilometers per hour”)). quote from

[http://www.centennialofflight.gov/essay/Dictionary/sound\\_barrier/DI94.htm](http://www.centennialofflight.gov/essay/Dictionary/sound_barrier/DI94.htm), Internet accessed September 30, 2005

<sup>10</sup> <http://boeing.com/commercial/717/717technical.html>, Internet accessed September 29, 2005

<sup>11</sup> <http://boeing.com/commercial/717/background.html>, Internet accessed September 29, 2005

<sup>12</sup> <http://www.airbus.com/en/aircraftfamilies/a320/a318/specifications.html>, Internet accessed September 30, 2005

<sup>13</sup> <http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=CurrentModels&cboCurrentModel=717&cboAllModel=&ViewReportF=View+Report>, Internet accessed October 15, 2005  
<http://www.airbus.com/en/aircraftfamilies/a320/a318/>, Internet accessed October 15, 2005

taking orders since 1995. More importantly, this market is unique in that the small, regional jet manufacturers Embraer and Bombardier, by offering their own jets for the 100-seat market, provide formidable competition to Boeing and Airbus. As production of the 717 is being halted, Boeing's most direct competitor in this market will be the 737-600. However, the 737-600 is providing minimal competition, having received only 13 orders since 2000.<sup>14</sup> In this market, Airbus seems to have bested Boeing, but due to the unique competition offered by regional jet makers, it is unlikely that any company will come to dominate this niche in the near future.

#### *The B737 vs. the A320 and the A319*

The 737 family includes the older 100-500 models and the "next generation" 600-900 models. The newest model is the 737-900ER (Extended Range). Only the 600-900 models are still being produced and delivered. The 737 family is the best-selling aircraft family between both Boeing and Airbus, with orders totaling nearly 6000 airplanes.<sup>15</sup> The 737-900 has seating for 177 people in a two-class arrangement or 189 people in one-class, a range of 3159 nm (5084 km), and a speed of 0.785 Mach.<sup>16</sup>

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<sup>14</sup><http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=Order&cboStartMonth=09&cboStartYear=2005&cboEndMonth=09&cboEndYear=2005&optDateRange=All&optCustInfo=Customer&cboCustomerName=AllCustomers&cboCountryName=&cboRegionName=&cboCurrentModelName=&cboAllModelName=AllModels&optModelInfo=AllDetailModels&cboAllMinorModelName=737-600&optSort=Customer&ViewReportF=View+Report>, Internet accessed October 31, 2005

<sup>15</sup><http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=Order&optDateRange=All&cboStartMonth=09&cboStartYear=2005&cboEndMonth=09&cboEndYear=2005&optCustInfo=Customer&cboCustomerName=AllCustomers&cboCountryName=&cboRegionName=&optModelInfo=AllModels&cboCurrentModelName=&cboAllModelName=737&cboAllMinorModelName=&optSort=Customer&ErrorNumber=980&flash=y&ContinueWithReport=Yes>, Internet accessed October 31, 2005

<sup>16</sup> <http://boeing.com/commercial/737family/technical.html>, Internet accessed October 15, 2005



The A319 is the second smallest member of the A320 family, with seating for 124 passengers, a range of 3700 nm (6800 km), and a cruise speed of 0.82 Mach.<sup>17</sup> The A320 is the original member of the family and also the first aircraft to offer fly-by-wire technology (analyzed in more detail later). The A320 seats 150 passengers, has a range of 3050 nm (5700 km), and a cruise speed of 0.82 Mach.<sup>18</sup>

It is difficult to gauge which aircraft is more successful in this particular niche of the aviation market. The Airbus aircraft seem to fare better in terms of raw physical data (e.g. range, speed), but it is the sale of these aircraft to airlines that ultimately determines any sort of “winner.” Here the data is even less telling. For example, the 737 family has had a total of nearly 6000 orders while the A320 family has only had about 3700.<sup>19</sup> However, this statistic favors the 737 as the A320 family has existed for a much shorter length of time. The A320 is the winner, however, if comparing average per-year sales. The 737 is at 141 per year whereas the A320 is at 163.6.<sup>20</sup> Yet this data is also a bit skewed as it includes the A319, the A318 which competes with the 717, and the A321, which competes more directly with the 757. Only one thing is certain: this market is extremely popular, especially with low-cost carriers, and both the 737 and the A320 and A319 are likely to continue selling in significant numbers, with many airlines opting to order planes from both manufacturers.

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<sup>17</sup> <http://www.airbus.com/en/aircraftfamilies/a320/a319/specifications.html>, Internet accessed September 30, 2005

<sup>18</sup> <http://www.airbus.com/en/aircraftfamilies/a320/a320/specifications.html>, Internet accessed September 30, 2005

<sup>19</sup> <http://www.airbus.com/en/aircraftfamilies/a320/a318/specifications.html>, Internet accessed September 30, 2005

<http://www.airbus.com/en/aircraftfamilies/a320/a319/specifications.html>, Internet accessed September 30, 2005

<http://www.airbus.com/en/aircraftfamilies/a320/a320/specifications.html>, Internet accessed September 30, 2005

<http://www.airbus.com/en/aircraftfamilies/a320/a321/specifications.html>, Internet accessed September 30, 2005

<sup>20</sup> <http://www.answers.com/topic/airbus-a320>, Internet accessed October 31, 2005

*The B757 vs. the A321, and the entrance of the 737-900ER*

The 757 includes the 757-200 and the 757-300, an extended version of the 757-200 which carries more passengers and has increased cargo space. The 757-200 seats 243 or 280 people in a two or one-class configuration respectively, has a maximum range of 3900 nm (7222 km), and a speed of 0.80 Mach.<sup>21</sup> The 757-300 seats 200 or 228 people in a two or one-class configuration respectively, has a maximum range of 3395 nm (6287 km), and a speed of 0.80 Mach.<sup>22</sup>

The A321 is the largest member of the A320 family. It seats 185 people, has a range of 3000 nm (5600 km), and a speed of 0.82 Mach.<sup>23</sup>

The A321 competes most closely with the 757 family. The 757 appears superior in range and seating (although it is slightly slower), however, several airlines often choose the A321 over the 757 because of its type commonality with the other A320 models. Furthermore, the 757 is not as economical as the A321 or even the 737-900 on shorter routes, and on longer routes most airlines prefer larger, widebody aircraft. The 757 line was discontinued in 2004.<sup>24</sup>

The 737-900ER is the newest addition to the 737 family. It was launched on July 18, 2005. It seats 180 people in a two-class configuration, has a range of 3,205 nm (5900 km), and a speed of 0.787 Mach.<sup>25</sup> The 737-900ER, according to Boeing, has “lower operating costs than the A321; about 7 percent lower per trip, and 5 percent lower per

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<sup>21</sup> <http://boeing.com/commercial/757family/technical.html>, Internet accessed September 30, 2005

<sup>22</sup> <http://boeing.com/commercial/757family/technical.html>, Internet accessed September 30, 2005

<sup>23</sup> <http://www.airbus.com/en/aircraftfamilies/a320/a321/specifications.html>, Internet accessed September 30, 2005

<sup>24</sup> [http://www.absoluteastronomy.com/encyclopedia/b/bo/boeing\\_737.htm](http://www.absoluteastronomy.com/encyclopedia/b/bo/boeing_737.htm), Internet accessed October 15, 2005

<sup>25</sup> [http://www.boeing.com/commercial/737family/media\\_kit/pdf/back\\_737-900ER.pdf](http://www.boeing.com/commercial/737family/media_kit/pdf/back_737-900ER.pdf), Internet accessed October 15, 2005

seat.”<sup>26</sup> The new 737-900ER seems to be Boeing's replacement for the 757 and their most direct competitor to the A321. It is scheduled to enter service in the first half of 2007.

Taken as a whole, the A320 family appears to dominate the aforementioned markets, with specifically the A320 and the A319 being the most popular and lucrative members of the family. One reason for the popularity of the A320 family is the exceptional commonality between models, thus a pilot trained to operate one aircraft can operate any of the others with minimal additional training. This allows airlines to increase overall efficiency by purchasing the different aircraft in the A320 family and satisfying several markets at the same time, while investing minimal resources in pilot training. As noted earlier, this is likely to remain a profitable market for both Boeing and Airbus, but it seems that Airbus has fared better in the past few years as evidenced by the demise of Boeing's 757 and 717.

#### *The widebody, long-range, 200-400 seat market*

This market is far more complex than those previously examined. It contains the Boeing 767 and 777 families, as well as the Airbus A300, A310, A330, and A340 families. All of these aircraft families are intricately intertwined in market relations and competition. Each will first be discussed briefly from a technical standpoint and then the market interactions will be examined.

The 767 family has three passenger jets, the 767-200ER, the 767-300ER, and the 767-400ER, and one freighter based on the 767-300ER, the 767-300F.<sup>27</sup> The 767-400ER seats 245, 304, or 375 people in a three, two, or one-class configuration respectively, has

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<sup>26</sup> [http://www.boeing.com/commercial/737family/media\\_kit/pdf/fact\\_737-900ER.pdf](http://www.boeing.com/commercial/737family/media_kit/pdf/fact_737-900ER.pdf), Internet accessed October 15, 2005

<sup>27</sup> <http://boeing.com/commercial/767family/background.html>, Internet accessed September 30, 2005

a maximum range of 5645 nm (10454 km), and a speed of 0.80 Mach.<sup>28</sup> The 767 family is becoming a bit outdated, and the new 787 “dreamliner” will effectively replace it.

The 777 family currently offers the 777-200, the 777-200ER, the 777-300, and the 777-300ER. Boeing is also in the process of developing the 777-200LR (longer-range) and the 777 Freighter. The 777-200 is the baseline 777, with all the other models being derived from it. The 777-300 seats 368, 451, or 550 passengers in a three, two, or one-class configuration respectively, has a maximum range of 5955 nm (11,029 km), and a speed of 0.84 Mach.<sup>29</sup> The 777-200LR was launched in February 2005. It will be the world's longest-range commercial passenger jet, with a maximum range of 9420 nm (17,446 km).<sup>30</sup> It will have seating for 301 passengers in a three-class configuration and a speed of 0.84 Mach.<sup>31</sup> The 777 Freighter was launched in May 2005. It is technologically based on the 777-200LR and will enter service in late 2008.<sup>32</sup>

The A300 is the first model that Airbus created and, as such, it is nearing the end of its market life. However, its entry into service in 1974 brought several lasting technological innovations to the industry. It was the world's first twin-engine widebody aircraft. Its constituent parts were manufactured at different sites across Europe, and the finished parts were then airlifted to the final assembly line in Toulouse, France. This production process was more efficient than building the entire aircraft at one site, and has since been adopted by Boeing (the 787 was manufactured this way, and future aircraft are likely to be as well).<sup>32</sup> Structural innovations were also introduced, such as a circular

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<sup>28</sup> <http://boeing.com/commercial/767family/technical.html>, Internet accessed September 30, 2005

<sup>29</sup> <http://boeing.com/commercial/777family/777technical.html>, Internet accessed September 30, 2005

<sup>30</sup> <http://777.newairplane.com/>, Internet accessed September 30, 2005

<sup>31</sup> <http://777.newairplane.com/>, Internet accessed September 30, 2005

<sup>32</sup> [http://boeing.com/commercial/777family/pf/pf\\_freighterback.html](http://boeing.com/commercial/777family/pf/pf_freighterback.html), Internet accessed September 30, 2005

fuselage, advanced wings, and a brake-by-wire system.<sup>33</sup> It is beyond the scope of this paper to examine the mechanics of these innovations; instead, it is more important to note that such technologies have since become standards in a multitude of both Airbus and Boeing aircraft. The A300-600 has seating for 266 people, a range of 4150 nm (7700 km), and a speed of 0.82 Mach.<sup>34</sup> The A300-600F (freighter) has a range of 2650 nm (4850 km) and a speed of 0.82 Mach.<sup>35</sup> Today, the A300 is used mainly as a freighter, with many of the existing passenger planes being converted for such use.

