Washington Aerospace Partnership
Aerospace Competitiveness Study
The Boeing 737 MAX Opportunity FINAL
November 15, 2011
## Competitive Assessment Table of Contents

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Situation

Boeing announced last August that the company will design and build a new version of its popular 737 aircraft. The plane, dubbed 737 MAX, will offer airlines lower operating costs compared to current versions of the 737, and affect thousands of aerospace jobs.

Boeing currently assembles 31 737s a month at its factory in Renton and has a huge backlog of orders. To keep up with demand, production is scheduled to ramp up to 42 aircraft a month by 2014, a rate which aviation observers feel may challenge Boeing’s capacity and that of its extended supply chain. The issue is: Where will Boeing assemble the 737 MAX? Company officials have announced they are considering Renton, but also sites throughout the state and country.

Opportunity and risk

One of the largest job opportunities of this decade for Washington lies in the Boeing 737 MAX siting decision. Facing intense competition from at least a handful of other states, Washington will need to take swift, bold action to ensure it lands the 737 MAX, and the tens of thousands of jobs that would accompany it.

Boeing’s choice presents a huge economic opportunity for the people of Washington. At stake are not only the nearly 20,000 jobs and over $5.5 billion of total economic activity tied to the 737 program, but also Washington’s status as one of the world’s preeminent aerospace hubs. The issue is bigger than Boeing – 89,000 people are employed at roughly 150 aerospace-focused companies in almost every county throughout Washington. Furthermore, roughly 650 additional machine shops, tooling firms, advanced materials, engineering and design firms, interiors specialists, electronics companies, and other firms with significant aerospace-related activities employ thousands more across the state.

If Boeing chooses to assemble the 737 MAX in Washington, the aerospace jobs and supplier companies are more likely to stay here, and the state’s aerospace cluster will continue to grow and thrive for at least another generation. If Boeing chooses to assemble the aircraft in another state, Washington’s aerospace cluster could weaken, creating a very uncertain future.

Market demands on Boeing

Boeing must deliver the 737 MAX on time and at its promised level of performance. Airlines have based their future financial performance on the on time delivery of fuel-efficient aircraft that can improve their profitability by replacing aging legacy aircraft and/or expanding fleet capacity in emerging markets. Yet Boeing must also produce aircraft that will be cost competitive with those from emerging aerospace manufacturers. For a generation, Boeing’s competition has largely been limited to Airbus. Today, companies/governments in at least five other countries – Brazil, Canada, China, Japan and Russia – will soon be able to offer alternatives to the Boeing-Airbus duopoly.

Washington’s recent history in supporting the aerospace industry

Aerospace is a fundamental thread in the fabric of Washington’s economy. And the State has made recent investments to keep its competitive edge in this industry. The State enacted and the governor implemented the following:

- A preferential B&O tax rate for aerospace firms.
- B&O tax credit for aerospace product development.
- Sales and use tax exemption on computers, hardware, and peripherals used in aerospace manufacturing.
- B&O tax credit for property taxes/leasehold taxes paid on aerospace facilities.
- Changes to unemployment insurance and workers compensation programs.
- An allocation of $3 million in discretionary federal funds to help veterans and unemployed workers for training to develop skills to work in the aerospace industry.
- An investment of more than $20 million bi-annually in the Community and Technical colleges for training aerospace workers and just recently received a federal DOL $20 million grant to double the state’s investment in aerospace training.
- An effort with the federal delegation to help land the US Tanker contract for Boeing which will be built in Washington State.

Washington Aerospace Partnership

Aerospace Competitiveness Study: Boeing 737 MAX Opportunity
In addition, local governments, particularly Snohomish and Grant Counties, worked closely with state government in developing proposals for siting the 787. The Memorandum of Understanding that contains the commitments made to Boeing with respect to the siting of the 787 production facility in Everett contains multiple provisions that demonstrate the support of local governments, including:

- City of Everett: local B&O tax reduction, freezing of utility rates, road construction.
- Port of Everett: dock and rail construction.
- Snohomish County: Construction and rate reductions at Paine Field.

While the state maintains some key components to support the 737 MAX production site, the competition for the program is especially strong and proactive. In order to win the 737 MAX and maintain the world’s leading airplane design and manufacturing hub, the State of Washington needs to do more.

Washington Aerospace Partnership

The Washington Aerospace Partnership (WAP) is a business/government/labor collaboration that has been working for several years to improve Washington’s competitiveness to attract and retain aerospace companies.

After Boeing announced its intention to consider alternative locations for assembly of the 737 MAX, the WAP commissioned Accenture to conduct a competitive analysis to determine what actions or policy initiatives could be taken to improve the state’s attractiveness to Boeing for the final assembly of the 737 MAX, and to make long term investments for strengthening Washington state’s aerospace cluster. Accenture examined Washington’s competitiveness across a range of qualitative factors as well as a thorough quantitative analysis of Boeing’s potential return on investment from selecting a 737 MAX assembly site in eight states with existing or emerging aerospace industries.

Washington advantages

Accenture found Washington has inherent advantages in its competitive position to attract the 737 MAX. Washington currently holds an advantage in the 737 MAX competition due to the high productivity and knowledge of its workforce. Over time the community and technical colleges have done a good job of training quality workers.

Additionally, the network of existing Boeing and supplier facilities in Washington that support 737 production are likely to provide Boeing a faster return on its 737 MAX manufacturing investment versus building brand new in-state or out of state assembly facilities.

Washington disadvantages

Washington also has some disadvantages in comparison with competitive states. There are higher recurring long term costs such as base wages, benefits, pensions, and health care. Other states are making strategic investments in their STEM K-12 programs, and are working to integrate their research universities and aerospace industries, actions that threaten Washington’s skills advantage. During this difficult economic time Washington’s higher education system has suffered deeper cuts than other states, limiting the state’s ability to produce the innovative, quality engineering talent that Boeing and others require to compete. Finally, there has been a recent history of strikes at Boeing that have affected airplane delivery schedules and the company’s profitability. And there is a perceived greater risk of future work stoppages based on this history.

Closing the gap

The Accenture report identified key actions that will help Washington State win the 737 MAX competition and strengthen its position in the emerging and increasingly global and cost competitive market for future airplane manufacturing. These are the steps which Washington could take to leverage its advantages and minimize its disadvantages.

Immediate Actions for 737 MAX Competition

1. Strengthen the state’s existing post-high school aerospace certification and apprenticeship programs to accelerate the state’s production of skilled manufacturing workers, with a particular focus on serving new high school graduates and veterans.
Washington Aerospace Partnership  
Aerospace Competitiveness Study: Boeing 737 MAX Opportunity

2. Increase the number of high quality engineering graduates and expand aerospace-relevant research from the University of Washington and Washington State University.

3. Improve the readiness of current high school students to meet the new workforce needs to enter the 737 MAX program or aerospace training programs upon graduation by focusing on STEM learning and building on programs such as Launch Year to increase aerospace career awareness.

4. Within the limits of the World Trade Organization, strengthen the current manufacturing and research base by extending state tax credits for investments in manufacturing and research while supporting targeted improvements to infrastructure that serves current 737 facilities.

5. Continue to pursue and promote government’s role in developing positive relationships and facilitating the exchange of ideas and requirements between government, Boeing, its suppliers and organized labor. There is a need to support collaborative management/labor relations by recognizing that a skilled and dependable work environment is essential to maintaining production schedules, lowering costs, and ensuring quality products.

To strengthen Washington State’s ability to compete for future planes and aerospace business in addition to implementing all work associated with the 737 MAX, the State must too enact the following recommendations in the next 12 to 24 months to remain.

6. Based on the aerospace focused grade 9-12 educational initiatives, increase student engagement and performance in math and science in grades K-8 in order to secure the long term quality of the aerospace workforce.

7. Create within the Governor’s office a robust role, led by an industry expert, to ensure and coordinate the state’s ongoing support for the aerospace sector and its workforce.

8. Work with the Washington’s U.S. senatorial and congressional delegations on funding and support for education, workforce development and training for returning veterans as well others, and research

Summary

Washington is uniquely positioned to win the 737 MAX. But to win, Washington must move decisively and make immediate decisions to secure the advantages it has today and to address targeted investments to secure its aerospace future. The opportunity before Washington has far reaching economic consequences. Washington’s ability to take advantage of this opportunity, in fact, has implications well beyond the 737, implications that will impact Washington’s ability to compete for subsequent airplane programs (e.g. a 777 replacement, etc.). This decision by Boeing is an important one, perhaps one of the biggest industrial jobs siting decisions in the country for the next decade. Time is short. The 737 MAX decision may be made within six months. The choices for Washington during this tough economic time are not easy, but the investments made today will benefit Washington tomorrow and will pay huge dividends for the future.
Success Factors for Boeing and the 737 MAX

Boeing’s customers expect the 737 MAX to be delivered on time, to support the growth of their businesses, and to help them operate more efficiently.

What Boeing’s customers require from the 737 MAX program

- For airplanes to be delivered according to Boeing’s promised production schedule
- For the aircraft to provide its promised operational benefits, e.g. fuel efficiency
- For Boeing to effectively increase its rate of 737 MAX production to meet demand

What Boeing must do to meet customer expectations

- Avoid program delays due to design challenges, supply shortages, manufacturing issues, testing, or work stoppage
- Seamlessly transition from producing the 737 NG to producing the 737 MAX
- Manage program cost to preserve the profitability of the 737 program
- Effectively integrate the innovations and engineering changes that will distinguish the 737 MAX from its competition

What a 737 MAX manufacturing site must be able to provide to support Boeing

- A stable manufacturing workforce that can quickly move up the production learning curve
- Labor rates that are competitive relative to the productivity and output of the workforce
- A pipeline of new, quality engineering and manufacturing talent to support the program as it grows
- Continued access to leading research to increase efficiency and reduce cost
- A plant, property, and equipment investment that supports a rapid return on investment
- Rapid and seamless integration into the existing network of 737 NG suppliers
The Position of Competitive States for the 737 MAX

Other states have made significant investments to emerge as formidable competitors for a 737 MAX.

**How competitive states have approached aerospace investments**

- Competitive states have made the strategic and difficult decision to **prioritize investments in aerospace**, manufacturing incentives, and economic development
- Many competitive states have demonstrated the ability to **use direct monetary incentives** as a competitive tool
- Leading competitive states such as Texas and Kansas have developed integrated aerospace and manufacturing educational and **workforce development programs** with significant input and resources from the aerospace industry
- Leading competitive states have state level officials responsible for **coordinating state aerospace policy**

**Primary strengths of competitive states in attracting new investment**

- All competitive states present a lower **labor cost** than Washington including wage, insurance, benefits, etc.
- Leading competitive states have demonstrated the ability to **perform complex airplane structure work for Boeing**
- Leading competitive states have made more **focused investments in workforce development** and lead Washington in the production of **engineering talent**
- All competitive states have greater flexibility in providing **direct financial support** to industrial investments

**Key challenges for competitive states**

- Developing a **quality workforce at the scale required** to effectively manage activities such as aircraft final assembly
- Overcoming the significant chance of **disruption to 737 MAX delivery** during the transition to a new final assembly site
- Incurring **significant new construction cost** to support a 737 MAX final assembly site
- Managing the complexity and risk in moving final assembly further away from **wing and other fabrication activities in Washington**
Washington’s Position for the 737 MAX

Washington’s strengths in the 737 MAX competition derive from its workforce and existing in-state 737 facilities, but these strengths are under threat.

How Washington has approached aerospace investments
- From building Boeing Field to winning the 767 tanker program, Washington has a long history of supporting aerospace, but investments have typically been event-driven rather than based on a long term vision for aerospace in Washington
- Washington has recently taken important steps to invest in education and workforce development and advance policies that encourage aerospace industry investment

Washington’s primary strengths in a 737 MAX competition: workforce and supply chain network
- The quality and productivity of the current Washington workforce strongly support 737 MAX program objectives
  - The workforce’s current learning curve supports 737 MAX launch and production more quickly and cost effectively
- The location of major Boeing fabrication and back shop facilities in Washington and their integration with the Renton 737 final assembly operation, enhances 737 manufacturing productivity and supports on-time delivery to customers
- The in-state supplier network to the 737 program, supports Boeing’s goals for efficient and cost-effective manufacturing

Washington’s primary weaknesses in a 737 MAX competition
- A significant portion of Washington’s aerospace engineering and manufacturing workforces are nearing retirement, but Washington is not prepared to provide quality engineers, manufacturing workers and industry relevant research at the scale needed to support the 737 MAX across its production lifetime
  - A reduction in workforce quality and productivity would increase 737 MAX program risk and cost to Boeing
- The cost of building and staffing new manufacturing facilities in Washington is significantly higher than in other states, placing a premium upon supporting improvements and investment in 737 facilities currently in Washington
- The outcome of ongoing Boeing labor contract negotiations is outside of the state’s direct control, but may cause 737 MAX program risk in Boeing’s eyes that could outweigh economic and other considerations in a site decision
To Win the 737 MAX
Immediate Actions within Six Months

To win the 737 MAX, Washington must preserve its workforce advantage and reinforce the state’s existing manufacturing locations.

Immediate Actions to Win the 737 MAX

1. Strengthen the state’s existing post-high school aerospace certification and apprenticeship programs to accelerate the state’s production of skilled manufacturing workers, with a particular focus on serving new high school graduates and veterans

2. Increase the number of high quality engineering graduates and expand aerospace-relevant research from the University of Washington and Washington State University

3. Improve the readiness of current high school students to meet the new workforce needs to enter the 737 MAX program or aerospace training programs upon graduation by focusing on STEM learning and building on programs such as Launch Year to increase aerospace career awareness

4. Within the limits of the World Trade Organization, strengthen the current manufacturing and research base by extending state tax credits for investments in manufacturing and research while supporting targeted improvements to infrastructure that serves current 737 facilities

5. Continue to pursue and promote governments’ role in developing positive relationships and facilitating the exchange of ideas and requirements between government, Boeing, its suppliers and organized labor.
Recommendation One – Preserve Washington’s Workforce Advantage for the 737 MAX

The efficiency, quality, and productivity advantages of Washington’s workforce distinguish it in a 737 MAX competition and must be strengthened to win.

Washington should strengthen existing aerospace certification and apprenticeship programs to accelerate the state’s production of skilled manufacturing workers, with particular focus on serving new high school graduates and military veterans. To succeed, government, labor, industry, and educational institutions must work together to define skill needs, build curriculum, provide internship experience, and define a clear path to employment for participants.

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<td>Boeing and Washington face shortfalls in its skilled manufacturing workforce that if not filled will reduce its advantage over competing states for producing the 737 MAX</td>
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<td>Other states such as Kansas and Texas have developed integrated programs between industry, cities, and community colleges to generate certified aerospace workers at scale</td>
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<td>Existing programs such as AJAC provide a model to rapidly expand workforce training to support the 737 MAX</td>
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<td>Air Washington’s receipt of a $20 million U.S. Department of Labor (DoL) grant to support aerospace training provides funding to augment potential state investments</td>
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<td>Pursue a policy of data driven planning, capacity and performance as outlined by the Workforce Training and Education Coordinating Board that:</td>
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<td>Engages industry and labor in defining skill needs, developing curriculum, and providing experience for trainees/apprentices</td>
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<td>Builds upon the DoL grant and the Air Washington consortium to identify and fund training sites</td>
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<td>Allocates future funding based on individual program results and return on investment</td>
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<td>Define specific roles and responsibilities (including funding) for all parties involved</td>
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<td>Use the Post 9/11 GI Bill and other federal monies to support veteran participation</td>
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Recommendation Rationale

Specific Actions
Recommendation Two – Producing Engineers and Research to Support the 737 MAX Program and Beyond

High quality, innovative engineering talent and research-driven innovation are central to Boeing’s competitiveness on the 737 MAX and into the future.

Washington should increase the number of high quality engineering graduates and expand aerospace-relevant research from the University of Washington and Washington State University. The expansion of industry-relevant research activities at universities in areas such as computing, manufacturing, and materials technologies would not only benefit industry directly, but also enhance the skills and value of engineering graduates entering industry.

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**Recommendation Rationale**

- Boeing has stated its competitiveness for the 737 MAX and future programs will be rooted in customer-based innovation and the improvement of its internal processes, advances that require engineering talent.
- Continued reduction in resources for higher education threatens the quality of Boeing’s new hires which will be required to replace outgoing peaks of retirees.
- Boeing is and will source research and talent from out of state if it cannot obtain it in state, reducing Washington’s role in program development for the 737 MAX and beyond.

**Specific Actions**

- Determine the appropriate funding mechanism and add additional engineering student slots at University of Washington and Washington State University to support the engineering needs of Boeing and the broader supplier community:
  - Build upon progress in tuition flexibility to provide universities with greater autonomy in allocating capital and other spending.
  - Accelerate students’ entrance the engineering path, while working with the K-12 system to reduce university capacity used for remedial instruction of prerequisites.
- Pursue joint industry-university research in computing, manufacturing efficiency, and materials/structures innovation, while addressing industry intellectual property needs.
Recommendation Three – Making High School Graduates Workforce-Ready for the 737 MAX

Budget cuts and declining student performance, particularly in math, threaten the quality of the new workers who will start their careers on the 737 MAX.

Build on programs such as Launch Year and increase emphasis on high school STEM initiatives to increase aerospace career awareness and improve the readiness of high school graduates to immediately enter the aerospace workforce or relevant aerospace certification programs. The 737 MAX program will look to those currently in grades 9-12 to meet a significant portion of its new workforce needs and these students must be prepared.

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**Recommendation Rationale**

- Boeing, aerospace suppliers in Washington, and our four year universities express concern on the declining numeracy of high school graduates and the impact that this skills gap has upon the quality and capability of those entering.
- Washington’s 2010 High School Proficiency Exam results similarly show that only 40% of test takers fully meet or exceed standards in math.
- Other states, particularly Texas and Kansas are investing in programs to engage high school students in aerospace, provide them with high school industry internships, and channel them directly into the workforce or additional aerospace training upon graduation.

