ANALYSIS OF COMPETITIVE
ADVANTAGE OF AIRBUS AND BOEING

Group: B8

<table>
<thead>
<tr>
<th>Name</th>
<th>Student ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abhishek Gupta</td>
<td>61710067</td>
</tr>
<tr>
<td>Aditya Singh</td>
<td>61710072</td>
</tr>
<tr>
<td>Indrajit De</td>
<td>61710761</td>
</tr>
<tr>
<td>Shravani Sinha</td>
<td>61710331</td>
</tr>
<tr>
<td>Swetha Viswanathan</td>
<td>61710157</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

This report analyzes strategic initiatives adopted by Airbus and Boeing that has resulted in the former gaining competitive advantage. It covers the analysis of the aerospace manufacturing industry, competitive position of companies within the industry, key drivers for growth across the value chain, and sources of competitive advantage. The two companies have been engaged in fierce competition, each enjoying considerable support from respective governments. The duopolistic industry is characterized by low threat of new entrants and substitutes, relatively high bargaining power of both suppliers and buyers and intense rivalry. In the long run, the industry dynamics may change as new companies in Russia and China begin to grow after overcoming current challenges and developing expertise. Through value chain analysis, we observe that Airbus has gained competitive advantage over Boeing by leveraging its technological expertise linked with marketing and sales efforts. Airbus has diversified its client base by partnering with upcoming organizations with disruptive technologies. On the other hand, Boeing continues to be heavily reliant on US government projects and focusing more on process improvements rather than disruptive technologies. However, both firms can leverage sources of sustainable competitive advantage as established by VRIO analysis to drive future growth. As for future growth strategies, both firms are focusing on increasing their revenue through services, and are adopting digital technologies not only to make their offerings better, but also to improve their own operations. Both Airbus and Boeing, through a series of acquisitions as well as geographic expansion, are acquiring new capabilities, forging ecosystem connects with suppliers, talent, etc., and working towards product and services portfolio expansion.
COMPANIES OVERVIEW

AIRBUS GROUP

Airbus was first created in 1970 and works not only with commercial airliners but also in the defense markets. The company is made up of three segments: operations, programs, and core functions. The main goal of this company is to create the most modern and comprehensive aircrafts for its customers as well as lead with the highest standards of their products and support. In 2015, Revenues were up 6 percent to € 64.5 billion, mainly driven by Commercial Aircraft, with deliveries up again to a record level of 635 aircraft. The improvement at Defense and Space reflects strong program execution across all business lines and transformation efforts.

THE BOEING COMPANY

Boeing leads the aerospace industry and is well known for its manufacturing of military airplanes and commercial airplanes. Boeing separates itself into 5 main divisions: Commercial Airplanes, Boeing Military Aircraft, Global Services and Support, Boeing Capital Corporation, and Network and Space Systems. Total company revenues rose 6 percent in 2015 to a record $96.1 billion. Boeing aims to leverage enterprise capabilities and technologies for future programs such as the T-X trainer, JSTARS recapitalization and numerous unmanned systems; and driving new levels of affordability and productivity through our ongoing market-based affordability and Partnering for Success efforts.

AEROSPACE MANUFACTURING INDUSTRY ANALYSIS

In analyzing the Aerospace manufacturing Industry, not only do we cover the five forces model which includes (1) the threat of new entry, (2) the power of suppliers, (3) the power of buyers, (4) product/service substitutes, and (5) the intensity of rivalry among competitors, we are adding the sixth force of another stakeholder group – the Unions.
1. Threat of New Entrants

The aerospace manufacturing industry is very well established. There are only a handful of big players in the industry and the threat of new entrants is low due to following factors:

- **High Start-up costs**: A great sum of money must be invested to attain the economies of scale, and it is difficult to enter the market with existing firms already operating on cost and differentiation strategies.

- **Risk on ROI**: With new airplanes and engines requiring extremely high investments, there is an associated high risk and inability to get a positive return on that investment for many years.

- **Experience effects**: Aerospace manufacturing has a long learning or experience curve due to its complex assembly and testing operations and its high content of labor performing complicated tasks. Companies can only attain this after many years of continuous investment in research and development.

