



# Bombardier Aerospace: A Strategic Analysis

Managerial Economics

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## TAXI! TAXI!



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## Executive Summary

This paper analyzes how Bombardier should react to technological advances in the airline industry that may revolutionize the transportation market. This proprietary technology has enabled Eclipse Aviation and Safire Aircraft Company to offer small highly fuel-efficient twin-turbofan engine private jets at a fraction of the cost of presently offered small private jets. Although Eclipse Aviation has successfully completed their first test flight, neither they nor Safire have completed all FAA requirements. If successful, the low-priced jets will attract a new market of customers who otherwise were not able to afford a private jet. In the not-so-distant future air-traffic will be organized like the highway system with people catching “air taxis” as frequently as traditional car taxis at about the cost of an airline coach seat. This will change the structure of the private jet industry. It will no longer just be the “high-end” of the air-travel market and this emerging market segment will grow significantly.

The Learjet, manufactured by Bombardier, is synonymous with the words wealthy, high quality, and luxurious - the so-called “Mercedes” of jets. Bombardier ought to develop a system enhancement strategy to implement the new technological advancements used by Eclipse and Safire to stay at the forefront of research and development. Because this technology may revolutionize the industry Bombardier should stay abreast of the technology but use it to innovate and improve products that are differentiated from Eclipse and other low-cost firms. The private jet market is continuing to grow and the growth will be amplified with the emergence of a new market attracted to the new low-cost jets. Bombardier should enter this new growth market utilizing the strategies of differentiation, early entry, and the development of complementarities in order to sustain a competitive edge in the private jet industry. This report begins with a background of the industry, proceeds to an analysis of the industry and the market, and lastly it discusses strategic considerations for Bombardier entering this new market.

## Background

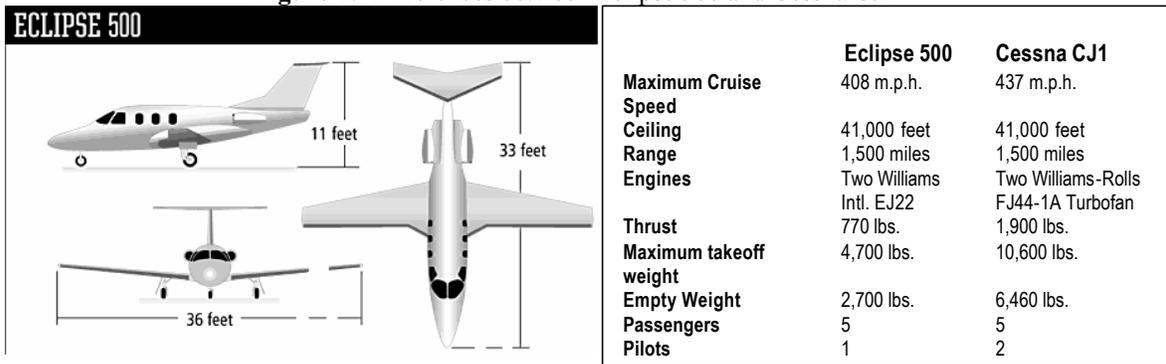
### *Introduction:*

The buyers in the private jet industry market have primarily been large companies or very wealthy people. Currently, private jets run from about \$3 million-\$45 million and seat six to 30 people. The majority of the industry’s revenues are concentrated in the higher-end segments, particularly in the super midsize and super large private jets. The private jet industry has historically catered to the elite and wealthy and the jets include such extremities as gold faucets and the finest leather interior.

The emergence of the six-seat Eclipse 500 that costs \$837,500 and has operating costs around 56 cents per mile opens up an untapped market. The Eclipse 500 is about a quarter of the cost of the next-cheapest private jet, Cessna’s Citation CJ-1. Figure 1 exhibits the main differences between the two jets.



**Figure 1.** Differences between Eclipse 500 and Cessna CJ1<sup>1</sup>



NASA and the FAA believe that unless the U.S. air traffic system is changed, there will be more capacity than the current system can handle. The current hub-and-spoke system is thought to be one of the system's flaws. The system is cost-effective and thus very popular with airlines: Most passengers and cargo head through 29 hub airports on their way to one of 600 spoke airports<sup>2</sup>. The system can be inefficient for travelers as it forces scheduled passengers to fly via large cities instead of directly between secondary destinations.