**Specific Actions**

- Work with industry and labor to strengthen and expand upon existing programs such as Launch Year to provide current high school students with greater exposure to and real experience in aerospace and manufacturing.
- Continue and strengthen ongoing efforts to improve high school performance and the quality of those entering the workforce: e.g. assessing math performance, implementing core standards for math and English, and agreeing to core graduation requirements.
- Engage industry, labor, high schools, and workforce programs to define the path from high school into higher levels of certification and skill and then on to the workforce.
Recommendation Four – Consolidating the Advantage of Existing 737 Facilities in the 737 MAX Competition

Washington must sustain and strengthen the cost advantage to Boeing of existing in-state 737 final assembly and component manufacturing facilities.

Within the limits set by the World Trade Organization (WTO), the state should provide tax credit support for investment in manufacturing and research while supporting targeted improvements to infrastructure that serves current 737 facilities. Such support would increase the cost advantage to Boeing of investing in existing facilities versus building new, while providing some counter to the significant cash and financing that can be offered by competing states.

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Recommendation Rationale

- A core advantage of Washington to Boeing is the existing 737 facilities in the state – incentives to invest in those facilities will improve the state’s position for the 737 MAX
- Competing states are able to provide reinforcing sets of city, county, and state grants, loans, and direct financial incentives to attract aerospace companies that Washington is constitutionally prohibited from offering
- Tax incentives for investment in existing facilities and people in Washington, while unlikely to reach the potential scale of competing states’ cash or bond offerings, provide a powerful message to Washington’s commitment to aerospace and the 737 MAX

Specific Actions

- Support industry’s investment in manufacturing and workforce development through targeted tax incentives on expenses such as:
  - Extension of R&D credits with emphasis on programs developed and manufactured in Washington
  - Extension of 787 sales tax abatement to other aerospace development activities
  - Investment in new or improved manufacturing facilities and tooling
  - Hiring costs for skilled employees (e.g. engineers) and support of internal workforce development
- Improvements to enabling infrastructure such as I-405 and public transit further improve the logistical and workforce attractiveness of existing 737 facilities in Washington
Recommendation Five – Continue Government’s Positive Engagement in Aerospace

Continuing existing efforts to engage Boeing and its suppliers on their key issues are essential to a positive discussion and outcome for the 737 MAX.

The state should continue to pursue government’s positive role in developing relationships and facilitate the exchange of ideas and requirements across government, Boeing, its suppliers, and organized labor. The state is in the unique position of having ready access to parties across the aerospace industry and being able to identify opportunities that can potentially benefit

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Recommendation Rationale

- The uncertain outcome of 2012 contract negotiations between Boeing and its represented workforce, and any perceived risk that a poor outcome may pose to the on time launch of the 737 MAX, may influence Boeing’s production site decision making regardless of how it evaluates objective factors
- While significant progress has been made in recent years, interviews with the state’s supplier community indicate that additional policy opportunities may exist to enhance their role in creating jobs in support of both Boeing and also the global aerospace industry

Specific Actions

- Recognize that while the state cannot directly influence ongoing negotiations between Boeing and its represented workforce, the state can work with suppliers, municipalities, and other interested parties to encourage a positive atmosphere for those discussions to take place; and
- Continue positive progress made in relationship building at the highest levels between the state, Boeing, and the state’s supplier community
- Continue engagement with the supplier community to support their needs and identify reforms that can reduce their cost to support the 737 MAX
Sustaining Long Term Competitiveness
Actions over The Next 12-24 Months

Washington’s continued competitiveness depends on the skill of its workforce and its participation in sustaining the growth of industry in the state.

Actions over the Next 12-24 Months to Sustain Long Term Competitiveness

6. Based on 737 MAX-focused Grade 9-12 educational initiatives, increase student engagement and performance in math, science, and English in grades K-8 in order to secure the long-term quality of the state’s aerospace workforce.

7. Create a robust cabinet level aerospace office led by an industry expert and dramatically strengthen the finances, organizational focus, and performance accountability of the Department of Commerce and local economic development corporations.

8. Work with the Washington’s U.S. senatorial and congressional delegations on funding and support for education, workforce development and training, and research.
Recommendation Six – Improve K-8 STEM Performance
Actions Over the Next 12-24 Months

The long term viability of Washington’s educational strength and manufacturing workforce begins with investments in early education.

Based on 737 MAX-focused Grade 9-12 educational initiatives, increase student engagement and performance in math, science, and English in grades K-8 in order to secure the long-term quality of the state’s aerospace workforce. Increasing skill the skill level of those entering high school will reduce remediation cost, and increase the pool of interested and capable candidates for the future aerospace workforce.

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<td>• Only 40% of Washington eighth graders rate at or above proficient in math and under 40% rate at or above proficient in science based on most recent National Assessment of Educational Progress data</td>
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<td>• Only 43% of Washington fourth graders rate proficient in math and 35% rate at proficient in science based on most recent National Assessment of Educational Progress data</td>
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<td>• K-8 performance drives remediation and higher cost at the high school level and beyond</td>
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<td>• A continuation of this cycle will injure the long term quality of the aerospace workforce</td>
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<td>• Extend core math, science, and English assessments and standards into K-8: e.g. assessing math performance, implementing core standards for math and English, and agreeing to core graduation requirements</td>
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<td>• Work with industry, labor, and workforce development institutions to bring engaging and age appropriate engineering and aerospace focused programming into schools</td>
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<td>• Provide faculty with access to enrichment, skill development, and other activities that can help to extend more current math, science, and engineering concepts into the secondary system</td>
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Recommendation Seven – Strengthen State Institutions
Actions Over the Next 12-24 Months

The multiple layers of decision authority in the state can hinder rapid policy and decision making in support of economic and workforce development.

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Create a robust cabinet level aerospace office led by an industry expert and dramatically strengthen the finances, organizational focus, and performance accountability of the Department of Commerce and local economic development corporations. As Washington transitions from the 737 MAX into subsequent Boeing competitions, it must be able to rely upon a permanent organization that can respond to Boeing’s requirements and address competitive pressures.

**Recommendation Rationale**

- Highly competitive states have specific government officials responsible for coordinating aerospace policy, promoting the state’s role in aerospace, and allocating state incentives, while permitting local economic development councils/corporations to take the lead in recruiting companies, promoting their local markets, and providing local incentive packages.
- While the need for a strong aerospace advocacy and development in Washington has been previously identified, actions taken to date have not placed Washington at the same level of capability and coordination as exists in other states.

**Specific Actions**

- Create a robust cabinet level aerospace office to define state aerospace industry strategy, identify priorities, collaborate with industry, and coordinate the Department of Commerce and local economic development councils/corporations.
- Clearly define the role, responsibility, and expectations of the Department of Commerce and local economic development councils/corporation as relates to aerospace and other industrial development.
- Identify and implement a set of outcomes-based metrics to measure the effectiveness and impact of investments in economic development and the programs they support.
Recommendation Eight – Secure Federal Support

Actions Over the Next 12-24 Months

Washington’s national congressional and senatorial delegations have long supported aerospace and will be key assets moving forward.

By working with the Washington’s U.S. senatorial and congressional delegations on legislation related to long term funding and support for education, workforce development and training, and aerospace research, the state can obtain alternate sources of funding for initiatives critical to its long term aerospace competitiveness.

| Legislature | Accountable |
| Local Govt., EDCs | Accountable |
| Labor | Consult |
| Industry | Consult |
| WAP | Responsible |

### Recommendation Rationale

- Current cuts and a slow economic recovery will continue to pose financial challenges to Washington as it seeks to sustain investments in aerospace and elsewhere and it will require additional sources of funding to sustain the momentum of its investments.
- While the national financial situation is also unlikely to improve in the short term, student aid, workforce development, support for veterans, and sustaining America’s global research and aerospace leadership are central to supporting the recovery.
- As the country’s leading exporter Boeing and its success are central to the country’s continued competitiveness in the global economy.

### Specific Actions

- Preserve federal funding for student loan programs, particularly for two year degree programs for technical training.
- Actively seek federal funding for research into computing and materials technologies.
- Continue access to Post 9/11 GI Bill and other federal funds to support military personnel reentering the workforce.
- Address FAA topics as needed, e.g. a shift to EASA-like type certification for maintenance to improve the position of Washington’s maintenance facilities and training institutions.
Competitive Assessment Table of Contents

Glossary

Washington State Profile and Opportunities

Total Landed Cost Analysis

Competitive State Profiles and Analysis

Appendix: Commercial Aviation Market Context

Appendix: Boeing Market Context

Appendix: Washington Aerospace Partnership Financial Supporters
## Glossary

<table>
<thead>
<tr>
<th>Term/ Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>737 MAX</td>
<td>Boeing's newly announced derivative to the existing 737NG (see below) that will provide increased fuel efficiency and other benefits to aircraft operators and passengers</td>
</tr>
<tr>
<td>737NG (New Generation)</td>
<td>Boeing's most current production derivative of the 737 aircraft which will be succeeded by the 737 MAX</td>
</tr>
<tr>
<td>A320</td>
<td>Airbus's competitor to the Boeing 737</td>
</tr>
<tr>
<td>A320NEO</td>
<td>Airbus’s &quot;new engine option&quot; derivative of the A320 providing increased fuel efficiency, competing against Boeing’s 737 MAX</td>
</tr>
<tr>
<td>Aerospace Joint Apprenticeship Committee (AJAC)</td>
<td>Aerospace and manufacturing apprenticeships providing occupational skills training that combines on-the-job training with classroom instruction</td>
</tr>
<tr>
<td>B&amp;O Revenue</td>
<td>Business and operations tax revenue collected by the state and local municipalities</td>
</tr>
<tr>
<td>B737</td>
<td>Boeing 737, single aisle aircraft</td>
</tr>
<tr>
<td>Backlog</td>
<td>Refers to the existing order book of an aircraft manufacturer</td>
</tr>
<tr>
<td>BLS</td>
<td>Bureau of Labor Statistics</td>
</tr>
<tr>
<td>COMAC</td>
<td>Commercial Airplane Corporation of China Ltd.</td>
</tr>
<tr>
<td>Competitive States/Competitive Set</td>
<td>Alabama, California, Florida, Kansas, New Mexico, North Carolina, South Carolina, and Texas</td>
</tr>
<tr>
<td>Compounded annual growth rate (CAGR)</td>
<td>The year-over-year growth rate of an investment over a specified period of time</td>
</tr>
<tr>
<td>Cost of Goods Sold (COGS)</td>
<td>Direct costs attributable to the production of the goods sold by a company</td>
</tr>
<tr>
<td>Cumulative Present Value (CPV)</td>
<td>Aggregate of future cash flows which have been discounted by an interest rate to reflect their present value; differs from net present value in that it does not consider the perpetuity of future payments but only the cash flows up to a specific point</td>
</tr>
<tr>
<td>Direct Labor (DL)</td>
<td>Employees or workers who are directly involved in production of goods or services</td>
</tr>
<tr>
<td>Disruption</td>
<td>Manufacturing stoppage due to factors such as natural disasters, workforce continuity, labor relations, supply chain events, etc.</td>
</tr>
<tr>
<td>Dispatch Reliability</td>
<td>The percentage of all scheduled flights that departed on time over a given period of time or for a particular operator</td>
</tr>
<tr>
<td>Economic Factors</td>
<td>Assessment element used to analyze the relative aspects of competitive state economies (e.g. access to financing, capital, state budget, etc.)</td>
</tr>
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</tr>
<tr>
<td>EDC</td>
<td>Economic development council/ corporation</td>
</tr>
<tr>
<td>Education, Training, and Social Institutions</td>
<td>Assessment element used to analyze the state’s educational and workforce development systems (e.g. higher education institutions, workforce development programs, K-12, etc.)</td>
</tr>
<tr>
<td>Final Assembly (FA)</td>
<td>The completion of a manufacturing process when the finished product is put together and readied for delivery to the final buyer</td>
</tr>
<tr>
<td>Fringe Benefits</td>
<td>Labor costs related to providing unemployment insurance, workers’ compensation, pension, 401K, and healthcare benefits</td>
</tr>
<tr>
<td>IAM</td>
<td>International Association of Machinists</td>
</tr>
<tr>
<td>Indirect Labor (IDL)</td>
<td>Employees or workers who do not directly produce goods or services but who make their production possible or more efficient</td>
</tr>
<tr>
<td>INWAC</td>
<td>Inland Northwest Aerospace Consortium, a group of companies from Eastern Washington and Northern Idaho that provide products and services to all areas within the aerospace industry.</td>
</tr>
<tr>
<td>Launch Year</td>
<td>House Bill 1808 directs high schools and colleges to identify and publicize a list of dual-credit courses that students can take in high school in order to cut down on the first year of college tuition costs</td>
</tr>
<tr>
<td>Term/ Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>Metropolitan Statistical Area (MSA)</td>
<td>Geographic entities defined by the Office of Management and Budget for use by federal statistical agencies for collecting, tabulating, and publishing federal statistics</td>
</tr>
<tr>
<td>NAEP</td>
<td>National Assessment of Educational Progress</td>
</tr>
<tr>
<td>Non Labor</td>
<td>Costs that are attributed to the manufacturing site that are not considered labor such as electricity, freight, etc.</td>
</tr>
<tr>
<td>Non-Recurring Costs (NR)</td>
<td>Components of developing an aircraft manufacturing site that are one time expenses such as tooling acquisition (capital equipment), initial training of a new workforce, hiring costs, manufacturing facility acquisition/ development/ renovation, etc.</td>
</tr>
<tr>
<td>OEM</td>
<td>Original equipment manufacturer (e.g. Boeing or Airbus), sometimes referred to as OEs or original equipment integrator</td>
</tr>
<tr>
<td>Operators</td>
<td>Passenger and freight airlines, customers of aircraft manufacturers</td>
</tr>
<tr>
<td>Operating Expense (Opex)</td>
<td>A category of expenditure that a business incurs as a result of performing its normal business operations</td>
</tr>
<tr>
<td>OJT</td>
<td>On the job training</td>
</tr>
<tr>
<td>Payback Period</td>
<td>The period of time for an investment to recover its costs, often expressed in years</td>
</tr>
<tr>
<td>Physical Infrastructure</td>
<td>Assessment element used to analyze the physical assets of competitive states (e.g. freight airports, road, rail, seaports, etc.)</td>
</tr>
<tr>
<td>Political Climate</td>
<td>Assessment element used to analyze the relative “business friendliness” of the state toward manufacturing operations, with a focus on aerospace (e.g. industry incentives, labor rules, etc.)</td>
</tr>
<tr>
<td>Property, plant, and equipment (PPE)</td>
<td>A company asset that is vital to business operations but cannot be easily liquidated</td>
</tr>
<tr>
<td>Rate</td>
<td>Production rate [of aircraft] per month</td>
</tr>
<tr>
<td>Recurring Costs</td>
<td>Components of an aircraft manufacturing cost structure that are ongoing such as labor, materials, etc.</td>
</tr>
<tr>
<td>SPEEA</td>
<td>Society of Professional Engineering Employees in Aerospace</td>
</tr>
<tr>
<td>STEM</td>
<td>Science, technology, engineering, and math</td>
</tr>
<tr>
<td>Supply Chain Network</td>
<td>Assessment element used to analyze the state’s fit within the existing supply chain (e.g. manufacturing network, logistics cost, etc.)</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strengths, Weaknesses, Opportunities, and Threats analysis</td>
</tr>
<tr>
<td>Total Landed Cost Model (TLC)</td>
<td>The total cost of manufacturing and delivering an aircraft to a customer. Total landed cost is used in this analysis to compare different production scenarios for the 737 MAX, to understand the potential cash flow to Boeing of building portions of, or the entire aircraft, in Washington versus in locations in competitive states.</td>
</tr>
<tr>
<td>TRS</td>
<td>Total return to shareholders</td>
</tr>
<tr>
<td>TTM</td>
<td>Trailing twelve months</td>
</tr>
<tr>
<td>Unemployment Insurance (UI)</td>
<td>Unemployment insurance provides workers who have lost their job through no fault of their own with monetary payments for a given period of time or until they find a new job.</td>
</tr>
<tr>
<td>Unit Cost</td>
<td>Cost per unit of production</td>
</tr>
<tr>
<td>WC</td>
<td>Workers’ compensation</td>
</tr>
<tr>
<td>Weighted Average Cost of Capital (WACC)</td>
<td>Calculation of a firm’s cost of capital in which each category of capital is proportionately weighted; capital categories are common stock, preferred stock, bonds, and long-term debt – WACC is often used to discount current cash flows</td>
</tr>
<tr>
<td>Workforce</td>
<td>Assessment element used to analyze the existing workforce (e.g. demographics, manufacturing experience, aerospace experience, skill mix &amp; quality, wage rates, etc.)</td>
</tr>
</tbody>
</table>
# Competitive Assessment Table of Contents

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<td>Appendix: Commercial Aviation Market Context</td>
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</tr>
<tr>
<td>Appendix: Washington Aerospace Partnership Financial Supporters</td>
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</tbody>
</table>
The qualitative analysis of Washington’s position is based on six factors that influence manufacturing and aerospace competitiveness.

- **Physical Infrastructure**
- **State of Washington Positioning**
- **Economic Factors**
- **Supply Chain Network**
- **Political Climate**
- **Education, Training, Social Institutions**

**Primary considerations in MAX decision**
- Primary contributors to ability to deliver MAX on time and to economic targets
- State action makes difference in winning the MAX

**Influential in MAX decision**
- Factors that can reduce cost, but not core to aircraft delivery
- State action reduces financial impact

**Foundational in MAX decision**
- Basic capability to be considered
- State action demonstrates commitment to making Washington a better place to do business
Qualitative Research Area Examples

The qualitative analysis examined a wide range of data across the comparative set of competitive states.