The A310 is a direct derivative of the A300. It seats 200 people, has a range of 5200 nm (9600 km) and has a speed of 0.84 Mach.<sup>36</sup> The A300 and A310 offer extensive commonality; a pilot for one type of aircraft can be trained for the other type with only a single day of training.<sup>37</sup> The A310 is also near the end of its market life, as it has been largely replaced by the A330 family.

The A330 family was introduced along with the A340 family and has effectively replaced the A300 and A310 families. It has two main variants: the longer A330-300 and the shorter A330-200. The A330-200 seats 253 or 293 people in a three or two-class configuration respectively, has a range of 6750 nm (12,500 km), and a speed of 0.86

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<sup>33</sup> [http://en.wikipedia.org/wiki/Airbus\\_A300](http://en.wikipedia.org/wiki/Airbus_A300), Internet accessed October 16, 2005

<sup>34</sup> <http://www.airbus.com/en/aircraftfamilies/a300a310/a300-600/specifications.html>, Internet accessed September 30, 2005

<sup>35</sup> <http://www.airbus.com/en/aircraftfamilies/a300a310/a300-600f/specifications.html>, Internet accessed September 30, 2005

<sup>36</sup> <http://www.airbus.com/en/aircraftfamilies/a300a310/a310/specifications.html>, Internet accessed September 30, 2005

<sup>37</sup> [http://en.wikipedia.org/wiki/Airbus\\_A310](http://en.wikipedia.org/wiki/Airbus_A310), Internet accessed October 16, 2005 from [http://en.wikipedia.org/wiki/Airbus\\_A310](http://en.wikipedia.org/wiki/Airbus_A310)

Mach.<sup>38</sup> The A330-300 seats 295 or 335 people in a three or two-class configuration respectively, has a range of 5650 nm (10500 km), and a speed of 0.86 Mach.<sup>39</sup>

The A340 family initially consisted of the A340-200 and the A340-300. The A340-200 is no longer in production. The A340-300 has a passenger capacity of 295, a range of 7400 nm (13,700 km) and a speed of 0.86 Mach.<sup>40</sup> The A340-500 and the A340-600 were introduced in 1997 as ultra-long-range and high-capacity variants, respectively. The A340-500 seats 313 passengers, has a range of 9000 nm (16,700 km) and a speed of 0.86 Mach.<sup>41</sup> The A340-600 seats 380 passengers, has a range of 7900 nm (14,600 km), and a speed of 0.86 Mach.<sup>42</sup>

There exists a myriad of general competitions here, as well as direct competitions between models. The A330-200 competes directly with the 767-400ER. The A330-300 competes with the 777-200. The A340-300 competes with the 777-200ER. The A340-500 will compete with the 777-200LR for ultra-long-range routes. The A340-600 competes with the 777-300ER. In fact, the 777-300 and the 777 Freighter are the only members of the 777 family without direct Airbus equivalents. The 777-300 most closely competes with the A340-600, and the Freighter will most likely compete with the A380-800F (freighter) when it enters service.

The 767 family was introduced to challenge the A300 and later the A310. The A330 family was developed to replace the A300 family and to compete with the 767. The

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<sup>38</sup> <http://www.airbus.com/en/aircraftfamilies/a330a340/a330-200/specifications.html>, Internet accessed September 30, 2005

<sup>39</sup> <http://www.airbus.com/en/aircraftfamilies/a330a340/a330-300/specifications.html>, Internet accessed September 30, 2005

<sup>40</sup> <http://www.airbus.com/en/aircraftfamilies/a330a340/a340-300/specifications.html>, Internet accessed September 30, 2005

<sup>41</sup> <http://www.airbus.com/en/aircraftfamilies/a330a340/a340-500/specifications.html>, Internet accessed September 30, 2005

<sup>42</sup> <http://www.airbus.com/en/aircraftfamilies/a330a340/a340-600/specifications.html>, Internet accessed September 30, 2005

introduction of the A330, specifically the A330-200, effectively eliminated the 767 from the market.<sup>43</sup>

The A340 family is the direct rival to the 777 family. It is difficult to gauge which of these rivals could be called any sort of “winner” in the aviation market. The 777, the A330, and the A340 were all introduced within a few years of each other, and thus comparing the sales data should be relatively “fair.” The 777 family had received 718 orders by the end of September 2005.<sup>44</sup> The A340 family had received only 385 orders by the end of September 2005.<sup>45</sup> From this data alone, the 777 appears to be leading the market. However, the A340 closely resembles the A330 family, and it would be easy to argue that A330 sales data should be included as well. The A330 had received 553 orders by the end of September 2005.<sup>46</sup> Therefore, the combined A330/340 sales total is 938 orders. Using this data, one might suggest that Airbus, not Boeing, is leading this market. Yet it would be premature to suggest that either company controls the market at this point as some of the market share is likely to be transferred to Boeing's new 787 and Airbus's new A350 when they enter the market.

### **3.2 Boeing and Airbus future models**

#### *The 747, the A380, and the 747-advanced*

<sup>43</sup> [http://en.wikipedia.org/wiki/Airbus\\_A330](http://en.wikipedia.org/wiki/Airbus_A330), Internet accessed October 15, 2005

<sup>44</sup> <http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=CurrentModels&cboCurrentModel=777&cboAllModel=&ViewReportF=View+Report>, Internet accessed October 16, 2005

<sup>45</sup> <http://www.airbus.com/en/aircraftfamilies/a330a340/a340-200/specifications.html>, Internet accessed September 30, 2005

<http://www.airbus.com/en/aircraftfamilies/a330a340/a340-500/specifications.html>, Internet accessed September 30, 2005

<http://www.airbus.com/en/aircraftfamilies/a330a340/a340-600/specifications.html>, Internet accessed September 30, 2005

<sup>46</sup> <http://www.airbus.com/en/aircraftfamilies/a330a340/a330-200/specifications.html>, Internet accessed September 30, 2005

<http://www.airbus.com/en/aircraftfamilies/a330a340/a330-300/specifications.html>, Internet accessed September 30, 2005

Until the A380 enters the market, the 747 remains the largest commercial jetliner in service. The 747-400 is the most common member of the family, although the 747-400ER entered service in 2002 and is now the most up-to-date version. The 747-400ER seats 416 or 524 passengers in a three or two-class configuration respectively, has a maximum range of 7670 nm (14205 km), and a speed of 0.855 Mach.<sup>47</sup> Also, the 747-400 Freighter and now the 747-400ER Freighter are integral parts of the 747 family. As older 747-400s are becoming outdated, many are being converted into freighters. Together with earlier versions, 747 freighters carry half the world's freighter air cargo.<sup>48</sup>

The Airbus A380 superjumbo double-decker four-aisle aircraft will directly rival the 747. The first A380 will be delivered to Singapore Airlines in the fourth quarter of 2006.<sup>49</sup> The A380-800 will seat 555 passengers in a three-class configuration, have a range of 8000 nm (15,000 km), and a maximum speed of 0.89 Mach.<sup>50</sup> Airbus is also developing a freighter version, the A380-800F, which is scheduled to enter service in 2008.<sup>51</sup> It will be the first commercial freighter with three full cargo decks.

The A380 will introduce a wealth of new and innovative technologies which are likely to be used in future Airbus models as well as those of Boeing. To summarize a few of these technologies: The A380 will feature a highly advanced glass cockpit, including a fly-by-wire system connected to side-stick controllers; general commonality with other Airbus aircraft, thus reducing the cost of training pilots and crew; various technologically advanced structural materials, including GLARE (GLASS-REINFORCED fiber metal

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<sup>47</sup> <http://boeing.com/commercial/747family/technical.html>, Internet accessed October 16, 2005

<sup>48</sup> <http://boeing.com/commercial/747family/background.html>, Internet accessed September 29, 2005

<sup>49</sup> [http://en.wikipedia.org/wiki/Airbus\\_A380](http://en.wikipedia.org/wiki/Airbus_A380), Internet accessed October 16, 2005

<sup>50</sup> <http://www.airbus.com/en/aircraftfamilies/a380/a380/specifications.html>, Internet accessed September 30, 2005

<sup>51</sup> <http://www.airliners.net/info/stats.main?id=29>, Internet accessed October 22, 2005



laminated), new aluminum alloys, composite materials, and thermoplastics; a Network Systems Server (NSS) which eliminates the necessity for bulky paper documents by storing data and offering “electronic documentation, providing a required equipment list, navigation charts, performance calculations, and an aircraft logbook;” aluminum power cables rather than copper, thus decreasing weight; a bulbless illumination system in the cabin, cockpit, cargo and certain fuselage areas, using light-emitting diodes (LEDs) rather than traditional incandescent light bulbs; and a wide variety of possible amenities, resulting from a nearly 50% increase in cabin volume compared to the 747-400, including relaxation areas, bars, duty free shops, a casino, below deck space for in-flight activities and services, and business centers, although most airlines are likely to opt for more seats.<sup>52</sup> Among other things, most of these advances reduce weight, increase fuel efficiency, and decrease noise levels. The A380 has 10-15% more range, 49% more floor space, can carry 35% more passengers, and has 15-20% lower per-seat operating costs than the 747-400.<sup>53</sup> Although it may be hasty to predict the future of the A380 or the 747 at this time, the A380 holds numerous advantages over its competitor and these advantages are not likely to be overlooked by airline companies. Therefore, based on this data, the A380 seems poised to supplant its relatively outdated competitor in the high-passenger long-range market.