- **Collaborators network**: Companies may require government subsidies, either directly through grants-in-aid or indirectly through military contracts, to enter the industry.

2. Bargaining Power of Suppliers

There are several suppliers to choose from and all the major suppliers are forced to compete with each other for market share. Their ability to raise prices or reduce the quality of purchased goods or services is really not that strong. But the usage of rare resources such as carbon-fibre and requirement for specialized facilities for production has shifted the bargaining power towards the suppliers. In addition, the high switching costs of airliners in case of moving to other suppliers has increased bargaining power of suppliers. Overall, bargaining power of suppliers is high.
3. **Bargaining Power of Buyers**

*Bargaining power for buyers is fairly high* in the aerospace manufacturing industry. Airline companies often force cutthroat competition between the aircraft manufacturers, Boeing and Airbus. Airlines ordering a large number of planes can press for astonishing discounts from the prime contractors. These orders are a relatively large percentage of the aerospace prime contractors' total sales, so buyers are in a valuable position to demand price reductions. The switching costs for aircraft and engines are very low, which increases the buyers' power. Airline pilots and mechanics can quickly be trained on other planes and engines.

4. **Threat of Substitute Products/Services**

Prime contractors in the commercial aerospace industry like Boeing *face almost no threats of substitute products* because of an airplane's uniqueness in speed and ability to travel over water. For short distances over land, airplanes may sometimes compete against automobiles and trains. The threat of substitute products exists at the part/component level and is moderately high in the aerospace industry. For example, new materials and/or new technology can make obsolete the materials previously in common use in the construction of airplanes and engines. Part of the industry involves changing with the latest and greatest technological advances.

5. **Intensity of Rivalry among Competitors**

The current market is dominated by two players, Airbus and Boeing with minor competition coming from manufacturers such as Ilyushin, Tupolev and Bombardier. Apart from this, *competition is fierce* between Airbus and Boeing for the reasons such as rate of industry growth, product or service characteristics, amount of fixed costs, and height of exit barriers. With new line-up of products aimed at addressing weaknesses of earlier models, both are aiming at being more competitive. For example, with A380, Airbus has been able to develop a challenger to
Boeing 747 super jumbo jets with added advantages of fuel efficiency and high passenger capacity. In return, Boeing expects to retrieve lost market share to A340 by developing the 747 and also expects to challenge the A380 by introducing the 787 Dreamliner which guarantees speed and fuel efficiency.

**NEW ENTRANTS IN THE INDUSTRY**

The large commercial jet aircraft manufacturing sector is a Boeing and Airbus duopoly. Over the years, aerospace firms from several non-traditional aircraft manufacturing nations have attempted to enter various parts of the international commercial aircraft sector and failed. Until recently, Russia and China have not been strong competitors in the international market but now plan to dominate a much larger share of their own domestic markets and, in turn, perhaps the global market. Most notable is a new Chinese initiative COMAC whose Comac C919, an approximately 156-seat aircraft with dimensions similar to the A320, is in development, though a production date has not yet been announced.iii Slated for certification no later than 2016, that model would compete directly with Boeing and Airbus. Though still in early design, Chinese officials have said the C919 should have operating costs 10% below those of comparable Western jetliners.iv Another competitor could be Russia’s United Aircraft Corporation (UAC), a Russian government-owned joint stock company. With its divisions such as Sukhoi and Tupolev Tu series, UAC has stated it plans to become the third-largest aircraft manufacturer worldwide by 2015.v Both Chinese and Russian aircraft manufacturers face significant hurdles in building commercial aircraft, since neither has ever built such airplanes for the commercial market, which requires planes to be reliable, have low operating costs, and be easily maintained. Another outstanding barrier to their market entry is certification by U.S. and EU aviation authorities.
VALUE CHAIN ANALYSIS

Airbus and Boeing have been involved in intense competition spurred by support from European and American governments respectively. In the recent years, Airbus has adopted a differentiation strategy involving technological leapfrogging, and has managed to achieve an edge over Boeing due to three reasons – (a) simultaneous R&D efforts on product improvement, early-stage, advanced-stage and disruptive technologies, (b) independence and autonomy of R&D division coupled with cross-collaboration across teams within R&D, (c) strong linkage with sales strategy which involves moving away from government-driven projects to partnering with number of impact-driven organizations across product categories. On the other hand, Boeing has lost out due to two reasons – (a) focus on government projects and internal process optimization and therefore less time on innovation and new technologies, (b) focus on existing clients while Airbus successfully pursued global expansion and gained access to new markets.

