Aerospace Regional and Local Economic Impacts

Seattle Metropolitan Chamber of Commerce

July 2024
Final

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EXECUTIVE SUMMARY

Aerospace, with Boeing and its supply chain at its epicenter, remains a cornerstone of Washington state's economy. The aerospace industry benefits nearly every corner of the state and nearly every sector of the state's economy.

The 737 MAX grounding in 2019 and subsequent COVID-19 pandemic greatly slowed plane production. The impacts of the pandemic were far-reaching for the industry and supply chain. Key industry metrics show recovery beginning in 2021 and continuing as the industry responds to increasing demand, all while grappling with challenges stemming from the pandemic's aftermath. In 2023, Boeing led an increase in productivity as demand for airplanes has quickly returned. This increase in productivity will be impacted by a changed workforce, global supply chain disruptions, inflation, and high interest rates all challenge productivity, along with serious incidents in early 2024 that affect industrywide performance.

Jobs, Revenues & Wages

- The Washington state aerospace industry employed **77,400 workers (annual average) in 2023**, and paid **$11.3 billion** in worker wages, generating **$57.2 billion in gross business revenues in 2023.** Industry expansion at the end of 2023 and early 2024, brings current aerospace jobs to a projected **81,800 jobs year-to-date in 2024.**
- The average annual wages within Washington's aerospace industry, when adjusted for inflation, have remained steady since 2015. The **average annual wage in 2023 stands at $133,200**, excluding benefits.
- **Employee benefits** in the aerospace industry are substantial. **With benefits, the average compensation in the industry is $214,000.** Benefits represent an additional 60% on top of total compensation for private industry aerospace workers nationwide, as reported by the Bureau of Labor Statistics, which far exceeds the economywide average of 40%. For Washington's aerospace industry, total average annual compensation includes salary, bonuses, overtime, and benefits.

Full Economic & Fiscal Impacts

- Total aerospace-associated economic impacts in Washington were more than **$71 billion in business revenues**, **194,000 jobs**, and **$19.4 billion in labor income in 2023**. These modeled estimates include business-to-business spending and employee spending of wages and income throughout the state.
- Total fiscal impacts of the industry in 2023, including indirect and induced fiscal impacts, are estimated at more than **$580 million in**

tax revenues for the state, including $209 million in direct tax revenues. The state's B&O tax represents most of these estimated direct revenues, totaling more than $173 million in B&O taxes in 2023.

- Every dollar of direct business revenue in the aerospace industry relates to a total of $1.40 in economic activity throughout the state, and every job in aerospace represents a total of 2.5 jobs economywide.

Boeing

- Boeing represents the vast majority of Washington's aerospace industry impacts. In 2023, Boeing supported 82% of industrywide business revenues, 80% of total jobs, and 77% of total labor income generated by the aerospace industry.
- New Boeing orders and unfilled orders reached a five-year peak in 2023 at 1,456 new orders, and as of June 30, 2024, Boeing's official unfilled order total reached 6,156 planes. This backlog and delivery measures (528 deliveries in 2023) provides confidence in the mid- to long-term outlook, as Boeing addresses challenges in 2024.

Local & Community Impacts

- **Aerospace workers contribute to local economies in communities throughout Washington state.** Their household spending supports local restaurants, retailers, consumer and health services and much more. Aerospace workers live throughout all of Washington state, and are mostly highly concentrated in Snohomish County, South King County and Northeastern Pierce County, reflecting access to Boeing production facilities and in communities where housing prices are not at the top of regional markets.
- **Local businesses throughout the greater Seattle region are highly attuned to Boeing and other aerospace workers' employment levels and compensation.** A few quotes from local business and community leaders are as follows:
  - *"We always hang a hat on the backlog at Boeing and the number one thing we look at is the jobs report."* – ***Snohomish County car dealership***
  - *"When Boeing is going strong and employment is up, you can see it everywhere in the community."* – ***City of Everett***
  - *"We have peers across the country in other markets that don't have the confidence in jobs and in employment that we do, because of our confidence in the aerospace industry."*– ***Snohomish County car dealership***
- Each local economy has varying strengths and concentrations that attract varied spending across local economies as highlighted below. Aerospace workers' household contributions to local economies in 2023 are estimated as follows.

  - **Lynnwood-Everett**: **$1 billion total local spending per year.** This includes an estimated equivalent of 1,160 car sales, enough to **support approximately four dealerships through aerospace worker spending alone**.
  - **North of Everett to Arlington: $615 million per year.** Spending at restaurants accounted for 11% of regional restaurant sales and supports the **equivalent of 35 regional restaurants.**
  - **Auburn-Renton: $725 million.** This includes the support of an **equivalent of 25 health care clinics.**
  - **Pierce County and South King County: $500 million**. Money spent at restaurants alone supports the **equivalent of 25 regional restaurants**.
  - **Seattle and Eastside: $835 million.** This includes more than $269 million of spending on retail sales, and greater than $566 million of spending on services.
- **Charitable contributions by Boeing and its employees** in Washington totaled **$44 million in 2023**, with $5 million donated by the Employees Community Fund to support local nonprofits.