<table>
<thead>
<tr>
<th>Workforce</th>
<th>Education, Training, Social Institutions</th>
<th>Supply Chain Network</th>
<th>Political Climate</th>
<th>Economic Factors</th>
<th>Physical Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Current trained workforce</td>
<td>• Demographics</td>
<td>• Capabilities and quality</td>
<td>• Industry incentives</td>
<td>• Access to financing, capital</td>
<td>• Airports</td>
</tr>
<tr>
<td>• Collective bargaining</td>
<td>• Higher education</td>
<td>• Manufacturing network</td>
<td>• Industry vision and support</td>
<td>• Insurance, liability</td>
<td>• Rail</td>
</tr>
<tr>
<td>• Aerospace wages</td>
<td>• Quality of life indicators</td>
<td>• Logistics cost</td>
<td>• Labor rules</td>
<td>• Land availability, pricing</td>
<td>• Seaports</td>
</tr>
<tr>
<td>• Skill mix, quality</td>
<td>• Secondary education</td>
<td>• Procurement and material</td>
<td>• Taxation</td>
<td>• Cost of living</td>
<td>• Road</td>
</tr>
</tbody>
</table>

Primary considerations ✅ Influential 📊 Foundational 📊
Relative Importance of Qualitative Factors

Some qualitative factors have a greater impact upon site decisions than others.

- **Workforce**: The productivity, learning curve, and wages of the manufacturing workforce drive total landed cost. Engineering innovation generates opportunities both for efficiency and also revenue.

- **Education, Training, Social Institutions**: The aging of Washington’s aerospace workforce may impact the state’s future productivity advantage. Educational and workforce development institutions are central to keeping this advantage.

- **Supply Chain Network**: The strength and maturity of existing aerospace final assembly and/or component facilities significantly influences the non-recurring investment needed to support 737 MAX production.

- **Political Climate**: Tax rates are a key element of total landed cost, while competitive state incentive programs can improve the return on investment for site construction or modifications.

- **Economic Factors**: The price of land and initial construction cost are key components to non-recurring costs, while insurance and liability influence the total loaded labor cost of the aerospace workforce.

- **Physical Infrastructure**: Most competitive states have the core road, rail, sea, and air infrastructure required to support a 737 MAX production site, turning the question to site construction/modification costs.
Washington’s Position – Qualitative Analysis

The qualitative analysis highlighted the importance of Washington’s workforce advantage and the opportunity to strengthen its existing manufacturing infrastructure:

- **Workforce Development**: Washington must accelerate the deployment of workforce development programs to prevent the incipient wave of retiring aerospace workers from depleting the state’s advantages in program quality and learning curve.

- **Existing Supply Chain Network**: In addition to the economic advantages identified through the total landed cost analysis, Washington’s existing network of Boeing and supplier facilities that serve the 737 program provide a distinct structural advantage over competitive states.

- **Industry Collaboration and Accountability to Investments**: In a time of increasingly scarce financial resources, it is more important than ever that public and private sector stakeholders share an understanding of desired economic development outcomes and measure the effectiveness of investments in education and elsewhere made to achieve those outcomes.

- **Permanent Focus on the Aerospace Industry and Manufacturing**: With other states improving their position and message and major aerospace employers willing to look elsewhere, Washington can no longer afford to take a reactive approach to economic development in aerospace.

Qualitative capabilities are rated on a four step scale:

1. **Lagging**: large gaps to industry requirements require significant investment or structural changes to close gaps
2. **Basic**: foundation in place for area assessed, but material gaps may exist to industry requirements
3. **Emerging**: pockets of maturity or innovation in area assessed with consistent performance to industry requirements
4. **Leading**: highly mature or innovative in area, clear distinction from other states in meeting or exceeding industry requirements
State Overview: Washington

**Competitiveness Overview:**
- Strong financial position relative to competitive set assessed but is unable to offer similar incentives to other states.
- Current lead in education and workforce development, however, structural, quality, and quantity improvements are needed for the state to retain its workforce advantages.
- Existing aerospace workforce provides learning curve and quality advantages over competitive states.
- Threat of work stoppages is a major consideration for unionized aerospace companies.

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

**Washington Budget Trends**

**Washington Four Year High School Graduation Rates 2003-2008**

Source: U.S. Department of Education, National Center for Education Statistics

Source: State of Washington
Centrality of Aerospace to Washington

Aerospace is a significant economic multiplier for Washington, with each direct aerospace job creating 1.8 additional jobs elsewhere in the state.

Impact of the Aerospace Industry on the Washington Economy

- Economic Output
- Jobs
- Labor Income
- Tax Revenue

- Aerospace businesses and aerospace labor force consume goods and services which have “ripple effects” through the economy through first, second, and third round purchases, generating economic activity between various industries
- Economic activity is measured using input-output models to show “multiplier effects”, or the ratio of an industrial sector’s total economic impact to its direct economic impact
- The aerospace industry generates direct economic activity within the State of Washington in the following ways:
  - Output or business activity
  - Job creation
  - Labor income levels
  - Tax revenues

Boeing employed nearly 81,000 workers in Washington as of September 2011, with an additional 8,000 workers employed in more than 150 other aerospace-focused firms across the state. However, the broader aerospace cluster—including aerospace companies, but also machine shops, tooling firms, advanced materials, engineering & design, interiors, electronics, and other firms with significant aerospace-related activities—includes roughly 650 such companies employing many additional thousands of workers. (Washington Department of Commerce)

Sources:
Technology Alliance, “Alliance The Economic Impact of Technology-Based Industries in Washington State”, 2010
Washington State Office of Financial Management
Accenture research
Boeing in Washington

Boeing contributes to Washington’s economy and community.

• As of September, 2011, Boeing employed 80,600 people in the State of Washington, approximately 8,000 of whom have been hired since January 2011

• An additional 8,000 workers are employed in more than 150 other aerospace firms across the state

• Several thousands more employees work in roughly 650 firms such as machine shops, tooling companies, etc. that may not be exclusively aerospace focused, but serve the aerospace industry

• Based upon the 2002 Washington State input-output model the ~89,000 aerospace-specific workers in Washington have a net jobs impact of more than 250,000 jobs across the state
  - This is purposefully conservative; other studies have found an even greater multiplier (e.g., the Washington Research Council’s estimate based on a REMI model, which states a “jobs multiplier” of 3.96 vs. DoC’s 2.81)

• Approximately 2,800 Boeing suppliers and vendors are located in Washington

• In 2010 Boeing purchases from Washington suppliers and vendors totaled approximately $3.36 billion

• In 2010 Boeing made approximately $42.7 million in charitable contributions in Washington, including organizations such as:
  - Forterra (formerly the Cascade Land Conservancy)
  - Farestart
  - Pacific Northwest Ballet
  - Seattle Opera
  - Special Olympics
  - United Way (of King County, of Pierce County, of Snohomish County)

Sources: Washington State Office of Financial Management, Washington Department of Commerce, Boeing
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Impact of the 737 Program on the Washington Economy

Keeping 737 MAX final assembly in Washington would sustain the program’s significant economic contribution.

Projected Annual State Tax Revenue to Washington at 42 Airplanes per Month (2011 dollars, figures in millions)

<table>
<thead>
<tr>
<th>Site</th>
<th>Estimated Gross Salaries ($M/year)</th>
<th>Renton 737 Headcount in Washington</th>
<th>Total Job Creation</th>
<th>Incremental Job Creation</th>
<th>Economic Spillover ($M)</th>
<th>Spillover Sales Tax Revenue from Residents ($M)</th>
<th>Spillover B&amp;O Tax Revenue from Business ($M)</th>
<th>Direct B&amp;O Taxes ($M)</th>
<th>Total Washington State Tax Benefit ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boeing Renton 737 Facilities</td>
<td>$622</td>
<td>8,840</td>
<td>20,125</td>
<td>11,285</td>
<td>$5,815</td>
<td>$271</td>
<td>$185</td>
<td>$86</td>
<td>$586</td>
</tr>
</tbody>
</table>

- Each 737 production job generates **1.28 additional jobs in the general economy**
  - 737 production jobs include manufacturing, manufacturing engineering, and liaison engineering, but do not include some higher income jobs thereby reducing the economy multiplier of 737 production jobs relative to the overall aerospace multiplier, which creates 1.8 additional jobs for each aerospace job
  - These roles would likely be transferred to the chosen final assembly location should a site other than Renton be selected

- At 42 planes per month, Boeing would likely employ over **8,800 737 production workers**, which would support an estimated **11,285 jobs in the local economy**

- This economic activity would generate **over $586 million in sales, use, and B&O tax revenue** for the state

Assumptions:
See “737 MAX State Revenue Impact Calculation and Assumptions” slide
Sources: Washington State Office of Financial Management, Aerospace Futures Alliance, Boeing, Accenture research
Calculation Methodology

- Boeing’s B&O obligation would be based on an average selling price of $70M per airplane at a tax rate of 0.2904%.
- Washington’s input-output model, developed by Washington State Office of Financial Management, was used to develop state revenue impacts based on Boeing Renton’s estimated gross salaries and headcount at 42 airplanes per month.

Assumptions

- Fixed coefficients – same impact with each additional dollar of increased demand.
- Wages and prices don’t adjust with increased demand.
- Cannot account for fundamental changes, only increased sales.
- B&O sales on airplanes delivered is 0.2904%, which is additive to the state revenue effects of increased business activity.
### Washington Strengths

- Experienced aerospace workforce provides a productivity advantage over competitive states
- Extensive and mature Boeing design and manufacturing assets are in place across Washington
- Washington’s community and technical colleges are aggressively building aerospace capabilities, based on their receipt of a newly won $20 million DoL grant and commensurate state support
- Washington has strong aerospace industry advocates at the local, state, and federal levels of government
- Washington aerospace suppliers support Boeing in its ability to manage cost and quality

### Washington Weaknesses

- A large portion of the Boeing workforce is likely to retire in the next five to seven years
  - Loss of experience and knowledge through retirement will shrink Washington’s qualitative workforce advantages over other states
- Existing workforce development programs and universities are not capable of producing quality manufacturing and engineering employees at the scale requirement for the 737 program
- Manufacturing plant advantages are confined to existing facilities and new investment is expensive relative to other states
- Limited statewide coordination on aerospace strategy and action
- Boeing may overly weight the potential of a production disruption (e.g. supply shortage) or work stoppage in its decision process

### Washington Opportunities

- Increase access to four-year and graduate engineering programs
- Increase quality of math and science instruction
- Work with industry, community and technical colleges, and existing apprenticeship programs to increase access to workforce development programs that provide a path to formal employment and accredited certification in a specific trade
- Pursue joint industry-university research in computing, manufacturing efficiency, and materials/structures innovation
- Create a full-time, robust, state-level role dedicated to retaining and attracting aerospace business and businesses
- Focus on coordinated economic development, building upon the strong local organizations individual efforts

### Washington Threats

- Other states have more freedom within their incentive programs, particularly in their ability to offer direct support in cash or in kind
- Competitive states offer low cost areas with existing infrastructure that is nearly or fully ready to support aerospace manufacturing activities
- Other states will become increasingly competitive in quality and cost as Washington’s workforce advantages are reduced through retirements and competitive states’ investments in workforce development close the talent gap with Washington
- Washington is vulnerable to some supply chain disruption, e.g. natural disaster
## Washington SWOT Analysis

### Workforce

<table>
<thead>
<tr>
<th>Washington Strengths</th>
<th>Washington Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Existing aerospace workforce provides</td>
<td>• Boeing may overly weight the potential of a work stoppage in its decision process</td>
</tr>
<tr>
<td>▪ Global leaders in systems engineering</td>
<td>▪ A large portion of the Boeing workforce is likely to retire in the next five to seven years</td>
</tr>
<tr>
<td>▪ Skilled workforce has effectively maximized 737 production and final assembly learning curves in Renton, Auburn, and Fredrickson</td>
<td>▪ Loss of experience and knowledge through retirement will shrink Washington’s qualitative workforce advantages over other state</td>
</tr>
<tr>
<td>▪ High level of collaboration between engineering and skilled workforce</td>
<td>▪ Washington’s wage and fringe benefit costs are higher than other states and COLA differences are not reflected in union wages</td>
</tr>
<tr>
<td>• Culture of innovation in place for both product development and process improvement</td>
<td></td>
</tr>
<tr>
<td>• Regional population is sufficient to meet future headcount quantity requirements</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Washington Weaknesses</th>
<th>Washington Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Boeing may overly weight the potential of a work stoppage in its decision process</td>
<td>• Other states will become increasingly competitive in quality and cost as Washington’s workforce advantages are reduced through retirements and the leveling of the talent pool</td>
</tr>
<tr>
<td>• A large portion of the Boeing workforce is likely to retire in the next five to seven years</td>
<td>• Competitive states are producing more qualified engineers per capita than the State of Washington</td>
</tr>
<tr>
<td>▪ Loss of experience and knowledge through retirement will shrink Washington’s qualitative workforce advantages over other state</td>
<td>• Competitive states offer lower wage and fringe benefit costs than does Washington</td>
</tr>
<tr>
<td>• Washington’s wage and fringe benefit costs are higher than other states and COLA differences are not reflected in union wages</td>
<td></td>
</tr>
</tbody>
</table>
# Washington SWOT Analysis

## Education, Training, Social Institutions

### Washington Strengths
- Washington has highly rated community and technical colleges that have the support of a newly won, significant federal grant to support aerospace training
- Good communication within the community college system and between local community colleges and the businesses they serve
- Four-year institutions provide high quality undergraduate and graduate engineering degrees
- Washington community and technical colleges receive approximately $20 million per year from the state and recently won a $20 million federal grant to expand aerospace training

### Washington Opportunities
- Strengthen aerospace apprenticeship programs in aerospace trades based upon continued funding of community and technical colleges and engages industry in developing curriculum and internship opportunities
- Attract military veterans and new K-12 graduates into aerospace
- Increase output of four-year and graduate engineering programs
- Increase applied learning (e.g. engineering, manufacturing, etc.) into K-12; increase quality of K-12 math and science instruction
- Pursue joint industry-university research in computing, manufacturing efficiency, and materials/structures innovation

### Washington Weaknesses
- There is a rapid drop-off in K-12 achievement, particularly in math
- Investments in workforce development projects such as AJAC are a good start and model but are far from meeting industry needs
- Existing workforce development programs and universities are not yet capable of producing quality manufacturing and engineering talent at the scale requirement for the 737 program and other high tech industries
- A complex educational hierarchy slows innovation and change
- Shallow pool of employment and university ready K-12 graduates

### Washington Threats
- Other states (e.g. Texas) are producing quality engineers and skilled workforce at a faster pace than Washington
- Further work is required to define the path from high school into the skilled manufacturing workforce and to improve the attractiveness of manufacturing careers
- Washington’s past success in importing engineers is not guaranteed to continue; companies may move closer to talent
- Competition for research dollars may move to other technology hubs, depriving Washington of revenue and placement for engineering students
# Washington SWOT Analysis

## Supply Chain Network

### Washington Strengths
- Wing and structure fabrication facilities in Auburn and Fredrickson support Boeing’s delivery targets while reducing its working capital costs
- Multiple existing aerospace clusters across the state support Boeing and other aerospace manufacturers
- These aerospace clusters are already integrated into the extended 737 supply chain (e.g. fuselage, engine, etc.)
- Washington suppliers support Boeing’s cost and delivery targets through just in time (JIT) delivery, lean manufacturing, and on-site collaboration

### Washington Weaknesses
- Beyond Renton or Everett there are no facilities that can immediately support major final assembly operations
- Certain major components (e.g. fuselage, engines, etc.) bound for Washington have relatively long transportation lead times
- Concentration of all final assembly operations within a single locations may increase the chance of external events disrupting production (e.g. natural disaster, supply chain disruption, work stoppage, etc.)

### Washington Opportunities
- Examine the use of targeted tax programs/incentives, within the confines of WTO regulations, to promote manufacturing investment – e.g. purchase of tooling, hiring of new apprentices/developing apprentice programs, expansion of existing facilities, etc.
- Invest in research into technology innovation (e.g. materials, propulsion, etc.) and efficient manufacturing techniques that can increase the value added by the in-state supply chain while increasing the efficiency of manufacturers’ assembly activities
- Promote the investment of supporting industries such as aerospace maintenance repair and overhaul (MRO), painting, etc.

### Washington Threats
- Competing states offer lower transportation costs and lead times within the contiguous U.S. for most 737 components
- Other locations offer sites that possess existing structures that can support final assembly operations with some additional investment or construction
- The departure of Boeing activity from Puget Sound would also draw away suppliers
- Other states have significant flexibility in the state and local incentives they can offer to attract supply chain operations – e.g. suppliers, logistics providers, etc.
## Washington SWOT Analysis

### Political and Economic Factors

### Washington Strengths
- No income tax
- High state credit rating
- Well organized and active county and municipal economic development agencies
- Aerospace specific incentives in place
- Washington has strong aerospace industry advocacy from U.S. congressional and senatorial delegations

### Washington Weaknesses
- Limited statewide coordination on economic development, particularly the retention and attraction of new businesses
- State constitution limits the ability of state, county, and municipal officials to offer significant incentives
- Washington aerospace incentives focus on OEMs limits ability to support small and medium aerospace companies
- Despite recent changes in L&I and workers’ compensation, small and medium size suppliers still view workers’ compensation as burdensome and

### Washington Opportunities
- Simplify the existing B&O and sales tax structure to reduce administrative costs on businesses and use aerospace-specific tax incentives to attract investment
- Continue the long term dialogue, particularly with small and medium sized businesses, on education, workforce development, and the impact of workers’ compensation and unemployment insurance
- Create a full-time role within the Governor’s office dedicated to retaining and attracting aerospace business and businesses
- Engage the delegation in Washington DC on key issues including potential federal subsidization of other states, taxes, etc.

