



Boeing: Strategic Audit

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Executive Summary

The Boeing Company's success within the commercial airline industry is well known in the United States, and globally as they have been a staple in aviation creating some of the best aircraft that people have come to rely on as a source of travel.

Over the next 20 years, Boeing is forecasting 41,030 deliveries of their fleet (737 series, 747, 767, 777 series and 787)¹. The composition of Boeing's fleet delivery breaks down to; 2,370 Regional Jet airplanes amounting to \$110B, 29,530 Single Aisle airplanes \$3,180B, 5,050 Small Widebody airplanes amounting to \$1,340B, 3,160 Medium/Large Widebody airplanes amounting to \$1,160B, and 920 freighters airplanes amounting to \$260B.

As a consulting group we evaluated Boeing's current state of operations relative to the industry, all while gaining well rounded comprehension of where Boeing has been to get to this current state. From our analysis, we were able to look specifically at four different areas of recommendation for Boeing over the next 20 years; Product Development, Production Capacity, Growth Markets, and Financing Structure.

Product Development: Boeing currently operates five commercial airline aircraft. The 737 series, a single aisle aircraft, the 747 a medium large wide body, the 767 a small wide body, the 777 a medium large wide body, and the 787 another medium wide large body. Using a BCG Matrix, we were able to conclude recommendations for each aircraft. The 737 series is Boeing's most utilized aircraft with demand overwhelming providing the most capital for the corporation. We identified the 737 series to be a "Cash Cow" and recommend that Boeing continue providing development expenditures to the aircraft. The 747 has a historical demand of 1,539 deliveries since its introduction in 1968, but in the fiscal year of 2016, there were only 18 orders placed. We identified the 747 as a "Star", moving to the "Dog" quadrant over the next 20 years. The 767 was the original wide body aircraft and would later be characterized as a small wide body. With low historical demand of 1,104 aircraft and the development of future aircraft within this category, we identified the 767 as a "Question", moving to the "Dog" quadrant over the next 20 years. The 777 series may be the most intriguing aircraft that Boeing has in development. The medium wide body aircraft was developed to replace both the 747 and the 767. Demand for the 777 series has been growing since its first introduction in 1995. We identified the 777 as a "Star" and remaining a "Star" over the next 20 years. The 787 like the 777 has a lot of potential for growth. The 787 series were also developed to replace the 767 and has some features that are more desirable to do so. Developed in 2011, we identified the 787 as a "Questions", but moving into the "Star" quadrant over the next 20 years.

Production Capacity: Boeing currently has over 5,639 total backlogs between their five commercial aircrafts. This backlog amount concerned us as we have identified the commercial airline as a growth market with the continued demand for consumer travel. We evaluated the 20 years plan that Boeing published, and determined that the currently projected production capacity was not sufficient enough. To meet the high demand of the industry and reduce the number of backlogged aircraft orders we are making the strategic recommendation to produce 70 "737s" a month, 1 "747s" a month, 4 "767s" a month, 12 "777s" a month and 26 "787s" a month by the year 2029.

Growth Markets: Passenger travel growth for the past five years has averaged a rate 6.2%, with an expected growth of 4.7% annually for the next 20 years. The expectation of deliveries for the next 20 years of new airplanes is estimated to be 41,030 deliveries worldwide valued at \$6.1 trillion. For Boeing to keep most of the market share it needs to keep its competitive advantage. It must stay up-to-date with the technologies that goes into each airplane they make, they need to produce new families of airplanes that are more advanced, environmentally friendly, and more.

Financing Structure: Over the last 15 years, Boeing has rapidly grown its revenues. A significant amount of this growth has been funded by debt. Now Boeing carries a debt ratio of nearly one and has had a current ratio less than one. Given the significant effect of external factors outside their control can have on the company, this practice puts them at risk of defaulting on debt. It is recommended that over time, Boeing explore options to alter their financing structure to make the company more robust to these external factors.

Introduction

At the age of 29 in 1910, after establishing Greenwood Timber Company, William Boeing purchased a shipyard in Seattle, Washington to expand on his passion for boating.² Six years later of what was once a simple shipyard off the Duwamish River would become The Boeing Company's first airplane factory. Boeing was founded in 1916 and became one of the world's leading manufacturers of airplanes. "In 1976, The Boeing Company became the first U.S. firm to complete 60 years of continuous operation as a manufacturer of airplanes"³⁴

Nowadays, "Boeing is the world's largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems. A top U.S. exporter, the company supports airlines and U.S. and allied government customers in 150 countries. Boeing products and tailored services include commercial and military aircraft, satellites, weapons, electronic and defense systems, launch systems, advanced information and communication systems, and performance-based logistics and training."³⁵ This allows the company to operate within five industry segments:

1. Boeing Military Aircraft
2. Network and Space Systems
3. Commercial Airplanes
4. Boeing Capital
5. Global Services and Support

Within the commercial airplanes segment, Boeing is a dominant player in the marketplace with over 40% market share. It currently offers five families of aircraft. The 737 is its oldest and most popular model and promises strong revenue into the future. The 747 is the largest family and competes in the medium to large widebody segment. The 767 is a small widebody plane that's found a niche use in the freighting industry. Both the 777 and 787 are medium widebody planes intended to improve on the weaknesses and capabilities of the previous 747 and 767 aircraft. Boeing's primary customers are commercial airlines, and its secondary customers are commercial freighters. For each of these customer groups, Boeing offers significant customization possibilities and additional services of support to suit the customer's needs.

For the purpose of this analysis, it has been assumed that the overall performance of the Boeing Company is reflective of its performance in the commercial aircraft segment, which this report will focus on exclusively. Additionally, the same assumption has been made for Boeing's competitors and the performance of the industry as a whole. Where possible, Boeing published information on strategy and company operations have been used as an indication of the company's current direction for the basis of this audit. All financial data has been pulled from SEC public information and accessed via the Wharton Research Data Services (WRDS) database.³³

External Environment & Industry Analysis

Customer Analysis

With 92% of their fleet as of 2016¹, Boeing's key market segment is the commercial airlines industry. Boeing's own Current Market Outlook 2017-2036 (Boeing CMO reference) sheds light on this key customer segment. "Low air fares, higher living standards with a growing middle class in large emerging markets, and the growth of tourism and travel relative to total consumer spending in major economies are all driving strength in the demand for air travel"¹. The need for new planes in developing markets and both the need for new planes and replacement for existing planes in developed markets creates the need for Boeing to develop aircraft that meet the needs of today's market. Airlines in today's world value fuel efficiency, layouts for increased seating density, the ability to support high volume and low yield operations, and standardization. Going forward, this market is expected to grow at 4.7% per year for the next 20 years. In line with the espoused needs of the market, the fastest growing airplane segments to support this market are the single aisle and small widebody segments at 114% and 155% respectively. As such, Boeing must pay attention to its future product development to create products to suit the customer needs. See Appendix D BCG Matrix and Product Development Strategy recommendation section below for more information.

Competitive Analysis

Boeing's main competitor in the commercial aircraft industry is Airbus SE, a European Aeronautic multinational corporation. The company founded in December of 1970 and has a current revenue of €66.58 billion for the 2016 calendar year. This revenue figure makes Airbus the most intriguing, if not the only competitor within the near duopoly of the commercial aircraft industry.