Education & Workforce Support

- Since 2009, the Pacific Northwest Aerospace Alliance has operated and maintained a scholarship fund where eligible aerospace students are given at least $1,000. Since the program began, **the alliance has raised about $359,000 to help more than 170 students** pursue their aerospace career aspirations.[1]
- Boeing has hired more than 1,000 employees through the **Core Plus Aerospace program**, a two-year advanced manufacturing curriculum that prepares high school students for high-demand jobs through hands-on learning.
- Boeing provided nearly $30 million in 2023 through the **Learning Together Program** to support more than 4,200 Washington state employees in pursuing post-secondary education.
- In 2022, Boeing invested $5 million in the **Boeing Center for Student Success** at Washington State University's Voiland College of Engineering and Architecture and donated $10 million to the University of Washington for its new Interdisciplinary Engineering Building.

[1] https://www.pnaa.net/pnaa/scholarships

INTRODUCTION

This report assesses the statewide, regional, and local impacts of the aerospace industry in Washington state. Washington's aerospace industry is foundational to the state economy. As such, the Seattle Metropolitan Chamber of Commerce desires an update to the aerospace impact analysis published in early 2019, presenting data for 2018.

Data and analysis in this report include updated estimates of the direct and secondary economic and fiscal impacts of aerospace statewide and a data-rich narrative on the contributions of the aerospace industry to local economic growth, economic resiliency, and the community overall.

Methods

This report leverages public data published by state and federal agencies, as well as proprietary information from Boeing. Employment, wage, and establishment count data for aerospace and related industries were procured from the Washington State Employment Security Department and U.S. Bureau of Labor Statistics, while the Washington State Department of Revenue publishes data on gross business income. Input-output modeling tools published by the Washington State Office of Financial Management are used for economic impact computations. Custom data modeling provides estimates of economic benefits of aerospace workers by select regions of Western Washington.

Organization of Report

The remainder of this report is organized as follows:

- **Industry Overview.** Defines the aerospace industry, including the Boeing supply chain and other parts of the industry cluster.
- **Current Conditions**. Documents the employment, occupations and establishments that comprise Washington's aerospace industry.
- **Economic Impacts**. Presents direct, indirect, and induced impacts supported by the aerospace industry.
- **Fiscal Impacts**. Discusses the direct and secondary statewide fiscal impacts supported by Washington's aerospace industry.
- **Community Impacts**. Presents community impact data including donations, sponsorships, workforce development activities, and the impacts of local spending by aerospace workers.
- **Industry Outlook**. Summarizes themes and findings from industry and supply chain interviews.

INDUSTRY OVERVIEW

Aerospace Industry Definition

The aerospace industry includes a range of businesses throughout Washington state and is anchored by Boeing, including the headquarters of Boeing Commercial Airplanes. The technical definition, which the analysis in this report uses, includes all businesses classified under aerospace product and parts manufacturing (NAICS code 3364).

The average annual employment within the aerospace product and parts manufacturing industry in 2023 was 77,400, of which it is estimated about 64,200 were Boeing jobs. Extending far beyond aerospace product and parts manufacturing firms, Washington's aerospace industry is supported by numerous additional manufacturing, transportation, professional services, and educational institutions. Previous reports and studies have undertaken the task in more detail, including the Governor's Office of Aerospace alongside the Washington State Employment Security Department in 2013. The quantitative analysis presented in this report uses the definition created by these organizations for the aerospace industry and related industries (**Appendix A**).

Washington's aerospace supply chain is diverse and supports a wide range of non-aerospace industries in addition to aerospace firms. These firms are spread among many specialty areas including:

- Aerospace engineering, research, and design
- Maintenance, repair, and overhaul
- Avionics and navigational systems
- Tooling
- Interiors
- Composites and advanced materials
- Air framers and aero structures

Manufacturing operations supporting the aerospace industry do business in other industries, including health care, energy, and recreation. Notably, some of these suppliers also maintain strong philanthropic arms within their business that emphasize social service and workforce development. Examples of aerospace businesses supporting other industries include Aero Plastics, Inc., Janicki Industries, and Toray Composite Materials. Companies with philanthropic and workforce development missions include Pioneer Industries and Orion Industries.