### Washington Threats
- Other states have more freedom within their incentive programs, particularly in their ability to offer direct support in cash or in kind
- Other states have far greater ability to lower and eliminate applicable taxes in order to attract aerospace and other companies
- Bordering states (e.g. Idaho) with lower taxes, right to work laws, and access to Washington population centers are attracting companies that had previously expressed interest in investing Washington
# Washington SWOT Analysis

## Physical Infrastructure

### Washington Strengths
- Recent and ongoing improvements to state highways have improved the flow of freight and workers
- Five airports capable of supporting 737 operations, manufacturing operations, and future infrastructure expansion
- Multiple Washington sites from Spokane to Puget Sound have ready access to existing 737 fuselage rail transit line
- In-state supply base and Boeing owned fabrication sites (wings, composites, etc.) supporting final assembly
- Three deep water ports supporting Boeing with others available

### Washington Weaknesses
- Availability of public transportation for manufacturing workers, particularly those who live and work in different counties
- To move to a new site in Washington would require the construction of significant manufacturing and finishing facilities at a higher cost than in competitive states
- Roadways in and out of existing Boeing facilities require investment to support existing and increased volume (e.g. I-405, SR-167)
- While significant progress has been made, permitting and approval times slightly lag those in highly competitive states

### Washington Opportunities
- Develop an integrated approach for transportation infrastructure investment to ensure business needs are addressed sufficiently across the state and improves the quality of commuting for the workforce
  - Improve I-405 and SR-167 to improve flow of freight and people to key Boeing facilities that support the 737 program
  - Improve public transportation to support manufacturing workforce in the areas where Boeing and other aerospace company employees live and work, i.e. commuter flow
- Three deep water ports supporting Boeing with others available

### Washington Threats
- Some competitive states offer properties (including those through the Base Closure and Relocation process) at low costs with existing infrastructure that can be to support aerospace manufacturing activities
- Competitive states are able to provide significant funding and/or lease-back arrangements to build required facilities and supporting infrastructure in support of aerospace projects
- Existing infrastructure in Western Washington is vulnerable to natural disaster and may be evaluated in a decision relative to hurricane risk in Carolinas, tornado risk in Kansas, etc.
State Support of Aerospace in Washington

State and local government have demonstrated the ability to support industry competitiveness through targeted policy and investment.

### Representative Examples of Recent State and Local Government Efforts to Support Aerospace

| Aerospace tax incentives | • Reduced B&O tax rate for aerospace businesses (including a reduction of Everett’s local B&O tax)  
| | • B&O credit for preproduction development expenditures (1.5% of expenditures)  
| | • B&O credit for Property/ leasehold taxes paid on aerospace business facilities  
| | • Sales & use tax exemption for aerospace businesses for computer hardware/ software/ peripherals |
| Expedited permitting efforts | • Project Olympus documents that the city of Everett provide a “Planned Action” expedited permit process for Boeing, its contractors and subcontractors consistent with Washington law  
| | • Interviews with local municipalities revealed a history of and a willingness to continue to expedited the permitting process related to business development/ investment for the aerospace cluster |
| Legislative changes to workers’ compensation | 2010 legislation made the following changes to workers’ compensation:  
| | • Enabled structured settlement agreements (lump sum payments for employees 55+)  
| | • 2012 freeze cost-of-living adjustments (COLA) for 2012  
| | • Eliminated interest (8%) on unpaid permanent partial disability (PPD) or impairment awards  
| | • Additional programs developed include Rainy Day Fund, medical provider network changes, Stay at Work program, fraud initiative, performance audit, occupational disease study, and Safety and Health Investment Projects (SHIP) grants |
| Education and Workforce | • Increased focus on STEM education in grades K-12  
| | • Introduced Launch Year to accelerate transition from high school to workforce  
| | • Directed Workforce Investment Act funds to support curriculum development and equipment purchases for aerospace training |
| Industry-government collaboration | • The state was a central player in building the coalition to win the 767 tanker program  
| | • The current administration has made significant efforts to engage the broader aerospace community in Washington in an effort to determine their operational needs  
| | • Creation of the Washington Aerospace Partnership focus on keeping future Boeing 737 manufacturing lines as well as other programs in Washington |
| Industry promotion | • Participation in the Paris Air Show  
| | • Trade missions to Southeast Asia |
Washington Aerospace Suppliers – by County and Activity

Source: Accenture Research
### Supplier Activity Definitions

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributor</td>
<td>Businesses that supply parts and equipment</td>
</tr>
<tr>
<td></td>
<td>Example: resellers</td>
</tr>
<tr>
<td>Ground Support Equipment</td>
<td>Businesses that provide ground support equipment and services</td>
</tr>
<tr>
<td></td>
<td>Example: hangar</td>
</tr>
<tr>
<td>Machining</td>
<td>Businesses that supply tools for machining and/or businesses that machine components</td>
</tr>
<tr>
<td></td>
<td>Example: tooling, precision-machined parts</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Businesses that manufacture aircraft components</td>
</tr>
<tr>
<td></td>
<td>Example: composite manufacturing, plastic manufacturing</td>
</tr>
<tr>
<td>Materials</td>
<td>Businesses that provide input materials for the aerospace industry</td>
</tr>
<tr>
<td></td>
<td>Example: aluminum casting, non-ferrous foundry</td>
</tr>
<tr>
<td>MRO</td>
<td>Businesses that perform maintenance, repair, and operation</td>
</tr>
<tr>
<td></td>
<td>Example: airframe maintenance</td>
</tr>
<tr>
<td>Other</td>
<td>Businesses that engage in other important functions for the aerospace industry</td>
</tr>
<tr>
<td></td>
<td>Example: airport</td>
</tr>
<tr>
<td>Professional Services</td>
<td>Businesses that provide various services to the aerospace industry</td>
</tr>
<tr>
<td></td>
<td>Example: consulting, engineering services, logistics</td>
</tr>
<tr>
<td>Test and Calibration</td>
<td>Businesses that supply testing equipment, perform testing/calibrating, and certifications</td>
</tr>
<tr>
<td></td>
<td>Example: test equipment</td>
</tr>
</tbody>
</table>
Current Aerospace Concentrations in Washington
Puget Sound Remains Primary, Spokane Emerging

**Snohomish County**
- Final assembly
- Machining
- Component manufacturing
- MRO and professional services

**Spokane County**
- Machining and finishing
- Component manufacturing
- MRO (emerging)

**Pierce County**
- Machining and manufacturing – complex structures and composites
- MRO

**King County**
- Final assembly
- Machining
- Component manufacturing
- MRO and professional services

Source: Accenture Research
Regional Strengths in Washington

Several regions within Washington have the potential to support present or future aerospace manufacturing operations.

- **Current final assembly locations: King and Snohomish Counties**
  - Existing workforce and large supplier networks allow for efficient just in time (JIT) production and supply to Boeing
  - Quick, convenient access to deep water ports allows efficient shipping to other regions of the world enabling companies to serve the global aerospace market

- **Pierce County**
  - A center of excellence for parts fabrication and wing manufacturing with established and nationally recognized composite curriculum programs

- **Grant County**
  - Recent business developments have shown the area’s strength for small to medium manufacturing operations (e.g. SGL/BMW composite plant)
  - Strong history of supporting flight test programs (e.g. Boeing, Embraer, Mitsubishi)
  - Location offers the lowest utility costs in the nation, a valuable asset for power intensive manufacturing operations

- **Spokane County**
  - Established aerospace manufacturing cluster and regional aerospace association (i.e. INWAC)
  - Experienced aerospace workforce with lower wage rate relative to other regions in the state

- **Kitsap County**
  - Dedicated industrial zone and ongoing investment in commercial infrastructure
  - Large contingent of retired military workforce and well structured workforce development/technical training organizations (e.g. Puget Sound Naval Shipyard (PSNS) apprenticeship, Olympic College)
  - Long manufacturing history with Puget Sound Navel Shipyard
Competitive Assessment Table of Contents

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Total Landed Cost Analysis

Competitive State Profiles and Analysis

Appendix: Commercial Aviation Market Context

Appendix: Boeing Market Context

Appendix: Washington Aerospace Partnership Financial Supporters
Total Landed Cost (TLC) Analysis Executive Summary
Texas and Idaho are Most Cost Effective Competitors

Washington is well positioned for a 737 MAX competition at current production rates, but must address its higher costs relative to other states.

Washington Situation
- Washington has a significant advantage with the existence of the current 737 facility in Renton and supporting facilities in Auburn and Fredrickson
- Washington’s workforce provides a strong learning curve advantage, which accelerates time to value versus other states

Washington Complication
- Washington has higher costs for land, labor, and capital (e.g. manufacturing equipment and tooling) compared to other states
- Washington’s tax, workers’ compensation, and other social structures are more costly than in other states; however, changes were made to begin to address these factors during the last legislation session
- Other states are investing in Washington’s strengths (workforce, etc.)

Washington Opportunity
- Build on strengths: workforce skills, existing infrastructure
- Engage industry to support workforce development and to make targeted investments that support the existing manufacturing infrastructure
- Investigate opportunities to diversify the manufacturing base to lower cost areas of the state, particularly for future programs
Sources of Positioning and Competitiveness
Quantitative Analysis

Qualitative findings are supported by a quantitative “total landed cost” model that examined the primary drivers of cost across all aspects of manufacturing a new airplane.

The total landed cost model demonstrated the relative financial advantages of siting 737 MAX production in Washington versus in the competitive set of states.
Summary of Analysis: Final Assembly in Renton Scenarios Provide Maximum Present Value for 737 MAX

737 MAX final assembly would stay in Renton. While some systems installation could move to a lower cost location out of state, this is unlikely due to the lack of qualified labor in out of state sites located en route from Wichita.

Renton’s value proposition is strengthened by the proximity of existing Auburn and Fredrickson Boeing locations where wing component manufacturing and parts fabrication are conducted.

*Source: Accenture total landed cost analysis
737 Production in Washington

The current 737NG supply chain served as the baseline for the 737 MAX TLC model.

- Renton operates in conjunction with Boeing Field from where 737s are delivered
- Some planes are painted at Boeing Field, the remainder at Renton
- Mechanics and engineers, represented by the IAM and SPEEA unions, comprise the relevant labor for this study
- Highest skill grades are found on flight lines where any final changes are made to the aircraft prior to customer delivery
- Each area’s direct labor (labor directly working on the airplane hardware) is supported by indirect labor (IDL) who deliver parts, resolve issues and sign off work
737 Family Production

The TLC model considers the changes in 737 production rates (i.e. moving from 32 to 42 aircraft per month) over time and key milestones for the introduction of the 737 MAX (cutover from the NG to the MAX).

- Boeing announced it is evaluating production sites to build the 737-MAX airplane
- Production rates are set to increase 33% in the next 3 years
- Boeing has announced rate increases up to 42 airplanes per month, a 33% increase in current production rates

That analysis assumes that based on Boeing’s high production rate, Boeing would likely try to minimize production risk when selecting a final assembly site for its top selling airplane.
737 MAX Production Scenarios beyond Renton, WA

The scenarios consider moving various parts of production from Renton and Boeing Field to other Washington and out of state locations.

• The below criteria were used to establish the different total landed cost scenarios with different percentages for each stage completed in different locations:
  - Delivery location
  - Final Assembly location
  - Wing assembly location
  - Fuselage systems installation location

• Existing operations for the 737NG is used as the baseline to compare all scenarios

<table>
<thead>
<tr>
<th>Washington State Scenarios</th>
<th>Out of State Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Snohomish County (excluding Everett)</td>
<td>• Idaho*</td>
</tr>
<tr>
<td>• Everett</td>
<td>• South Carolina</td>
</tr>
<tr>
<td>• Bremerton</td>
<td>• Kansas</td>
</tr>
<tr>
<td>• Moses lake</td>
<td>• Florida</td>
</tr>
<tr>
<td>• Spokane</td>
<td>• New Mexico</td>
</tr>
</tbody>
</table>

*Idaho only evaluated as a systems “stuffing” location, not for final assembly operations
Total Landed Cost Analysis Conclusions – 737 MAX and Beyond

The economics of a derivative airplane such as the 737 MAX suggest Boeing would not exit Renton. However, the outcome could be completely different on a new airplane program such as a 777 replacement.

For the 737 MAX

• Boeing has the current capital and infrastructure investment in Puget Sound to keep 737 MAX production in Washington, theoretically up to 60 airplanes per month
  – Boeing has announced its intent to increase 737 production to 42 airplanes per month in Renton
  – Boeing could consider an intermediate site between Wichita and Renton for fuselage “stuffing” to relieve space constraints
  – The most likely sites outside of Washington would be Texas for a second final assembly line or Coeur d’Alene for stuffing the NG and MAX to take advantage of lower wage rates

• The largest disincentive to moving production would be the potential halting of production across all airplane models, as the cost of one month of no production would outweigh nearly five years of potential labor rate savings on the 737 Program

Beyond the 737 MAX

• Labor savings would not outweigh the non recurring costs of acquiring land and capital improvements or the potential of disrupting production for at least 10 years (assuming current cost differences hold)

• However, Boeing would have an incentive to exit Washington on a new airplane program that ramps up in parallel using capital assets and people skills that downplay Renton’s skills and experience
  – Different capital and tooling assets would be used in building a non-metallic airplane.
  – New skills would be required affecting an estimated 20% of Boeing’s labor force
## Most Promising Out of State Options – Idaho and Texas

Idaho Benefits through Systems Installation (i.e. stuffing), Texas through Full Production and Assembly

<table>
<thead>
<tr>
<th>State</th>
<th>Recurring Costs</th>
<th>Non-Recurring Costs</th>
<th>Disruption Risk</th>
<th>Workforce Availability</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>◯</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Idaho (1) (stuffing)</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Proximity to Spokane would ease labor workforce availability</td>
</tr>
<tr>
<td>Texas (2) (3)</td>
<td>◯</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Benefits from low labor wages and low non-recurring investment requirement</td>
</tr>
<tr>
<td>North Carolina</td>
<td>◯</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Uncompetitive versus Texas</td>
</tr>
<tr>
<td>Alabama</td>
<td>◯</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Uncompetitive versus Texas</td>
</tr>
<tr>
<td>Florida</td>
<td>◯</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Uncompetitive versus Texas</td>
</tr>
<tr>
<td>New Mexico</td>
<td>◯</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Uncompetitive versus Texas</td>
</tr>
<tr>
<td>South Carolina</td>
<td>◯</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Uncompetitive versus Texas</td>
</tr>
<tr>
<td>Kansas</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Skilled workforce, but labor savings only just cover non-recurring costs.</td>
</tr>
<tr>
<td>California</td>
<td>○</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Inadequate labor cost differential to cover the cost of non-recurring costs</td>
</tr>
</tbody>
</table>

**Notes:**
1. Idaho could be a systems installation ("stuffing") location, especially given proximity to Spokane, but not a final assembly site
2. Workforce is availability of people, and ability to train and ramp production fast.
3. Boeing has a San Antonio facility for finishing 787s that may be available by 2017

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737 MAX does not need a new site with the possible exception of offloading some stuffing en route. For competitions post-737 MAX, Washington must focus on the areas that provide Boeing greater reason to stay.

### Relative Advantages of Sites in Washington

<table>
<thead>
<tr>
<th>Location</th>
<th>737 Max</th>
<th>New Airplane</th>
</tr>
</thead>
</table>
| Renton                           | • Safe for current program  
• Valuable land but vulnerable to natural disaster  
• Facilities could not accommodate transition on a new airplane program (i.e. 7x7) without disruption | • Less advantaged in 5-10 years when much of current experienced workforce will have retired  
• However, recent hires should be fully trained and ready to support the program |
| Everett                          | • Would likely require non-recurring investment and there are no labor savings relative to Renton. | • Attractive due to the experienced labor force and little to no non-recurring investment cost – labor experience would need to overcome labor rate disadvantages through productivity gains  
• Recurring costs such as labor rates and utilities are higher versus other locations in the state such as Moses Lake or Spokane |
| Snohomish County (excl. Everett) | • Cost prohibitive due to non-recurring investment                      | • A possibility if Everett campus has no space and a new campus is required, assuming space and runway are already available. |
| Spokane                          | • Potential for useful labor wage break subject to unions allowing a differentiated union labor contract that reflects different cost of living in Eastern Washington  
• Good labor pool for rapid ramp | • Potential for useful labor wage break subject to unions allowing a differentiated union labor contract that reflects different cost of living  
• Low utility costs  
• Affordable space |
| Moses Lake                       | • Unlikely to be able to ramp fast to anticipated 737 MAX rates given workforce and infrastructure | • Similar advantages to Spokane but without similarly sized supporting supply chain network and workforce pool to justify the labor savings. |
| Bremerton                        | • Disadvantaged on recurring and non-recurring costs                   | • Continue efforts to build aerospace supplier based and industry manufacturing expertise |
Alternate Washington Sites Outside Puget Sound for 737 MAX Final Assembly

Eastern Washington would be an economical option if cost of living adjustments were made to manufacturing labor wage rates versus Puget Sound.