The Small Aircraft Transportation System (SATS)—currently being developed by NASA, the FAA, Embry-Riddle, and nearly 60 other aviation-related companies, agencies, and universities comprising the Southeast SATSLab Consortium—offer a solution to arising capacity problems. The U.S. Congress has funded the program with \$9 million for fiscal year 2001 and has awarded \$69 million for future funding<sup>3</sup>. By employing a new generation of inexpensive small business jets and an innovative computerized flight control network, air taxi companies would be able to provide direct service from and into any of the more than 5,000 public-use airports that have been unusable for commercial flights because they lack the staff and equipment. SATS would create a virtual interstate highway system in the sky. The small airports would be unstaffed and be equipped with less expensive but sophisticated computer systems that would automatically plan the flight path. These systems would integrate real-time air traffic information, Global Positioning System navigation, collision-avoidance technology, and preprogrammed knowledge of each airport and surrounding terrain to provide pilots with all the information they need to take off and land at unstaffed airports without the aid of air traffic control or advanced instrument landing skills. Eventually, flying may not be that difficult as the goal is to make everything totally automated. By 2005, NASA hopes to demonstrate four key SATS capabilities: higher air traffic volumes at unstaffed airports; lower landing minimums (the weather thresholds at which airports can continue to operate) at these airports; an overall improvement in safety and efficiency; and a plan for integrating SATS into the current system. The systems full

Wallace, James. "Air Taxi Flies in the Face of the Norm." *Seattle Intelligencer*. Eclipse Aviation. 19 Sep. 2002 <[www.eclipseaviation.com/inthenews.html](http://www.eclipseaviation.com/inthenews.html)>

<sup>2</sup> Scott, Phil. "Taxi! Taxi!" 8 Nov. 2002. *Popular Science*. 10 Nov. 2002 <[www.popsci.com](http://www.popsci.com)>

<sup>3</sup> Syrett, Nadine. *SATS Overview*. 27 Mar. 2002. NASA. 4 Nov. 2002 <[www.sats.larc.nasa.gov/overview\\_sats.html](http://www.sats.larc.nasa.gov/overview_sats.html)>



deployment phase at federal, state and local levels will occur in 2015 and SATS should be mature and fully operational by 2020<sup>4</sup>.

*Bombardier:*

The four segments of Canadian based Bombardier are Bombardier Aerospace, Bombardier Transportation, Bombardier Recreational Products, and Bombardier Capital. The operations of Bombardier Aerospace consist of designing, manufacturing, marketing, and selling business aircraft, regional aircraft and amphibious aircraft as well as providing aviation support and services. Bombardier Aerospace also includes a fractional jet ownership company named Flexjet, and Skyjet, an on-line private jet charter reservation service. Bombardier Aerospace is focused on strengthening its leadership in its target markets, and on innovation and the quality of its products and services. Bombardier claims to have the broadest range of product offerings in the business jet market from the light to ultra-long range segments. Currently, the majority of the industry's revenues are concentrated in the higher-end segments, the large to super-large jets. In 2001-2002 Bombardier Aerospace delivered a total of 162 business aircraft with total revenues of \$12.0 billion<sup>5</sup>.

*Eclipse Aviation and Safire Aircraft Company:*

These companies hope to revolutionize the industry by providing low-cost, fuel-efficient small private jets. Eclipse's goal is to produce an affordable private jet. The six-seat Eclipse 500, whose prototype was unveiled in July, has a pair of Williams International EJ22 jet engines that each weighs only 85 pounds yet produces 770 pounds of thrust. The Eclipse 500 costs \$837,500 and its operating costs are expected to be around 56 cents per mile. Eclipse has over 2,000 jets ordered (with nonrefundable deposits of \$97,500 each) and hopes to begin delivering them in 2004. This exhibits the current and growing demand for these new low-cost private jets.

Eclipse will be able to manufacture an estimated 1,500 aircraft per year at its full production rate by 2007<sup>6</sup>. This manufacturing technology has been adapted from Boeing and the auto industry. This high volume production is achieved by using innovative manufacturing practices including the use of friction stir welding instead of an aluminum tube held together by thousands of rivets, precisely machined parts, a modular approach to assembly, and modern supply chain management that leverages outsourced components. Using this technology will save time and labor costs.