Boeing Activities in Washington

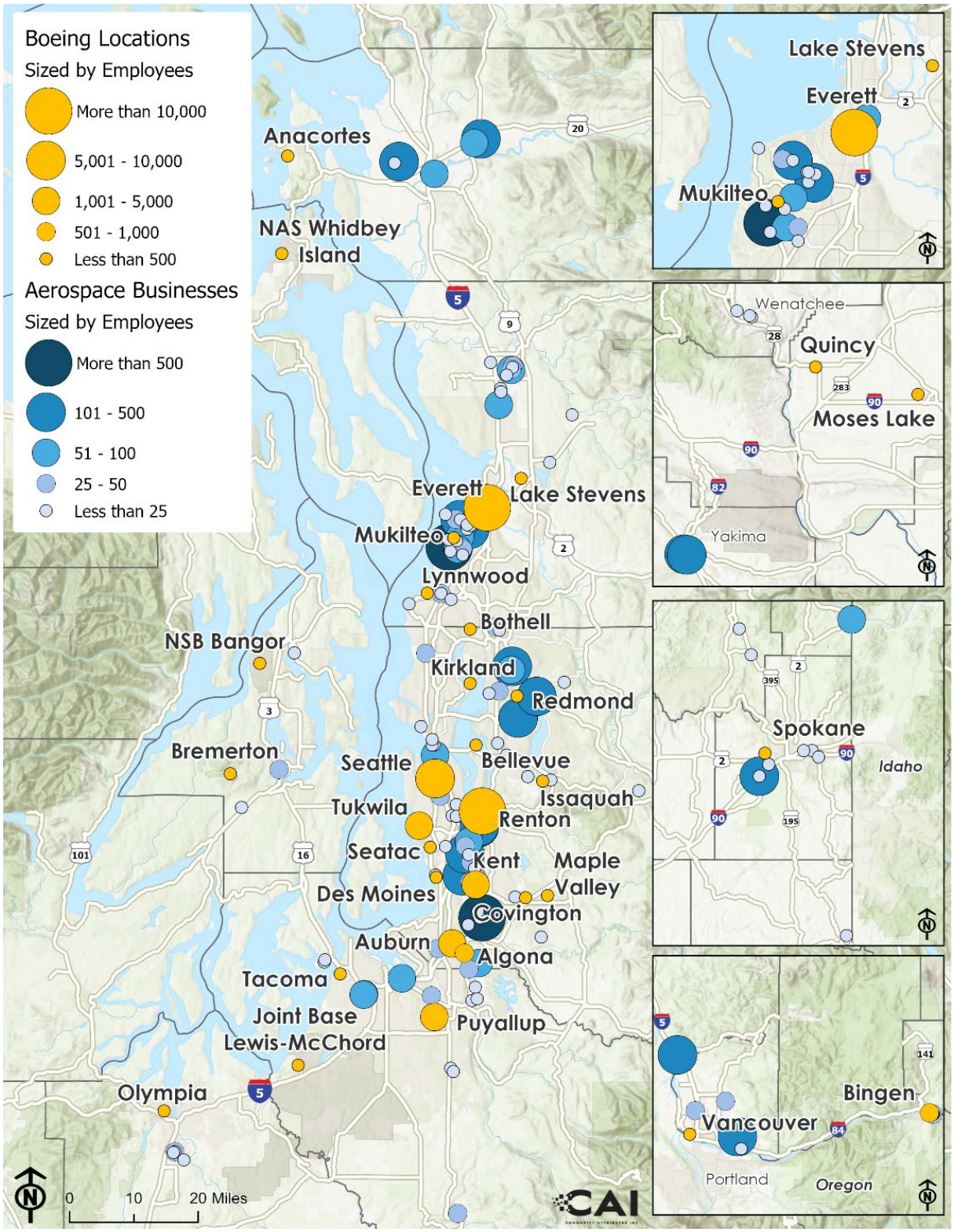
Boeing's largest Washington employment bases are located in Everett and Renton where its commercial operations include manufacturing the 737, 767, and 777 model aircraft and the 777X Composite Wing Center. Defense programs include the manufacturing of military derivatives of the 737 and 767 models, which include the P-8 Poseidon and KC-46A Pegasus Tanker in Washington, and Boeing's E-7 Airborne Early Warning and Control program. Currently, the Renton factory is the sole producer of 737 planes, but Boeing anticipates beginning production of 737s in Everett in 2025 when the Federal Aviation Administration concurs it is ready to increase production rates on the program. Currently, the Everett site produces the commercial 767 Freighter and 777 and 777X models.

In addition to Boeing's Renton and Everett sites, it employs workers at sites across Washington including Seattle, Auburn, Algona, Tukwila, Kent, Frederickson, Bingen and Moses Lake. **Exhibit 1** presents Boeing employment by location alongside non-Boeing aerospace businesses.

As Boeing is the largest driver of Washington's aerospace industry, its unfilled orders (backlog) and delivery metrics can shed light on the current and future state of the industry. The effects of the COVID-19 pandemic and the grounding of the 737 MAX have reverberated throughout the state's aerospace industry, including the supply chain serving the industry. A large Boeing backlog, while no guarantee of future success, provides confidence for the industry and supply chain and provides a sense of reduced risk for companies supporting Boeing as it restabilizes its operations. As of June 30, 2024, Boeing's total unfilled orders had reached 6,156 planes, 4,730 of which were 737s.