<table>
<thead>
<tr>
<th>Site</th>
<th>Recurring Costs</th>
<th>Non-Recurring Costs</th>
<th>Disruption Risk</th>
<th>Workforce Availability</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renton</td>
<td>[ ]</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>Capacity and capable workforce but labor rate higher than other parts of Puget Sound (excluding Everett)</td>
</tr>
<tr>
<td>Spokane</td>
<td>●</td>
<td>[ ]</td>
<td>●</td>
<td>[ ]</td>
<td>Attractive workforce size and cost structure but would require additional non-recurring investment to support a manufacturing line</td>
</tr>
<tr>
<td>Moses Lake</td>
<td>●</td>
<td>[ ]</td>
<td>●</td>
<td>[ ]</td>
<td>Relatively small workforce and would require additional non-recurring investment to existing facilities to support a manufacturing line</td>
</tr>
<tr>
<td>Everett</td>
<td>[ ]</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>No labor benefits, but could be a good site in an expansion scenario if space is available</td>
</tr>
<tr>
<td>Snohomish County (excl. Everett)</td>
<td>[ ]</td>
<td>[ ]</td>
<td>●</td>
<td>[ ]</td>
<td>Only practical in an expansion scenario or when a new campus is required</td>
</tr>
<tr>
<td>Bremerton</td>
<td>[ ]</td>
<td>[ ]</td>
<td>●</td>
<td>[ ]</td>
<td>No labor benefit and large non-recurring investment required.</td>
</tr>
<tr>
<td>Tri-Cities</td>
<td>[ ]</td>
<td>[ ]</td>
<td>●</td>
<td>[ ]</td>
<td>No labor benefit and large non-recurring investment required.</td>
</tr>
</tbody>
</table>
## Considering Future Competitions – Post-737 MAX

### New Airplane and New Technology

An airplane based on new technology could reduce Washington’s workforce and supply chain network advantages.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mature Technology (e.g. 737 Classic to NG)</th>
<th>New Technology (e.g. 767, 777, 787)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Aluminum</td>
<td>Composite</td>
</tr>
<tr>
<td>Tooling</td>
<td>Reused from Classic</td>
<td>New tooling</td>
</tr>
<tr>
<td>People Skills</td>
<td>Readily reused</td>
<td>New or train existing for some skill codes (e.g. composite layup but not systems installation)</td>
</tr>
<tr>
<td>Supply Base</td>
<td>Carried over</td>
<td>Potential changes to suppliers, their roles, and responsibilities</td>
</tr>
<tr>
<td>Rate</td>
<td>Space was available for transition from Classic to NG</td>
<td>Existing space may not be sufficient to meet production rate for a totally new aircraft that requires new production technology</td>
</tr>
</tbody>
</table>

Washington’s ability to take advantage of the efficiency of its workforce and existing manufacturing facilities to win site decisions would decline should subsequent airplane programs be “revolutionary” (e.g. a 777 replacement) rather than “evolutionary” (e.g. a re-winged 777).*

*Illustrative only. There is no confirmation that Boeing would pursue either of these options.
The economics of the 737 MAX analysis indicate that future siting decisions will share many of the same decision criteria as for 737 MAX.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Criterion</th>
<th>Relative Importance</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disruption Potential</td>
<td>Workforce continuity, labor relations</td>
<td>Very High</td>
<td>One month of disruption would likely outweigh more than five years of potential labor savings</td>
</tr>
<tr>
<td></td>
<td>Supply chain disruption (e.g. supplier issues, natural disaster, etc.)</td>
<td>Very High</td>
<td>One month of disruption could outweigh more than five years of potential labor savings</td>
</tr>
<tr>
<td>Recurring</td>
<td>Fully loaded labor costs</td>
<td>High</td>
<td>Ongoing benefit</td>
</tr>
<tr>
<td></td>
<td>Low effective tax rate</td>
<td>High</td>
<td>B&amp;O tax impacts companies during downward business cycles</td>
</tr>
<tr>
<td>Non-Recurring</td>
<td>Leaseback of land and building at competitive rate</td>
<td>Medium</td>
<td>Mitigates the upfront costs of relocating</td>
</tr>
<tr>
<td></td>
<td>Total Environmental Costs (e.g. associated with paint hangars)</td>
<td>Medium</td>
<td>For example, waste water, remediation (as required), etc.</td>
</tr>
<tr>
<td>Transition</td>
<td>Semi &amp; fully qualified workforce availability</td>
<td>Low</td>
<td>State funded training needed to ramp the workforce.</td>
</tr>
<tr>
<td></td>
<td>Tax credits for OTJ Training</td>
<td>Low</td>
<td>Tax credits for OTJ training programs (for labor loss)</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td>Low</td>
<td>Would want the best and brightest working in industry developing new technologies</td>
</tr>
<tr>
<td>Certainties / No Surprises</td>
<td>Ability to cap or settle workmans’ comp</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Business friendly local government</td>
<td></td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Necessity</td>
<td>Infrastructure</td>
<td>Necessity, but can be a tie breaker</td>
<td>Ground and air freight are dominant modes of transport for aerospace parts. Sea would be used for major overseas structures. Rail would not be greatly valued for a composite plane.</td>
</tr>
</tbody>
</table>
# Competitive Assessment Table of Contents

- Glossary

- Washington State Profile and Opportunities

- Total Landed Cost Analysis

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</tr>
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</table>

- Appendix: Commercial Aviation Market Context

- Appendix: Boeing Market Context

- Appendix: Washington Aerospace Partnership Financial Supporters
Washington’s workforce, physical infrastructure, and supply chain network distinguish it from competitive states.

- All states demonstrated budget shortfalls, which in combination with their balanced budget requirements will force significant trade offs to be made regarding where they choose to invest their limited funds.
- K-12 educational performance across all states reflects general negative national trends in educational performance, particularly in math and science.
- Washington’s key strength was the integrated Boeing and non-Boeing supply network around Renton, supported by a deeper, more skilled aerospace workforce than competitive states.
- Texas is the most likely threat based upon its infrastructure, strong output of quality engineering talent, growing aerospace workforce, and ability to deploy significant economic incentives to attract companies.
- South Carolina, though a Boeing manufacturing location, must overcome state budgetary challenges, the scalability of its workforce, and its lack of integration with the 737 supply chain to support the 737 MAX.
- Competitive states’ existing and future tax incentives’ WTO compliance is not currently known.

We rated competitive states’ qualitative capabilities on a four step scale:

1. **Lagging:** large gaps to industry requirements require significant investment or structural changes to close.
2. **Basic:** foundation in place for area assessed, but material gaps may exist to industry requirements.
3. **Emerging:** pockets of maturity or innovation in area assessed with consistent performance to industry requirements.
4. **Leading:** highly mature or innovative in area, clear distinction from other states in meeting or exceeding industry requirements.

*Note: there is no weighting of one category (e.g. education or workforce) relative to others*
## Competitive States Executive Summary – 737 MAX

Washington a Leader on Many Qualitative Measures

<table>
<thead>
<tr>
<th>State</th>
<th>Key Objectives</th>
<th>Workforce</th>
<th>Education, Training, Social Institutions</th>
<th>Supply Chain Network</th>
<th>Political Climate</th>
<th>Economic Factors</th>
<th>Physical Infra.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>Existing 737 supply base and an experienced workforce are key strengths but high wages in comparison to the other metro areas assessed and possible work stoppages related to contract negotiations increase the potential of delivery delays</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Alabama</td>
<td>State has limited funds and is not making an overt effort to attract aerospace businesses; focus is on improving unemployment and standard of living issues</td>
<td></td>
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</tr>
<tr>
<td>California</td>
<td>Has a massive budget shortfall and is using high taxes, both personal and corporate, to help reduce deficit rather than cutting business expenses to entice companies to come to the state</td>
<td></td>
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</tr>
<tr>
<td>Florida</td>
<td>Florida offers a more solvent state budget but is behind the curve in education and offers the fewest number of engineers as a percentage of total workforce</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kansas</td>
<td>Has established a very experienced aerospace workforce but is “scraping the bottom of the barrel” in being able to hire quality labor in any significant quantities, low unemployment (4.1% in Wichita) is an indicator of this issue</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>New Mexico</td>
<td>Has the existing funding and desire to build a strong aerospace cluster, but must first invest in building up the workforce talent and experience as well as a global supply chain physical infrastructure</td>
<td></td>
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</tr>
<tr>
<td>North Carolina</td>
<td>The ability to construct custom tax incentives for companies and the development of Spirit’s Kinston plant show its desire to foster a robust aerospace cluster</td>
<td></td>
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</tr>
<tr>
<td>South Carolina</td>
<td>State lacks funding and educational structure to serve another major aircraft program as the current labor pool does not contain enough skilled/ experienced workers to satisfy Boeing’s existing needs regarding the 787</td>
<td></td>
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<tr>
<td>Texas</td>
<td>Aggressively pursuing businesses to invest in Texas, specifically the aerospace industry. Established councils and roles to effectively promote Texas offerings. Utilizing Texas Enterprise Fund to entice investment in the state of Texas.</td>
<td></td>
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</tbody>
</table>
Manufacturing Locations in Competitive States Examined for 737 MAX

The study examined potential site locations across a group of states that are active in building aerospace manufacturing capabilities and could bid for the 737 MAX.

- Huntsville, AL
- Mobile, AL
- Long Beach, CA
- Wichita, KS (Spirit/Boeing)
- Wichita, KS (Hawker Beechcraft)
- Kinston, NC
- Charleston, SC
- San Antonio, TX
- Melbourne, FL
- Holloman AFB, NM
- Tampa, FL
- Victorville, CA
- Santa Fe, NM
State Overview: Alabama

**Competitiveness Overview:**
- Workforce has a very limited manufacturing propensity as a percent of total economy and a small manufacturing labor pool, but offers >19% savings over the Puget Sound (PS) region.
- Major cuts to the K-12 budget while its students continue to perform poorly in math and science as reported by ACT results.
- Offer very few tax incentives or funds to attract and retain businesses and have little to no aerospace focus.

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

**Alabama Budget Trends**

**Washington Budget Trends**

Source: State of Alabama
Source: State of Washington
Huntsville, Alabama

### General Airport Information

- **Airport name:** Huntsville International
- **Runway length (ft.):** 12,600
- **Existing building:** No
- **Existing nearby aerospace cluster:** Yes
- **Existing nearby aerospace manufacturing:** Yes
- **Existing Boeing facility in metro area:** Yes

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

### State Assessment Overview

#### Reference: Alabama Assessment Summary:

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Factors</td>
<td></td>
</tr>
<tr>
<td>Physical Infrastructure</td>
<td></td>
</tr>
<tr>
<td>Education, Training, and Social Institutions</td>
<td></td>
</tr>
<tr>
<td>Political Climate</td>
<td></td>
</tr>
<tr>
<td>Supply Chain Network</td>
<td></td>
</tr>
<tr>
<td>Workforce</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Comments

- Existing Boeing facility is located approximately 21 miles west of Huntsville International
- Boeing has conducted engineering work on other programs in its Huntsville
### Mobile, Alabama (Brookley Industrial Park)

**General Airport Information**

- **Airport name:** Mobile Regional
- **Runway length (ft.):** 8,527
- **Existing building:** No
- **Existing nearby aerospace cluster:** No
- **Existing nearby aerospace manufacturing:** No
- **Existing Boeing facility in metro area:** No

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height*

### State Assessment Overview

**Reference: Alabama Assessment Summary:**

<table>
<thead>
<tr>
<th>Economic Factors</th>
<th>Political Climate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Infrastructure</td>
<td>Supply Chain Network</td>
</tr>
<tr>
<td>Education, Training, and Social Institutions</td>
<td>Workforce</td>
</tr>
</tbody>
</table>

### Additional Comments

- Mobile metro area has easy access to port facilities which are not a major consideration for 737 operations but could be a long term consideration for future programs.
Alabama Assessment Details

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Observations</th>
</tr>
</thead>
</table>
| **Economic Factors** | • Alabama’s budget shortfall as a percent of the general fund is approximately 12.5% putting it among the highest of all the competitive states  
• Moody’s bond rating place Alabama at Aa1 and Standard and Poor’s (S&P) rates the state at AA |
| **Education, Training, and Social Institutions** | • 17.9% reduction in K-12 spending from FY2008-FY2012  
• Only 32% of the ACT participants score at or above what is deemed passing for the math portion of the test, tied for the lowest of the competitive states assessed; only 25% of participants were at or above in the science portion of the same test  
• Auburn University has a solid engineering history but is not ranked with premier national programs |
| **Physical Infrastructure** | • No immediate access to a large freight airport  
• Mobile offers a deep water port for easy access to import/ export operations  
• Commute times are at or below national average; however, the percentage of the population that utilize public transportation is .83%, far below the national average of 4.84% |
| **Political Climate** | • Limited number of incentives to attract businesses, none specifically focused on the aerospace industry or complex manufacturing  
• Similar to Washington, there are no caps on workers’ compensation for permanent total disability (PTD)  
• Low personal income tax (5%) and residents can deduct federal income tax payments; however, very low threshold to enter the top tax bracket ($3,000-single, $6,000-couple)  
• Fallout from Mobile’s role in EADS tanker bid could hamper its ability to compete for Boeing work |
| **Supply Chain Network** | • Limited supply base that currently supports the 737 program  
• MRO and space program heritage but little commercial aerospace manufacturing experience  
• Vulnerable to natural disasters such as tornados and hurricanes due to its proximity to the Gulf of Mexico |
| **Workforce** | • While metro areas such as Mobile and Birmingham offer large relative labor savings to Puget Sound (>19%), manufacturing propensity of the workforce is limited  
• Skilled labor force lacks the requisite skills and education to support major manufacturing operations |
State Overview: California

**Competitiveness Overview:**

- California’s budget shortfall is in excess of $9B, a 12.1% unemployment rate and low bond ratings, creates uncertainty in the state’s ability to invest in education and industry.
- Largest pool of manufacturing workforce of the competitive states and is associated with a high manufacturing propensity as percentage of total economy.
- Limited wage rate savings over the PS region (~6%).
- California’s physical infrastructure are a strength and provide good freight mobility aside from some of the most densely populated metro areas.

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

**California Budget Trends**

- Transportation
- Education
- Remaining

**Washington Budget Trends**

- Transportation
- Education
- Remaining

Source: State of California
Source: State of Washington
Long Beach, California

General Airport Information

- **Airport name:** Long Beach Municipal
- **Runway length (ft.):** 10,000
- **Existing building**: No
- **Existing nearby aerospace cluster**: Yes
- **Existing nearby aerospace manufacturing**: Yes
- **Existing Boeing facility in metro area**: Yes

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

State Assessment Overview

Reference: California Assessment Summary:

- Economic Factors
- Political Climate
- Physical Infrastructure
- Supply Chain Network
- Education, Training, and Social Institutions
- Workforce

Additional Comments

- Boeing has existing facilities in the Long Beach and Seal Beach areas
- Significant exodus of aerospace companies from the region in the 1980s and 1990s has weakened a historically strong industrial cluster
Victorville, California

**General Airport Information**

Airport name: Southern California Logistics Airport

Runway length (ft.): 15,050

Existing building*: No

Existing nearby aerospace cluster: Yes

Existing nearby aerospace manufacturing: Yes

Existing Boeing facility in metro area: Yes

---

**Reference: California Assessment Summary:**

- Economic Factors
- Political Climate
- Physical Infrastructure
- Supply Chain Network
- Education, Training, and Social Institutions
- Workforce

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

---

**Additional Comments**

- 2,500-acre world-class aviation and air cargo facility serving domestic and international needs
- 2,500-acre commercial and industrial complex totaling 60 million square feet of diverse development
# California Assessment Details

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Observations</th>
</tr>
</thead>
</table>
| **Economic Factors** | • California received the lowest bond ratings from Moody’s and S&P in competitive set, A1 and A- respectively  
• The state’s budget shortfall exceeds $9B, comprising >25% of the entire General Fund  
• As of August 2011, the state’s unemployment rate was 12.1% |
| **Education, Training, and Social Institutions** | • From FY2008-FY2012, California cut 23% of the K-12 education budget, second highest among competitive states  
• California students perform well on both the SAT and ACT versus competitive states, but four year graduation rates slipped from 74%-71% in most recent data  
• 29.4% of metro area population ages 18-24 in focus cities hold at least a four-year degree |
| **Physical Infrastructure** | • Easy access to major freight airports  
• California maintains the second largest number of sheer state road miles (168,076) and class I rail miles (5,861) compared to the competitive states and reports an above average percentage of commuters utilize mass transit  
• Several major deep water ports supply the state with sufficient import/export operation access |
| **Political Climate** | • Highest corporate and personal state income tax among competitive states, 8.84% and 9.3% respectively  
• Incentives are focused on developing specific areas of the state as well as the creation of new jobs, e.g. $3,000 incentive provided to an employer per job created; incentives aimed at manufacturing industry |
| **Supply Chain Network** | • Strong commercial aerospace heritage e.g. McDonnell Douglas, with the residual infrastructure to support aerospace activities  
• Top tier supply base with weakened, but still prominent, aerospace manufacturing cluster in southern California  
• Vulnerable to earthquakes given proximity to fault lines |
| **Workforce** | • Southern California workforce provides ~6-8% savings over the Puget Sound region and boasts the largest manufacturing labor pool of all the metro areas assessed  
• As a percentage of total workforce, engineers declined over the past several years in line with the decline in manufacturing-intensive industry in the region |
**State Overview: Florida**

**Competitiveness Overview:**
- Florida’s budget deficit, as a percentage, is one of the lowest of the competitive states and receive top tier bond ratings
- Student graduation rates are only 67%, second lowest among the assessed states
- Student mean SAT scores for math are the second lowest across the assessed states
- Students are falling behind in science curriculum; the number of students “below basic” aptitude increases from ~25% to ~40% from fourth to eighth grade
- Miami provides Florida metro areas a major freight airport

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

**Florida Budget Trends**

- Transportation
- Education
- Remaining

**Washington Budget Trends**

- Transportation
- Education
- Remaining

Source: State of Florida
Source: State of Washington
**Tampa, Florida**

**General Airport Information**

- **Airport name:** Tampa Int’l
- **Runway length (ft.):** 11,002
- **Existing building***: No
- **Existing nearby aerospace cluster:** No
- **Existing nearby aerospace manufacturing:** No
- **Existing Boeing facility in metro area:** No

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

**State Assessment Overview**

**Reference: Florida Assessment Summary:**

- **Economic Factors**
- **Political Climate**
- **Physical Infrastructure**
- **Supply Chain Network**
- **Education, Training, and Social Institutions**
- **Workforce**

**Additional Comments**

- Has relatively high utility costs relative to competitive states
- Cost advantages from workforce are offset by lack of legacy aerospace cluster and manufacturing experience in the region
Melbourne, Florida

State Assessment Overview

Reference: Florida Assessment Summary:

- Economic Factors
- Physical Infrastructure
- Education, Training, and Social Institutions
- Political Climate
- Supply Chain Network
- Workforce

General Airport Information

Airport name: Melbourne International
Runway length (ft.): 10,181
Existing building*: No
Existing nearby aerospace cluster: Yes
Existing nearby aerospace manufacturing: Yes
Existing Boeing facility in metro area: No