Although Eclipse has successfully completed their first test flight, neither they nor Safire have completed all Federal Aviation Authority (FAA) requirements. Eclipse hopes to receive full FAA certification by the end of 2003 and deliver jets in early 2004. There are four major certifications: welding, avionics, the engine, and the aircraft. Eclipse is expecting the Williams EJ-22 engine used in their plane to be certified by the FAA by December of 2002. Eclipse is also trying to patent the friction stir welding manufacturing process.

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<sup>4</sup> [SATS Overview](#). NASA

<sup>5</sup> [Business Aircraft](#). Bombardier Aerospace. 29 Sep. 2002 <[www.bombardier.com](http://www.bombardier.com).>

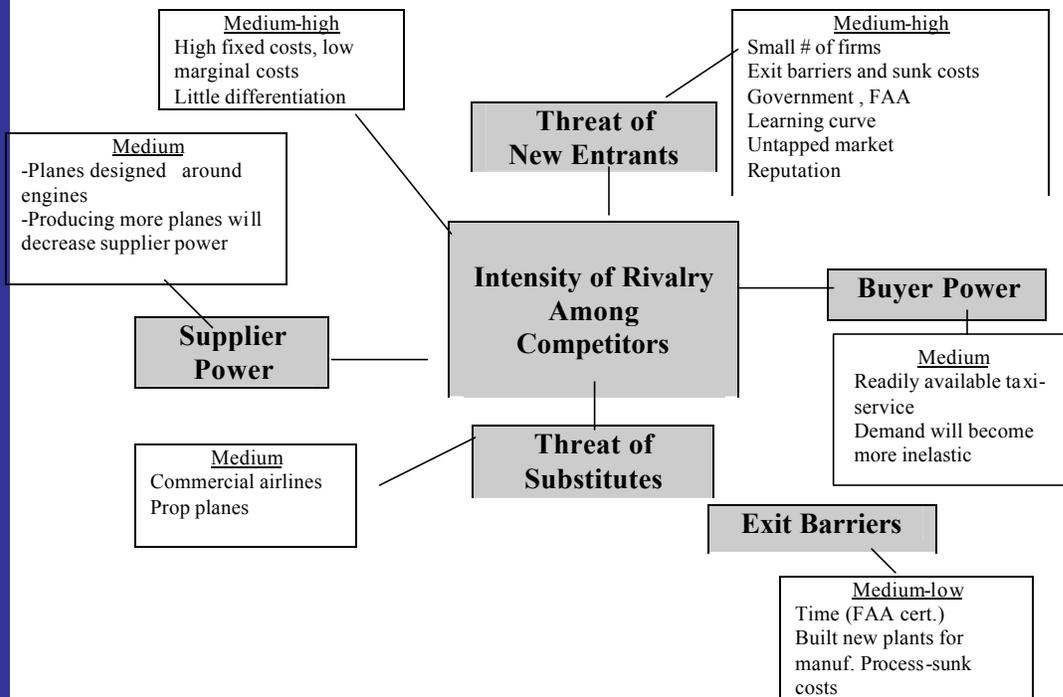
<sup>6</sup> Daniel, Caroline. "Eclipse Flies in the Face of Criticism." [Financial Times](#). Eclipse Aviation. 10 Oct. 2002 <[www.eclipseaviation.com/inthenews](http://www.eclipseaviation.com/inthenews).>

*New Low-cost Jet Industry Analysis:*

The structure of the industry is illustrated in the five forces framework diagrammed in Figure 2.

**New Entrants:** The threat of new entry in the new low-cost jet industry will increase as the jets get nearer to being FAA certified. By entering, Bombardier will be signaling that the market is growing and can likely hold more firms. Also, by investing heavily in research and development it will signal that new technology and new products are on the horizon. These forms of signaling will attract entrants into the new market. A number of significant entry barriers will help keep the threat of new entrants at a minimum. A major barrier that many in the air-transportation industry are watching is the FAA certification. Bombardier, having dealt with the FAA in the past will have the experience and funding necessary to help accelerate the certification of the new jets. Also, the FAA has been working with NASA and others on helping to develop SATS and new light weight jets. If nothing more, NASA and the FAA will be enthusiastic about entrants into the new jet market. Reputation is another barrier that is important in the jet industry. Being a first mover, Eclipse (if successful) will brand themselves as being low-cost and technologically innovative. By naming the new jet Learjet; Bombardier will take advantage of this barrier, as the Learjet name is synonymous with high quality and luxury.