As Airbus Group implemented strategic initiatives driven by medium-term vision to focus on 3 Is – Integration, Internationalization, Innovation, Boeing experimented with dramatic shifts in processes with high exposure to risk. This enabled Airbus to gain competitive advantage while Boeing has borne the brunt of competition. [Refer exhibit 4]

AIRBUS GROUP

Operations

- **Global expansion**: Set up multiple production centers in Alabama, France and China
- **Focus on operational efficiency**: Implemented lean initiatives at divisional level of operations by developing standard processes and tools to reduce lead times and costs
- **Prioritizing key aircraft**: Ramped-up production of key aircraft such as A320, A330 and A400M coupled with supply chain improvements to deliver greater value to large clients vi
Sales & Marketing

- **Partnerships:** Strengthens sales base by building relationships and leveraging them to win contracts. For e.g. Cassidian (division of Airbus Group) partnered with for supplying mobile ground segment entities; Airbus Defence & Space teamed up with OneWeb to provide affordable internet by designing and developing 900 telecommunication satellites\(^{vii}\)

- **Segment-based targeting:** Entered into an agreement with PT Dirgantara Indonesia to jointly launch NC212 specifically in the light and medium segment

- **Priority customers:** Air-Asia (biggest A320 customer) was given the first A320 equipped with sharklets as a mark of respect for and importance of their partnership

Services

- **Expanding integrated service offerings:** Opened 5 flight simulators globally; set up training center in Mexico and a support center in Australia; launched Airbus Flight Hour Services offering faster and easier access to spare parts and services; established exclusive engine maintenance business in Australia and South East Asia

Technology Development

- **Focused approach:** R&D efforts are managed by a separate subsidiary comprising of over 1000 scientists and researchers; established a dedicated innovation center and a corporate venture fund\(^{viii}\) in Silicon Valley to identify and capitalize on disruptive technologies

- **Organized structure:** Distinct teams carry out R&D activities across distinct areas such as upgradation of aircraft, new product development, early-stage technology, advanced technology, leveraging each other’s strengths with no duplication of efforts

- **Customization based on customer needs:** Developed Tiger helicopters specially optimized for conditions in Afghanistan; established a customization center in China for helicopters
Procurement

- **Global sourcing:** Set up country sourcing offices in India, China, US and Brazil to lower costs and in line with supplying to global markets
- **Leveraging operational expertise:** Leverages operations experts to diagnose and fix supply chain issues; brings together procurement specialists previously in operational roles while negotiating with strategic vendors to foresee operational challenges and problem-solve\textsuperscript{iix}
- **Supplier synergies:** Identifies synergies at group level by exchanging best practices, discussing supplier performance, meeting common suppliers etc. to take advantages of scale and build strong relationships with and retain important suppliers

Human Resources

- **Leadership development:** Set up Leadership University\textsuperscript{x} offering opportunities for employees to reflect and learn (offering ~500 leaders with over 55000 days of development programs annually, and ~140K employees with ~3.2 million hours of regular training)
- **Promoting diversity:** Launched policies to increase diversity on gender, social backgrounds and disability fronts; designed development programs specifically for women
- **Catering to employee needs:** Expanded childcare arrangements by setting up new facilities across sites and partnering with childcare providers close to sites.\textsuperscript{xi}

Firm Infrastructure

- **Improving governance:** Agreed on simplifying company’s share-holding structure and governance by increasing number of minimum independent directors, removing veto voting rights to reduce exposure to national politics and increase voice of shareholders
- **Decentralization and increased autonomy:** Increased autonomy at plat level via decentralization of responsibilities and resources coupled with harmonization of process
across all production sites, thereby empowering teams to improve efficiency and fostering an entrepreneurial spirit

**BOEING**

**Operations**

- *Economies of scale:* Delivered an industry-record 762 commercial and 186 military aircraft to USA, EU and South East Asian countries

- *Improved operational efficiency:* Achieved step-function improvements in safety, quality and productivity increasing the design and manufacturing capabilities, reducing development time.