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

Additional Comments

- Northrop Grumman located across from the existing airfield with direct access to a sizeable facility
- Embraer is developing an aircraft assembly plant and customer center on airport property
Melbourne, Florida (Space Coast)

General Airport Information

Airport name: NASA Landing Facility (potential site)
Runway length (ft.): 15,000
Existing building*: No
Existing nearby aerospace cluster: No (space)
Existing nearby aerospace manufacturing: No
Existing Boeing facility in metro area: No

State Assessment Overview

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

Reference: Florida Assessment Summary:

- Economic Factors
- Physical Infrastructure
- Education, Training, and Social Institutions
- Political Climate
- Supply Chain Network
- Workforce

Additional Comments

- NASA has recently shut down the shuttle program indicating the existing landing facility could possibly be used for commercial operations
### Florida Assessment Details

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Factors</td>
<td>• Florida’s budget shortfall is approximately 10% of the General Fund, one of the lowest among the competitive states</td>
</tr>
<tr>
<td></td>
<td>• Moody’s rates Florida’s bonds as Aa1, but S&amp;P provides its top rating of AAA to the state</td>
</tr>
<tr>
<td>Education, Training, and Social Institutions</td>
<td>• Florida has made significant cuts to the K-12 educational budget, 18.1% from FY2008-FY2012</td>
</tr>
<tr>
<td></td>
<td>• Graduation rates are the second lowest among competitive states (67%)</td>
</tr>
<tr>
<td></td>
<td>• Student mean SAT scores for math are the second lowest across the assessed states</td>
</tr>
<tr>
<td></td>
<td>• National Assessment of Educational Progress reports a significant increase of student’s below basic science aptitude from the fourth to the eighth grade (~25% to 42%)</td>
</tr>
<tr>
<td>Physical Infrastructure</td>
<td>• Miami provides Florida metro areas a major freight airport</td>
</tr>
<tr>
<td></td>
<td>• Tampa deep water port boasts one of the largest, most active ports in the country handling ~32M containers/ year</td>
</tr>
<tr>
<td></td>
<td>• Limited double stack rail access, only one major line running into the state</td>
</tr>
<tr>
<td>Political Climate</td>
<td>• Low corporate state income tax rate of 5.5%</td>
</tr>
<tr>
<td></td>
<td>• Much of the state’s incentive program is focused around developing specific areas of the state (rural and urban enterprise zones)</td>
</tr>
<tr>
<td>Supply Chain Network</td>
<td>• Strong space heritage and general aviation that has been significantly reduced due to budget cuts related to those programs</td>
</tr>
<tr>
<td></td>
<td>• Geographically far from major airplane sections and part suppliers but well placed for Europe supply base</td>
</tr>
<tr>
<td></td>
<td>• Vulnerable to hurricanes and flooding</td>
</tr>
<tr>
<td></td>
<td>• Has historically focused on MRO distributors rather than a manufacturing parts supply base</td>
</tr>
<tr>
<td>Workforce</td>
<td>• Tampa and Orlando offer &gt;23% labor savings as compared to the Puget Sound region but have limited density of manufacturing as well as manufacturing history</td>
</tr>
<tr>
<td></td>
<td>• Next to North Carolina, Florida offers the least number of engineers as a percentage of total workforce</td>
</tr>
<tr>
<td></td>
<td>• Florida has the highest violent crime index among the assessed states</td>
</tr>
</tbody>
</table>
State Overview: Kansas

**Competitiveness Overview:**
- Smallest budget shortfall of the competitive set, <$.5B overall deficit
- Kansas boasts the highest graduation rates of the competitive set and is among the leaders in ACT math scores
- Highest manufacturing propensity labor force while offering ~13% savings over the PS but shallow available and qualified labor pool and has extremely low unemployment
- Largest 737 component supplier, Spirit, manufactures fuselages in Wichita
- Existing Boeing facility footprint well placed in Wichita and potentially underutilized

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

Source: State of Kansas
Wichita, Kansas (Spirit/Boeing)

General Airport Information

- **Airport name:** McConnell AFB
- **Runway length (ft.):** 12,000
- **Existing building:** No
- **Existing nearby aerospace cluster:** Yes
- **Existing nearby aerospace manufacturing:** Yes
- **Existing Boeing facility in metro area:** Yes

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

Additional Comments

- Boeing maintains some defense operations near Spirit AeroSystems 737 fuselage manufacturing facility and Largest 737 component (fuselage) is made in the Wichita metro area
- Significant commitment to workforce development

State Assessment Overview

Reference: Kansas Assessment Summary:

- Economic Factors: [ ]
- Political Climate: [ ]
- Physical Infrastructure: [ ]
- Supply Chain Network: [ ]
- Education, Training, and Social Institutions: [ ]
- Workforce: [ ]

Boeing maintains some defense operations near Spirit AeroSystems 737 fuselage manufacturing facility and Largest 737 component (fuselage) is made in the Wichita metro area

Significant commitment to workforce development
Wichita, Kansas (Hawker Beechcraft)

**General Airport Information**

- **Airport name:** Beech Factory Landing Field
- **Runway length (ft.):** 8,000
- **Existing building:** No
- **Existing nearby aerospace cluster:** Yes
- **Existing nearby aerospace manufacturing:** Yes
- **Existing Boeing facility in metro area:** Yes

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

**State Assessment Overview**

**Reference: Kansas Assessment Summary:**

- **Economic Factors**
- **Political Climate**
- **Physical Infrastructure**
- **Supply Chain Network**
- **Education, Training, and Social Institutions**
- **Workforce**

**Additional Comments**

- While on-site observations indicate multiple busy shifts at Hawker, the field provides an additional potential site in an aerospace hub
- Largest 737 component (fuselage) is made in the Wichita metro area
<table>
<thead>
<tr>
<th>Assessment Criteria Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic Factors</strong></td>
</tr>
<tr>
<td>• Kansas claims the smallest budget shortfall across the competitive states at &lt;9%, actual shortfall is &lt;$.5B</td>
</tr>
<tr>
<td>• The State is not covered by Moody's of S&amp;P rating services; however, the Wichita metro area is covered and is rated Aa1 from Moody's and AA+ from S&amp;P</td>
</tr>
<tr>
<td>• Kansas has a low state unemployment rate of 6.7%, but Wichita metro area is even lower at 4.1%</td>
</tr>
<tr>
<td><strong>Education, Training, and Social Institutions</strong></td>
</tr>
<tr>
<td>• Kansas has cut K-12 education budget by 12.4% over that past four years</td>
</tr>
<tr>
<td>• National Center for Aviation Training at Wichita Area Technical College and aerospace engineering tradition at Wichita State and University of Kansas are part of extensive workforce development efforts</td>
</tr>
<tr>
<td>• Kansas maintains the highest graduation rate (79%) in the competitive set</td>
</tr>
<tr>
<td>• ACT scores are among the highest in math and the highest in English</td>
</tr>
<tr>
<td><strong>Physical Infrastructure</strong></td>
</tr>
<tr>
<td>• Kansas’s central location reduces overall average transport time of 737 components reducing the impact of not having immediate access to freight access</td>
</tr>
<tr>
<td>• Centrally positioned with close access to many rail networks in Kansas City</td>
</tr>
<tr>
<td>• Nearest deep water port is Houston, approximately 603 miles away</td>
</tr>
<tr>
<td><strong>Political Climate</strong></td>
</tr>
<tr>
<td>• No aerospace specific tax incentive programs advertised within the state of Kansas, but research and development, operational excellence, and machinery and equipment credit is available</td>
</tr>
<tr>
<td>• Kansas' corporate income tax rate is a flat 4% but becomes more expensive as the state levies an additional 3% on all taxable income over $50,000</td>
</tr>
<tr>
<td><strong>Supply Chain Network</strong></td>
</tr>
<tr>
<td>• Key tier one supplier, Spirit, is located in Wichita which is the sole supplier for 737 fuselages</td>
</tr>
<tr>
<td>• Well developed parts fabrication supply base</td>
</tr>
<tr>
<td>• Adjacent to Boeing’s existing military modifications center which could help smooth workforce hiring issues through business cycles (workforce reduction as defense budgets are cut)</td>
</tr>
<tr>
<td>• Vulnerable to tornados</td>
</tr>
<tr>
<td><strong>Workforce</strong></td>
</tr>
<tr>
<td>• Wichita offers the highest propensity for manufacturing in the competitive set as well as ~13% savings over the Puget Sound region, but hiring has been saturated as is indicated by the unemployment rate of 4.1% for Wichita</td>
</tr>
<tr>
<td>• Spirit has had difficulty hiring qualified workers due to low unemployment and a relatively small labor pool</td>
</tr>
</tbody>
</table>
State Overview: New Mexico

**Competitiveness Overview:**
- Limited budget shortfall as a percentage of its General Fund (~9%), high bond ratings
- Recorded lowest ACT results in math, reading, and English; studies have shown the state’s students begin to fall behind early in mathematics
- New Mexico is one of only two states that offer aerospace specific incentives covering a range of different business types (OEMs to MRO)
- Large workforce savings relative to the PS but among the smallest manufacturing labor pools

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

**New Mexico Budget Trends**

Source: State of New Mexico

**Washington Budget Trends**

Source: State of Washington
Albuquerque, New Mexico

General Airport Information

- **Airport name:** Holloman AFB
- **Runway length (ft.):** 10,576
- **Existing building***: No
- **Existing nearby aerospace cluster:** No
- **Existing nearby aerospace manufacturing:** No
- **Existing Boeing facility in metro area:** No

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

State Assessment Overview

**Reference: New Mexico Assessment Summary:**

- Economic Factors
- Political Climate
- Physical Infrastructure
- Supply Chain Network
- Education, Training, and Social Institutions
- Workforce

**Additional Comments**

- Holloman is still an active military air force base but contains large amounts of undeveloped land adjacent to existing air strips
## State Assessment Overview

### Reference: New Mexico Assessment Summary:

<table>
<thead>
<tr>
<th>Economic Factors</th>
<th>Political Climate</th>
<th>Physical Infrastructure</th>
<th>Supply Chain Network</th>
<th>Education, Training, and Social Institutions</th>
<th>Workforce</th>
</tr>
</thead>
</table>

### General Airport Information

- **Airport name:** Santa Fe Municipal
- **Runway length (ft.):** 8,342
- **Existing building***: No
- **Existing nearby aerospace cluster**: No
- **Existing nearby aerospace manufacturing**: No
- **Existing Boeing facility in metro area**: No

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

### Additional Comments

- Much of the local workforce consist of highly educated personnel working for space agencies, the surrounding skilled labor pool is shallow when considering manufacturing operations.
New Mexico Assessment Details

<table>
<thead>
<tr>
<th>Assessment Criteria Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economic Factors</strong></td>
</tr>
<tr>
<td>• New Mexico’s budget shortfall is a ~9% and the total shortfall in dollars is ~$.5B, almost identical to Kansas which is tops among the competitive set</td>
</tr>
</tbody>
</table>
| • Moody’s ranks New Mexico as Aaa and S&P AA+
| • New Mexico’s unemployment is a low 6.6% compared to the national average  |
| **Education, Training, and Social Institutions** |
| • New Mexico has reduced its K-12 education budget by 12.4% over that past four years |
| • Scored the lowest on ACT for math, reading, and English of the assessed states |
| • New Mexico students are falling behind in mathematics as the state ranks among the lowest and has shown little improvement from 2007 to 2009 |
| **Physical Infrastructure**      |
| • Have to rely on other state’s major commercial freight airports |
| • Limited road mileage covering the state but offer three major interstates to cover the State’s geography |
| • Nearest port is San Diego, 771 miles away, which can handle medium size volumes, with additional capacity available through Long Beach/Huntington Beach |
| • Easy double stack rail access to Wichita fuselage suppliers |
| **Political Climate**            |
| • One of only two states to offer tax credits specific to the aerospace industry; New Mexico provides incentives from aircraft manufacturing to maintenance operations (MRO) |
| • Additional incentives available for research & development and job creation |
| • High corporate state income tax rate (7.6%) for businesses that gross more than $1M in taxable income |
| **Supply Chain Network**         |
| • Emerging space capability, largely through private sector ventures |
| • In the short term would be dependent on Southern California supply base, workforce, and logistics support due to limited local capability |
| • Relatively low natural disaster risk and reliable weather |
| **Workforce**                    |
| • Santa Fe offers 28%+ savings over Puget Sound region but have very little manufacturing propensity; Albuquerque has a slightly larger labor pool but only offers ~15% savings over Puget Sound |
| • Manufacturing labor force for the metro region is among the smallest in the competitive set |
| • Boast one of the highest populations of engineers as a percentage of total workforces due to legacy of U.S. military programs, particularly in advanced research (e.g. Los Alamos) |
State Overview: North Carolina

**Competitiveness Overview:**
- Highest bond rating of assessed states and limited budget shortfall of $2.5B
- Reporting lower quartile SAT math results and have remained at that same aptitude while the vast majority of other states have shown improvement
- Growing aerospace capability accelerated by Spirit’s new plant in Kinston, NC, however, the aerospace workforce is small and inexperienced
- Can offer custom tax abatements and have aggressively focused on job creation
- No major local freight airport

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

North Carolina Budget Trend

Washington Budget Trends

Copyright © 2011 Accenture. All rights reserved.
Kinston, North Carolina (Spirit)

General Airport Information

Airport name: Kinston Regional Jetport
Runway length (ft.): 11,500
Existing building*: No
Existing nearby aerospace cluster: Yes
Existing nearby aerospace manufacturing: Yes
Existing Boeing facility in metro area: No

State Assessment Overview

Reference: North Carolina Assessment Summary:

- Economic Factors
- Political Climate
- Physical Infrastructure
- Supply Chain Network
- Education, Training, and Social Institutions
- Workforce

*Building must have a minimum footprint of 360,000 ft², 100 ft. in height and cargo doors 60 ft. in height

Additional Comments

- Spirit AeroSystems maintains a 500K ft² facility for the composite center fuselage section panels and front wing spar for the Airbus A350 XWB
- Facility is on very slow ramp up to accommodate the workforce learning curve
## North Carolina Assessment Details

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Observations</th>
</tr>
</thead>
</table>
| **Economic Factors** | • North Carolina has a projected budget shortfall of approximately 12%, a total shortfall of $2.5B  
  • Moody’s and S&P rate the state’s bonds Aaa and AAA respectively, the highest of any state in the competitive set  
  • The unemployment rate for North Carolina is 10.4%, high among the competitive set |
| **Education, Training, and Social Institutions** | • North Carolina has cut its K-12 budget by 14.7% over the past four fiscal years and overall percentage of the state budget allocated to education has declined over the past three years  
  • The Research Park Triangle area of the state and its supporting universities (North Carolina, North Carolina State, and Duke) provide a solid engineering culture and pipeline of graduates |
| **Physical Infrastructure** | • No major local freight airport  
  • Large road system in place (99,813 miles)  
  • Port of Morehead City is 70 miles from Kinston but cannot handle container shipments and Port Wilmington is 200 miles and can handle light volumes of container shipments |
| **Political Climate** | • North Carolina can offer custom tax discounts, exemptions, and refunds  
  • State offers grants through the following funds: Job Development Investment Grants (JDIG), One North Carolina Fund, Site and Infrastructure Grant Fund, Job Maintenance and Capital Development Fund (JMAC) Grants |
| **Supply Chain Network** | • Despite the presence of Goodrich’s headquarter function, aerospace is relatively young in the state  
  • Interviews indicate that Spirit’s deliberate approach to production increases is in large part due to the workforce learning curve  
  • Relatively small 737 supply base in state with Magellan and Goodrich providing detail parts  
  • Vulnerable to hurricanes and tornados |
| **Workforce** | • Charlotte offers approximately 15% savings over the Puget Sound region, a medium sized manufacturing labor pool and the overall economy is made up of ~9% manufacturing; Winston and Kinston offer larger savings but much smaller labor pools  
  • One of the lowest states in regards to the number of engineers as a percentage of total workforce |
State Overview: South Carolina

**Competitiveness Overview:**
- Budget shortfall is approximately $.6B, however, that represents nearly 12% of the total budget and the state is experiencing 11.1% unemployment rates.
- K-12 budget cuts of 24.1% over four years highest among all states; aptitude scores reflect indications of students struggling with mathematics as they place last in the SAT.
- Offers ~20% labor savings over Puget Sound, but questions persist regarding the depth of the labor pool and its ability to meet even existing aerospace manufacturing needs.
- Low corporate state income taxes at 5%.