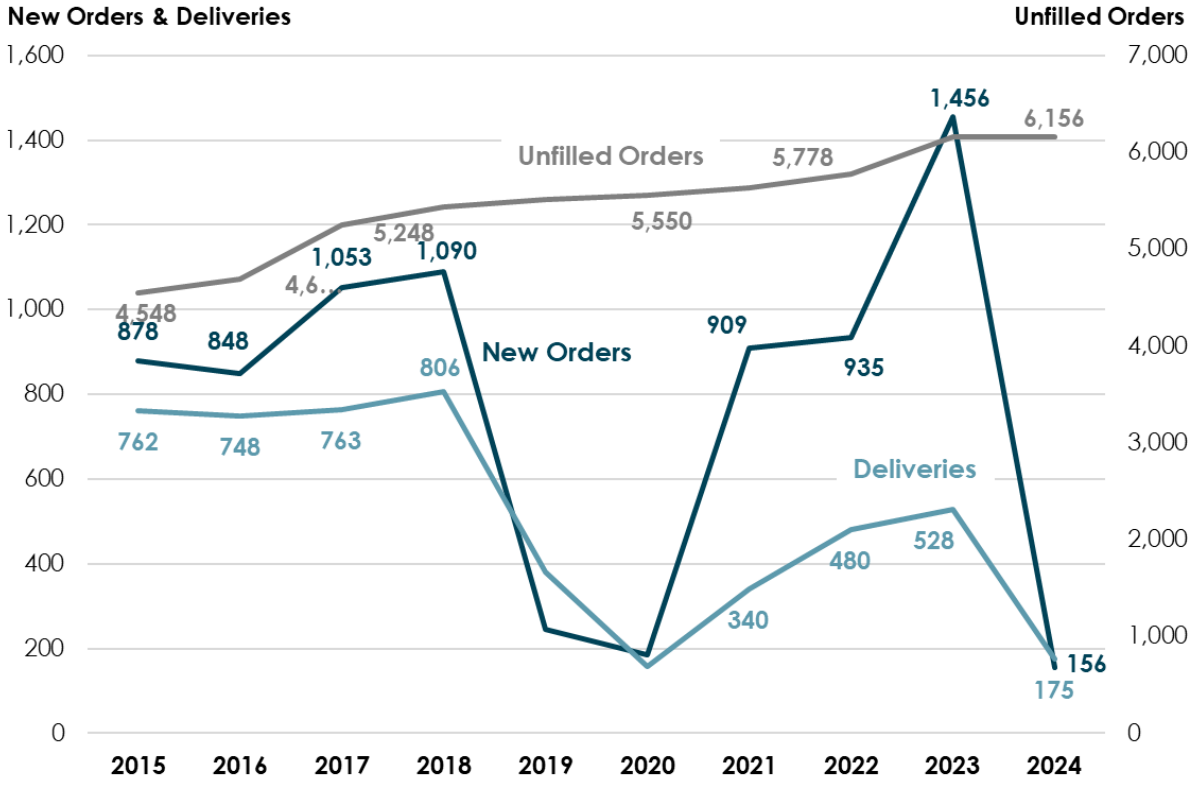
Exhibit 2 presents Boeing Commercial's new orders, cumulative unfilled orders, and deliveries from 2015 through the end of June 2024. The years 2019 and 2020 saw declines across all metrics, with new orders falling the most from 1,090 in 2018 to 184 in 2020. In 2023, new orders returned to near pre-pandemic levels, exceeding the number of new orders in 2015 and 2016. Deliveries saw an increase to more than 400 in 2022 and more than 500 in 2023.

Exhibit 1. Employment by Boeing and Aerospace Business Locations, 2023



Sources: The Boeing Company, 2023; ESRI, 2023; Community Attributes Inc., 2023.

Exhibit 2. Boeing New Orders, Deliveries, and Cumulative Unfilled Orders, 2015 – June 30, 2024 (Year to Date)



Sources: The Boeing Company, 2024; Community Attributes Inc., 2024.

CURRENT CONDITIONS

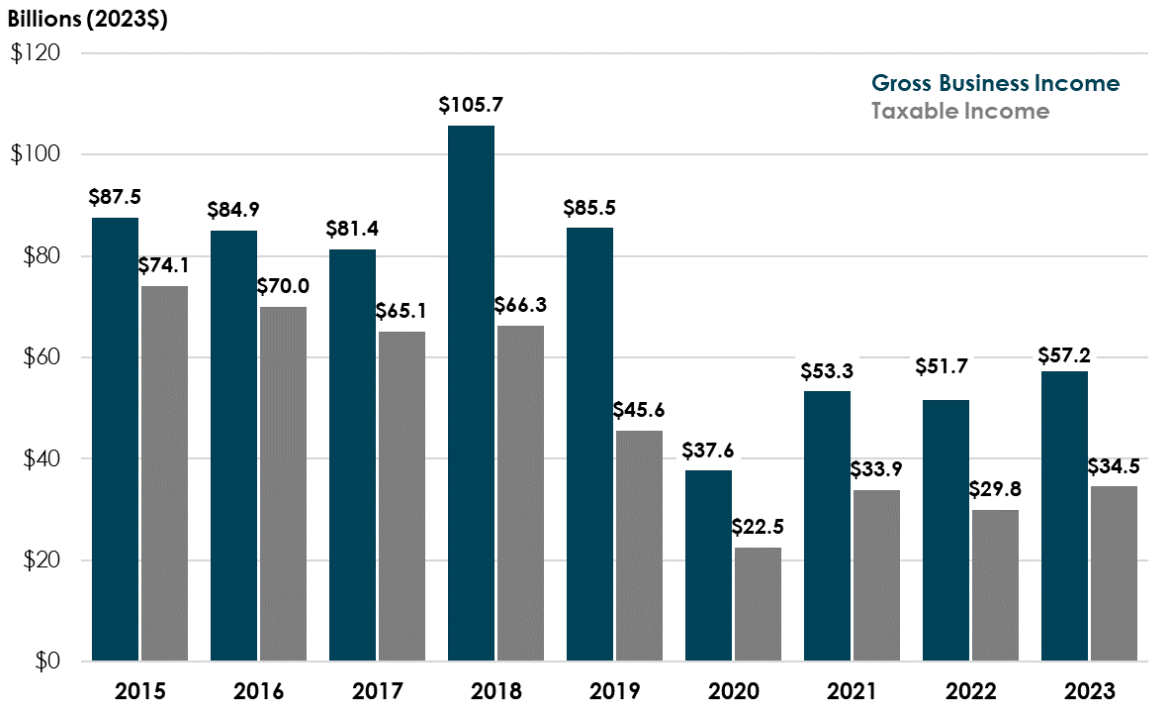
This section reviews historical and current conditions of Washington's aerospace industry and Boeing, capturing trends and illustrating shifts in the industry over the past eight years.