**Figure 2.** New Light-weight Jet Industry Five Forces Analysis





**Threat of Substitutes:** The most significant substitutes will be commercial airlines as the cost of catching a flight on an air taxi is projected to be similar to the cost of a coach airline ticket. It is estimated that 8-12% of first-class passengers have moved to private jets<sup>7</sup>. This is due in part from post-9/11 frustrations of airline travel, inefficiency of airports and commercial airlines, and today's increased emphasis on time and efficiency.

**Buyer Bargaining Power:** Buyer bargaining power will increase as entry into this market increases. Although, as more people move from commercial airlines to air taxis demand will become more inelastic and this will have the effect of lowering buyer bargaining power.

**Supplier Bargaining Power:** Supplier bargaining power has traditionally been strong for suppliers of the engines and inputs as planes are designed around them and historically few planes are built per year. Eclipse is purchasing inputs at a fraction of the cost because they are buying large quantities compared to other jet manufacturers. Bombardier's entry could further reduce supplier's bargaining power because they can better negotiate on bulk prices as more inputs will be needed.

**Rivalry:** Due to new manufacturing technology that somewhat resembles an auto factory; the new industry will have high fixed costs and low marginal costs. This may increase rivalry among competitors. The new market this technology will create also increases rivalry as it will attract new entrants. Bombardier's strategy will be to differentiate their plane as high quality and to obtain a competitive edge by entering this market early. Although they are not technically "first-movers" Bombardier will be able to take advantage of some of the first mover advantages, namely the learning curve and market recognition.

**Complements:** Complements to the private jet industry are oil (jet fuel), a booming economy as demand follows the business cycle, pilots, commercial airline and airport inefficiency, and fractional jet ownership. Bombardier has quality complementarities, which can deter entry as complementarities can make it more difficult for competitors to imitate Bombardier's strategy. Quality complementarities include excellent and high-class service. The value of services as a quality complementarity increases when a jet is purchased.

We can therefore conclude that, if Bombardier pursues the strategies of differentiation, early entry, and development of complementarities, their participation in this industry has potential for sustained profits.

#### *Market Analysis:*

The new low cost private jets along with SATS technology is expected to attract new markets to the private jet industry. The air taxi concept is important to enable success in the new lightweight jet industry as the concept depends on the emergence of a new market. Vern Raburn, the CEO of Eclipse, estimates that a fleet of 50,000 aircraft will be

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<sup>7</sup> Sharkey, Joe. "Market for Corporate Jet Continues to Look Up." New York Times. 1 Oct. 2002  
<<http://www.nyt.com>>.

needed to meet the demand for air taxi services in the US<sup>8</sup>. Growing frustration of commercial airlines and airports is expected to help attract people to this industry. The low cost private jet manufacturers aim to attract current commercial airline passengers that include business travelers, vacationers, and personal travelers.

Expected buyers of these new jets include individuals, charter fleet operators, pilots, businesses (small and large), fractional jet ownership firms, and possibly commercial airlines. New companies have been formed around the new low-cost jets and the SATS technology. A new Switzerland-based international jet club company named Aviace AG has been formed entirely around Eclipse jets. So far, they have ordered 112 Eclipse jets.

The use of air-transportation is growing and expected to continue to grow, despite September 11th. In 2001, 570 million passengers boarded airliners and that number is projected to grow between 3 and 5 percent annually over the next decade<sup>9</sup>. Part of the growth of the private jet market in the past ten years can be attributed to the increase in corporate wealth through things like stock options. A current downturn in the economy and the rising trend towards corporate frugality may lead to purchases of the new low-cost jets instead of higher-end jets.

Another attribute of these jets is fuel-efficiency. The price of jet fuel fluctuates with the price of oil. Small businesses and individuals are not efficiently able to hedge fuel prices, so fuel efficiency can greatly lower the cost of flying a plane. The Eclipse has around the same fuel-efficiency as an SUV<sup>10</sup>. The new jets only have a maximum range of about 1,500 nautical miles, but 44% of all airline passengers in the US travel less than 400 nautical miles. The average number of passengers on a business charter flight is 2.7<sup>11</sup>.