Boeing is not taking this new competition lightly, however, and is offering its own new model which will likely counter the A380. This model is the 747 Advanced. The 747 Advanced will be based off of new 787 technologies, thus increasing its

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<sup>52</sup> [http://en.wikipedia.org/wiki/Airbus\\_A380](http://en.wikipedia.org/wiki/Airbus_A380), Internet accessed October 16, 2005

[http://www.airbus.com/en/aircraftfamilies/a380/passenger\\_comfort.html](http://www.airbus.com/en/aircraftfamilies/a380/passenger_comfort.html), Internet accessed October 22, 2005

[http://www.discoverychannelasia.com/ontv\\_airbusa380/index.shtml](http://www.discoverychannelasia.com/ontv_airbusa380/index.shtml), Internet accessed October 22, 2005

<sup>53</sup> <http://www.airliners.net/info/stats.main?id=29>, Internet accessed October 22, 2005

efficiency and capabilities. The 747 Advanced will be able to accommodate 448 passengers, have a range of over 8000 nm (14,816 km), and a speed of 0.86 Mach.<sup>54</sup> A 747 Advanced Freighter version will also be available. Boeing has not yet officially launched the 747 Advanced, but is expected to soon.

It is nearly impossible at this point to suggest how the 747 Advanced will fare against the A380 as it is in such a preliminary stage. On the other hand, airlines may choose to add both the A380 and the 747 Advanced to their fleets. Boeing seems to be emphasizing that the 747 Advanced is “the only jetliner in the 400- to 500-seat market,” thus suggesting that the 747 Advanced is filling its own niche in the market rather than competing with the A380, which fills the 500+ seat market.<sup>55</sup> However, airlines typically prefer completely new, revolutionary models, such as the A380, to derivative, evolutionary models based on existing ones, such as the 747 Advanced. By the end of September 2005, the A380 had received 149 firm orders, but Airbus estimates that the break-even point is slightly above 250.<sup>56</sup> In addition to this, Airbus delayed delivery of the A380 by six months after it was forced to shut down its main assembly line in Toulouse from May to August due to staffing problems and a lack of engineers.<sup>57</sup> As a result, Airbus is required to pay certain airlines steep penalties for the delay. The 747 Advanced has not as of yet received any firm orders, but many companies have shown interest in the 747 Advanced, and Luxembourg's Cargolux Airlines International SAS has been negotiating with Boeing over the purchase of 10 747 Advanced Freighters.<sup>58</sup>

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<sup>54</sup> [http://en.wikipedia.org/wiki/Boeing\\_747\\_Advanced](http://en.wikipedia.org/wiki/Boeing_747_Advanced), Internet accessed October 16, 2005

<sup>55</sup> <http://www.boeing.com/randy/pdf/747AdvCard.pdf>, Internet accessed October 22, 2005

<sup>56</sup> <http://www.airbus.com/en/aircraftfamilies/a380/>, Internet accessed September 30, 2005

<http://www.forbes.com/work/feeds/ap/2005/10/21/ap2291713.html>, Internet accessed October 22, 2005

<sup>57</sup> Landler, M. (2005, September 23). Airbus chief sees some virtue in high oil prices. *New York Times*, p. C2.

<sup>58</sup> Oneal, M. (2005, August 18). Boeing sees spurt in 747 demand. *New York Times*, p. 1.

Some analysts suggest that there simply is not enough demand in this market for the A380 to make a profit. As previously stated, the A380 has 149 orders. Although this is impressive, Airbus acknowledges that they need at least 250 orders to break even. In contrast, the 787 (discussed in the next section), which will enter service nearly two years after the A380, has already received nearly twice as many orders. Perhaps the long-range, high-passenger, very-large aircraft market is not as large as Airbus had expected. Many analysts believe that, despite the A380's innovations and capabilities, it will never turn a profit if only for the sole reason that there is not enough demand in the market for such an aircraft. To be more specific, Airbus has predicted a market demand for 1500 of its superjumbo A380s over the next 20 years, whereas Boeing has predicted the demand to be closer to 700. A detailed empirical study of the industry by economists D. Irwin and N. Pavcnik found that the number of aircraft sold in their simulation conformed much more closely to Boeing's estimate of 700 than Airbus's 1500.<sup>59</sup> The study also revealed that Airbus will have to sell its A380 at discount prices (about 10-30% off) to sell any appreciable amount of them. In addition to this Airbus will likely only make a marginal profit after repaying its government loans, thus nearly reaffirming Boeing's assertion that the A380 will never be a profitable endeavor. On a different note, it is also stated that the A380 "could reduce the market share of the 747 by up to 14.8 percentage points in the long range widebody market segment (depending upon the discounts offered on the A-380), but would reduce the market for Airbus's existing wide-bodies by an even greater margin."<sup>60</sup> Therefore, the conclusion reached is that the entry of the A380, although it is

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<sup>59</sup> Irwin, D. A., & Pavcnik, N. (2003). Airbus versus Boeing revisited: international competition in the aircraft market. *Journal of International Economics*, 64, 223-245

<sup>60</sup> Irwin, D. A., & Pavcnik, N. (2003). Airbus versus Boeing revisited: international competition in the aircraft market. *Journal of International Economics*, 64, p. 223

generally superior to the 747, will not alter the market dramatically and it will neither precipitate a further decline in Boeing's overall market power nor will it substantially increase that of Airbus's.

### *The 787 and the A350*

Although not competing in the same market as the A380, the 787 and the A380 share many parallels and are nevertheless in competition with each other. They both represent the product of the two rivals' recent investments and developments, they both put the fate of their respective companies at stake, they both are completely new and revolutionary aircraft rather than derivatives of existing models, and they both offer technological innovations that will likely be used in the future aircraft of both companies. Regardless, the 787's true direct competitor is the A350, even though the A350 is still at a premature state comparable to the 747 Advanced.

The 787 is Boeing's newest aircraft family, and the future success of Boeing is largely at stake with the success of the 787 (as well as the success, or lack thereof, of the A380 and A350). The 787 was formally launched on April 26, 2004.<sup>61</sup> The 787 will replace the 767 family and compete to an extent with certain 777 models. The 787-8 is the base member of the family, with the first deliveries expected in 2008, along with 787-9 and 787-3 derivatives expected in 2010.<sup>62</sup> The 787-8 will seat 223 passengers in a three-class configuration, have a range of 8500 nm (15,700 km), and a speed of a 0.85 Mach.<sup>63</sup>

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<sup>61</sup> [http://www.boeing.com/news/releases/2004/q2/nr\\_040426g.html](http://www.boeing.com/news/releases/2004/q2/nr_040426g.html), Internet accessed October 22, 2005

<sup>62</sup> <http://boeing.com/commercial/7e7/programfacts.html>, Internet accessed September 30, 2005

<sup>63</sup> <http://boeing.com/commercial/7e7/facts.html>, Internet accessed September 30, 2005

In designing the 787, Boeing's emphasis was on efficiency. This is particularly appealing to airlines amidst the recent surge in jet fuel prices. Similarly to the A380, the 787 will feature extensive technological innovations which are likely to be utilized in future aircraft. The 787's most noticeable feature is its extensive use of composites, making up the entire fuselage and wing sections.<sup>64</sup> The 787 will employ more composites than any other aircraft to date. By weight, the 787 will be 50% composite and only 20% aluminum.<sup>65</sup> For comparison, the typical 777 is only 12% composite and 50% aluminium.<sup>65</sup> The use of composites significantly reduces overall weight and increases overall efficiency. To summarize a few of the other technologies: the 787 will feature a bulbless cabin illumination system consisting of LEDs, much like the A380's; an increase in internal pressure intended to increase passenger comfort, from the standard equivalent of 8000 feet (2400 m) altitude to 6000 feet (1800 m); and a higher humidity level in the passenger cabin.<sup>66</sup>

Currently, Airbus's most direct competitor to the 787 is its A330-200. To counter the 787, Airbus first developed the idea of the A330-200Lite, but the model grew into less of a derivative and more of an entirely new aircraft, and thus it became the A350. Two versions of the A350 were officially launched by Airbus on October 6, 2005; the A350-800 and the A35-900.<sup>67</sup> The A350-800 seats 253 passengers in a three-class configuration, has a range of 8800 nm (16,300 km), and a speed of 0.86 Mach.<sup>68</sup> The

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<sup>64</sup> <http://boeing.com/commercial/7e7/background.html>, Internet accessed September 30, 2005

<sup>65</sup> <http://boeing.com/commercial/7e7/programfacts.html>, Internet accessed September 30, 2005

<sup>66</sup> [http://en.wikipedia.org/wiki/Boeing\\_787](http://en.wikipedia.org/wiki/Boeing_787), Internet accessed October 22, 2005

<sup>67</sup> [http://www.boeing.com/news/releases/2004/q2/nr\\_040426g.html](http://www.boeing.com/news/releases/2004/q2/nr_040426g.html), Internet accessed October 22, 2005

<sup>68</sup> <http://www.airbus.com/en/aircraftfamilies/a350/specifications.html>, Internet accessed October 6, 2005

larger A350-900 seats 300 passengers in a three-class configuration, has a range of 7500 nm (13,900 km), and a speed of 0.86 Mach.<sup>69</sup> Entry into service is expected in 2010.<sup>70</sup>

The A350 shares many new features with the A380, as well as a few from the 787. As with other Airbus aircraft, the A350 will feature commonality with similar families (A320/330/340/380). Like the 787, its design includes a substantial amount of composites. 60% of the airframe will be composed of composite materials, including the entire wing (although, unlike the 787, not the entire fuselage).<sup>71</sup>

787-A350 competition is fierce, and much lies on the success of these two aircraft. The A350-800 will directly compete with the 787-8 and the A350-900 will compete more closely with the 777-200. In assessing the situation, it is not enough to analyze the facts presented by the companies themselves, as both companies cite their own aircraft's superiority and their competitor's inherent inferiority. For example, Airbus stated on its website that "as a result of the cabin's innovative design the A350 can accommodate 35 more seats than its closest rival [the 787]. And with a seat-mile cost advantage of up to 10 percent over its nearest competitors, the A350's superior economics are plain to see."<sup>72</sup> On Boeing's website it was stated that "the 787 will provide airlines with unmatched fuel efficiency, resulting in exceptional environmental performance. The airplane will use 20 percent less fuel for comparable missions than any similarly sized airplane [the A350]" and "will enjoy approximately 45 percent more

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<sup>69</sup> [http://www.airbus.com/en/aircraftfamilies/a350/a350-900\\_specifications.html](http://www.airbus.com/en/aircraftfamilies/a350/a350-900_specifications.html), Internet accessed October 6, 2005

<sup>70</sup> [http://www.airbus.com/en/aircraftfamilies/a350/programme\\_update.html](http://www.airbus.com/en/aircraftfamilies/a350/programme_update.html), Internet accessed October 22, 2005

<sup>71</sup> [http://www.airbus.com/en/aircraftfamilies/a350/advanced\\_materials.html](http://www.airbus.com/en/aircraftfamilies/a350/advanced_materials.html), Internet accessed October 22, 2005

<sup>72</sup> [http://www.airbus.com/en/aircraftfamilies/a350/programme\\_update.html](http://www.airbus.com/en/aircraftfamilies/a350/programme_update.html), Internet accessed October 22, 2005

cargo revenue capacity.”<sup>73</sup> Although these facts are all true, they provide little help in assessing the situation in an unbiased, neutral manner.