Business Revenues

All Aerospace

Total gross business income generated by Washington's aerospace industry has fluctuated since 2015. Business income peaked in 2018 at nearly $106 billion, before falling below $40 billion in 2020 at the beginning of the COVID-19 pandemic. Aerospace business income has recovered between 2021 and 2023 (**Exhibit 3**). **Exhibit 3** also presents total taxable income[2] within the aerospace industry from 2015 to 2023. Taxable income directly impacts the tax revenues generated by the industry and fluctuated between $74.1 billion and $22.5 billion from 2015 through 2023. **Appendix C** provides further discussion of gross business income.

Exhibit 3. Aerospace Gross Business Income and Taxable Income, Washington State, 2015 – 2023



Source: Washington State Department of Revenue, 2024; Community Attributes Inc., 2024.

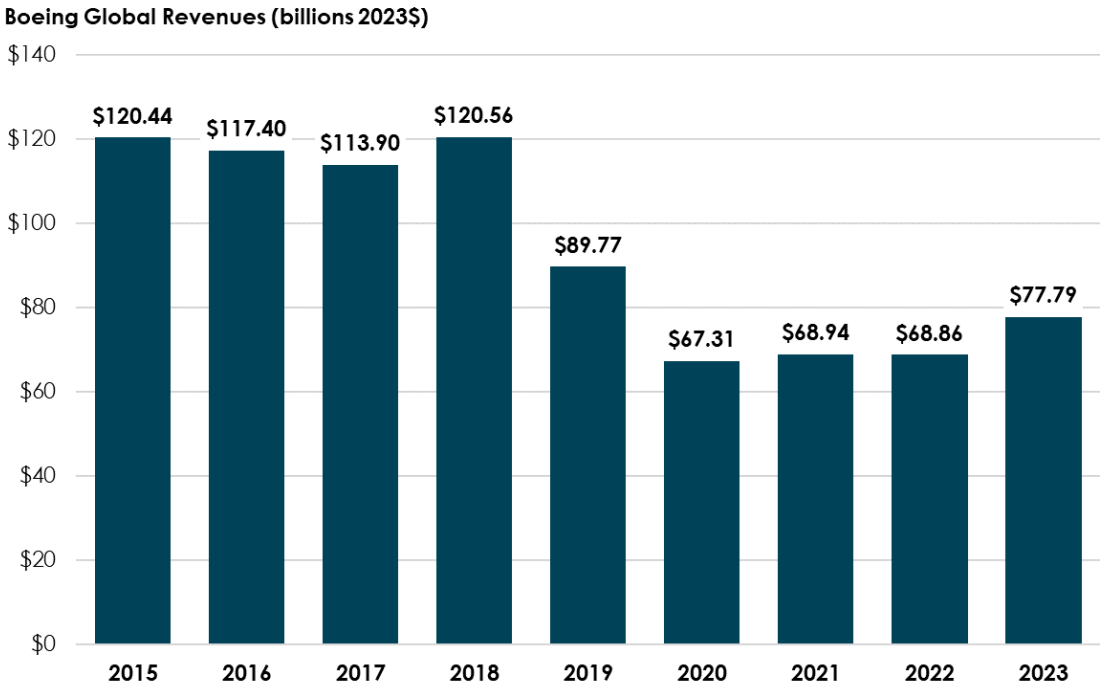
[2] Taxable business income is equal to gross business income minus any applicable deductions.

Boeing

In many ways, Washington's aerospace industry mirrors that of Boeing's annual outcomes (**Exhibit 4**). Since 2015, the pattern in aerospace gross business income in Washington has followed the patterns seen in Boeing annual global revenues.

The revenues presented by **Exhibit 4** are sourced from Boeing's annual reports. These revenues include the company's global revenues, inclusive of Boeing Commercial Airplanes, Boeing Defense, Space & Security, and Boeing Global Services.