Airbus currently develops nine different aircraft and jet models, A300, A310, A320ceo, A320neo, A330ceo, A330neo, A340, A340, A350, and A380. The line of models creates a slight disadvantage to Boeing due to their reduced ability to provide a wide spread slate of aircraft. Boeing, in comparison to Airbus, develops fifteen different commercial aircraft and jets, the 707, 717-200, 727, 737 original, 737 classic, 737 NG, 737 Max, 747, 747-8, 757, 767, 777, 777x, and 787. Based on Boeing's delivery index as of September 2017⁴, of the 24,186 orders, 18,527 were delivered. Airbus, had 17,370 orders, with 10,662 delivered as of September 2017⁵. The two corporations were requested for high volumes of orders for their respective most desired aircraft. For Airbus, buyers ordered 13,308 A320's. As previously noted, the A320 comes in several different configurations, garnering popularity and familiarity from buyers. Boeing was able to file 14,148 orders for the variety of their 737 aircraft. There was a larger discrepancy between orders from Boeing with the failure of producing adequate deliveries for their 737 Max. The 737 Max has a total of 3,872 incomplete orders. By the numbers Airbus has been able to produce 7,472 single aisle planes, A320's, with 399 of those deliveries coming since June of 2017. Boeing's 737 single aisle series recorded 418 deliveries since June of 2017.

Airbus takes a customer centric viewpoint in its strategy and uses market feedback heavily in its product development. At the center of its operations, Strategy and Marketing come together under a single leader to inform company operations. Airbus sees this as essential given the strong link between these two departments. "Marketing is about understanding how our products meet the needs of customers and Strategy is about anticipating how those needs will evolve and proposing products and services adapted to their future business environment and the world they operate in"⁶. In support of this focus on customer driven development, Airbus

supports experimentation with new ideas and has created a project-focused culture. These further its ultimate pursuit of creating a “better connected, safer and more prosperous world”⁸.

Airbus is proud of its European heritage and maintains close ties with powerful EU governments from which it came. Part of this takes the form of Reimbursable Launch Investment in which country governments put up funds for the development of an aircraft in exchange for royalties on a defined amount of future plane sales¹⁰. This helps cover the cost of development without requiring commercial debt or the use of Airbus’ own funds. This strength for Airbus also has created problems however. Primarily, the World Trade Organization, at the request of the US government, brought forth a case against select European governments for illegal subsidies to Airbus, which allows it an unfair competitive advantage in the global market.

As part of its global strategy, Airbus has acquired a majority stake in rival Bombardier’s C-Series aircraft⁹. Airbus will bring its expertise in procurement, sales and marketing, and customer support to aid Bombardier in exchange for a 50.1% stake in the program. The C-Series promises a well-suited addition to the Airbus product line in the 100-125 seat aircraft size. This presents its own challenges though. Similar to the WTO case against EU governments, Boeing has pushed a similar case of illegal subsidies to the US Department of Commerce against Bombardier for aid received from the Canadian and EU governments. The US Department of Commerce sided with Boeing and has applied a 300% tariff on all C-series aircrafts sold to US customers⁷. Airbus intends to get around this by manufacturing the US bound C-Series aircraft in its own US manufacturing plant, but it is unclear if this will work. This issue remains open until a final decision in 2018.

Porter’s Five Forces

To best evaluate the External Environment for Boeing within the Commercial Aircraft Industry, we opted to first begin the analysis by utilizing Michael Porter’s Five Forces as a barometer for where we see Boeing relative to the industry. We looked at Boeing relative to the five forces and attributed one of the following characteristics; very low, low, moderate, high or very high. To further explain the initial characteristic of the given force, we determined sub categories or forces that led to the result of the force being very low, low, moderate, high or very high. From this exercise we were able to determine the following:

Rivalry among existing Competitors: Moderate

There were five factors that contributed to a characteristic of moderate for the rivalry among existing competitors. Those factors were fast industry growth, few competitors, high switching costs among customers, diversification of portfolios and high exit barriers.

The fast industry growth yielded a very low characteristic signifying that the due to fast industry growth, rivalry amongst competitors and significant year over year demand growth, the industry provides for a very low rivalry amongst existing competitors as there is ample demand to go after. Example of this is Airbus’ current 6,645 aircraft backorder amounts⁵. This led us to look at the very low characteristic of the few competitors within the commercial aircraft industry. Boeing currently represents nearly 45% of the global aircraft market^{11,12}. As of 2016 the Commercial Aircraft industry has been operating as a near-Duopoly between Boeing and Airbus. The two companies have dominated the industry with high market share and growing revenues. In 2016, Boeing, recorded revenues of \$94.6 billion, while Airbus recorded revenues of \$77.65 billion. What Boeing and its rivals have been able to do is keep switching costs among customers high. Given the knowledge of how to service/use/operate certain equipment, this we felt that it was appropriate to state that this characteristic was low within the rivalry amongst competitors. There were two areas that yielded characteristics of high, which ultimately led us to characterize the rivalry amongst competitors as moderate. Rivals diversification of portfolios

leads to diverse competitors, and the industry has high exit barriers, which tends to increase competition across the industry.

Bargaining Power of Suppliers: Low

There were five factors that contributed to a characteristic of low for the Bargaining Power of Suppliers. Those factors were easy replacement of suppliers, power to negotiate supplier prices, high expectations of suppliers, current supplier relationship and success, and costly design changes and testing.

The suppliers that Boeing currently works with have a very low bargaining power due to the easy ability for Boeing to replace a given supplier, with a supplier that can duplicate a needed part or piece of equipment. Boeing has a high volume of international vendors in 65 countries with over 20,000 contracted suppliers¹³. This also leads to Boeing possessing the power to negotiate supplier prices due to volumes. This characteristic also rated very low for the bargaining power of suppliers. In the current supplier structure, Boeing has the ability to fund their vendors through their third-party branch, Boeing Capital Corporation. Boeing Capital Corporation supports business units, managers, portfolios, and ensures the ability of financing for their current and future customers and suppliers. The bargaining power of suppliers remains low as Boeing has high expectations of suppliers. The stringent expectations are created through their Corporate Social Responsibility program and strict quality marks¹⁴. The supplier environment set forth by Boeing also inspires collaboration and expects vendors to be excellent in sustainability. Although the final characteristic of the bargaining power of suppliers yielded a low, there were two areas that we characterize as high. Boeing is dependent on current supplier relationship to drive their success, and suppliers are locked in with design releases with costly design changes and testing. Stated on a sub website, Boeing states that, “The relationships we forge with suppliers are key to our team’s agility, integrity and competitiveness”¹⁵

Bargaining Power of Buyers: Moderate-High

There were four factors that contributed to a characteristic of low for the Bargaining Power of Buyers. Those factors were high switching costs, demand created by buyers’ customers, Growing number of buyers and similar products serving similar purpose.

To clarify this segment, we determined that buyers are considered any airline that seeks aircraft to then operate. Buyers of Boeing products experience high switching costs due to different control systems and service needs. Because of this, we deemed these factors a low for the bargaining power of buyers. What increases this factor to moderate high are the remaining three factors. The demand caused by buyers’ customers yielded a moderate as the customer satisfaction of the aircraft is important not only for the buyer, but for Boeing. This leads to a moderate/high as a growing number of buyers, which creates incentive to capture new market opportunities. Similar products serving similar purposes among competitor offerings creates a high characteristic for the bargaining power of buyers.

Threats of Substitute Products: Moderate

Although there were only three factors that contributed to a characteristic of moderate for the Threats of Substitute Products, we believe that the sub factors serve a significant threat to Boeing. Those factors were that flying is the most convenient method of long distance travel, traditional forms of transportation and the Hyperloop.

Boeing is in a safe position when it comes to flying being the most convenient method of long distance travel. Flying has become ingrained in modern society and has momentum with future generations¹⁶. Because of this the threat of a substitute yields fairly low for Boeing. However, when it comes to short distance travel, and travel during high peak seasons, traditional

modes of transportation such as cars, trains, buses, boats and trucking creates for a moderate level of for a threat to Boeing. The most significant of these traditional modes of transportation comes with the advancement of technology and innovation with cars. Due to third party entrance and tech advances, more people are willing to fly, but companies like Uber, Lyft, and the advancement of car mileage distances has created an interesting threat to Boeing and flying in general. The largest threat to Boeing may be with an Elon Musk inspired project and company, Hyperloop, from the “The Boring Company”. We characterized Hyperloop as high as it possesses a real threat to flying and Boeing. The reason we established this as “high” opposed to “very high” is due to the time frame of completion of the Hyperloop, along with the effective coordination from the company, society and the United States government. The Hyperloop and The Boring Company experiences their first level of success with the announcement of approval to begin working on the Hyperloop to connect Washington, DC, with New York City^{17, 18}.