**Sales & Marketing**

- *Clear organization:* Boeing established “Boeing International Sales Corporation” for international sales and “Boeing Sales Corporation” for domestic sales catering to global orders for 9100 new wide body airplanes with autonomy and independence

**Services**

- *Allied services:* Boeing's Capital Corporation business unit is a subsidiary providing asset backed lending and leasing services to some of the company's major clients.

**Technology Development**

- *Focus on big budget projects to increase new segment sales:* Primarily caters to interests of US government’s defense efforts such as supersonic aircraft with the hope that commercial airlines will buy them as customers demand shorter travel times

- *Internal process optimization:* Heavily invests in reducing labor and capital costs by building prototypes with full automated robotic production settings
Procurement

- **Leveraging supplier expertise:** Boeing fostered partnerships with approximately 50 tier-1 strategic partners known as “integrators” who assemble different parts and subsystems produced by tier-2 suppliers.

- **Global sourcing:** Developed web-based tool Exostar to gain supply chain visibility, improve control and reduce development time and cost.

Human Resources

- **Leadership development:** Boeing encourages leadership development programs like Excellence Acceleration Program (LEAP) and Lifelong Learning program, investing more than a billion dollars in employee education throughout the year 2015.

- **Health care benefits:** Employees are encouraged to complete a Health Risk Assessment (HRA) survey through the Mayo Clinic offering better health and productivity in addition to helping Boeing manage rising health care costs over time.

Firm Infrastructure

- **Improving internal structure:** Boeing utilizes the matrix structure of management where communication among the departments (business units or functional units) is the key.

- **Centralized work flow:** Through corporate governance, strict hierarchy, and vertical differentiation, Boeing continues to work towards its shared value system comprising of:
  - Leadership, integrity, quality and customer satisfaction.

VRIO ANALYSIS

Based on our analysis, the strategic interventions that have fostered the interrelationship between Sales & Marketing and Technology Development is a source of sustained competitive advantage.
for Airbus. In the case of Boeing, the linkage between Human Resource and Technology Development is a source of sustained competitive advantage.

**AIRBUS GROUP**

- **Valuable:** Airbus’ go-to-market strategy has been via partnerships and agreements. With a relentless focus on developing technologies and customized products based on consumer needs paves way for bigger and better partnerships.
- **Rare:** Airbus Ventures is already on its way to identify and capitalize on disruptive technologies for both the company as well as the industry. By leveraging skills and expertise of over 1000 employees at its R&D center, Airbus has a rare competitive advantage. Products developed out of these projects would bolster the company’s ability to win new contracts, reinforcing the strong linkage.
- **Costly to imitate:** The linkage has been developed over a long period of time and founded on the company’s culture making it a socially complex resource that is costly to imitate.
- **Organized to capture value:** Firm’s emphasis on increasing autonomy via decentralization and fostering leadership has laid a strong foundation to further strengthen the linkage.

**BOEING**

- **Valuable:** Boeing’s emphasis on R&D has paved way for important contracts. On the HR front, various development programs like LEAP, LDP and LTP have been instrumental in attracting and retaining the best talents for the company.
- **Rare:** Boeing has built a strong relationship with US Government that is key to driving R&D efforts and budgets. It banks on a dedicated and motivated workforce.
- **Costly to imitate:** The linkage is socially complex and any attempt to imitate would be costly both in terms of resources as well as time.
- **Organized to capture value:** Firm’s emphasis on increasing centralization backed up by top management system strengthens the already-stable interrelationship.