Exhibit 4. Boeing Global Revenues, 2015 – 2023



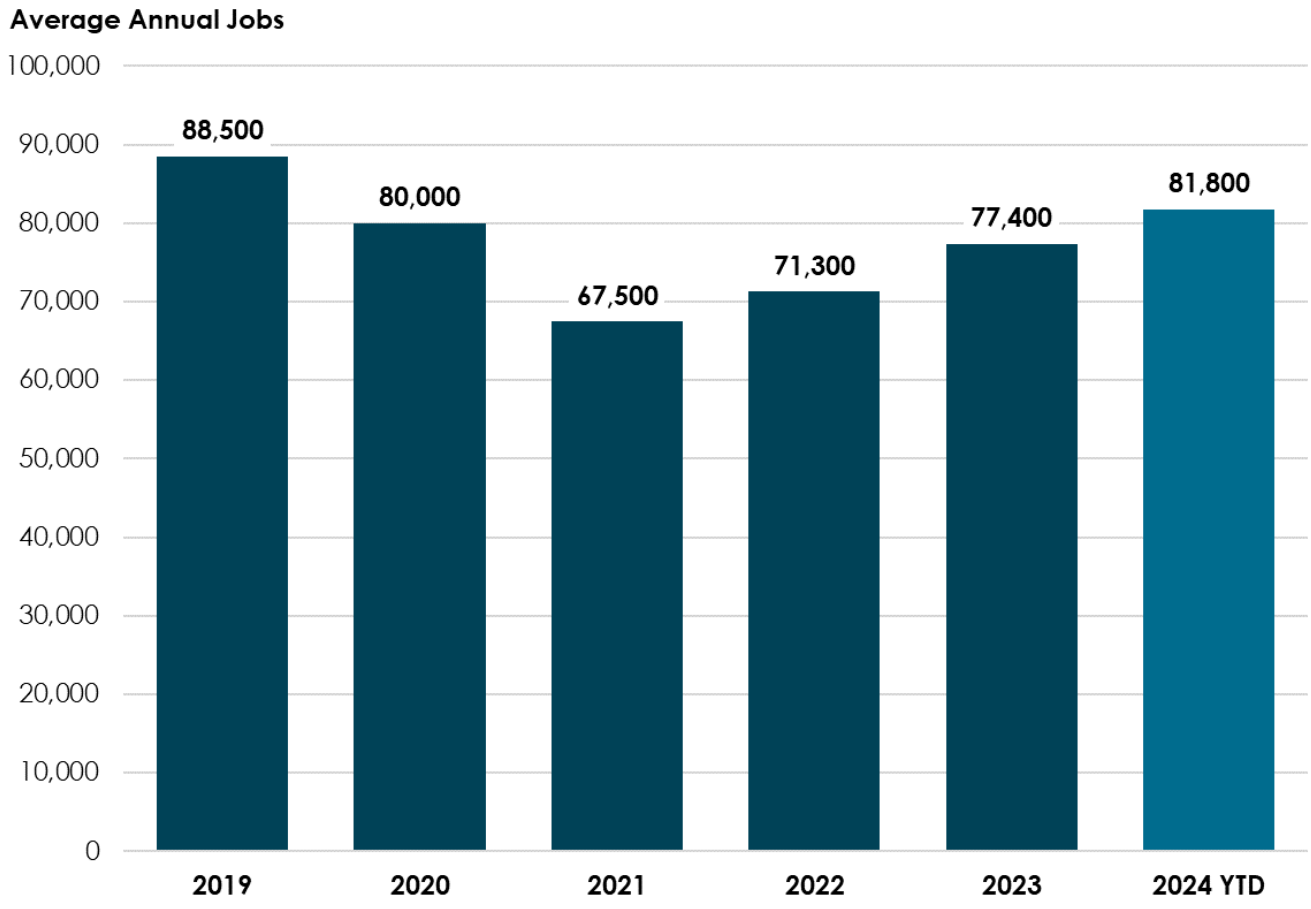
Source: The Boeing Company, 2024; Community Attributes Inc., 2024.

Jobs

All Aerospace

Annual average aerospace employment in Washington state declined from 2019 to 2021 but has grown since the pandemic. The lowest period of aerospace employment followed the COVID-19 pandemic, hitting a low of 67,500 in 2021. Employment rebounded in 2023 to reach an annual average of 77,400 jobs with additional growth experienced year-to-date in 2024 (**Exhibit 5**).