Threats of New Entrants: Very Low

Threats of New Entrants yielded a characteristic of very low due to five factors that all ranked very low to low on our rating scale. Those factors were that Boeing’s several acquisitions of companies over the years, High Research and Development (R&D) costs, high capital and knowledge costs to join industry, a slow sales cycle and high trust in existing competitors.

To fend of new entrants, Boeing has acquired several companies over the years. The acquisitions have kept the field of competition low, which makes the threat of new entrants very low on our scale²⁰. In addition to company acquisitions, the costs of R&D in the commercial aircraft industry is extremely high, which makes the threat from new entrants very low. The R&D in the industry can be confused with the existing capital and knowledge, however we felt that it was appropriate to establish the high capital and knowledge costs to join industry as its own characteristic. Due to the ability to obtain capital, we see this as a significant deterrent, which again makes the threat of new entrant’s low to Boeing¹⁹. For companies to enter into the commercial aircraft industry, there must be an attracting revenue generation proposition. However, we determined that a slow sales cycle, results in a long-time frame to realize revenues. This along with high trust in existing competitors again yields low for the threat of new entrants.

Industry Attractiveness

When it comes to the aviation industry, there are many key success factors involved, but six that stand out: economies of scope, well-developed internal processes, establishment of export markets, ability to accommodate environmental requirements, economies of scale, and access to the latest available and most efficient technology and techniques. Where the economies of scope provides more opportunities and outputs for larger businesses at a lower cost, the company gets a competitive edge when it has an efficient inventory systems and cost management systems, access to overseas market can have a positive impact on the company's profit, in this era a lot of people are more environment friendly and this is increasing more demand to manufacture a more eco-friendly aircraft, economies of scale allows massive cost reductions across products ranges, and finally the use of new and improved technology gives the company more competitive edge over its competitors such as fuel efficiency and more.

Boeing has put together several plans to leave a positive footprint on this world. There is no denying that there will be impacts from airplanes. It is critical that policies and plans formed to leave minimal effects on the planet while they continue to operate in this industry. Modernization and technology advancements will help monitor and eliminate past environmental hazards. Boeing will remain committed to providing an environmental friendly product and will continue the campaign of zero additional greenhouse emission in 2017 and moving onward into the future generations of Boeing.

Internal Environment Analysis

Boeing Goals Timeline

Boeing sets its sights on their enterprise strategy goals: Operate as One Boeing, Build Strength on Strength and Sharpen and Accelerate to Win. Their 2025 goals focus on a wide scope, including market leadership, top-quartile performance and returns, growth fueled by productivity, design, manufacturing and services excellence, accelerated innovation, global scale and depth, best team, talent and leadership, and top corporate citizenship. The former provides a framework for maintaining business excellence and propelling the company through the rapidly evolving transportation industry.

Though this framework details all aspects of success in the many years from now, we should consider the near future (two to five years). This consideration borrows from the competitive analysis and Porter's Five Forces analysis. Because Boeing has a strong hold on the market and competition is not a large threat, we can consider competition that may not even exist yet.

Boeing must keep their competitive edge by focusing on producing high quality and technologically advanced aircrafts. If innovations in transportation come to fruition (like the Hyperloop), flight companies may see a drastic decrease in national travel and, likely, Boeing would see a decrease in demands for new aircrafts such as the 737 MAX. Because the demand exists now, Boeing should focus intensely on their production and output to meet the demand as much as possible. They can capitalize on the demand now as a buffer for the future. The strategic goal plan will run through 2025 and be reviewed by the board to stay on pace with the line of sight.

Financial Analysis

A cursory inspection of Boeing's financial performance shows an ROE of nearly 600% over the last fiscal year. Looking through time, Boeing has an extremely variable ROE from year to year. Some of these returns are exceptional and require a more in-depth look to fully understand. To do this, the WRDS database³³ was used to construct a DuPont Analysis of Boeing's performance over the last 16 years and allows a detailed look at the financial components creating such returns.

Year	Profit Margin	Asset Turnover	Equity Multiplier	ROE
1999	4%	160%	3.2	20.1%
2000	4%	122%	3.8	19.3%
2001	5%	120%	4.5	26.1%
2002	1%	103%	6.8	6.4%
2003	1%	95%	6.5	8.8%
2004	4%	97%	4.8	16.6%
2005	5%	91%	5.4	23.3%
2006	4%	119%	10.9	46.7%
2007	6%	113%	6.6	45.2%
2008	4%	113%	-41.6	-206.5%
2009	2%	110%	29.2	61.7%
2010	5%	94%	24.8	119.6%
2011	6%	86%	22.8	114.3%
2012	5%	92%	15.2	66.5%
2013	5%	93%	6.2	30.8%
2014	6%	91%	11.4	62.9%
2015	5%	102%	14.9	81.7%
2016	5%	105%	110.2	599.1%

DuPont Analysis

The DuPont Analysis table shows that through time, profit margin has been very consistent, even though America's great recession. This suggests the company has been very consistent in its operating efficiency. That the profit margin is consistently positive and in line with industry averages²⁵ is a good sign. Similarly, Asset Turnover is fairly consistent throughout the years. With values near 100%, Boeing successfully uses their assets to efficiently generate revenue. This is impressive given the significant revenue (and asset) growth the company has created over the last 16 years. This leaves only the equity multiplier to explain variation in ROE. From looking at the equity multiplier over time, there is a clear increasing preference for using financial leverage to fund company activities. The increasing ratio between assets and equity must be made up with leverage. Indeed, in 2008 debt surpassed assets resulting in a negative equity multiplier and resulting ROE. The exception to this trend is the most recent fiscal year where the massive change in ROE was due not to an increase in debt but instead to a massive reduction in equity through a ~\$7B stock buyback which converted most of the shareholder equity to treasury stock. See financial details in Appendix B for more details. The ultimate takeaway for this analysis is that Boeing has shown consistent aptitude in the realms of operating and asset utilization efficiency but is certainly willing to engage in financial engineering and take on debt to finance company activities. Possibly, this is a sign of the confidence management places in the company's ability to perform.

Such a notion is supported reasonably based on past history. Through time Boeing has maintained favorable debt and current ratios, indicating they maintain enough assets in the long term and, particularly, capital in the short term to cover their debt. The exception to this is the 9-year period starting in 2000 where Boeing's current assets were just short of its current liabilities on average. This resulted in negative working capital turnover despite a high magnitude for the ratio when comparing to their closest competitor, Airbus.

On other high-level metrics, Boeing and Airbus compare similarly. Shown in Appendix C are the Price-to-Earnings ratio, Profit Margin, and ROE of each company plotted through time. With the exception of the previously mentioned financial engineering that causes large swings in Boeing's ROE, the two companies are achieving similar performance.