The high-end private business jet market has grown around 400%. Production of big-cabin jets in the super mid-size category is expected to more than double in 2003, to 847 aircraft worth \$14.2 billion<sup>12</sup>. The high-end business jet market accounts for much of the private jet industries profits as customers seem willing to pay almost any price. Bombardier and other jet manufacturers are currently producing jets to rival the speed of the Concorde. These jets are marketed as being the fastest-in-their-class. This shows a divergence in the private jet industry from one that is comprised of high-cost small private jets and high-cost large private jets to one comprised of supersonic jets and super light-weight jets. By entering into the super light-weight market Bombardier will be protecting their market share of small private jets. Also, by entering into the new market they will be pursuing their strategy of providing the broadest range of product offerings in the business jet market from the light to ultra-long range segments. The differences between private jets of different segments are exhibited in Figure 3.

<sup>8</sup> Daniel, Caroline. "Eclipse Flies in the Face of Criticism." Financial Times. 25 Sep. 2002. Financial Times. 20 Oct. 2002 <<http://www.financialtimes.com>>.

<sup>9</sup> Sharkey, Joe.

<sup>10</sup> Lunsford, Lynn J. "Tech Pioneer's New Business Jets: Seats Six for \$850,000." Wall Street Journal. Eclipse Aviation. 15 Sep. 2002 <[www.eclipseaviation.com/inthenews.detail\\_02.htm?content\\_id=334](http://www.eclipseaviation.com/inthenews.detail_02.htm?content_id=334)>

<sup>11</sup> Edwards, Bob. "New Air Taxi Option, the Eclipse 500." National Public Radio, Morning Edition. 12 Sep. 2002. 20 Oct. 2002 <<http://www.npr.org>>.

<sup>12</sup> Aboulafia, Richard. "Industry Insights." Teal Group. American Institute of Aeronautics and Astronautics. 8 Nov. 2002 <<http://www.aiaa.org/market/index.hfm?mar=61>>



	<b>Eclipse</b>	<b>Citation CJ1</b>	<b>Learjet 40</b>	<b>Global Express</b>
Price	<b>837,500</b>	<b>3,800,000</b>	<b>7,400,000</b>	<b>40,000,000</b>
Speed (mph)	<b>408</b>	<b>430</b>	<b>534</b>	<b>590</b>
Direct Operating Costs (\$ per mile)	<b>.56</b>	<b>1.20</b>	<b>2.20</b>	<b>Not published</b>
Passengers	<b>5</b>	<b>5</b>	<b>6</b>	<b>19</b>
Range (nautical miles)	<b>1,500</b>	<b>1,313</b>	<b>1,803</b>	<b>6,010</b>
Operating Altitude (ft)	<b>41,000</b>	<b>41,000</b>	<b>51,000</b>	<b>51,000</b>

The new lightweight jets are expected to fair well in other countries as well. Markets in Europe, the Middle East, and Latin America are all growing. Bombardier Aerospace will be able to tap into this market as it already has an international presence with locations in the US, Canada, Middle East, Hong Kong, China, and throughout Europe.

Through our analysis of the private jet industry market we can conclude that Bombardier should enter the growing super light-weight private jet market as the market shows room for sustained profits.

### **Strategy Considerations**

#### *System enhancement strategy:*

This strategy involves improvement of the processing and error-correction activities. Processing activities are those that get a good to market. Error-correction activities are those that help minimize errors in processing. Improvements come from three broad sources: external technological changes, internal technological developments, and responses to environmental changes<sup>13</sup>. Bombardier needs to implement all of these sources of improvements including integrating SATS, more fuel-efficient engines, and new manufacturing processes into their aerospace business. This strategy fits well with Bombardier Aerospace’s corporate strategy. They strive to develop next-generation products in order to respond to emerging needs. A system enhancement strategy will enable Bombardier Aerospace to maintain their competitive edge in a technologically changing environment.

#### *Option value of investment:*

By entering this new market Bombardier will exercise the option of entering at a later time. Entering this industry will create new options, like the option of selling jets to a new market. Through research and development Bombardier will create options for improving their existing products and developing new products. Entering this market will enable Bombardier to stay at the forefront of research and development.