**AIRBUS’S GROWTH STRATEGY**

1. **Growth via Digitalization:** To achieve more business value from digital technologies, Airbus has appointed a Digital Transformation Officer to oversee operational deployment of digital projects. Its core capabilities include Big Data Analytics, VR and AR, 3D Printing, IoT, Cloud, Collaboration, Mobility, Artificial Intelligence, and Robots/Drones.

   a) **Improving Operational Excellence and Employee Collaboration:** With the proliferation of digital technologies, Airbus is increasing shop floor automation through its ‘Factory of the future’, aimed at exploring new ways of manufacturing. These include robotic applications (lightweight robots and small machining systems for specific tasks such as painting, waterproofing and testing complex parts of the fuselage), wearable robotic light-weight exoskeletons to improve ergonomic conditions, collaboration platform for all 140,000 employees to facilitate real-time knowledge sharing, support and information exchange, and 3D printing for making prototypes and components. 3D-Printing has helped the company achieve a weight reduction of 30-55% and a raw material reduction of 90%. It has also deployed MiRA: a mixed reality application for providing aircraft workers access to 3D models. Airbus aims to create a host of humanoid robots (that use AI and machine learning) for its factories.

   b) **Enhanced Customer Experience:** Airbus is leveraging mobility and Wi-Fi to provide in-flight entertainment to the passengers on its aircrafts. It also launched its “I Fly A380”, a digital
booking assistant. Its helicopter unit is also working on setting up a permanent web connection with all its clients and launch digital after-sales service to facilitate aircraft maintenance.\(^{xviii}\) The predictive maintenance offering will help Airbus improve performance, anticipate orders, improve the helicopters’ performance, and reduce fuel consumption.\(^{xix}\)

2. **Growth & Diversification via Acquisitions:** Airbus has acquired several businesses in the past few years to help it diversify into new areas, as well as strengthen its core competencies. July, 2014: Salzburg München Bank AG from Raiffeisenverband Salzburg in order to establish its company bank for providing additional financing options.\(^{xx}\) June, 2015: Set up a $150M corporate V.C. fund, named Airbus Group Ventures for Internationalization and Innovation (2 of the 3Is).\(^{xxi}\) June, 2015: Air New Zealand's subsidiary Safe Air for its military offerings.\(^{xxii}\) December, 2015: Navtech, a provider of flight operations solutions (EFB solutions, aeronautical charts, navigation data solutions, flight planning, aircraft performance, and crew planning solutions) to help it in its digitalization and services-oriented growth strategy.\(^{xxiii}\)

3. **Growth via Product & Range Diversification:** Airbus is counting on product and range diversification to survive in fluctuating market conditions as well as reduce the threat of rivals (primarily Boeing). Its Helicopter segment is soon coming up with the new H160 model.\(^{xxiv}\) At the same time, it is Airbus is speculating upgrading its new A330neo jetliner to minimize the range advantage of 787-9 Dreamliner by Boeing, as well as a continued evolution of a modern product line (including A320neo and A380).\(^{xxv}\) Other innovations include an e-Concept Plane, silent aircraft taxiing, reduced emission flights and new “alternate” energies for powering its aircrafts, performance-based navigation solutions, reduction in separation between arriving aircraft, real-time wind updates and parallel runway operations.\(^{xxvi}\)
BOEING’S GROWTH STRATEGY

1. Growth through Acquisitions: Boeing has acquired several companies since 2012 in order to boost its internal data capabilities, and offer richer solutions to its customers, primarily in the field of MRO, fuel-efficiency, fleet management, etc. Exhibit 6 calls out key acquisitions made by Boeing since 2012. xxvii Boeing’s Defense arm is looking at acquiring smaller firms that can lend their capabilities to Boeing for it to bolt on.xxviii

2. Growth through Product Diversification & Line Extension: Boeing’s related product diversification is seen through its satellites, missiles, helicopters, and a number of technical products for defense and security. It is also trying to expand its services business (spares, training, maintenance and upgrades for its aircrafts), especially in the defense sector.xxx This diversification helps Boeing counter adverse industry conditions. Boeing is also contemplating penetrating the midsize aircraft market. It is working on Max (version of 737 with new engines) and an upgrade of the 777.xxx