SWOT Analysis

Strengths:

- Strong history in the industry and common household name: Boeing is one of the two major commercial jet airplanes manufacturer in the world, which gives it a strong market position given its existence for more than 100 years. Boeing delivered 60 more commercial airplanes in 2016 than its number one competitor for a total 748 airplanes, and 115 more widebody airplanes.²¹
- Landed defense contract in 2000 that now accounts for 30% of the company's revenues.
- For commercial use Boeing accounts for 50% of the market with over 10,000 aircrafts flying around. This is attributed to their 7-series line that is used by a majority of the airlines.
- Internal financing for their customers has leveraged their sales as customers can use "in house" funding.
- With 70% percent of sales being completed outside the United States which enforces their diverse programs.
- Forward thinking in technology developments
- Focus on R&D: The company's R&D accounts for \$4.6 billion in FY2016. Boeing is always expanding its product line to meet customer needs and tries its best to be the technological leader in the industry, and that is why it's spends lots of money on the Engineering, Operation, and Technology (EO&T) activities. "EO&T is an advanced R&D organization which provides technical and functional capabilities to Boeing. It is focused on innovative technologies, improved processes and the creation of new products."³

Weakness:

- Highly leveraged. Current ratio is extremely close to 1. A financial blip would decrease ability to pay back suppliers immediately
- Execution (especially with 787 Dreamliner): Boeing fails to meet deadlines when it comes to delivering commercial aircraft. “Boeing said the 787’s first flight won’t take place until the end of the second quarter, a three-month delay from the company’s most recent estimate”²²
- Labor Unions: “Approximately 57,000 employees, which constitute approximately 38% of the company’s total workforce, were union represented as of December 31, 2016.”³ Having unions especially with this high percentage in a company leads to work stoppages and delays when these unionized employees go on strikes.
- Larger Dependence on Suppliers: Boeing depends on other companies and suppliers to provide raw material, integrated components and more. “In 2016, Boeing spent nearly \$60 billion with more than 13,000 suppliers from all 50 U.S. states and 48 countries. Supplier-provided components and assemblies make up approximately 65 percent of the cost of Boeing products.”²³ If there is a delay from one of those suppliers, which might lead to a delay in the whole manufacturing process which will not allow Boeing to meet deadlines to its customers.

Opportunities:

- Increasing demand from commercial airliners: Boeing’s commercial market outlook for the period 2017-2036 projects a \$6.1 trillion market value for 41,030 new airplanes over the next 20 years as the current world fleet more than doubles in size¹
- High demand in air travel
 - Increased means of consumer income
- High backlog: Boeing has 5,651 backlogs of commercial airplanes as of September 30th, 2017²⁴. This number shows great future growth in customer orders for Boeing with expected increase of 10 more planes per month of the 737 aircraft by 2019²⁴. Therefore, the higher demand the company is expecting the stronger indicator of its product value in the market

Threats:

- Hyperloop, and other modes of transportation (cars, trains, buses)
- Transportation tech advances
 - Driverless vehicles
 - Uber, Lyft
 - Car mileage advances
- Political atmosphere (economy, presidential/congress cycles): Changing economic and geopolitical tides are threat to the company’s business. Boeing’s revenue is heavily tide to its international business, with an expected market value of \$180 billion in Africa in the next 20 years, \$2.5 trillion in Asia-Pacific, 1.085 trillion in China, and \$320 billion in Northeast Asia¹. If any political issues arise in any of these markets that will affect the bottom line for the company in a negative way.

Ethical Implications

For Boeing to remain ethical in the industry they will have to continue their current practices and also forecast to future generations to remain an ethical household name. Boeing will have to remain focused on two areas to achieve the ethical rankings they have. The two focal points are employee satisfaction and creating sustainable products that put the world first.

To continue a culture of ethics within the company Boeing will have remain competitive and take care of their employees and create a culture that is adaptive and healthy for the wellbeing of the people who operate the company. Incentive programs such as growing tomorrow's leaders will be critical as the future of their company relies solely on how they cultivate the leaders of tomorrow. This will naturally cause growth in the workforce as the employee satisfaction will be high. The leadership development program will establish growth in sustainability a program such as this will “develop the capabilities of

future leaders.”³²

Boeing has government contracts that have bound them to remain up to date on being an environmentally safe in regard to production practices. This is achieved by Boeing being smart on who they work with and the standards they hold their vendors to. Programs such as Boeing global engagement has created opportunity for Boeing to give back to local and worldwide communities. Boeing's most notable milestone in ethical decisions is to pledge to a zero growth in greenhouse gas emissions, water intake, solid waste to landfill and hazardous waste generated from company operations in 2017 from the 2012 numbers³¹. Policies such as these will create a positive effect for remaining a common worldwide household name.

Strategic Recommendation & Action Plan

With critical threats arising with a changing world we recommend that Boeing looks into capturing new ventures through technology based modes of transportation

“Commercial aviation is a dynamic industry that continuously adapts to various market forces. Forecasting long-term demand for airplanes requires assumptions and predictions about the macro trends and drivers that will shape the airline industry far into the future. A multitude of factors are at play, and they often vary from market to market. However, we can broadly categorize three key dimensions of the macro environment that drive airplane demand forecasts:

- The underlying demand for air travel.
- The regulatory, infrastructure, and technology environment.
- The strategies and products airlines offer in the marketplace.”¹

Product Development Recommendation

Based on the BCG Matrix in Appendix D, the following recommendations are being made for further development of Boeing aircraft models/model segments.

737 - The 737 is Boeing’s cash cow. Fitting into the single aisle aircraft, it is used primarily by airlines for domestic and short-range point-to-point or point-to-hub routes and makes up 67% of the fleet of the current production of Boeing aircraft as shown in Appendix D. Over the next 20 years, this segment is expected to grow by 114%¹. Particularly under the assumption that shorter point-to-point routes will open up, Boeing should aggressively place the 737 in the growing market. By taking a customer centric approach and making design and feature tweaks to the 737 to improve its appeal, Boeing will be able to win business in this growing segment. It is recommended that internal efforts focus on growing the 737 into a star in preparation of its market segment to more than double in the coming years.

747 - Boeing 747, also known as the ‘Queen of the Skies’, is most notable for its use as the presidential aircraft and luxury commercial airlines. It has been in production since the end of the 1960s, and it took more than 50,000 employees to bring it to life. After introducing it in the mid-1960s, it took 29 months to get the idea from a piece of paper to full life model. Its first flight was in 1969 and became a commercial airplane in 1970. A modified version of this airplane has been used by NASA to do some studies such as air turbulence, and ferrying space shuttles. Its Cargo version is used by many shipping companies like UPS, and more. It's being used by 10 commercial companies, and it is the Air Force One airplane. Airlines have opted to increase seat density instead of moving to bigger planes to handle extra travel demand and have not faced customer backlash for doing so. This leads to our recommendation to moving to 747 to Dog as there is less and less demand for such airplane in the industry. It might still be alive in the cargo section of the industry as its huge size allows shipping companies to move more inventory in less time, but when it comes to people’s preferences, they prefer to use single aisle jets than the ‘queen of the skies’.

767 - The 767 is a small wide body plane available in 4 different passenger plane configurations (primarily affecting the fuel range) and one freight configuration. Seating arrangement for passenger models varies with airline options. All airplane models have identical outside dimensions. The 767-300 Freighter is equipped with a main deck cargo door that enables it to load cargo containers and/or pallets on the main deck. The main deck can accommodate either a manual cargo handling system or a powered transfer system²⁶. The 767-300 Freighter does not have windows and doors, except for the left entry door for crew access. We believe that there will be constant demand for this aircraft, whether for middle of the line transportation or

for freight usage, so this aircraft should remain in the production lineup. Boeing can consider feature upgrades and updating technology in these planes as it advances but should limit any further R/D or putting additional resources into the development of this line of aircrafts. We've designated this aircraft as a Dog on our matrix; as such we recommend that Boeing maintains its production, but without much further advancement of the line.