Sales data, which reflect airlines' interests and also future success of the aircraft, are a more telling source. By its launch date the A350 had received 140 orders from nine different customers.<sup>74</sup> John Leahy, the chief commercial officer of Airbus, predicts they will book at least 200 orders by the end of 2005.<sup>75</sup> By the end of September 2005 the 787 had received 174 firm orders from 14 different airlines and 273 announced orders from 23 different airlines.<sup>76</sup> By October 18 the 787 had already received 200 firm orders, 138 of them from the same year (2005).<sup>77</sup> However, the 787 was launched nearly a year and a half before the A350, and its sales figures reflect that. Based on this evidence, it would appear that neither Boeing nor Airbus is as of yet the clear victor. However, for reasons that will be extensively discussed in section 4, the 787 has actually been a huge success for Boeing, while it is uncertain whether or not the A350 will perform similarly for Airbus, thus suggesting that Boeing is at least the short-term winner of this battle.

### 3.3 Other pertinent technologies

#### *Use of composites*

There has been a strong trend recently to replace traditional materials, especially aluminum, with composites, as illustrated in Boeing and Airbus's recent planes.

Composites are materials created from two or more components.<sup>78</sup> Examples include

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<sup>73</sup> <http://boeing.com/commercial/7e7/background.html>, Internet accessed September 30, 2005

<sup>74</sup> <http://www.airbus.com/en/aircraftfamilies/a350/>, Internet accessed October 22, 2005

<sup>75</sup> Landler, M. (2005, September 23). Airbus chief sees some virtue in high oil prices. *New York Times*, p. C2.

<sup>76</sup> <http://boeing.com/commercial/7e7/programfacts.html>, Internet accessed September 30, 2005

<sup>77</sup> Gillie, J. (2005, October 18). Boeing announces deal for 787s. *The News Tribune* (Tacoma, WA).

<sup>78</sup> <http://en.wikipedia.org/wiki/Composites>, Internet accessed October 22, 2005

carbon-fiber reinforced plastics, glass-fiber reinforced plastics, quartz-fiber reinforced plastics, and thermoplastics.<sup>79</sup> Consider four recent aircraft, in sequence of oldest to newest, and their relative composite composition: the 777 consists of 12% composites, the A380 consists of 25% composites, the 787 consists of 50% composites, and the A350 consists of 60% composites.<sup>80</sup> An indicator of the apparent surge in demand for composites would be the state of composite manufacturers, and, as expected, composite manufacturers are indeed experiencing a phenomenal growth in demand and revenues. Consider, for example, Fischer Advanced Composite Components (FACC), a provider of composites to Boeing, Airbus, Bombardier, and engine manufacturers Rolls-Royce and CFM International. FACC is expecting a doubling of revenues over the next two years, and its CEO Walter Stephan said that he expects the sector to grow six-fold by 2010.<sup>81</sup> It is evident that composite technology is rapidly becoming ubiquitous in the aviation industry and it will affect the future of both Boeing and Airbus.

### *Fly-by-wire*

Fly-by-wire is essentially an autopilot, a digital flight system that eliminates bulky cables and hydraulics and instead relies on electronics, simple wires, and computers. The pilot controls the plane with a side-stick, or more commonly a “joystick,” which sends a signal across an electronic interface and controls the aircraft accordingly.<sup>82</sup> Fly-by-wire was first introduced into commercial passenger jets by Airbus with the introduction of the

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<sup>79</sup> [http://en.wikipedia.org/wiki/Airbus\\_A380](http://en.wikipedia.org/wiki/Airbus_A380), Internet accessed October 16, 2005

<sup>80</sup> <http://boeing.com/commercial/7e7/background.html>, Internet accessed September 30, 2005  
[http://www.airbus.com/en/aircraftfamilies/a350/advanced\\_materials.html](http://www.airbus.com/en/aircraftfamilies/a350/advanced_materials.html), Internet accessed October 22, 2005

<sup>81</sup> Flottau, J. (2005, August 15). Composite coup. *Aviation Week and Space Technology*, 163 (7), p. 36.

<sup>82</sup> <http://en.wikipedia.org/wiki/Fly-by-wire#Fly-by-wire>, Internet accessed October 22, 2005



A320 in 1981. Since then, Airbus has used fly-by-wire in every model, and Boeing began using it with the launch of the 777 in 1990 and has continued using it in subsequent models. However, there is one stark difference between Boeing and Airbus philosophies when it comes to fly-by-wire. Airbus gives the fly-by-wire system ultimate control, never allowing the plane to exceed certain parameters, thus making it technically “safer” as the pilot cannot perform any maneuvers that would cause the plane to stall or malfunction. Boeing on the other hand gives ultimate control to the pilot. Therefore, the pilot can, if he deems it necessary, override the fly-by-wire system. There is endless debate about which method is appropriate between aviators, engineers, and other relevant individuals, but it seems unlikely that any consensus will be reached in the near future. Regardless of this, fly-by-wire in one form or another will continue to be utilized in the future as an integral component of passenger jets.

*Connexion by Boeing and OnAir by Airbus*

In addition to its aircraft, Boeing is offering a product known as Connexion. Connexion is “a mobile information services provider delivering real-time, high-speed connectivity to airline passengers, affording them personalized access to the Internet, to their personal and business email accounts (including attachments) and to entertainment content.”<sup>83</sup>

Connexion was developed in April 2000, and commercial service of the product began in May 2004 with Lufthansa.<sup>84</sup> Connexion is currently available on flights operated by Lufthansa, Scandinavian Airlines System (SAS), All Nippon Airways (ANA), Japan Airlines and Singapore Airlines. China Airlines, Korean Air, Asiana and El Al Israeli

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<sup>83</sup> <http://boeing.com/connexion/backgrounder.html>, Internet accessed October 22, 2005

<sup>84</sup> <http://boeing.com/connexion/factsheet.html>, Internet accessed October 22, 2005

Airlines are also planning to equip their aircraft with Connexion. Additionally, Boeing is attempting to expand their product to standard-size business jets and the maritime market.<sup>85</sup> Note that although at first glance Connexion seems to be a profitable enterprise for Boeing, not a single American airline has signed onto it. Originally, Boeing signed up United, Delta, and American Airlines to Connexion in June 2001 with each airline agreeing to outfit 500 planes each.<sup>86</sup> However, the terrorist attacks of September 11, 2001, severely damaged the American airline industry and all three airlines subsequently withdrew their commitments to Connexion, citing cost concerns. But demand for the product is nevertheless present outside of America, and Boeing is more than willing to work with foreign airlines if American airlines are uninterested. However, a recent survey conducted by the Innovation Analysis Group in San Diego suggests that there is a high demand present in travelers on both sides of the Atlantic, despite unenthused airlines in America. The study discovered that more than half of all frequent fliers claim they are willing to pay for an in-flight internet connection, and foreign airlines are finding that their passengers are willing to pay prices ranging from \$9.95 (8.26€<sup>87</sup>) for 30 minutes to \$29.95 (24.86€) for the whole flight.<sup>88</sup> Connexion may very well become more widespread and prosperous in the coming years, and its profits are likely to assist Boeing in developing future aircraft, possibly providing an edge over Airbus.

Airbus, in its usual competitive spirit, has responded with its own service, OnAir. OnAir is a joint venture by Airbus, SITA INC (Information Networking Computing), and

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<sup>85</sup> <http://boeing.com/connexion/background.html>, Internet accessed October 22, 2005

<sup>86</sup> Barrionuevo, A. (2005, October 4). To surf web in-flight, fly foreign (for now). *New York Times*, p. C1.

<sup>87</sup> Dollar to Euro conversion- \$1 = 0.83€ conversion rate accurate as of November 1, 2005

<sup>88</sup> Barrionuevo, A. (2005, October 4). To surf web in-flight, fly foreign (for now). *New York Times*, p. C1.

Tenzing.<sup>89</sup> OnAir began on February 1, 2005. OnAir provides in-flight communication services ranging “from in-seat SMS using the airline’s onboard system to mobile telephony and Internet access using passengers’ personal devices, such as mobile phones, personal digital assistants and laptops.”<sup>90</sup> Airbus plans on equipping A320 and A380 aircraft with OnAir in the second half of 2006.<sup>91</sup> It is unclear how profitable this venture will be for Airbus due to its nascence, but Airbus is optimistic.

It is important to note that airlines have the option of outfitting either Boeing or Airbus aircraft with either Connexion or OnAir (many of the aforementioned European airlines have outfitted their Airbus aircraft with Connexion).

To summarize the conclusions thus far:

Airbus has bested Boeing in the 100-seat market, but it faces formidable competition from regional jet makers. The mid-range market (737 and A320 families) has been exceptionally lucrative for both companies, but the A320 family, taken as a whole, dominates the market, especially after the recent demise of the 717 and the 757, leaving only the 737 family to compete with the A320. In the widebody market, Airbus has arguably performed better than Boeing, but the market may change dramatically upon the entrance of the 787 and the A350. The A380 is likely to replace the 747 in the future as the aircraft of choice for that particular section of the market, but it will not be as profitable as Airbus had originally expected and it will not dramatically change the commercial aviation market. Competition between the 787 and the A350 is less easy to

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<sup>89</sup> [http://www.onair.aero/en/about/about\\_about\\_en.asp](http://www.onair.aero/en/about/about_about_en.asp), Internet accessed October 22, 2005

<sup>90</sup> [http://www.onair.aero/en/about/about\\_about\\_en.asp](http://www.onair.aero/en/about/about_about_en.asp), Internet accessed October 22, 2005

<sup>91</sup> [http://www.airbus.com/en/presscentre/pressreleases/pressreleases\\_items/09\\_15\\_05\\_WAEA.html](http://www.airbus.com/en/presscentre/pressreleases/pressreleases_items/09_15_05_WAEA.html), Internet accessed October 22, 2005

predict based on data examined thus far, but the 787 has distinct advantages over the A350 for reasons which are more appropriately discussed in the subsequent sections.

Therefore, it is the conclusion of this paper that Airbus has come to dominate the commercial aviation market in recent years, but its current hegemony may soon fade. However, in order to form a more comprehensive analysis, it is also necessary to consider global market data in addition to the individual, technical data presented thus far.

## **4 Global Market Competition**

Consider the Boeing and Airbus sales data presented in tables 4.1 and 4.2 on the following page. Note that very recently Airbus has surged past Boeing in both orders and deliveries. 2003 represented a landmark year for Airbus as it was the first time Airbus had ever exceeded Boeing in deliveries. However, also note the figures for 2005. Both Boeing and Airbus are enjoying a phenomenal year in orders. Yet Boeing holds a substantial lead in this respect, with 643 to Airbus's 407 orders, and far more than twice its orders for the previous year. All this data raises the questions, where did this sudden demand come from, and what are the ramifications for Boeing and Airbus? This paper will consider these questions separately before reconsidering the whole.