3. Growth through Geographic Expansion: Boeing has R&D partnerships in over 35 countries in fields such as biofuels, manufacturing processes, structures, and robotics. The presence of corporate offices in several high return countries helps it build awareness. Its workforce is also spread across geographies: an engineering base in Russia apart from the one in the U.S., training and test-flight services in Australia (includes UAV flights), and IT services support in China.xxxi Its multi-billion dollar long term partnership with Japanese firm Toray Industries for the supply of carbon fiber composite showcases its global supply diversification strategy.xxxii

4. Growth through Digitalization: Over the past few years, the emphasis on leveraging digital technologies has increased manifold. The company is building data-centric solutions to provide
better maintenance, improve performance, and enhance its customers experience. Its digital endeavours can be broadly classified under three heads:

**a) Operational Environment:** This includes customer-experience enhancing digital services for Equipment Health and Performance Monitoring, Fleet Operations Monitoring, Real-time Machine & Sensor Integration, Wearable Technology, and Real-time Alerts.

**b) Smart Factory:** This includes Boeing’s internal solutions for better safety, predictive asset maintenance, sensors on parts (Machine to Machine/ IoT), and energy management. These help in increasing Boeing’s own operational excellence and lowering bottom line through maximizing asset utilization, and integrated manufacturing.

**c) Supply Chain:** This includes leveraging digital capabilities such as cloud, mobility and analytics for raw material availability, warehouse management & location insights, container tracking, design & build optimization, and security, frauds and counterfeit controls.

**CONCLUSION**

This report analyzes strategic initiatives adopted by Airbus and Boeing that has resulted in the former gaining competitive advantage. Over the last few years, Airbus has matched Boeing in the number of orders received. This was primarily due to its focus on technology and the linkage with sales strategy. Moving beyond government-related projects helped Airbus increase the number of orders received in a short duration. Its 3I strategy helped it serve a larger market with more advanced products. However, Boeing’s future strategy entails a lot more focus on leveraging niche technologies to serve customers better with their aircrafts and services. Both Airbus and Boeing are aiming at after-sales services such as predictive maintenance, fuel efficiency, and fleet optimization, while alongside improving their factories and processes. Therefore, in order to gain competitive advantage, Boeing may consider focusing on diversifying
its client base, leveraging operational expertise to drive innovation and implement disruptive technologies.

**EXHIBITS**

**Exhibit 1: Airbus Organization Structure**
Exhibit 2: Boeing Organization Structure

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairman &amp; CEO</td>
<td>Dennis Muilenburg</td>
</tr>
<tr>
<td>Lead Director</td>
<td>Kenneth Duberstein</td>
</tr>
<tr>
<td>Director</td>
<td>David Calhoun</td>
</tr>
<tr>
<td>Director</td>
<td>Arthur Collins</td>
</tr>
<tr>
<td>Director</td>
<td>Edmund Gribbani</td>
</tr>
<tr>
<td>Director</td>
<td>Lynn Good</td>
</tr>
<tr>
<td>Director</td>
<td>Lawrence Kellner</td>
</tr>
<tr>
<td>Director</td>
<td>Edward Liddy</td>
</tr>
<tr>
<td>Director</td>
<td>Susan Schwab</td>
</tr>
<tr>
<td>Director</td>
<td>Randall Stephenson</td>
</tr>
<tr>
<td>Director</td>
<td>Ronald Williams</td>
</tr>
<tr>
<td>Director</td>
<td>Mike Zafirovski</td>
</tr>
<tr>
<td>CFO, Strategy &amp; BusDev</td>
<td>Greg Smith</td>
</tr>
<tr>
<td>Legal</td>
<td></td>
</tr>
<tr>
<td>Defense, Space &amp; Security</td>
<td></td>
</tr>
<tr>
<td>Capital Corporation</td>
<td></td>
</tr>
<tr>
<td>Germany &amp; Northern Europe</td>
<td></td>
</tr>
<tr>
<td>Shared Services</td>
<td></td>
</tr>
<tr>
<td>Boeing International</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td></td>
</tr>
<tr>
<td>CTO (-&gt; Jul 2016)</td>
<td></td>
</tr>
<tr>
<td>Government Operations</td>
<td></td>
</tr>
<tr>
<td>Internal Governance &amp; Ad...</td>
<td></td>
</tr>
<tr>
<td>Supply Chain &amp; Operations</td>
<td></td>
</tr>
<tr>
<td>Commercial Airplanes</td>
<td></td>
</tr>
<tr>
<td>Digital Aviation &amp; Jepp...</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td></td>
</tr>
<tr>
<td>Procurement, Shared Serv...</td>
<td></td>
</tr>
<tr>
<td>CIO &amp; Information &amp; Anal...</td>
<td></td>
</tr>
<tr>
<td>787 Program</td>
<td></td>
</tr>
<tr>
<td>Engineering, Test &amp; Tech...</td>
<td></td>
</tr>
<tr>
<td>Program, Integration &amp; D...</td>
<td></td>
</tr>
<tr>
<td>CFO, Technology</td>
<td></td>
</tr>
<tr>
<td>Engineering &amp; Technology</td>
<td></td>
</tr>
<tr>
<td>Cargo Helicopters &amp; H-47...</td>
<td></td>
</tr>
<tr>
<td>EHS</td>
<td></td>
</tr>
<tr>
<td>Intellectual Property Mnt...</td>
<td></td>
</tr>
<tr>
<td>HR</td>
<td></td>
</tr>
<tr>
<td>Attack Helicopter Program...</td>
<td></td>
</tr>
</tbody>
</table>
### Exhibit 3: A Timeline of Boeing & Airbus Innovations