777/777X - The Boeing 777 series is a wide-body jet airliner manufactured in the United States Boeing Commercial that first took flight June 12, 1994. The aircraft seats between 314 to 451 passengers, (9,695 to 17,594 km). Boeing set out to develop this aircraft to close the gap and potentially replace the 747 and the 767. Since both the 747 and 767 are still in production, the 777 series have replaced older wide-body airliners that they had in production that could help increase the range of the aircraft. Today the 777 series has a range of 5,235 to 9,500 nautical miles. Of the five aircraft, the 777 is perhaps the most unique given the way that it was designed. The aircraft was designed with computer mediated controls and computer aided design²⁷. The 777 series has similarities to the 787 Dreamliner, however the 777 continues to be one of Boeing's bestselling aircraft due to its modern features and fuel efficiency. The 777's direct competition is the Airbus A330 and A350. The A330 and A350 were developed to challenge the 777. Although there are significant competitions, sources reveal that the consumers are favoring the 777 and future 777x²⁸

This aircraft has been designated as a "Star" within our BCG Matrix (Appendix D). We anticipate this aircraft remaining within this quadrant, however we also are recommending that the 777-series potential fulfil its desired purpose and replace both the 747 and the 767. There's an opportunity to further expand on the 777 through Research and Development to replace the 747 and 767 for commercial flights. Boeing continues to enhance the features of this aircraft with the 777x that was announced by Boeing in November of 2013. With the demand for bigger, faster, and more fuel-efficient aircraft, Boeing will have the 777x into service by 2020.

787 - Being the latest design to Boeing's portfolio of commercial aircraft, the 787 Dreamliner is equipped with many features not found in older models such as the 767 and 747 that it is at least partially intended to replace. These include composite construction, fuel efficient aerodynamics and engines, lithium-ion batteries, and fly-by-wire and other electronic controls. The \$32B development cost²⁹ to develop this aircraft though, led to a rocky start for the first few years of production. A series of lithium-ion battery fires while in service and various production issues causing delays, creates some concern for the future of the Dreamliner.

With those issues resolved, there is promise for the 787. For fiscal year 2016, the 787 received the second most orders for all of Boeing's platforms (see BCG Matrix in Appendix D), signaling that existing commercial aircraft buyers (typically airlines) have an interest in the new design. With 670 order backlogs as of October 2017²⁹, Boeing has the opportunity to refine and improve the production efficiency to try and capture more value from its new product.

Given the increasing demand for travel, crowdedness at the world's airports, and shift in travel preferences from hub and spoke to point-to-point routes³⁰, Boeing would be well served to prepare for growth of the 787 programs since it offers advantages in all of these areas. In fact, market research suggests that the two market segments the 787 competes in, the small wide body and medium wide body, are expected to see 155% and 84% growth over the next 20 years¹. As such, it is strongly recommended that Boeing take action to prevent any further quality problems or production delays, spend on communication with customers on the 787's benefits, aggressively integrate customer feature requests, and optimize production efficiency to maximize what likely be a growing product line in the coming years.

Production Capacity Recommendation

By the end of September 2017, Boeing has a staggering number of backlogs for their commercial aircraft demand. There are 5,639 total backlogs between the 737, 747, 767, 777 and 787. It's a major concern, as over 4,431 of those backlogs are with their 737 aircraft, the aircraft that we determined was a "Cash Cow" (Appendix D) for the corporation. The Backlog concerns are not only a general concern from within our audit, but we can see that there are customer satisfaction concerns due to consumer expectation and there is a growing threat of up and coming manufacturers in China and Canada.

Not only is there a true concern for the backlog, but we have growing concerns with the production capacity. As of September 2017, Boeing has published plans to increase their production capacity. The may be a long-term development, but one that we are also in line with. Boeing produces the 47 of the 737's a month, 0.5 of the 747's a month, 2.5 of the 767's a month, 5 of the 777's a month and 5 of the 787's a month. Based on the (Appendix E) Table, Boeing only indicates future plans for production capacity for the 737 series and the 787. Our concern is with the level of backlogs relative to the production pace. With an optimistic outlook and taking into consideration the 2019 production changes with the current order demand remaining as it is (640 "737" series, 18 "747s", 101 "767s", 427 "777" series and 683 "787s") it will take roughly 77.5 months (6 years and 5.5 months) to cover the current backlog order of 4,431 for the 737 series, 34 months (2 years and 10 months) to cover the current backlog order of 17 for the 747 series, 41 months (3 years and 5 months) to cover the current backlog order of 101 for the 767 series, 86 months (7 years and 2 months) to cover the current backlog order of 427 for the 777 series and roughly 49 months (4 years and 1 month) to cover the current backlog order of 683 for the 787 series.

Based on these projected production numbers and a looming growth of competition due to current the backlog, we are making the strategic recommendation to produce the following over the next 10 years:

Aircraft	Current Production Rate	Recommended Future Changes	Backlog
737 Series	47 / month	70 / month in 2029 (+23)	4,431
747	0.5 / month	1 / month in 2029 (+0.5)	17
767	2.5 / month	4 / month in 2029 (+1.5)	101
777 & 777x	5 / month	12 / month in 2029 (+7)	101 & 326
787	12 / month	26 / month in 2029 (+14)	683

Data from Boeing's investor fact sheet²⁴

We believe that by making these production increases, Boeing will be able to continue fulfilling the backlogged orders that are pending, while getting ahead of the demand curve by producing the aircraft that are either in development or not.

Market Growth Recommendation

"Worldwide air travel has grown at a historically brisk pace. Year-over-year passenger travel growth for the past five years has averaged 6.2 percent. Low air fares, higher living standards with a growing middle class in large emerging markets, and the growth of tourism and travel relative to total consumer spending in major economies are all driving strength in the demand for air travel"¹

Being is expected a global forecast for the next 20 years with 41,030 deliveries (23,470 are estimation for the growth in the industry, and 17,560 are replacement for aging aircrafts), set at \$6.1 trillion market value, 4.7% traffic growth, and 3.5% fleet growth. Of the 41,030 deliveries of new airplanes, 2370 are expected to be regional jets with a value of \$110 billion, 29530 are single aisle valued at \$3,180 billion, 5050 are small widebody with a value of \$1,340 billion, 3160 medium/large widebody valued at \$1,160 billion, and 920 freighters valued at \$260 billion.

When it comes to passenger traffic, the number of passengers traveling annually has grown from 100 million in 1960, to over 3.6 billion in 2016, and it is expected to keep on growing on an upward trajectory especially in Southeast Asia, China, and India where the economies are expanding, and more people prefer air travel over other methods of transportation. Based on previous data from 1960s to 2016, we can expect a long-term demand in the industry with a growth rate of 4.7% per year over the next 20 years.

Let's focus on each market/region where Boeing operates and see what we believe the outcome will be within the next 20 years:

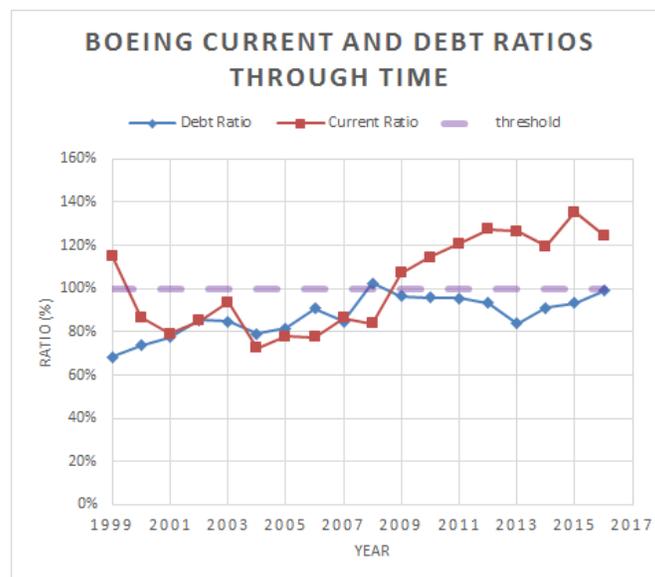
- Africa: when it comes to aviation industry in Africa, there is a lot of positive developments underway as it plays an important role in connecting all the African cities and countries with each other. the carriers in Africa are expected to grow 5.9% annually for the next 20 years, and with this growth, a total of 1,220 new airplanes are expected to be ordered. Most of the planes will be single aisle jets which are expanding from 58% to 66% of fleet totaling 74% of the total deliveries, and 23% will be widebody airplanes, and the rest will be regional jets totaling \$180 billion dollars in new planes.
- Asia-Pacific: Asia-Pacific comprises nearly 40% of the worldwide deliveries. Over the past decade we have seen Asian airlines doubling their fleets with the market growing at 5.7% annually in the next 20 years mainly due to their GDP that is expected to grow at a rate of 3.9% annually as well. Estimated delivery of 16,050 new planes at a value of \$2.5 trillion with a majority being of the single-aisle plane family.
- China: the middle class is expected to double in size in the next 10 years reaching about 600 million which in turn increases the need for air travel as China has more than 55% share in all flights between China and the rest of Asia. It is expected to have 7,240 new airplanes to be delivered in the next 20 years at a value of \$1,085 billion with an expected traffic growth of 6.2% annually.
- Northeast Asia: It is expected to have 1,470 new airplanes to be delivered in the next 20 years at a value of \$320 billion with an expected traffic growth of 2.2%
- South Asia: It is expected to have 2,200 new airplanes to be delivered in the next 20 years at a value of \$310 billion with an expected traffic growth of 8%.
- Southeast Asia: It is expected to have 4,210 new airplanes to be delivered in the next 20 years at a value of \$645 billion with an expected traffic growth of 6.2%
- CIS: Russia and the Commonwealth of Independent States (CIS) is expected to have 1,230 new airplanes to be delivered in the next 20 years at a value of \$140 billion with an expected traffic growth of 4.3%
- Europe: It is expected to have 7,530 new airplanes to be delivered in the next 20 years at a value of \$1,110 billion with an expected traffic growth of 3.7%
- Latin America: It is expected to have 3,010 new airplanes to be delivered in the next 20 years at a value of \$350 billion with an expected traffic growth of 6.1%
- Middle East: It is expected to have 3,350 new airplanes to be delivered in the next 20 years at a value of \$730 billion with an expected traffic growth of 5.6%

- North America: It is expected to have 8,640 new airplanes to be delivered in the next 20 years at a value of \$1,040 billion with an expected traffic growth of 3%

This 20-year forecast shows great advantage for Boeing, but it also has threats attached to it as well. In order to achieve these results, and hopefully exceeds them, Boeing needs to keep its competitive advantage. It must stay up-to-date with the technologies that goes into each airplane they make, they need to produce new families of airplanes that are more advanced, environmentally friendly, and designed to have bigger seating as people would rather fly more comfortably especially in long flights overseas. Failure to do so will lead to the reduction of the company's market share worldwide and give competitors an edge in the market.

Financial Structure Recommendation

Boeing's increasingly growing revenue stream is a good sign. However, with the growing revenue has come a growing debt load and growing concern that Boeing could find itself in a situation where it is unable to meet its debt obligations. A plot of the company's current and debt ratios shows the story below³³.

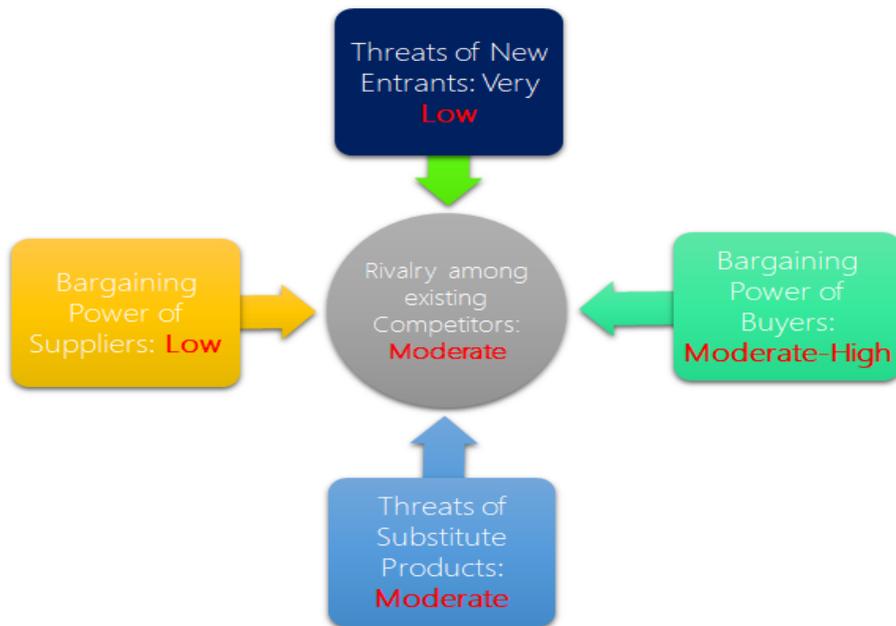


Boeing debt ratios for the past 17 years

The 10-year period from 2000 to 2009, saw Boeing having more current debt than assets with which to cover those debts. While the following years to current time have had a healthy current ratio, the debt ratio has climbed precariously close to the 1:1 ratio threshold. This indicates a nearly equal balance between total debt and total assets for the company. Such a position puts the company in a vulnerable position; negative consequences from failed projects or external factors could leave the company unable to meet its debt obligations. Given this, Boeing should pursue alternative financing means to balance their position. If previous recommendations for product development are followed, the debt position will be improved as Boeing generates more revenue from its expenditures on development. Additionally, by pursuing deals with tax breaks or where costs are shared with other entities, Boeing could effectively reduce its debt burden for new or continued project operations by reducing the capital it needs. Note that, while the debt load is an issue, it is not a crisis situation. In line with this, the recommendations and expected actions from Boeing are those of limited urgency.

Appendix

Appendix A: Porter's Five Forces



Appendix B: SWOT Analysis Table

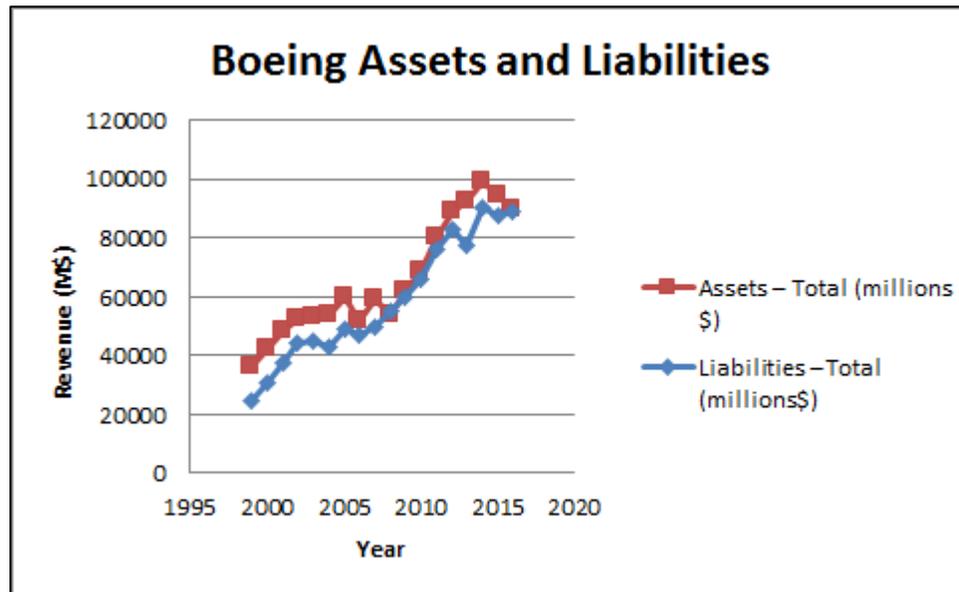
S	Strengths <ul style="list-style-type: none"> •Market share •History •Boeing Defense, Space & Security contracts •Internal financing •diverse program •Research and development 	W	Weaknesses <ul style="list-style-type: none"> •Execution •Labor Union •Suppliers
O	Opportunities <ul style="list-style-type: none"> •Increase demand from commercial airliners •High demand in air travel •High backlog 	T	Threats <ul style="list-style-type: none"> •Hyperloop •Transportation technological advancement •Political atmosphere

Appendix C: Financial Tables & Diagrams

All data from Wharton Research Data Services (33) and compiled by report authors.