Exhibit 5. Aerospace Jobs in Washington, Annual Averages, 2019 – 2024 YTD

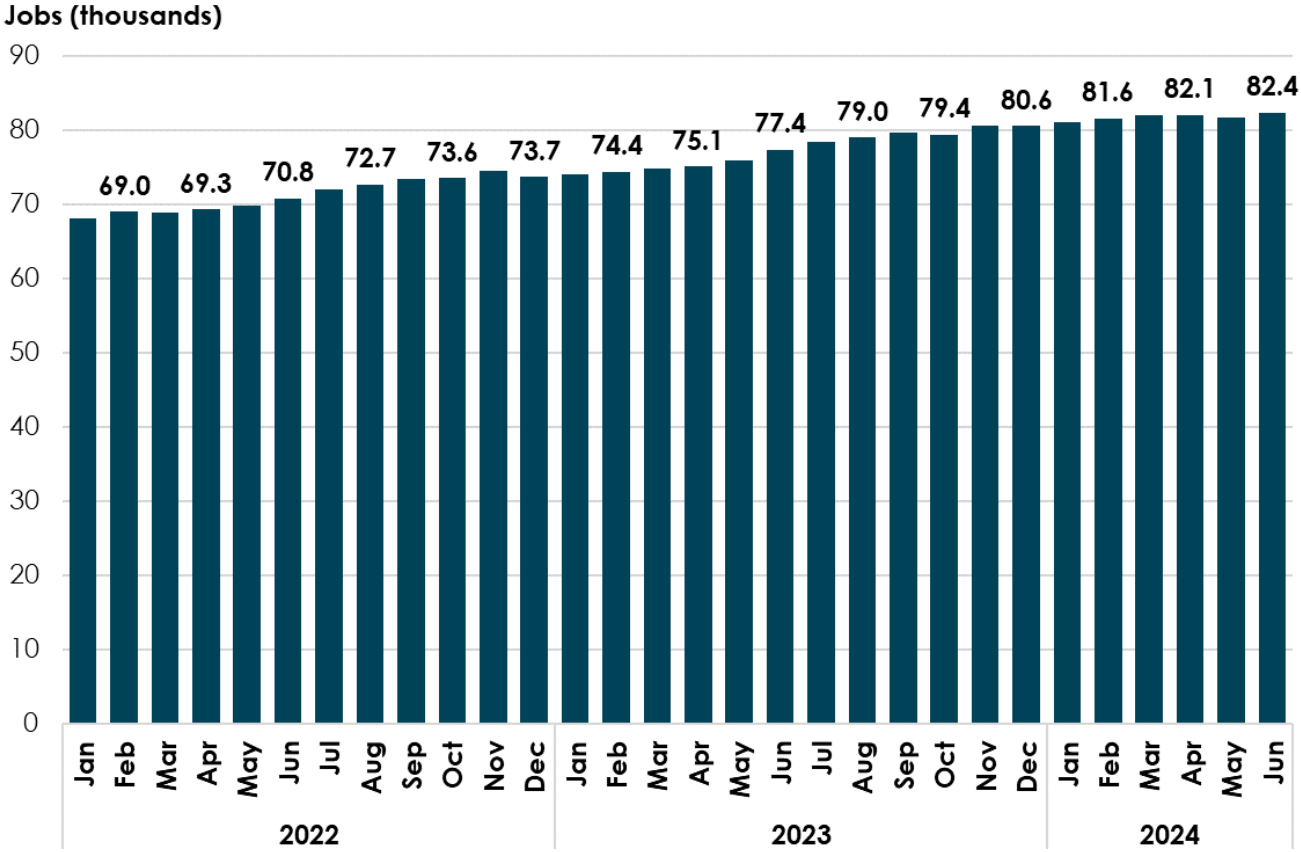


Source: Washington State Employment Security Department, 2024; Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.

Note: 2024 Year to Date (YTD) reflects monthly for monthly data through Q2 2024.

Monthly aerospace employment throughout Washington State has steadily increased since the beginning of 2022. As of June 2024, aerospace industry employment is greater than 82,000 jobs (**Exhibit 6**).

Exhibit 6. Aerospace Jobs in Washington, Monthly, 2022 – 2024 YTD



Source: Washington State Employment Security Department, 2024; Bureau of Labor Statistics, 2023; Community Attributes Inc., 2024.

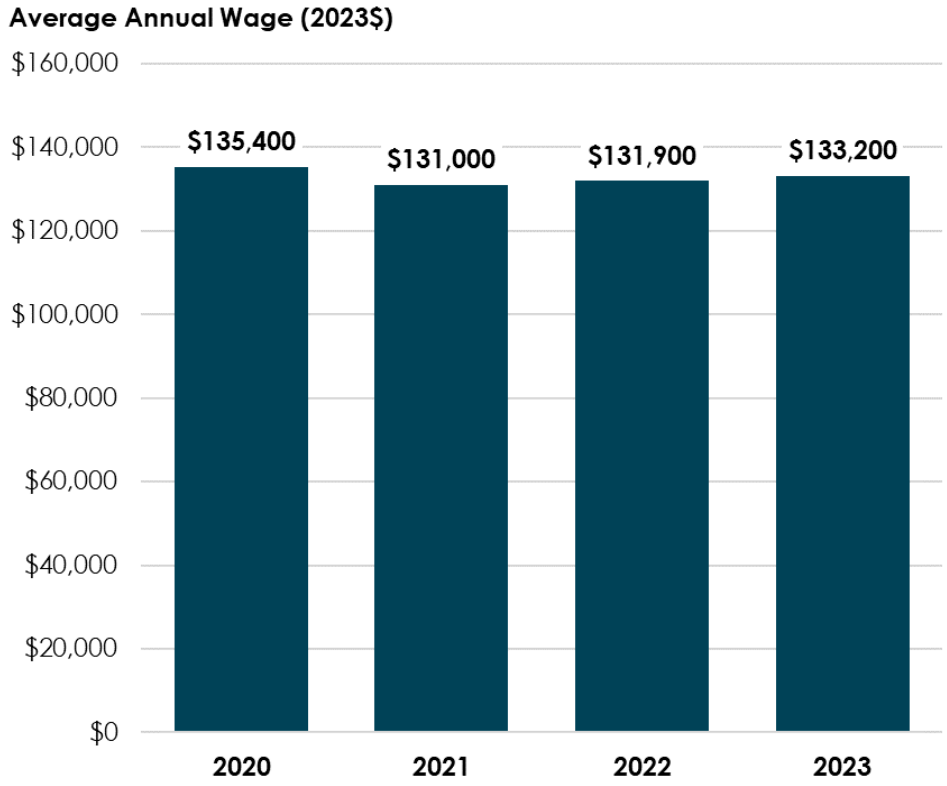
Boeing

As of December, 2023, Boeing employed 66,800 workers throughout Washington state. This represents an increase of more than 5,000 workers since December, 2022. In addition to Boeing's full-time employees, it works with nearly 1,200 contracted positions in Washington spread across commercial operations, defense operations, engineering test and technology division, and its global services division. Despite the 737 MAX groundings, which began in March 2019, Boeing retained its employment levels rather than reducing its workforce size. To avoid reducing staff, Boeing took out debt and cross-trained employees from the 737 Final Assembly Factory in Renton to other locations in the Puget Sound region. Boeing succeeded in retaining workforce levels until the compounding effects of the COVID-19 pandemic halted domestic and international travel throughout the world, further straining Boeing, ultimately leading to a reduction in force primarily through voluntary (buyouts) and early retirements.