### Exhibit 4: A Value Chain Comparison of Airbus & Boeing

<table>
<thead>
<tr>
<th></th>
<th><strong>Airbus Group</strong></th>
<th><strong>Boeing</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firm Infrastructure</strong></td>
<td>Autonomy, decentralization</td>
<td>Cross-functional collaboration</td>
</tr>
<tr>
<td><strong>Human Resource</strong></td>
<td>Leadership development, catering to employee needs</td>
<td>Leadership development, catering to employee needs</td>
</tr>
<tr>
<td><strong>Technology development</strong></td>
<td>Customer need based, driven by multiple partnerships for commercial projects</td>
<td>Internal operations based, driven by big-budget government projects</td>
</tr>
<tr>
<td><strong>Procurement</strong></td>
<td>Leveraged scale, internal operational expertise</td>
<td>Leveraged supplier ability to integrate efficiently (external)</td>
</tr>
<tr>
<td><strong>Operations</strong></td>
<td>Global expansion, operational efficiency to reduce lead time</td>
<td>Operational efficiency to reduce lead time</td>
</tr>
<tr>
<td><strong>Sales &amp; Marketing</strong></td>
<td>Increase sales by expanding client base via partnerships</td>
<td>Increase sales by selling more to same customer</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td>Global expansion, access to spares &amp; maintenance services</td>
<td>Focus on asset-backed lending and leasing services</td>
</tr>
</tbody>
</table>
Exhibit 5: A Comparison of Airbus & Boeing Orders & Deliveries

Exhibit 6: A Comparison of Airbus & Boeing Orders & Deliveries

<table>
<thead>
<tr>
<th>Data &amp; Information Capabilities</th>
<th>Customer Offerings Enhancement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immedius</strong>: Software applications and services provider for managing and sharing information and learning content (^{xxxvi})</td>
<td><strong>ETS Aviation</strong>: Fuel-efficiency management (monitor fuel consumption, identify fuel savings opportunities, and track and report carbon emissions) and analytics software</td>
</tr>
<tr>
<td><strong>Ventura Solutions</strong>: Information and security capabilities (^{xxxvii})</td>
<td><strong>Miro Technologies</strong>: Enterprise software solutions to manage maintenance, supply, and repair for complex assets operating in air, space, sea and ground environments (^{xxxviii})</td>
</tr>
<tr>
<td><strong>AerData</strong>: Provides integrated software solutions for lease management, engine fleet planning and records management (^{xxxix})</td>
<td><strong>Peter Software GmbH</strong>: Provider of European Aviation Safety Agency based training content for early stage pilot training (^{xl})</td>
</tr>
</tbody>
</table>
REFERENCES


24