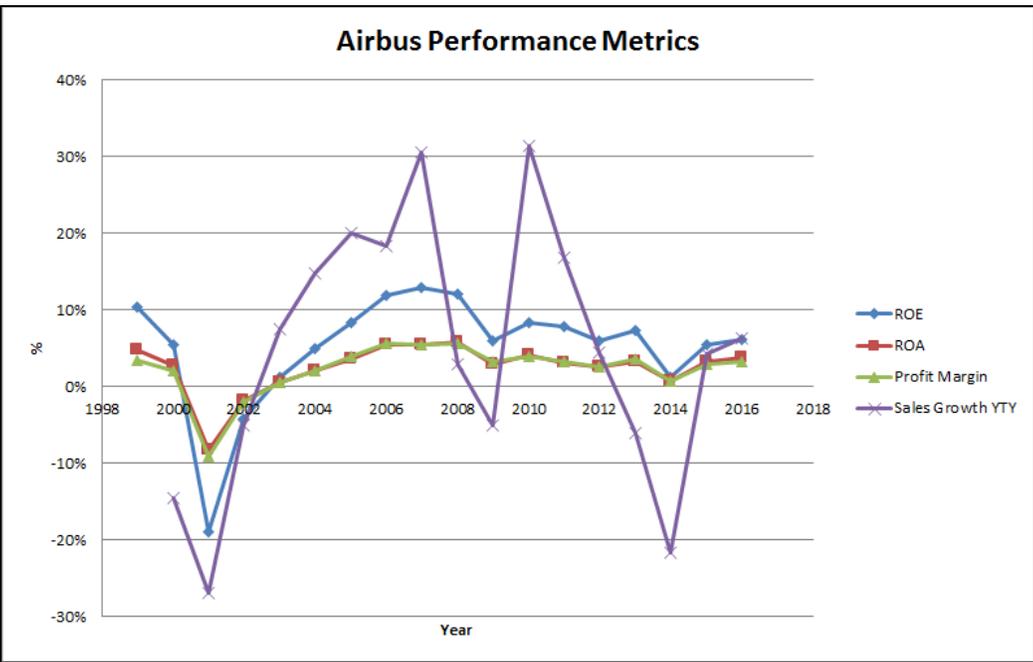
Boeing

Data Year - Fiscal	Earnings Per Share (Diluted) - Excluding Extraordinary Items		Sales							Working Capital (\$M)	Net working capital turnover
	ROE	ROA	Profit Margin	Growth YTY	Debt Ratio	Current Ratio	P/E ratio				
2005	3.19	23%	4%	5%	5%	82%	0.8	22.0	\$ (6,220.00)	-8.8	
2006	2.84	47%	4%	4%	12%	91%	0.8	31.3	\$ (6,718.00)	-9.2	
2007	5.26	45%	7%	6%	8%	85%	0.9	16.6	\$ (4,258.00)	-15.6	
2008	3.65	-206%	5%	4%	-8%	102%	0.8	11.7	\$ (4,961.00)	-12.3	
2009	1.87	62%	2%	2%	12%	96%	1.1	28.9	\$ 2,392.00	28.5	
2010	4.46	120%	5%	5%	-6%	96%	1.1	14.6	\$ 5,177.00	12.4	
2011	5.33	114%	5%	6%	7%	95%	1.2	13.8	\$ 8,536.00	8.1	
2012	5.11	66%	4%	5%	19%	93%	1.3	14.7	\$ 12,327.00	6.6	
2013	5.96	31%	5%	5%	6%	84%	1.3	22.9	\$ 13,588.00	6.4	
2014	7.38	63%	5%	6%	5%	91%	1.2	17.6	\$ 11,068.00	8.2	
2015	7.44	82%	5%	5%	6%	93%	1.4	19.4	\$ 17,822.00	5.4	
2016	7.61	59%	5%	5%	-2%	93%	1.2	20.5	\$ 12,354.00	7.7	

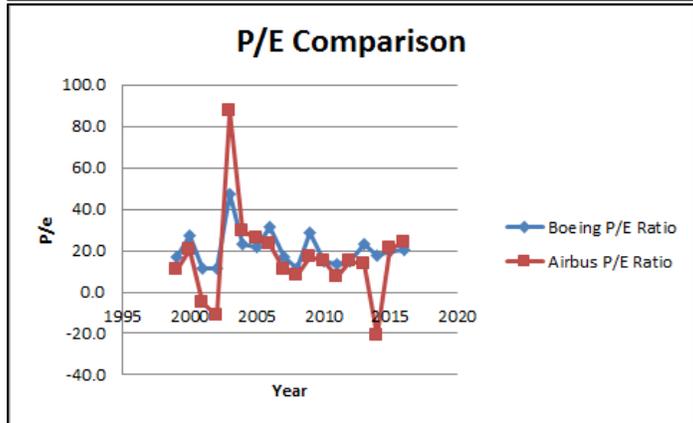
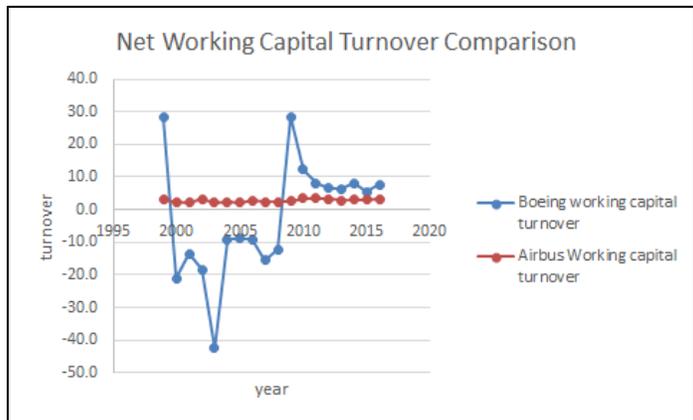