## Aircraft orders

**Table 1**

<b>Year</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005<sup>92</sup></b>
<b>Airbus<sup>93,94</sup></b>	520	375	300	284	370	407
<b>Boeing<sup>95,96</sup></b>	598	314	251	250	277	643

## Aircraft deliveries

**Table 2**

<b>Year</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005<sup>92</sup></b>
<b>Airbus<sup>93,94</sup></b>	311	325	303	305	320	271
<b>Boeing<sup>95,97</sup></b>	491	527	381	281	285	217

<sup>92</sup> Data accurate as of September 30, 2005

<sup>93</sup> [http://www.airbus.com/store/mm\\_repository/pdf/att00003196/1989-2004\\_results.pdf](http://www.airbus.com/store/mm_repository/pdf/att00003196/1989-2004_results.pdf), Internet accessed October 22, 2005

<sup>94</sup> <http://www.airbus.com/en/aircraftfamilies>, Internet accessed October 22, 2005

<sup>95</sup> McLaughlin, T. (2005, September 21). Boeing's order list grows as Machinists strike continues. Planemaker has booked more than 600 orders, but union is on Day 21. *St. Louis Post – Dispatch*, p. C1.

<sup>96</sup> <http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=Order&cboReportMonth=01&cboReportQuarter=&optTimePeriod=Yearly&cboReportYear=2005&ViewReportF=View+Report>, Internet accessed October 22, 2005

<sup>97</sup> <http://active.boeing.com/commercial/orders/displaystandardreport.cfm?RequestTimeout=500&optReportType=CurYrDelv>, Internet accessed October 22, 2005

#### 4.1 Origins of the demand

The sudden increase in orders can be attributed to several factors, all of which are important. Perhaps the most significant factor is the recent surge in fuel prices. Another factor is aging fleets; that is, many airlines' planes are growing old and will soon need replacement. Another factor is the high demand from new or emerging airline industries in countries such as China, India, and Malaysia. In addition to this, substantial demand has been building up since the airline industry crashed in 2001, with the demand seeming to culminate in 2005 and possibly remaining strong for 2006 and 2007.

##### *Fuel prices*

Jet fuel prices are at record highs. The recent surge in prices is a result of several factors. The cost of crude oil is rising due to a loss in refining capacity in the Middle East (many refining facilities have been damaged or destroyed) and in the Gulf Coast (20% loss in refining capacity), with the latter suffering mostly as a result of hurricanes Katrina and Rita.<sup>98</sup> This decrease in supply naturally raises the cost of crude oil based on fundamental supply and demand dynamics. However, the problem is worsened by the fact that refineries are focusing what limited capacity remains on gasoline production, thus raising the cost of jet fuel even higher. For example, on September 28, 2005, crude oil closed at \$66.35 (55.07€) per barrel, while Gulf Coast jet fuel closed at \$124.99 (103.74€) per barrel, a difference of \$58.64 (48.67€). In comparison, the average price difference from 1996 to 2004 was \$3.70 (3.07€) per barrel.<sup>98</sup> Although this recent spike in prices occurred directly after hurricane Rita, which was itself not long after Katrina, and prices dropped

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<sup>98</sup> Reed, D. (2005, October 2). Sky-high price of jet fuel forces canceled flights. USA Today. Retrieved October 25, 2005 from [http://www.usatoday.com/money/biztravel/2005-10-02-jet-fuel-usat\\_x.htm](http://www.usatoday.com/money/biztravel/2005-10-02-jet-fuel-usat_x.htm)

shortly thereafter, they still remain relatively high. At this writing (end of October 2005), oil prices are averaging between \$70 (58.1€) and \$80 (66.4€) per barrel, and some analysts predict it may reach levels as high as \$100 (83€) per barrel.<sup>99</sup>

Airlines are having difficulty coping with these prices. For example, American Airlines was forced to cancel 16 daily flights on September 30, 2005, shortly after hurricane Rita. American Airlines vice president Dan Garton stated that due to the high price of jet fuel, the flights were no longer “economically viable” for the airline.<sup>100</sup> Although this day may have been extreme compared to normal situations, it illustrates how much airlines are affected by the price of jet fuel. However, although the high price of jet fuel has a negative impact on airlines, it is in some ways beneficial to the jet makers, Boeing and Airbus. The high cost of jet fuel has convinced airlines of the importance of fuel-efficient aircraft, now more than ever. In particular, the 787 and the A350 are being advertised as highly efficient aircraft, perfect for current market conditions and oil prices. The 787 already holds 273 orders and commitments and the A350 holds 140. Even if oil prices fall again, fuel-efficient aircraft will still be in high demand by airlines in case of another price surge.

### *Aging fleets*

Airlines' fleets typically consist of a mix of newer and older planes, and the older planes (usually 15-20 years old) must necessarily be replaced on a regular basis. Not only this, but older planes are far less fuel-efficient than new-generation planes, such as the 787,

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<sup>99</sup> Creedy, S. (2005, October 26). Airbus chief fuels price optimism. *The Australian*. Retrieved October 25, 2005 from

[http://www.theaustralian.news.com.au/common/story\\_page/0,5744,17035488%255E643,00.html](http://www.theaustralian.news.com.au/common/story_page/0,5744,17035488%255E643,00.html)

<sup>100</sup> Reed, D. (2005, October 2). Sky-high price of jet fuel forces canceled flights. *USA Today*. Retrieved October 25, 2005 from [http://www.usatoday.com/money/biztravel/2005-10-02-jet-fuel-usat\\_x.htm](http://www.usatoday.com/money/biztravel/2005-10-02-jet-fuel-usat_x.htm)

the A350, and to an extent the A380 or 777, thus increasing demand for new aircraft. For example, the Australian airline Qantas is expected to announce an order for 60 to 100 aircraft in November of 2005, 24 of which are to replace older 767-300ERs with a mix of 787s and A350s.<sup>101</sup> Qantas also plans to replace their 24 747-400s with 777-200LRs and A340-500s for ultra-long range routes, and they are considering replacing an aging fleet of 21 737-400s and 11 737-300s with either 737-800s or A320s.<sup>101</sup> Qantas CEO Geoff Dixon cited escalating fuel prices as the primary reason behind the drive to acquire new aircraft as replacements.<sup>101</sup> As another example, Garuda, an Indonesian carrier, plans to order 10 787s and replace its fleet of 48 737-300s, 400s, and 500s with 737-800s in the near future.<sup>102</sup>

#### *New markets in developing countries*

Another critical factor in the high demand for new aircraft is demand from foreign or nascent airlines in countries where the airline industry is not yet fully developed. In these nations, the country itself may not be what is normally considered a “developing” country per se, but its airline industry is at its prime growth period, whether in the case of India with deregulation of the industry or in the case of China with overwhelming demand from its citizens.

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<sup>101</sup> Dennis, W. (2005, October 6). Qantas To Announce Order For Mix Of Boeing, Airbus Jets. *Aviation Daily*, 362 (4), p. 5.

<sup>102</sup> Schofield, A. (2005, September 19). Garuda negotiating order for 30 Boeing aircraft. *Aviation Daily*, 361 (55), p. 3.



### *China*

According to Boeing, China “is and will remain the largest market outside the U.S. for new commercial planes.”<sup>103</sup> Boeing predicts demand for 2600 new aircraft worth \$213 billion (176.8€billion) over the next 20 years.<sup>104</sup> Airbus expects China to be a “big market” for its A380, and expects to have 50% of the market by 2013, compared to its current 34%.<sup>104</sup> Already this year five Chinese airlines have jointly ordered 69 aircraft from Airbus; three of these are new customers.<sup>105</sup> Airbus China president Laurence Barron is expecting an annual growth rate of 20% for China in the future.<sup>105</sup>

### *India*

Along with China, India has one of the fastest growing airline industries in the world, and Airbus and Boeing are more than willing to meet their demand for new aircraft. Until recently the airline industry in India was under strict government control. However, the industry was recently deregulated, and an unprecedented surge in demand for new aircraft has ensued. Examples of this abound. Indian Airlines recently ordered 43 Airbus aircraft in a deal totaling more than \$2 billion (1.66€billion).<sup>106</sup> The deal was for 19 A319s, four A320s, and 20 A321s.<sup>106</sup> Air India plans to purchase 68 aircraft from Boeing, 27 of which are 787s.<sup>107</sup> Jet Airways, the largest domestic carrier in India, has ordered 10

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<sup>103</sup> McLaughlin, T. (2005, September 21). Boeing's order list grows as Machinists strike continues Planemaker has booked more than 600 orders, but union is on Day 21. *St. Louis Post – Dispatch*, p. C1.

<sup>104</sup> News breaks. (2005, September 26). *Aviation Week & Space Technology*, 163 (12), pp. 18-20

<sup>105</sup> Airbus Strives for China's Civil Aviation Market. (2005, September 22). *SinoCast China Business Daily News*, p. 1.

<sup>106</sup> Aircraft acquisition: Indian airlines' long wait is over. (2005, September 14). *Businessline. Chennai*. p. 1.

<sup>107</sup> AI hopes to ink deal with Boeing for 68 aircraft soon. (2005, September 28). *Businessline. Chennai*. p. 1.

777-300ERs from Boeing, a deal valued at \$2.53 billion (2.1€billion).<sup>108</sup> Jet Airways also plans to buy 10 Airbus aircraft with the option of buying 10 more, a deal worth about \$1.5 billion (1.2€billion).<sup>109</sup> In total, there have been more than 200 orders for aircraft in India this year, and India's government is predicting airline industry growth of 20 % per year.<sup>109,110</sup>

### *Aggregating demand since 2001*

Following the terrorist attacks of September 11, 2001, the airline industry descended into a deep depression. America's industry suffered the worst losses. Passenger demand for air travel plummeted, and many airlines could no longer make a profit. Since then, a number of airlines has filed for Chapter 11 bankruptcy or has exited the market entirely. Among them are United, US Airways, Vanguard, Delta, and Northwest Airlines.<sup>111</sup> Abroad, direct or indirect victims of the market crash include Sabena (Belgium), Swissair, and Ansett Australia.<sup>111</sup> However, for those airlines that survived, there has been a demand building since 2001 (mostly as a result of September 11) that has recently become quite substantial. Therefore, those surviving airlines are opting to once again order new planes to augment or replace their fleets.

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<sup>108</sup> Boeing wins order. (2005, September 13). *Chicago Tribune*, p. 2.

<sup>109</sup> Neely, J., & Plumb, C. (2005, June 14). India leads \$13 bln of Airbus, Boeing jet deals. Yahoo! *India News*. Retrieved October 25, 2005 from <http://in.news.yahoo.com/050614/137/5yyk1.html>

<sup>110</sup> Michaels, D., & Lunsford, J., L. (2005, September 20). Boeing, Airbus foresee peak year for orders despite airline woes. *Wall Street Journal*, p. A1.