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

Source: State of South Carolina

Source: State of Washington

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South Carolina Budget Trend

<table>
<thead>
<tr>
<th>Year</th>
<th>Transportation</th>
<th>Education</th>
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<tbody>
<tr>
<td>2008</td>
<td>$8,000</td>
<td>$4,000</td>
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<td>2009</td>
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Source: State of South Carolina

Washington Budget Trends

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Source: State of Washington
Charleston, South Carolina

**General Airport Information**

- **Airport name:** Charleston International
- **Runway length (ft.):** 9,000
- **Existing building*:** No
- **Existing nearby aerospace cluster:** Yes
- **Existing nearby aerospace manufacturing:** Yes
- **Existing Boeing facility in metro area:** Yes

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

**Reference: South Carolina Assessment Overview**

- **Economic Factors**
- **Physical Infrastructure**
- **Education, Training, and Social Institutions**
- **Political Climate**
- **Supply Chain Network**
- **Workforce**

**State Assessment Overview**

- Boeing operates the second 787 production facility in the Charleston metro area and has been building a workforce for approximately five years
- However, the continued use of contractor labor calls the local labor pool into question
# South Carolina Assessment Details

## Assessment Criteria Observations

| Economic Factors | • South Carolina budget shortfall is approximately $0.6B, however, that represents nearly 12% of the total General Fund  
• The state receives high bond ratings from Moody’s and S&P, Aaa and AA+ respectively  
• South Carolina’s unemployment rate is 11.1%, second only to California in the competitive set |
| Education, Training, and Social Institutions | • Made the most significant cuts to the K-12 educational system of assessed states, reducing budget by 24.1% over the last four years  
• The state displays a significant increase in students struggling with mathematics curriculum as the number of those below basic aptitude raises from ~28% in fourth grade to ~43% in eighth  
• Aptitude scores reflect early education issues as they place last in SAT math results  
• Graduation rates are the second lowest in the competitive set |
| Physical Infrastructure | • The relatively small state (in geography) boasts a vast number of interstate roads connecting the different regions both in and out of state  
• Ready access to rail and sea routes, however rail routes into Charleston for double stack cars are not as direct as to other regions |
| Political Climate | • South Carolina focuses on job creation through their tax abatement programs  
• Offer property tax exemptions; however, Boeing is currently taking advantage of this incentive in Charleston and it is unclear whether the state would provide additional exemptions should Boeing expand its presence with the 737  
• Corporate state income taxes are a low 5%  
• Property taxes are significant in the state for both urban and rural commercial locations |
| Supply Chain Network | • Emerging aerospace presence with Boeing’s 787 Charleston final assembly facility as well as the former Vought facilities, now Boeing Charleston  
• Vulnerable to tornadoes and hurricanes |
| Workforce | • Offers ~20% labor savings over Puget Sound, but the labor pool may not contain enough skilled/experienced workers to satisfy Boeing’s existing needs regarding the 787 much less the 737  
• Next highest manufacturing propensity of comparative metro areas after Wichita |
State Overview: Texas

**Competitiveness Overview:**
- Major budget shortfall of $9B, but still maintain high bond ratings
- Texas has only reduced the K-12 budget by 12.0% over the past 4 years
- Centralized structure to coordinate P-16 educational policy but uncertain effectiveness
- ~26% savings for the San Antonio metro area and Dallas offers the largest labor pool
- Texas can offer incentives, financing, and even cash to attract businesses to the state and are aggressively pursuing businesses in the aerospace industry
- Centrally located with efficient access to major sea, air, and rail freight hubs

**Assessment Elements:**

1. Economic Factors
2. Political Climate
3. Physical Infrastructure
4. Supply Chain Network
5. Education, Training, and Social Institutions
6. Workforce

**Texas Budget Trends**

<table>
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**Washington Budget Trends**

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<tr>
<td>2012</td>
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</tbody>
</table>

Source: State of Texas

Source: State of Washington
San Antonio, Texas

State Assessment Overview

Reference: Texas Assessment Overview:

- Economic Factors
- Physical Infrastructure
- Education, Training, and Social Institutions
- Political Climate
- Supply Chain Network
- Workforce

General Airport Information

Airport name: Lackland AFB (Kelly Field)
Runway length (ft.): 8,502
Existing building*: Yes
Existing nearby aerospace cluster: Yes
Existing nearby aerospace manufacturing: Yes
Existing Boeing facility in metro area: Yes

*Building must have a minimum footprint of 360,000 ft.², 100 ft. in height and cargo doors 60 ft. in height

Additional Comments

- Port of San Antonio offers companies a lease back option on building structures as well as bond financing – city and county incentives also available
- Military workforce and the Alamo Aerospace Academy provide solid worker pipeline
# Texas Assessment Details

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Observations</th>
</tr>
</thead>
</table>
| **Economic Factors** | - Texas has a major budget shortfall of $9B, second only to California, however, that comprises only 20% of the General Fund  
- Texas still receives strong bond ratings from Moody’s and S&P, Aaa and AA+ respectively |
| **Education, Training, and Social Institutions** | - Texas P-16 program established to support organization and coordination across industry and academia  
- Specific workforce development programs (e.g. Alamo Academy) stand out as national examples – leading engineering programs at state universities  
- Texas has cut K-12 spending by 12% over the past four years  
- Texas is a low performer compared to the competitive state set as it relates to SAT math scores |
| **Physical Infrastructure** | - Dallas Fort Worth airport offers Texas a major low cost option for air freight transport  
- Texas roads system provides excellent freight mobility from ports outward into the state and beyond  
- Houston is the major port of the state of Texas and is only 209 miles from San Antonio  
- Electricity rates in Texas are relatively high compared to other competitive states |
| **Political Climate** | - Texas has a great deal of flexibility in what they can offer businesses, from credits to bonds to cash grants (utilizing the Texas enterprise fund); can tailor offerings to specific businesses and their needs  
- There is no personal state income tax and corporate state income tax is only assessed at 1% for corporations that gross in excess of $1M  
- Texas has been utilizing aggressive tactics to attract businesses to the state and has demonstrated a desire to focus on the aerospace industry with the creation of the Office of Aerospace, Aviation, & Defense |
| **Supply Chain Network** | - Strong military aerospace heritage and manufacturing experience due to the presence of Boeing Defense and Lockheed Martin  
- Centrally located with good access to major sea, air, and rail freight hubs  
- Vulnerable to tornados, low earthquake risk (e.g. 4.6 level quake on October 19, 2011) |
| **Workforce** | - San Antonio provides ~26% labor savings over the Puget Sound but the manufacturing propensity is lower than the region; Dallas offers the second largest workforce of the metro areas assessed but realizes less in labor savings (~16%)  
- Texas has shown strong growth in the number of engineers in employment as a percent of total workforce |
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Total Landed Cost Analysis

Competitive State Profiles and Analysis

Appendix: Commercial Aviation Market Context

Appendix: Boeing Market Context

Appendix: Washington Aerospace Partnership Financial Supporters
Commercial Aerospace Segment Executive Summary

Established commercial aerospace original equipment manufacturers (OEMs) like Boeing are facing growing business opportunity and competition.

Industry Situation

• New aircraft demand is rising through new fleet growth in emerging markets and fleet renewal in North America and Western Europe
• Much of this growth is being driven by the single aisle (120-150 passenger) segment currently dominated by the A320 and B737

Complication for Established OEMs

• Customers require certainty of delivery for new orders to achieve their financial targets, regardless of issues in manufacturing, workforce, or supply
• New entrants are bringing lower cost alternatives to market that will soon present lower priced alternatives in the single aisle segment

The OEM Opportunity

• Improve quality and reliability of suppliers and the commodities critical to new technologies, e.g. carbon fiber
• Continue to improve the efficiency and cost of airplane integration
• Expand product sales and service offerings into new markets
Significant growth in passenger travel in emerging markets will drive fleet expansion, particularly for single aisle aircraft.

To capitalize upon the potential revenues of in-region travel, particularly in emerging markets, operators will push manufacturers for rapid delivery of new, efficient aircraft.
In developed markets, operators are moving to renew their fleets to increase fuel efficiency and operating profitability.

Timely and predictable fleet replacement is critical for airlines seeking to meet their targets for cost reduction and revenue generation, through fuel savings and higher asset utilization.

Customer Requirements are Driving Manufacturer Focus
Growth in the Single Aisle Segment

The single aisle market, led by the B737NG/MAX and A320/320NEO, is the primary focus for operators’ fleet expansion and fleet renewal.

**Commercial Aircraft Demand (2011-2030)**

- Large: 820
- Twin Aisle: 7,330
- Single Aisle: 23,370
- Regional Jets: 1,980

Source: Boeing, Accenture research

**Commercial Aircraft Fleet Size and Growth**

- Large:
  - 2010 Fleet Size: 48%
  - 2030 Fleet Size: -29%
- Twin Aisle:
  - 2010 Fleet Size: 135%
  - 2030 Fleet Size: 129%

Source: Boeing, Accenture research
Many OEMs Are Vying to Meet Operator Demand

Global demand is spurring global competition in the single aisle market from China, Russia, Canada, and Brazil.

**Implications**

- Boeing will continue to compete against both Airbus and newer entrants with its historic combination of product quality and improving operator (airline) financial performance.
- In addition to the naturally lower labor and capital costs in these markets, national and local governments will support new entrants by underwriting production as well as customer purchases.
- This will reduce incumbents’ capacity to charge a significant premium for their products and push them to aggressively manage cost.
- Incumbents’ ability to deliver airplanes on time and to customer expectations will be critical to their competitiveness.

*Source: Flight Global 2010, Accenture research*
Emerging Global Competition in the Single Aisle Segment
Competitors Vying to Meet Customer Needs at a Lower Initial Cost

A global Airbus will be joined by several new competitors in the next five years.

**Bombardier**
- Models: C-Series
- Approx. Service Entry: 2014
- Manufacturing Locations: Montreal
- Backing: Canada and Quebec governments, China (partnership with COMAC)

**Embraer**
- Models: E190 or new entrant
- Approx. Service Entry: N/A
- Manufacturing Locations: Sao Jose dos Campos (Brazil)
- Backing: Brazil federal and state government

**Airbus**
- Models: A320, A320NEO
- Approx. Service Entry: (NEO) 2015
- Manufacturing Locations: Hamburg, Toulouse, Tianjin
- Backing: EU, Chinese governmental bodies

**Mitsubishi**
- Models: MRJ
- Approx. Service Entry: 2015
- Manufacturing Locations: Tokyo, Nagoya
- Backing: Mitsubishi Keiretsu, Japan Ministry of the Economy

**Irkut/United Aircraft Corp.**
- Models: MS-21
- Manufacturing Locations: Moscow
- Backing: Russian national government

**COMAC**
- Models: C919
- Manufacturing Locations: Shanghai
- Backing: Chinese government, national industrial groups, AVIC (military aircraft)

*Note: Embraer announced on November 10, 2011 that it would not produce a 737 MAX size aircraft in the near future, however its re-engined E Series will remain a market alternative at a smaller seating size.*
# Commercial Aviation – What Operators Want

Commercial airline and cargo operators, Boeing’s customers, are focused on the certainty of the delivery date, quality, and quantity of new aircraft they are relying upon to meet their business objectives.

**New Fleet Growth-Focused Operators**

- Seek to capitalize upon revenue opportunities emerging from rapid economic growth in developing economies
- Time to market and availability of new aircraft may trump fuel economy and operating efficiency in decisions to purchase and take delivery of new aircraft – may be more biased toward a 737NG or A320
- Certainty of delivery is required in order to capture market share and generate revenue ahead of rivals and new entrants to the market

**Fleet Replenishment-Focused Operators**

- Seek to take advantage of more favorable financing climate to invest in replacing aging aircraft with new planes that burn less fuel and have high dispatch reliability
- Access to more efficient, reliable, and customer-focused aircraft is critical for these airlines’ revenue and margin targets – may be more likely to be B737 MAX or A320NEO customers
- Certainty and speed of delivery is required to achieve aggressive financial targets
What Operators are Saying

Operators are relying upon manufacturers to deliver new aircraft to support their businesses without delays.

“Today’s announcement paves the way for us to achieve important milestones in our company’s future, giving us the ability to replace our narrow-body fleet and finance it responsibly.” Gerard Arpey, Chairman and CEO, AMR commenting on American Airlines 737 MAX and A320NEO order.


“While cancellations based on the current, revised delivery schedule are possible…any additional delay would lead [Malaysia Air Lines] to pull the plug. He said the carrier ‘cannot tolerate’ further delays. He explained that the four-year postponement of its first A380 delivery has made it ‘very difficult to plan to make sure that our network is in the right place.’”

Air Transport World. June 22, 2011

“The addition of these state-of-the-art, fuel-efficient aircraft to our fleet will be a major factor in Frontier maintaining its position as an industry cost leader and will allow Frontier to continue to offer travelers low fares despite persistently high fuel prices.” Bryan Bedford, Chairman President and CEO, Republic Airways commenting on A320NEO

CBS MarketWatch. June 22, 2011

“If union leaders and management can’t get their act together to avoid strikes, we’re not going to come back here again. We’re already thinking, ‘Would we ever risk putting another order with Boeing?’ It’s that serious.” Richard Branson, founder, Virgin Atlantic Airlines, 2008.

Implications of Emerging Competitors to Established Manufacturers

Emerging competitors’ lower costs and government support will push established manufacturers to focus on product quality, the ability to generate financial outcomes for operators, and intellectual property/innovation.

### How New Entrants are Competing

- Working with established component and assembly suppliers (e.g. engines, avionics) to accelerate product development and reliability
- Local manufacturers creating captive markets in their respective geographies using government and other influences – e.g. COMAC in China, Irkut in Russia
- Employing government and/or industrial investments to bring their products to market
- Taking advantage of these investments in tandem with lower cost labor pools to reduce manufacturing cost and end price to the customer while increasing delivery date certainty through limited labor disruptions

### How Established Players are Competing

- Focusing on intellectual property, innovation, and protecting that innovation from competitors
- Building upon ability to meet operator requirements for improving key metrics such as fuel economy and dispatch reliability
- Reducing long term operating cost through both high initial product quality as well as mature networks for service and support
- Working with, and dictating to, suppliers in order to reduce the cost of key commodities and inputs in order to maintain market pricing power and margin
Suppliers will be pushed to provide more and integrate more deeply with manufacturers but at a lower cost.

<table>
<thead>
<tr>
<th>What Manufacturers are Asking</th>
<th>How Suppliers are Responding</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Suppliers must focus on reducing cost – for Boeing suppliers, up to 3-5% per year</td>
<td>• Suppliers are consolidating to gain share on programs and to hold the line on price and margin</td>
</tr>
<tr>
<td>• Manufacturers are dialing back on the degree to which they are deferring engineering responsibility to suppliers in exchange for greater demands for manufacturing delivery certainty</td>
<td>• Suppliers are investing in higher margin after market support businesses in which they may compete directly with manufacturers</td>
</tr>
<tr>
<td>• Manufacturers are acutely aware of potential shortages in key components and material as production ramps up and will look to diversify sources of supply to maintain production security</td>
<td>• Suppliers are investing in processes and technology to increase their integration with manufacturers to improve communication and reduce chance for error and delay</td>
</tr>
<tr>
<td></td>
<td>• Suppliers are moving closer physically and virtually to manufacturers</td>
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<td>• Suppliers are diversifying their manufacturer customers to maintain predictable revenues</td>
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The Aerospace Workforce at a Turning Point
Are Skills in Place to Support Growth?

The ability to efficiently and affordably refresh and scale an aging workforce, while retaining its irreplaceable knowledge will be a crucial component of manufacturers’ and suppliers’ success in the commercial aerospace market.

Age Distribution – Companies with Over 50,000 Employees

- 35 and Under: 23%
- 36-55: 22%
- 56 and Older: 55%

Age Distribution – Companies with Fewer than 1,000 Employees

- 35 and Under: 17%
- 36-55: 33%
- 56 and Older: 50%

Source: 2011 Aviation Week Workforce Study

Industry, government, and labor are all balancing the need to manage cost with the understanding that underinvestment in workforce development can have severe implications in the long term.
Sustaining and Refreshing the Aerospace Workforce

While the delayed retirement of older employees has postponed the industry’s demographic shift, there is increasing concern that the industry does not present a compelling proposition to younger workers, particularly engineers.

**Older Employees are Staying Longer**

“While 20% of employees at companies with more than 50,000 employees will be eligible to retire next year – up from 14% this year – shrinking 401(K) accounts and declining home values have prompted many older workers to stay on the job longer than expected…Industry leaders also believe that some employees are choosing to work longer, in large part because they don’t see a need to cut a career short when they are still fully engaged, contributing, and healthy.”

*Aviation Week and Space Technology. August 22, 2011*

**But the Pipeline of New Employees is in Question**

“The bad news is that the industry’s attraction to young professionals could lessen as shuttle program fades into history and cash-strapped militaries curtail development of new weapons systems. The young professionals study finds serious concerns within this segment as to whether the industry is committed to the research required to remain on the cutting edge.”

*Aviation Week and Space Technology. August 22, 2011*
Aerospace Companies Require a Variety of Engineering Talent

A recent survey of U.S. aerospace and defense companies identified the highest demand skills for college graduates.

### High Demand Areas by Size of Organization – In Rank Order

<table>
<thead>
<tr>
<th>Under 1,000 Employees</th>
<th>1,000 to 9,999 Employees</th>
<th>10,000 to 49,999 Employees</th>
<th>Over 50,000 Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace Engineering</td>
<td>Mechanical Engineering</td>
<td>Systems Engineering</td>
<td>Systems Engineering</td>
</tr>
<tr>
<td>Structural Engineering</td>
<td>Systems Engineering</td>
<td>Software Engineering</td>
<td>Aerospace Engineering</td>
</tr>
<tr>
<td>Program Management</td>
<td>Aerospace Engineering</td>
<td>Program Management</td>
<td>Programming/Software Engineering</td>
</tr>
<tr>
<td>Business Development</td>
<td>Software Development</td>
<td>Mechanical Engineering</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Financial Analysis</td>
<td>Enterprise IT</td>
<td>Business Development</td>
<td>Program Management</td>
</tr>
<tr>
<td>Software Development</td>
<td>Software/Computer Engineering</td>
<td>Software Development</td>
<td>Software Development</td>
</tr>
</tbody>
</table>

Source: Aviation Week and Space Technology. August 22, 2011

While hiring patterns illustrate where companies are looking for skills, the core skill that suppliers and manufacturers are looking for is the ability to learn, create, problem solve, and innovate.
Where Aerospace Companies Source Engineering Talent

Washington’s colleges and universities are not top sources of engineering talent for the U.S. aerospace industry, nor for industry in general.

Top Schools for Aerospace Industry Engineer Hiring

<table>
<thead>
<tr>
<th>Rank</th>
<th>School</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pennsylvania State University</td>
</tr>
<tr>
<td>2. (tie)</td>
<td>Georgia Institute of Technology</td>
</tr>
<tr>
<td>2. (tie)</td>
<td>California Polytechnic University-San Luis Obispo</td>
</tr>
<tr>
<td>3.</td>
<td>Purdue University</td>
</tr>
<tr>
<td>4.</td>
<td>Virginia Tech</td>
</tr>
<tr>
<td>5.</td>
<td>University of California, Los Angeles</td>
</tr>
</tbody>
</table>

In-State Engineering Degree Production Per 1,000 Occupations (2005)

- National Average: 0
- Engineering: 29.8
- Computer Science: 21.0

Source: Aviation Week and Space Technology. August 22, 2011

Source: University of Washington, Technology Alliance

Washington’s aerospace, software, and technology industries have historically been net importers of engineering talent; companies will go where they need to go to get the talent they require.
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Appendix: Boeing Market Context

Appendix: Washington Aerospace Partnership Financial Supporters
Boeing Market Context Executive Summary

Boeing understands the importance its customers place on delivery speed and certainty but must meet those needs in an evolving competitive environment.