Airbus

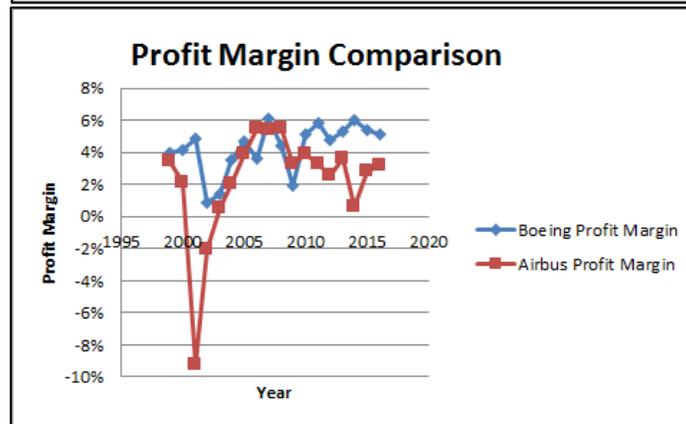
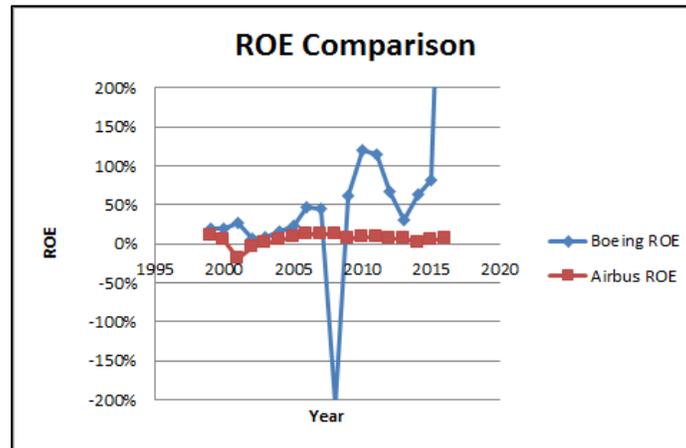
Data Year - Fiscal	Price Close - Annual - Fiscal	Earnings Per Share (Diluted) - Excluding Extraordinary Items		Sales							working capital (\$M)	Net working capital turnover
		ROE	ROA	Profit Margin	Growth YTY	Debt Ratio	Current Ratio	P/E ratio				
1999	13.875	1.28	10%	5%	3%	54%	3.1	10.84	347.451	2.9		
2000	14	0.69	5%	3%	2%	52%	3.9	20.29	360.464	2.4		
2001	11.44	-2.08	-19%	-8%	-9%	56%	2.9	-5.5	286.192	2.2		
2002	4.5	-0.39	-4%	-2%	-2%	57%	1.9	-11.538	192.837	3.1		
2003	9.58	0.11	1%	0%	1%	57%	3.3	87.091	300.943	2.2		
2004	16.04	0.55	5%	2%	2%	57%	3.0	29.164	314.517	2.4		
2005	24.08	0.94	8%	4%	4%	57%	3.3	25.617	436.666	2.1		
2006	32.5	1.42	12%	5%	6%	54%	2.5	22.887	389.215	2.7		
2007	19.28	1.77	13%	6%	5%	57%	3.6	10.893	564.932	2.5		
2008	14.7	1.92	12%	6%	6%	52%	3.3	7.6563	596.894	2.4		
2009	19.7	1.16	6%	3%	3%	50%	2.7	16.983	537.879	2.5		
2010	26.39	1.81	8%	4%	4%	51%	2.2	14.58	497.975	3.6		
2011	12.05	1.65	8%	3%	3%	61%	2.2	7.303	590.046	3.5		
2012	20.06	1.38	6%	3%	3%	57%	2.7	14.536	644.7	3.4		
2013	24.3	1.83	7%	3%	4%	55%	2.8	13.279	714.8	2.8		
2014	29.54	-1.4	1%	1%	1%	44%	2.3	-21.1	542.1	2.9		
2015	24.41	1.16	6%	3%	3%	40%	2.7	21.043	544.1	3.1		
2016	34.94	1.45	6%	4%	3%	39%	2.7	24.097	553.4	3.2		



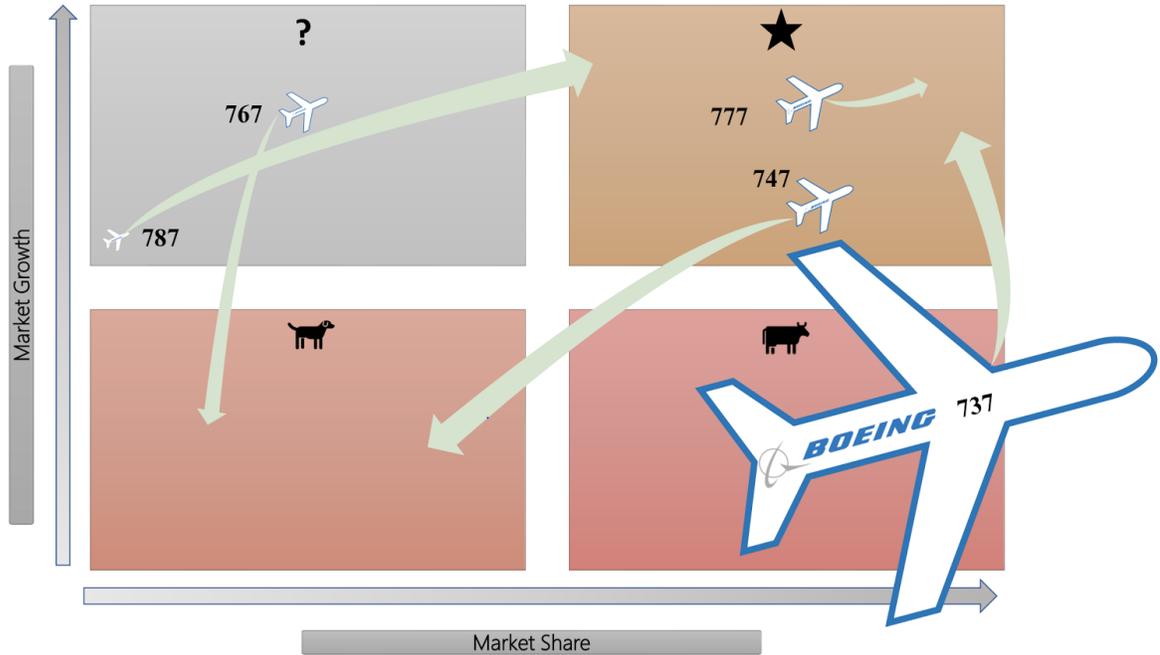
Boeing and Airbus Cross-sectional Charts for Key Metrics



Boeing and Airbus Cross-sectional Charts for Key Metrics (cont.)



Appendix D: BCG Matrix



BCG Matrix Key

Plane Size = All Time Delivery #

737 = 9,753 since 1967

747 = 1,539 since 1968

767 = 1,104 since 1982

777 = 1,520 since 1995

787 = 613 since 2011



= Projection within 20 years based on Fiscal Year 2016 Orders and Plane Outlook

737 = 640 in FY16

747 = 18 in FY16

767 = 26 in FY16

777 = 23 in FY16

787 = 80 in FY16

- = Cash Cows (High Market Share, Low Market Growth)
- = Stars (High Market Share, High Market Growth)
- = Questions (Low Market Share, High Market Growth)
- = Dogs (Low Market Share, Low Market Growth)

Appendix E: Boeing Production Table

Aircraft	Production Rate	Future Changes	Backlog	Key Facts / Dates
737 Series	47 / month	52 / Month in 2018 57 / Month in 2019	4,431	<ul style="list-style-type: none"> -The 737 MAX has an 8% lower operating cost than its main competitor -Captured over 3,900 orders for 737 MAX since launch -Completed first flight of the 737 MAX 9 in 2Q17 -First delivery of the 737 MAX 8 in May 2017 -Launched 737 MAX 10 in 2Q17 with 361 orders and commitments
747	0.5 / month	-	17	-747-8 selected as next U.S. Presidential Aircraft
767	2.5 / month	-	101	<ul style="list-style-type: none"> -FedEx has placed firm orders for 100 767s -Potential market of up to 400 tanker aircraft worth \$80 billion -Expect to deliver the first 18 fully operational tanker aircraft in 2018
777 & 777x	5 / month	-	101 & 326	<ul style="list-style-type: none"> -Nearly 1,500 aircraft in-service -Over 70 customers -Over 600 aircraft have been in service more than 10 years <li style="text-align: center;">777x -Largest product launch in commercial jetliner history -New engines and composite wings; existing 777 fuselage -Opened 777X Composite Wing Center in 2Q16 -Began production of the first complete 777X wing for structural test in 3Q17 -First delivery targeted for 2020
787	12 / month	14 / month by 2019	683	<ul style="list-style-type: none"> -Fastest twin aisle to over one million passenger flights -Over 150 new non-stop markets planned or already connected by the 787 -Completed first flight of the 787-10 in 1Q17 787-10 first delivery is expected in 2018

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