<sup>111</sup> America's airlines, flying on empty. (2005, September 16). *The Economist*, Retrieved October 25, 2005 from [http://www.economist.com/agenda/displayStory.cfm?story\\_id=4399993](http://www.economist.com/agenda/displayStory.cfm?story_id=4399993)  
<http://airtravel.about.com/cs/remembering911/a/AirlineLosses%20.htm>, Internet accessed October 25, 2005

## 4.2 Additional considerations

### *Deliveries and the worker strike*

Although Boeing leads the orders category, Airbus maintains its lead in deliveries. Deliveries are crucial to aircraft manufacturers, accounting for the majority of their profits, whereas orders are merely promises to purchase the aircraft at a later date, usually with a down payment of about 10%.<sup>112</sup> Also, it is not uncommon for orders that have been placed to be cancelled, postponed, or switched to a different model. A delivery effectively signifies the actual sale of the aircraft, with the remainder of the proceeds then being received by the manufacturer. Airbus plans on delivering more than 360 jets this year and more than 400 next year.<sup>112</sup> Boeing was expected to deliver 320 planes this year and plans on delivering 385 planes next year.<sup>112</sup>

However, Boeing is now unlikely to meet its goal of 320 planes by the end of the year due to a widespread worker strike caused by contractual disagreements over worker payments and benefits. The strike included over 18,000 machinists at key assembly plants and lasted for over three weeks, stretching from September 2 to a tentative agreement reached on September 25.<sup>113</sup> Fortunately, Boeing missed only a few deliveries in September and is facing minimal repercussions for it, but overall the strike delayed the delivery of between 25 and 30 aircraft for the year.<sup>114</sup> Taking this into consideration, Boeing will undoubtedly fall short of its expected 320 deliveries for the year and fall yet farther behind Airbus. However, its prediction for 2006 is likely to remain accurate, and within a few years it is possible that Boeing may even surpass Airbus once again.

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<sup>112</sup> Michaels, D., & Lunsford, J., L. (2005, September 20). Boeing, Airbus foresee peak year for orders despite airline woes. *Wall Street Journal*, p. A1.

<sup>113</sup> Yu, R. (2005, September 27). Boeing strike deal 'big win for both parties.' *USA Today*, p. B4

<sup>114</sup> McLaughlin, T. (2005, October 5). Boeing suffers a case of jet lag. *St. Louis Post – Dispatch*.

*WTO dispute*

The WTO dispute is viewed by many as the defining event in the current Boeing-Airbus competition. The reason is this: although the bitter rivalry between Boeing and Airbus continues, it deals mainly with issues such as competition for new technology, competing models such as the A350 and the 787, or general market competition. Insofar as these examples are concerned, they are nothing more than good, lawful, capitalistic competition (albeit, the market they compete in is actually an impenetrable duopoly, as it would be nearly impossible for a third 100+ seats jet manufacturer to enter). However, the WTO dispute raises the issues of illegal subsidies and competitive advantage, and ultimately enters the political arena, with the US and the EU facing off for their respective companies, Boeing and Airbus. The WTO dispute addresses fundamental philosophical and social values behind the US and the EU and their respective governments.

The US's argument is that certain EU governments are providing direct financial support in the form of repayable loans to Airbus, which it claims is in breach of world trade rules. The EU's argument is that the United States is providing similar support to Boeing, but in the form of indirect support such as tax-breaks, which it claims is no less illegal than any subsidies it is providing to Airbus. This can be viewed as conflicting economic and philosophical doctrines between the US and the EU. Whereas the US believes in a more purely capitalistic approach with minimal government intervention, the EU tends to be more in favor of state intervention in the economy, thus making the direct subsidies and loans seem only proper.

The current dispute has its origins in a 1992 agreement on a similar dispute in which the US accused certain EU governments of providing unfair production subsidies to Airbus. The 1992 agreement prohibited production subsidies and limited direct government support to 33% of development costs and only to projects likely to repay the loans within 17 years.<sup>115</sup> Therein lies the first problem relating to today's dispute. Boeing and the American government deem it unfair that not only can Airbus receive substantial loans, but it is only forced to repay them if the project is successful.

The current dispute has its immediate origins in the launch of the A380 and now the A350 and in Boeing's recent loss of number one status to Airbus. On October 6, 2004, the US officially rejected the 1992 agreement (it was agreed that should one party fail to comply with the terms of the agreement, the other party had the right to abrogate it) and filed a formal complaint with the WTO about the EU's illegal support for Airbus.<sup>116</sup> The EU immediately countered with its own suit, accusing the US government of also providing illegal aid to Boeing indirectly in the form of tax-breaks and government subsidies to defense and aerospace sectors. In monetary terms, the US claims that Airbus has received approximately \$40 billion (33.2€billion) in subsidies and loans since 1967, while the EU claims that Boeing has received \$18 billion (14.9€billion) in direct and indirect subsidies since 1992.<sup>116</sup>

In 1998 the WTO declared the US federal government's policy of not collecting tax revenue on exports to be an illegal subsidy, and in 2003 the WTO authorized the EU

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<sup>115</sup> Hayward, K. (2005, April). Trade disputes in the commercial aircraft industry: A background note. *The Aeronautical Journal*, pp. 157-166.

<sup>116</sup> <http://news.bbc.co.uk/2/hi/business/3722888.stm>, Internet accessed October 26, 2005

to impose sanctions of \$4 billion (3.3€billion) on US exports.<sup>117</sup> The US passed new laws in Congress in an attempt to comply with the WTO, but the WTO once again found them to be illegal. The sanctions were temporarily suspended earlier this year but may be reimposed at the start of 2006 if the US fails to comply. This of course adds another level of complexity to the Boeing-Airbus dispute, as the EU has the ability to threaten imposing sanctions if the US does not cooperate on the issue.

Britain, France, Germany, and Spain have pledged billions of dollars in aid to the A350 already, but Airbus says it is willing to forgo these loans until at least 2007 as long as credible bilateral talks between the US and the EU continue.<sup>118</sup> The US is unimpressed and unpersuaded by these statements, however, and has stated that it merely changes “when they formally write the check” for these loans.<sup>118</sup> Shortly afterwards, the US took the next step in its complaint and selected a panel of judges to hear the case. The EU followed suit shortly thereafter.

Should the dispute actually come to be resolved in the WTO, the outcome could be disastrous for both sides. The winner in such a case is given the right to impose trade sanctions on the loser until they end any and all actions in violation of the agreement reached. Therefore, it is possible that both the EU and the US would win their suits, resulting in catastrophic sanctions being imposed on both parties, and further exacerbating already tense US-EU relations. It is likely that both groups have taken this into consideration as they have gone on record multiple times stating that they would

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<sup>117</sup> Watson, R. (2005, October 1). WTO rules that US tax concession breaks law. *The Times* (United Kingdom). Business section, p. 56.

<sup>118</sup> Ameet, S. (2005, October 11). U.S., EU soften tone on aircraft-subsidy dispute. *Chicago Tribune*.

prefer bilateral negotiations rather than having to resolve the issue in the WTO.<sup>119</sup>

However, bilateral negotiations have not been progressing well, and the WTO may very well have to arbitrate the dispute, leaving the fate of Boeing and Airbus languishing in the realm of politics.

### **4.3 Ramifications**

All of the factors previously analyzed do not act independently, but rather they form an intricate and delicate relationship in which the sum is greater than its parts. Now it would be logical to reconsider all of the various aspects analyzed thus far and discuss them once more within the context of each other, at last revealing the totality of the subject at hand.

The implication of the sudden increase in orders for Boeing and their success with the 787 is that Boeing now has the potential to reclaim its position as the leader in the commercial jetliner manufacturing industry. This can be achieved by developing fuel-efficient aircraft and marketing them effectively, marketing to developing markets in countries with a relatively young airline industry, and taking advantage of momentary opportunities. Note that these criteria apply equally to Airbus.

#### *Fuel-efficient aircraft*

Boeing has developed a highly fuel-efficient aircraft, the 787, and has effectively marketed it to airlines. Therefore, in this aspect, Boeing has been successful.

Airbus has also developed a highly efficient aircraft, the A350, but it is a matter of debate whether or not it has effectively marketed it to airlines. As it is, the A350 only

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<sup>119</sup> WTO Launches Aid Probes of Boeing, Airbus; As the trade body begins investigating claims of improper government subsidies, the U.S. and the EU say they are open to negotiations. (2005, July 21). *Los Angeles Times*, p. C5.

has 140 orders, whereas Airbus has claimed throughout the year that it would have at least 200 by the end of the year. Not only this, but the A350 is not expected to enter service until 2010, nearly a full two years after Boeing's 787. Also, considering the six-month delay in delivery of the A380, airlines may be wary of investing in new Airbus aircraft at such an early stage. Therefore, in this aspect, Airbus has only been marginally successful, developing new aircraft but not effectively marketing them.

Boeing has found more success than Airbus in this criterion.

#### *Marketing to developing markets*

Boeing has been booking hundreds of orders from developing airlines in certain countries, particularly in China and India. Therefore, in this aspect, Boeing has been successful.

Airbus has also been marketing to the same airlines, currently holding 34% of the Chinese market and expecting to increase its share to 50% by 2013. In this aspect, Airbus has also been successful.

It is difficult to suggest that either company has performed significantly better than the other in this criterion, but each company's ability to do so will have a major impact on their future success.

#### *Taking advantage of momentary opportunities*

Although there are innumerable advantages that could be examined, consider two that have already been presented; aging fleets and aggregating demand. Boeing is taking advantage of aging fleets as it has recently sold a considerable number of aircraft to



several airlines, Qantas being the main example given earlier, to replace some of their older, less efficient planes. Also, there is a steady supply of orders from airlines that have to replace their older 737 models with newer 737s, e.g. replacing 737-400s with 737-800s. Boeing has obviously taken advantage of aggregating demand as well over the past few years, reflected in their extraordinary number of orders for new aircraft. Therefore Boeing has absolutely been successful in this criterion.

Airbus is taking advantage of aging fleets in a manner similar to Boeing. Airbus has also taken advantage of aggregating demand, but the demand is more profound in American airlines, which also happen to traditionally order more planes from Boeing. Nevertheless, Airbus is still experiencing an above-average year in sales. Therefore Airbus has been moderately successful in this criterion.

Again, it is difficult to gauge which company has performed better in this criterion. However, based on Boeing's slightly better performance in both of the aforementioned momentary advantages, it is concluded that Boeing has found more success in this area than Airbus.

#### *A final note*

Considering all three criteria as a whole, Boeing has performed better than Airbus. It follows that Boeing should be more successful than Airbus in the future. Data from the immediate past support this.

Evidence of Boeing's recent successes can be seen in their raw market company data. Boeing has received over \$80 billion (66.4€billion) in new orders during the past

two years.<sup>120</sup> Boeing's stock increased 31% this year, driven primarily by the surge in orders, including a substantial number of orders for the 787.<sup>121</sup> Also, Boeing's second-quarter revenues for the year 2005 rose 15% and earnings increased by 30%.<sup>122</sup>

## 5 Conclusion

It was originally proposed in this paper that Airbus has recently come to dominate the commercial aviation market, but this is a pivotal moment in the industry's history and Boeing is in the midst of a strong comeback. Nearly all the evidence confirms this.