**Boeing Situation in Industry Context**

- Boeing understands the need to support the growing demand in commercial aviation at speed to meet customer needs and increase its own earnings potential*
- Boeing has extended its supply chain and service network to embed itself in rapidly growing areas of customer demand

**Boeing Complication**

- The cost advantages and market support provided by government backed competitors challenge Boeing’s ability to effectively compete globally**
- Airbus has built an initial order backlog advantage for enhanced fuel efficient single aisle aircraft, causing Boeing to play fast follower with the 737 MAX while simultaneously protecting its existing 737NG order backlog

**Boeing Opportunity**

- Operators’ desire for aircraft dispatch reliability and fuel economy plays to the historic strengths of the 737 family
- Boeing will look to reduce cost across its business in order to close the pricing gap with state-sponsored competitors, while maintaining some quality premium in its market pricing

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* See, for example, Boeing CEO J. McNerney’s comments in his 2011 Address to Shareholders at Boeing’s annual meeting of shareholders.

**See, for example, Boeing CEO J. McNerney’s comments at the Atlantic Legal Foundation. March 10, 2011.
Innovation and Intellectual Property  
Central to Continued Competitiveness and Leadership  

As Boeing faces increased price competition from new entrants, intellectual property and innovation will be central to its ability to continue to provide a differentiated product and to increase the efficiency of its product development and manufacturing operations.

“From a Boeing standpoint, our strategy for capturing this future growth (regardless of the market) is to drive increased competitiveness in our businesses today. We’re doing that with an intense focus in two areas:

- first, customer-based innovation (where we strive to provide our customers a substantial competitive advantage over their competitors) ...
- and second, making continuous improvements in fundamental productivity in our own shop, not only to fund our investment in innovation but also to sustain it through its inevitable ups and downs. (Because as we all know, innovation doesn’t always go as planned, and that’s when financial strength becomes ever more important.)”


- Boeing will invest in both internal innovation and in partnerships with academic and other research institutions that are able to support innovation in core research as well as in the operational efficiency that can keep it ahead of its competitors
- However, research partners must understand the emphasis Boeing and other aerospace companies will place on protecting the intellectual property that emerges from sponsored research as it will form the basis of these companies’ competitiveness

Source: Industry interviews.
The announced production rate increases to the 737NG seek to balance customer demand, Boeing profitability, and the sustainability of the supply base.

Announced Boeing 737 Production Rate Increases

Lean improvements in Renton, investments in tooling, supplier collaboration, and engineering coordination are all critical to supporting announced rate increases. The ability of suppliers to scale and efficiency efforts to manage cost will be a focus as production ramp begins.
The Boeing Workforce Reflects Industry Trends

While Boeing faces the same general workforce challenges as the industry as a whole, it also faces challenges specific to its own workforce.

- The IAM machinist population in the Puget Sound follows national demographic patterns at the top age groups but demonstrates a significant drop off in the younger segments of the population.
- Workforce development, training, and recruitment are significant priorities to bolster the strength of new workers while retaining the knowledge of those moving quickly toward retirement.
- Boeing’s significant engineer hiring wave of the late 1980s and early 1990s has progressed through the organization, placing a significant number of deeply skilled engineers approaching retirement.
- The 737 engineering community is particularly concentrated in the Puget Sound region and benefits from the deep knowledge base resident in the region and the tight collaboration possible with local 737 component production and final assembly locations.
Considerations of Work Stoppages in Current Climate

While the quality of Washington’s workforce has been a long time strength for Boeing, Boeing will seek to minimize the potential for work stoppages as it evaluates the 737 MAX.

- Work stoppages in Washington have had significant impacts to delivery schedule in the past

<table>
<thead>
<tr>
<th>History of IAM Work Stoppages</th>
<th>History of SPEEA Work Stoppages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Duration (in days)</td>
</tr>
<tr>
<td>1989</td>
<td>48</td>
</tr>
<tr>
<td>1995</td>
<td>69</td>
</tr>
<tr>
<td>2005</td>
<td>28</td>
</tr>
<tr>
<td>2008</td>
<td>57</td>
</tr>
</tbody>
</table>

- The potential of increased labor tension, even work stoppages, resulting from the IAM National Labor Relations Board (NLRB) complaint against Boeing and upcoming IAM Local 751 2012 contract negotiations may reduce the certainty of Boeing’s ability to deliver new aircraft on time to its customers – a chance Boeing may not be willing to take given the expectations of its customers and shareholders

- Boeing would likely evaluate this scenario against the potential cost of disruptions to its delivery schedule – e.g. inability to scale, poor quality – at a new 737 MAX production site

- While the state can influence many competitiveness factors, the threat of work stoppages and delivery delays is an externality that may outweigh other considerations for a site selection

- Improvements to the management-labor culture on these areas would strengthen Washington’s competitive advantage versus other states

Source: Accenture research and Interviews.
Boeing Financial Indicators in Industry Context

Boeing’s focus on certainty in meeting customer delivery expectations is further driven by investor expectations.

• Boeing has delivered industry average return to shareholders over the past five years and is looking at the rebound in total commercial aviation orders, growth in the single aisle market, and the certification of the 787 as key parts of how it can improve upon that market performance.

• Investors share a similar perspective and have placed a relatively heavy weight on their future expectations of Boeing relative to other companies in the aerospace and defense industry.

• Boeing Commercial Airplanes comprises a significant portion of the Boeing Company’s overall revenues and operating income, raising the importance of executing with certainty, efficiency, and affordability within that business unit.

• Within Commercial Airplanes, the 737 contributes a significant portion of both revenue and margins, emphasizing the importance of the solid execution of any rate increases or new manufacturing investments, regardless of location.
Boeing Return to Shareholders

Boeing’s recent market performance has been in line with the industry average, but investor expectations are growing.

**Aerospace and Defense Industry Total Return to Shareholders (TRS), Compound Annual Growth Rate (CAGR) 2006-2011**

- **Five Year TRS CAGR**: 1.4% (Boeing), 1.8% (Industry Leader), 16.7% (Industry Average)
- **Three Year TRS CAGR**: 0.9% (Boeing), 0.3% (Industry Leader), 28.5% (Industry Average)
- **One Year TRS CAGR**: 13.0% (Boeing), 2.0% (Industry Leader), 48.9% (Industry Average)

Source: S&P, Accenture Research
Note: Five Year Leader=Goodrich, Three Year Leader=Safran, One Year Leader=EADS
Commercial Airplanes Performance is Critical to Boeing’s Ability to Meet Investor Expectations

Commercial Airplanes comprises the majority of Boeing’s revenue.

- Full year 2010 revenues dipped 6% y/y to $64 billion affected by lower airplane deliveries, reduced defense volumes and higher R&D spending relating to the 787 Dreamliner program.
- A favorable tax settlement and a charitable trust contribution contributed to the improved profit levels in 2010.
- Boeing said 2011 results would be affected by “higher pension expense, the revised 787 schedule and the current defence contracting environment.
- Obstacles to long-term revenue growth:
  − S&P anticipates defense to be, at best, a slow growing business going forward. James McNerney, Chairman and CEO of Boeing has indicated that there is no question that the overall cost structure of its defense business has to decrease.
  − It is estimated that Boeing will need to sell at least 1,500 787 twinjets to break after more than three years of delays attributed to supply chain even and design issues, that’s an estimated 30 to 40 year production cycle. Boeing has earned 843 orders to date for the new majority composite twinjet.

Source: Boeing Website, Capital IQ

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<table>
<thead>
<tr>
<th>Commercial Airplanes</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues Growth ($M)*</td>
<td>33,386</td>
<td>28,263</td>
<td>34,051</td>
<td>31,834</td>
</tr>
<tr>
<td>Operating Profit ($M)</td>
<td>5,604</td>
<td>3,705</td>
<td>1,871</td>
<td>4,698</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Boeing Military Aircraft</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues Growth ($M)*</td>
<td>13,499</td>
<td>13,445</td>
<td>14,304</td>
<td>14,238</td>
</tr>
<tr>
<td>Operating Profit ($M)</td>
<td>5,604</td>
<td>3,705</td>
<td>1,871</td>
<td>4,698</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Network &amp; Space Systems</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues Growth ($M)*</td>
<td>11,481</td>
<td>11,346</td>
<td>10,877</td>
<td>9,455</td>
</tr>
<tr>
<td>Operating Profit ($M)</td>
<td>5,604</td>
<td>3,705</td>
<td>1,871</td>
<td>4,698</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Global Services &amp; Support</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues Growth ($M)*</td>
<td>7,072</td>
<td>7,256</td>
<td>8,480</td>
<td>8,250</td>
</tr>
<tr>
<td>Operating Profit ($M)</td>
<td>5,604</td>
<td>3,705</td>
<td>1,871</td>
<td>4,698</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Capital, Corporate &amp; Other</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues Growth ($M)*</td>
<td>949</td>
<td>599</td>
<td>569</td>
<td>529</td>
</tr>
<tr>
<td>Operating Profit ($M)</td>
<td>5,604</td>
<td>3,705</td>
<td>1,871</td>
<td>4,698</td>
</tr>
</tbody>
</table>
Commercial Airplanes also Drives Boeing Operating Income

Commercial Airplanes also constitutes a significant portion of Boeing’s operating income, highlighting the importance of delivery reliability.

- Commercial Airplanes: income in 2010 was dragged down by higher than expected R&D costs related to 787 but analysts believe that at this point in the aerospace cycle when the company is on the verge of entering two new aircraft into service and earnings are coming off a trough, future income is likely to increase considerably.

- Boeing Military Aircraft: experienced higher costs on the Airborne Early Warning & Control program in 2010.

- Network & Space Systems: higher costs on the Airborne Early Warning & Control program.

- Global Services & Support: higher costs on the Airborne Early Warning & Control program.

- Capital, Corporate & Other: Boeing Capital Corporation expects that its aircraft finance portfolio will continue to reduce in 2011, as new aircraft financing of less than $0.5 billion is expected to be lower than normal portfolio runoff through customer payments and depreciation.

Sources: Company Financial Release, FY11 Q1, 27 April 2011

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Boeing Commercial Airplanes Orders and Backlog – 737NG

The backlog of over 2,200 737NGs will influence rate increases as well as the transition of orders from 737NG to 737 MAX.

<table>
<thead>
<tr>
<th>Model Series</th>
<th>Orders</th>
<th>Deliveries</th>
<th>Unfilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>737-600</td>
<td>69</td>
<td>69</td>
<td>-</td>
</tr>
<tr>
<td>737-700</td>
<td>1,376</td>
<td>1,067</td>
<td>309</td>
</tr>
<tr>
<td>737-700BBJ</td>
<td>114</td>
<td>105</td>
<td>9</td>
</tr>
<tr>
<td>737-700C</td>
<td>15</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>737-700W</td>
<td>14</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>737-800</td>
<td>3,867</td>
<td>2,308</td>
<td>1,559</td>
</tr>
<tr>
<td>737-800A</td>
<td>22</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>737-800BBJ</td>
<td>20</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>737-900</td>
<td>52</td>
<td>52</td>
<td>-</td>
</tr>
<tr>
<td>737-900BBJ</td>
<td>7</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>737-900ER</td>
<td>406</td>
<td>94</td>
<td>312</td>
</tr>
<tr>
<td><strong>737 Total</strong></td>
<td><strong>5,962</strong></td>
<td><strong>3,755</strong></td>
<td><strong>2,207</strong></td>
</tr>
</tbody>
</table>

Source: The Boeing Company.
http://active.boeing.com/commercial/orders/index.cfm?content=displaystandardreport.cfm&pageid=m25065&RequestTimeout=20000

Customer demand for more efficient aircraft, delivered sooner, will be a significant influence upon how quickly Boeing “burns through” its backlog and how many 737NG orders will be shifted to the 737 MAX.
### The 737 is Critical to Commercial Airplanes’ Success

The past and projected growth in 737 family revenues reflects growing global demand in the single aisle market as well as the centrality of the 737 to the success of Commercial Airplanes.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>737 Family</td>
<td>$14,190</td>
<td>$11,977</td>
<td>$15,066</td>
<td>$15,416</td>
<td>$15,750</td>
<td>$17,779</td>
<td>$17,638</td>
<td>$18,860</td>
<td>$19,680</td>
</tr>
<tr>
<td>737 % of Revenue</td>
<td>48%</td>
<td>51%</td>
<td>51%</td>
<td>58%</td>
<td>52%</td>
<td>43%</td>
<td>39%</td>
<td>38%</td>
<td>37%</td>
</tr>
<tr>
<td>747</td>
<td>$2,432</td>
<td>$2,100</td>
<td>$1,200</td>
<td>$ -</td>
<td>$1,800</td>
<td>$4,500</td>
<td>$3,600</td>
<td>$3,600</td>
<td>$3,600</td>
</tr>
<tr>
<td>767</td>
<td>$1,200</td>
<td>$1,000</td>
<td>$1,040</td>
<td>$960</td>
<td>$1,440</td>
<td>$1,440</td>
<td>$1,440</td>
<td>$1,760</td>
<td>$1,760</td>
</tr>
<tr>
<td>787</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$1,000</td>
<td>$6,000</td>
<td>$8,400</td>
<td>$11,448</td>
<td>$13,200</td>
</tr>
<tr>
<td>777</td>
<td>$11,205</td>
<td>$8,235</td>
<td>$11,880</td>
<td>$10,212</td>
<td>$10,074</td>
<td>$11,824</td>
<td>$13,640</td>
<td>$13,912</td>
<td>$14,938</td>
</tr>
<tr>
<td>Total</td>
<td>$29,027</td>
<td>$23,312</td>
<td>$29,186</td>
<td>$26,588</td>
<td>$30,064</td>
<td>$41,542</td>
<td>$44,717</td>
<td>$49,580</td>
<td>$53,178</td>
</tr>
</tbody>
</table>

Source: Morgan Stanley, August, 2011
Note: “737 Family” is based upon 737NG history and order bookings, but may be applied to 737 MAX as a proxy.

The sustained success and stability of the 737 program has been critical to Commercial Airplanes’ ability to sustain operating momentum in the face of the delayed market entry of the 747-8 and 787 and will continue to drive BCA profitability as 747-8 and 787 recoup development investments.
The 737 Contribution to Commercial Airplanes Margin

Boeing’s ability to sustain healthy margins during the 737NG to 737 MAX transition will depend upon its ability to deliver on time to customers while managing new development, supplier, and model transition costs.

<table>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>737 Family</td>
<td>28%</td>
<td>29%</td>
<td>28%</td>
<td>32%</td>
<td>32%</td>
<td>34%</td>
<td>32%</td>
<td>32%</td>
<td>31%</td>
</tr>
<tr>
<td>747</td>
<td>15%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>767</td>
<td>8%</td>
<td>4%</td>
<td>4%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>777</td>
<td>25%</td>
<td>28%</td>
<td>27%</td>
<td>30%</td>
<td>30%</td>
<td>31%</td>
<td>30%</td>
<td>29%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Source: Morgan Stanley, August, 2011

Note (1): "737 Family" is based upon 737NG history and order bookings, but may be applied to 737 MAX as a proxy.

Note (2): Boeing’s 2011 Q3 results announcement (http://boeing.mediaroom.com/index.php?s=43&item=1987) established the initial accounting quantity for the 787 at 1,100 units, but timing to positive program margin is still uncertain. Analysts indicate that significant improvements in learning curve and efficiency will be required to attain profitability at this level ("Boeing May Peg 787 Profit Benchmark to Output of 1,100 Jets." Bloomberg. October 25, 2011).
Boeing – What Comes Next

Boeing has made no formal announcements regarding future rate increases on the 737 or regarding new programs, however initial analysis indicates the greater likelihood of a production rate at or around the announced 42 planes per month.

• While production rates of 60 planes per month have been mentioned in the popular press for the 737NG or 737 MAX, we believe that 42 planes per month is a more likely production scenario for the 737 due to constraints of the supply base and the risk of market saturation

• No formal announcements have been made regarding the next major production program for Commercial Airplanes; two options are most often discussed:
  − A replacement or enhancement for the 777
  − The New Small Airplane (NSA) to succeed the 737 MAX

• Third party research and industry discussions indicate an enhanced or new 777 is the more likely candidate for the next production program

• The introduction of Airbus’s A350 to compete with the 777 and the need to recoup investment and meet customer demand on the 737 MAX suggest that an enhanced 777 would be the most likely next project for Boeing

• Investments that Washington makes to preserve the 737 MAX should also apply to long term strengthening of Washington’s position for a revamped 777
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Appendix: Washington Aerospace Partnership Financial Supporters
This effort was made possible by generous support from business, government, and labor organizations from across the State of Washington and their contributions to the Washington Aerospace Partnership. A list of these organizations can be found on the following page.
# Washington Aerospace Partnership Contributing Members

<table>
<thead>
<tr>
<th>Contributor</th>
<th>Contributor</th>
<th>Contributor</th>
</tr>
</thead>
<tbody>
<tr>
<td>State of Washington</td>
<td>Port of Seattle</td>
<td>City of Marysville</td>
</tr>
<tr>
<td>EDB Tacoma Pierce</td>
<td>Master Builders Association</td>
<td>City of Mountlake Terrace</td>
</tr>
<tr>
<td>Pierce County</td>
<td>Enterprise Seattle</td>
<td>City of Mill Creek</td>
</tr>
<tr>
<td>Port of Tacoma</td>
<td>Columbia Bank</td>
<td>City of Snohomish</td>
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