#### *Differentiation:*

The key to Bombardier’s strategy is to differentiate their plane as being high quality, not as low-cost. The manufacturing process and fuel-efficiency are what make the plane cheaper to manufacture and fly. Bombardier should utilize these factors to produce a

<sup>13</sup> McAfee, Preston. *Competitive Solutions*. Princeton, New Jersey: Princeton University Press, 2002.



new technologically innovative Learjet model plane. The Learjet brand name signals wealth and high quality. Eclipse is currently marketing their jet as “low-cost.” Bombardier will seek to differentiate themselves through quality as sustaining competitive advantages with quality tend to last quite a long time. Ways to differentiate include offering options, such as different grades of leather, built in LCD’s, and choice of paint colors and offering excellent service. By certifying their own mechanics and emphasizing safety Bombardier helps to alleviate worries about the safety of private jets which may provide a competitive advantage.

By utilizing quality complementarities Bombardier can deter entry as complementarities can make it harder for competitors to copy their strategy. A higher quality in one dimension will increase the value of quality in other dimensions<sup>14</sup>. Bombardier’s quality complementarities include excellent and high-class service.

#### *Pricing:*

Bombardier’s strategy should be to offer a differentiated jet from Eclipse. Bombardier should charge a higher price for their high-quality light weight jet. Branding their project a Learjet and charging a higher price, they would be engaging in a form of price discrimination. Bombardier could also utilize the concept of product bundling. Bombardier could bundle their new jet with quality service. The purchasing of a jet increases the need for service. By doing this, Bombardier will capture the enhanced value for each good that is created by the sale of the other good<sup>15</sup>.

#### *Industry Cooperation:*

Bombardier and Eclipse could both benefit by cooperating to get the jets FAA certified. FAA, NASA, Learjet, and Eclipse could possibly form a consortia aimed to help their common goal of making their vision reality.

In the past, inputs to private jets have been costly. Through cooperation Bombardier and Eclipse may be able to obtain less expensive inputs through the idea of economy of scale.

#### *Disadvantages of Entering:*

- By entering into this new low-cost market Bombardier will exercise their option not to enter into this new market and hence lose flexibility.
- Although SATS technology and the air-transportation industry seem to be moving towards the air taxi concept, this concept is still a vision and not yet reality.
- The market analysis is mostly projected and not certain.
- If Bombardier does not employ the differentiation strategy effectively, entering this low-cost market could risk tainting the high quality Learjet image.
- Also, by entering Bombardier will be signaling that the private jet market is growing and that new products and technology are on the horizon. This will have the effect of attracting entrants.

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<sup>14</sup> McAfee, pg 74-75.

<sup>15</sup> McAfee, pg 277-278.



### *Eclipse's Reaction to Bombardier's Entry:*

Eclipse could react in a few different ways. Eclipse could pursue a dissuasion strategy and offer a high-end model to compete with Bombardier. However, Eclipse would have trouble competing with Bombardier's quality complements. Eclipse could also pursue an accommodation strategy and make room for Bombardier to enter and both could aim to serve different niches. Eclipse may welcome Bombardier's entry as it would bring more credibility to their vision. Bombardier's entry would serve to create more momentum and support.

### *Commercial Airline Industry's Reaction to New Low-Cost Private Jets:*

The airlines could ignore Bombardier's entry. The airlines could become customers. United Airlines has expressed interest in entering the private jet market. The airlines could compete by lowering fares (especially business class), entering the market and producing their own planes, or conduct a negative advertising campaign against the new low-cost jets.

### *Government Reaction to Bombardier's Entry:*

The FAA and NASA should be expected to support entry into this new industry as it supports their vision of SATS and light weight jet industry.

The Federal Trade Commission (FTC) could support Bombardier's entry as there would be more than one firm, which would foster competition. If Bombardier and Eclipse cooperate they need to make it clear that this cooperation will increase competition, not reduce competition. If the cooperation leads to a lessening of competition they could face legal retribution from the FTC or the anti-trust division of the Department of Justice. This doesn't seem likely in the new low cost jet market as the advancement of these technologies will attract new entrants.

## **Conclusion**

Innovative technology like SATS and Williams' fuel-efficient turbo-fan engine very well might revolutionize the airline industry. To remain at the forefront of research and development Bombardier should pursue a system enhancement strategy. The private jet market is expected to continue to grow; this growth will be amplified with the new emerging light-weight jet market. To respond to the emerging light-weight jet growth market and sustain their competitive edge Bombardier should enter. Through the strategies of differentiation, early entry, and the development and use of quality complementarities, Bombardier will likely be successful in this venture.