When considering Airbus's current supremacy, its domination of the A320 over the market formerly controlled by the 717, 737, and 757 exemplifies this. Also, Airbus has come to dominate the widebody market in recent years with its A330/A340 duo.

Yet, consider the remainder of the thesis; that Boeing is in a position to once again secure its former lead in the industry. The A380 is proving to not be as profitable for Airbus as expected, thus setting them behind monetarily and consuming much of their time that could have been spent on more profitable ventures. Boeing, on the other hand, has spent its time developing the 787, which has been far more successful than the A380 and possibly the A350. In addition to this, Boeing has been experiencing a phenomenal year in orders. The reasons for this demand include rising fuel prices, aging fleets, nascent airlines, and aggregating demand. Three criteria were created which were used to gauge either Boeing or Airbus's ability to succeed in the near future for this market. The

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<sup>120</sup> Mecham, M. (2005, September 26). Peak demand. *Aviation Week & Space Technology*, 163 (12), pp. 47-48.

<sup>121</sup> McLaughlin, T. (2005, October 5). Boeing suffers a case of jet lag. *St. Louis Post – Dispatch*.

<sup>122</sup> Mecham, M. (2005, September 26). Peak demand. *Aviation Week & Space Technology*, 163 (12), pp. 47-48.

criteria included developing fuel-efficient aircraft (Boeing was much more successful than Airbus in this criterion), selling aircraft to young airlines in developing countries (Boeing and Airbus were about equally successful), and taking advantage of momentary opportunities (Boeing performed slightly better than Airbus). The WTO dispute is another critical factor in the current competition, bringing the conflict into the realm of politics. Certain outcomes of this dispute could be severely inimical to either one or both parties in the conflict. As regards a solution, both Boeing and Airbus would prefer a bilateral agreement, but they seem to be unable to resolve the issue on their own, and it is likely that the WTO will have to arbitrate the dispute. Therefore, after careful contemplation of the issue, it is the conclusion of this paper that Boeing, despite Airbus's current hegemony, is poised to regain its domination over the commercial aviation market in the coming years.

## References

- 717 model summary*. (2005). Retrieved October 15, 2005 from  
<http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=CurrentModels&cboCurrentModel=717&cboAllModel=&ViewReportF=View+Report>
- 737 Orders cumulative through September 2005*. Retrieved October 31, 2005 from  
<http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=Order&optDateRange=All&cboStartMonth=09&cboStartYear=2005&cboEndMonth=09&cboEndYear=2005&optCustInfo=Customer&cboCustomerName=AllCustomers&cboCountryName=&cboRegionName=&optModelInfo=AllModels&cboCurrentModelName=&cboAllModelName=737&cboAllMinorModelName=&optSort=Customer&ErrorNumber=980&flash=y&ContinueWithReport=Yes>
- 737 technical specifications*. Retrieved October 15, 2005 from  
<http://boeing.com/commercial/737family/technical.html>
- 737-900ER*. Retrieved October 10, 2005 from  
[http://www.boeing.com/commercial/737family/media\\_kit/](http://www.boeing.com/commercial/737family/media_kit/)
- 747 advanced*. Retrieved September 29, 2005 from  
<http://boeing.com/commercial/747family/back/back9.html>
- 747 advanced*. (2004). Retrieved October 22, 2005 from  
<http://www.boeing.com/randy/pdf/747AdvCard.pdf>
- 747 technical specifications*. Retrieved October 16, 2005 from  
<http://boeing.com/commercial/747family/technical.html>
- 757 technical specifications*. Retrieved September 30, 2005 from  
<http://boeing.com/commercial/757family/technical.html>
- 767 Orders cumulative through September 2005*. Retrieved October 31, 2005 from  
<http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=Order&cboStartMonth=09&cboStartYear=2005&cboEndMonth=09&cboEndYear=2005&optDateRange=All&optCustInfo=Customer&cboCustomerName=AllCustomers&cboCountryName=&cboRegionName=&cboCurrentModelName=&cboAllModelName=AllModels&optModelInfo=AllDetailModels&cboAllMinorModelName=737-600&optSort=Customer&ViewReportF=View+Report>
- 767 technical specifications*. Retrieved September 30, 2005 from  
<http://boeing.com/commercial/767family/technical.html>

- 777 freighter background.* Retrieved September 30, 2005 from  
[http://boeing.com/commercial/777family/pf/pf\\_freighterback.html](http://boeing.com/commercial/777family/pf/pf_freighterback.html)
- 777 model summary.* (2005). Retrieved October 16, 2005 from  
<http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=CurrentModels&cboCurrentModel=777&cboAllModel=&ViewReportF=View+Report>
- 777 technical specifications.* Retrieved September 30, 2005 from  
<http://boeing.com/commercial/777family/777technical.html>
- A brief history: Building a company.* Retrieved October 7, 2005 from  
<http://boeing.com/history/boeing/building.html>.
- A brief history: Jets and rockets take off.* Retrieved October 7, 2005 from  
<http://boeing.com/history/boeing/commercial.html>
- A300-600 specifications.* (2005). Retrieved September 30, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a300a310/a300-600/specifications.html>
- A300-600F specifications.* (2005). Retrieved September 30, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a300a310/a300-600f/specifications.html>
- A310 specifications.* (2005). Retrieved September 30, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a300a310/a310/specifications.html>
- A318 specifications.* (2005). Retrieved September 30, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a320/a318/specifications.html>
- A318 the 100-seat widebody.* (2005). Retrieved October 15, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a320/a318/>
- A319 specifications.* (2005). Retrieved September 30, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a320/a319/specifications.html>
- A320 specifications.* (2005). Retrieved September 30, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a320/a320/specifications.html>
- A321 specifications.* (2005). Retrieved September 30, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a320/a321/specifications.html>
- A330-200 specifications.* (2005). Retrieved September 30, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/a330a340/a330-200/specifications.html>

- A330-300 specifications.* (2005). Retrieved September 30, 2005 from <http://www.airbus.com/en/aircraftfamilies/a330a340/a330-300/specifications.html>
- A340-200 specifications.* (2005). Retrieved September 30, 2005 from <http://www.airbus.com/en/aircraftfamilies/a330a340/a340-200/specifications.html>
- A340-300 specifications.* (2005). Retrieved September 30, 2005 from <http://www.airbus.com/en/aircraftfamilies/a330a340/a340-300/specifications.html>
- A340-400 specifications.* (2005). Retrieved September 30, 2005 from <http://www.airbus.com/en/aircraftfamilies/a330a340/a340-500/specifications.html>
- A340-500 specifications.* (2005). Retrieved September 30, 2005 from <http://www.airbus.com/en/aircraftfamilies/a330a340/a340-500/specifications.html>
- A350 programme update.* (2005). Retrieved October 22, 2005 from [http://www.airbus.com/en/aircraftfamilies/a350/programme\\_update.html](http://www.airbus.com/en/aircraftfamilies/a350/programme_update.html)
- A350 specifications.* (2005). Retrieved October 6, 2005 from <http://www.airbus.com/en/aircraftfamilies/a350/specifications.html>
- A350-900 specifications.* (2005). Retrieved October 6, 2005 from [http://www.airbus.com/en/aircraftfamilies/a350/a350-900\\_specifications.html](http://www.airbus.com/en/aircraftfamilies/a350/a350-900_specifications.html)
- A380 specifications.* (2005). Retrieved September 30, 2005 from <http://www.airbus.com/en/aircraftfamilies/a380/a380/specifications.html>
- Advanced materials.* (2005). Retrieved October 22, 2005 from [http://www.airbus.com/en/aircraftfamilies/a350/advanced\\_materials.html](http://www.airbus.com/en/aircraftfamilies/a350/advanced_materials.html)
- AI hopes to ink deal with Boeing for 68 aircraft soon. (2005, September 28). *Businessline. Chennai.* p. 1.
- Airbus.* (2005). Retrieved October 9, 2005 from <http://en.wikipedia.org/wiki/Airbus>
- Airbus A300.* (2005). Retrieved October 16, 2005 from [http://en.wikipedia.org/wiki/Airbus\\_A300](http://en.wikipedia.org/wiki/Airbus_A300)
- Airbus A310.* (2005). Retrieved October 16, 2005 from [http://en.wikipedia.org/wiki/Airbus\\_A310](http://en.wikipedia.org/wiki/Airbus_A310)
- Airbus A318.* Retrieved October 31, 2005 from <http://www.airliners.net/info/stats.main?id=21>
- Airbus A319.* Retrieved September 30, 2005 from <http://www.airliners.net/info/stats.main?id=23>

- Airbus A320*. Retrieved October 31, 2005 from  
<http://www.answers.com/topic/airbus-a320>
- Airbus A320*. (2005). Retrieved October 16, 2005 from  
[http://en.wikipedia.org/wiki/Airbus\\_A320](http://en.wikipedia.org/wiki/Airbus_A320)
- Airbus A330*. (2005). Retrieved October 16, 2005 from  
[http://en.wikipedia.org/wiki/Airbus\\_A330](http://en.wikipedia.org/wiki/Airbus_A330)
- Airbus A340*. (2005). Retrieved October 16, 2005 from  
[http://en.wikipedia.org/wiki/Airbus\\_A340](http://en.wikipedia.org/wiki/Airbus_A340)
- Airbus A380*. Retrieved October 22, 2005 from  
<http://www.airliners.net/info/stats.main?id=29>
- Airbus A380*. (2005). Retrieved October 16, 2005 from  
[http://en.wikipedia.org/wiki/Airbus\\_A380](http://en.wikipedia.org/wiki/Airbus_A380)
- Airbus demonstrates first multipurpose wireless cabin network at WAEA in Hamburg*. (2005). Retrieved October 22, 2005 from  
[http://www.airbus.com/en/presscentre/pressreleases/pressreleases\\_items/09\\_15\\_05\\_WAEA.html](http://www.airbus.com/en/presscentre/pressreleases/pressreleases_items/09_15_05_WAEA.html)
- Airbus results*. (2005). Retrieved October 22, 2005 from  
[http://www.airbus.com/store/mm\\_repository/pdf/att00003196/1989-2004\\_results.pdf](http://www.airbus.com/store/mm_repository/pdf/att00003196/1989-2004_results.pdf)
- Airbus strives for China's civil aviation market. (2005, September 22). *SinoCast China Business Daily News*, p. 1.
- Aircraft acquisition: Indian airlines' long wait is over. (2005, September 14). *Businessline. Chennai*. p. 1.
- Aircraft families*. (2005). Retrieved October 22, 2005 from  
<http://www.airbus.com/en/aircraftfamilies/>
- Aircraft flight control systems*. (2005). Retrieved October 22, 2005 from  
<http://en.wikipedia.org/wiki/Fly-by-wire#Fly-by-wire>
- Airline losses after September 11*. Retrieved from  
<http://airtravel.about.com/cs/remembering911/a/AirlineLosses%20.htm>
- Ameet, S. (2005, October 11). U.S., EU soften tone on aircraft-subsidy dispute. *Chicago Tribune*.

- America's airlines, flying on empty. (2005, September 16). *The Economist*, Retrieved October 25, 2005 from [http://www.economist.com/agenda/displayStory.cfm?story\\_id=4399993](http://www.economist.com/agenda/displayStory.cfm?story_id=4399993)
- Barrionuevo, A. (2005, October 4). To surf web in-flight, fly foreign (for now). *New York Times*, p. C1.
- Boeing*. (2005). Retrieved October 7, 2005 from <http://en.wikipedia.org/wiki/Boeing>.
- Boeing 2005 orders detail*. (2005). Retrieved October 22, 2005 from <http://active.boeing.com/commercial/orders/displaystandardreport.cfm?optReportType=Order&cboReportMonth=01&cboReportQuarter=&optTimePeriod=Yearly&cboReportYear=2005&ViewReportF=View+Report>
- Boeing 717*. Retrieved October 15, 2005 from [http://www.absoluteastronomy.com/encyclopedia/b/bo/boeing\\_717.htm](http://www.absoluteastronomy.com/encyclopedia/b/bo/boeing_717.htm)
- Boeing 717*. (2005). Retrieved November 1, 2005 from [http://en.wikipedia.org/wiki/Boeing\\_717](http://en.wikipedia.org/wiki/Boeing_717)
- Boeing 717: Background*. Retrieved September 29, 2005 from <http://boeing.com/commercial/717/background.html>
- Boeing 717: Technical*. Retrieved September 29, 2005 from <http://boeing.com/commercial/717/717technical.html>
- Boeing 737*. Retrieved October 15, 2005 from [http://www.absoluteastronomy.com/encyclopedia/b/bo/boeing\\_737.htm](http://www.absoluteastronomy.com/encyclopedia/b/bo/boeing_737.htm)
- Boeing 747*. (2005). Retrieved October 16, 2005 from [http://en.wikipedia.org/wiki/Boeing\\_747](http://en.wikipedia.org/wiki/Boeing_747)
- Boeing 747 advanced*. (2005). Retrieved October 16, 2005 from [http://en.wikipedia.org/wiki/Boeing\\_747\\_Advanced](http://en.wikipedia.org/wiki/Boeing_747_Advanced)
- Boeing 757*. Retrieved October 15, 2005 from [http://www.absoluteastronomy.com/encyclopedia/b/bo/boeing\\_757.htm](http://www.absoluteastronomy.com/encyclopedia/b/bo/boeing_757.htm)
- Boeing 767*. (2005). Retrieved October 16, 2005 from [http://en.wikipedia.org/wiki/Boeing\\_767](http://en.wikipedia.org/wiki/Boeing_767)
- Boeing 777*. (2005). Retrieved October 16, 2005 from [http://en.wikipedia.org/wiki/Boeing\\_777](http://en.wikipedia.org/wiki/Boeing_777)
- Boeing 777 program background*. Retrieved September 30, 2005 from <http://boeing.com/commercial/777family/background.html>



- Boeing 777-200LR worldliner.* (2005). Retrieved September 30, 2005 from <http://777.newairplane.com/>
- Boeing 787.* (2005). Retrieved October 22, 2005 from [http://en.wikipedia.org/wiki/Boeing\\_787](http://en.wikipedia.org/wiki/Boeing_787)
- Boeing 787 dreamliner.* Retrieved September 30, 2005 from <http://boeing.com/commercial/7e7/programfacts.html>
- Boeing 787 dreamliner: Program fact sheet.* Retrieved September 30, 2005 from <http://boeing.com/commercial/7e7/facts.html>
- Boeing 787 family background information.* Retrieved September 30, 2005 from <http://boeing.com/commercial/7e7/background.html>
- Boeing launches 787 dreamliner.* (2004). Retrieved October 22, 2005 from [http://www.boeing.com/news/releases/2004/q2/nr\\_040426g.html](http://www.boeing.com/news/releases/2004/q2/nr_040426g.html)
- Boeing wins order. (2005, September 13). *Chicago Tribune*, p. 2.
- Building for the future.* Retrieved October 7, 2005 from <http://boeing.com/history/boeing/future.html>
- Company evolution.* (2005). Retrieved October 9, 2005 from [http://www.airbus.com/en/corporate/people/Airbus\\_short\\_history.html](http://www.airbus.com/en/corporate/people/Airbus_short_history.html)
- Composite material.* (2005). Retrieved October 22, 2005 from <http://en.wikipedia.org/wiki/Composites>
- Connexion backgrounder.* Retrieved October 22, 2005 from <http://boeing.com/connexion/backgrounder.html>
- Connexion factsheet.* Retrieved October 22, 2005 from <http://boeing.com/connexion/factsheet.html>
- Creedy, S. (2005, October 26). Airbus chief fuels price optimism. *The Australian*. Retrieved October 25, 2005 from
- Current year deliveries through October 2005.* (2005). Retrieved October 22, 2005 from <http://active.boeing.com/commercial/orders/displaystandardreport.cfm?RequestTimeout=500&optReportType=CurYrDelv>
- Defining the future of flight.* Retrieved October 7, 2005 from <http://boeing.com/history/boeing/planning.html>

- Dennis, W. (2005, October 6). Qantas to announce order for mix Of Boeing, Airbus jets. *Aviation Daily*, 362 (4), p. 5.
- Flottau, J. (2005, August 15). Composite coup. *Aviation Week and Space Technology*, 163 (7), p. 36.
- Giant of the skies: Building the Airbus A380*. (2005). Retrieved October 22, 2005 from [http://www.discoverychannelasia.com/ontv\\_airbusa380/index.shtml](http://www.discoverychannelasia.com/ontv_airbusa380/index.shtml)
- Gillie, J. (2005, October 18). Boeing announces deal for 787s. *The News Tribune* (Tacoma, WA).
- Hayward, K. (2005, April). Trade disputes in the commercial aircraft industry: A background note. *The Aeronautical Journal*, pp. 157-166.
- Irwin, D. A., & Pavcnik, N. (2003). Airbus versus Boeing revisited: International competition in the aircraft market. *Journal of International Economics*, 64, 223-245
- Key Boeing facts and figures*. (2005). Retrieved October 16, 2005 from <http://www.thetravelinsider.info/2003/boeing5.htm>
- Landler, M. (2005, September 23). Airbus chief sees some virtue in high oil prices. *New York Times*, p. C2.
- McLaughlin, T. (2005, September 21). Boeing's order list grows as Machinists strike continues Planemaker has booked more than 600 orders, but union is on Day 21. *St. Louis Post – Dispatch*, p. C1.
- McLaughlin, T. (2005, October 5). Boeing suffers a case of jet lag. *St. Louis Post – Dispatch*.
- Mecham, M. (2005, September 26). Peak demand. *Aviation Week & Space Technology*, 163 (12), pp. 47-48.
- Michaels, D., & Lunsford, J., L. (2005, September 20). Boeing, Airbus foresee peak year for orders despite airline woes. *Wall Street Journal*, p. A1.
- Neely, J., & Plumb, C. (2005, June 14). India leads \$13 bln of Airbus, Boeing jet deals. *Yahoo! India News*. Retrieved October 25, 2005 from <http://in.news.yahoo.com/050614/137/5yyk1.html>
- Neville, P. (2004). *The Boeing-Airbus Duopoly: Origins and Trade Disputes*. Retrieved October 7, 2005 from [http://www.geocities.com/paul\\_neville/writing\\_gu\\_Boeing.htm](http://www.geocities.com/paul_neville/writing_gu_Boeing.htm).

News breaks. (2005, September 26). *Aviation Week & Space Technology*, 163 (12), pp. 18-20

*Official address Airbus-Boeing dispute*. (2005). Retrieved October 22, 2005 from <http://www.forbes.com/work/feeds/ap/2005/10/21/ap2291713.html>

*OnAir*. Retrieved October 22, 2005 from [http://www.onair.aero/en/about/about\\_about\\_en.asp](http://www.onair.aero/en/about/about_about_en.asp)

Oneal, M. (2005, August 18). Boeing sees spurt in 747 demand. *New York Times*, p. 1.

Q&A: Boeing and Airbus. (2004, October 7). *BBC News*. Retrieved October 26, 2005 from <http://news.bbc.co.uk/2/hi/business/3722888.stm>

Reed, D. (2005, October 2). Sky-high price of jet fuel forces canceled flights. *USA Today*. Retrieved October 25, 2005 from [http://www.usatoday.com/money/biztravel/2005-10-02-jet-fuel-usat\\_x.htm](http://www.usatoday.com/money/biztravel/2005-10-02-jet-fuel-usat_x.htm)

Schofield, A. (2005, September 19). Garuda negotiating order for 30 Boeing aircraft. *Aviation Daily*, 361 (55), p. 3.

*The A380 family*. (2005). Retrieved September 30, 2005 from <http://www.airbus.com/en/aircraftfamilies/a380/>

*The Airbus A320*. Retrieved October 22, 2005 from <http://www.airliners.net/info/stats.main?id=23>

*The Airbus fight to stay ahead*. (2000). Retrieved October 9, 2005 from <http://news.bbc.co.uk/1/hi/business/802741.stm>

*The Boeing 737-900ER*. (2005). Retrieved October 15, 2005 from [http://www.boeing.com/commercial/737family/media\\_kit/pdf/back\\_737-900ER.pdf](http://www.boeing.com/commercial/737family/media_kit/pdf/back_737-900ER.pdf)

*The Boeing 747 family*. Retrieved September 29, 2005 from <http://boeing.com/commercial/747family/background.html>

*The Boeing 757 family*. Retrieved September 30, 2005 from <http://boeing.com/commercial/757family/background.html>

*The Boeing 767 family*. Retrieved September 30, 2005 from <http://boeing.com/commercial/767family/background.html>

*The Boeing next-generation 737 family*. Retrieved September 29, 2005 from <http://boeing.com/commercial/737family/ngback/back3.html>

- The new Boeing 737-900ER*. (2005). Retrieved October 15, 2005 from [http://www.boeing.com/commercial/737family/media\\_kit/pdf/fact\\_737-900ER.pdf](http://www.boeing.com/commercial/737family/media_kit/pdf/fact_737-900ER.pdf)
- Wallace, J. (2000, March 20). Unlike Airbus, Boeing lets aviator override fly-by-wire technology. *Seattle Post-Intelligencer*. Retrieved October 22, 2005 from <http://seattlepi.nwsourc.com/business/boe202.shtml>
- Watson, R. (2005, October 1). WTO rules that US tax concession breaks law. *The Times* (United Kingdom). Business section, p. 56.
- WTO Launches Aid Probes of Boeing, Airbus; As the trade body begins investigating claims of improper government subsidies, the U.S. and the EU say they are open to negotiations. (2005, July 21). *Los Angeles Times*, p. C5.
- Yu, R. (2005, September 27). Boeing strike deal 'big win for both parties.' *USA Today*, p. B4