Occupations and Wages

Since 2020 average annual wages within Washington's aerospace industry have kept pace during a period of historically high inflation (**Exhibit 7**). The wages presented in **Exhibit 7** include bonuses and overtime pay, but exclude benefits, which often represent a large value for employees of private companies. For the aircraft manufacturing industry in December 2023, the Bureau of Labor Statistics reported benefits represent nearly 38% of total compensation for private industry workers nationwide, while wages and salaries represented the remaining 62%. If these proportions hold true in Washington's aerospace industry, total average annual compensation (including salary, bonuses, overtime, and benefits), would total more than $214,000 in 2023. This exceeds the national average for private industry workers, for which benefits accounted for about 30% total compensation while wages and salaries accounted for the remaining 70% in December 2023.

Exhibit 7. Aerospace Industry Average Annual Wage, Washington State, 2020 – 2023



Sources: Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.

Nationwide data on the aerospace industry suggests the median age of workers is declining. Since 2011, the median age of aerospace product and parts manufacturing workers has declined from 48 to about 43. This could be caused by workers reaching retirement age or an uptick in younger workers

joining the industry, or a combination of the two. As more tenured employees earning high wages leave the workforce for retirement, the average wage will likely be driven down as the remaining workforce has less industry experience, and therefore likely earns lower wages.

Exhibit 8 presents the occupations estimated to have more than 1,000 jobs in Washington's aerospace industry in 2023. Aircraft structure, surfaces, rigging, and systems assemblers (all one occupation title) are the most concentrated occupation in the aerospace industry; weighers is the second-most concentrated occupation. These two occupation categories require a high school diploma or equivalent. The average wage for workers within this occupational classification in Washington state was $75,500 in 2023. Other leading occupations within Washington's aerospace industry include inspectors, aircraft mechanics, and aerospace engineers. Typical educational requirements for aerospace's top occupations range from a high school diploma or equivalent to a bachelor's degree.

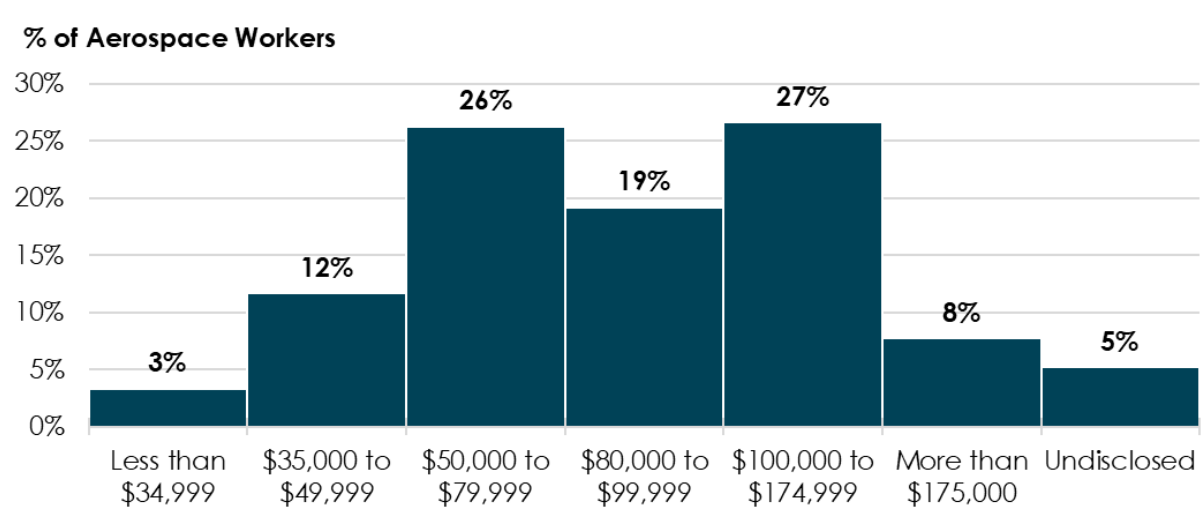
Exhibit 8. Leading Aerospace Occupations and Average Wages, Washington State, 2023

SOC	Occupational Title	2023 Employment	2023 Average Wage	Typical Educational Level Required
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	9,840	$75,450	High school diploma or equivalent
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	4,610	$63,370	High school diploma or equivalent
49-3011	Aircraft Mechanics and Service Technicians	3,640	$80,450	Postsecondary nondegree award
17-2011	Aerospace Engineers	3,620	$150,390	Bachelor's degree
43-5071	Shipping, Receiving, and Inventory Clerks	3,010	$51,540	High school diploma or equivalent
49-2091	Avionics Technicians	2,730	$89,320	Associate's degree
13-1081	Logisticians	2,680	$97,510	Bachelor's degree
17-2071	Electrical Engineers	2,590	$127,440	Bachelor's degree
13-1020	Buyers and Purchasing Agents	2,300	$85,230	Bachelor's degree
51-2020	Electrical, Electronics, and Electromechanical Assemblers	2,280	$59,120	High school diploma or equivalent
15-1252	Software Developers	2,230	$159,990	Bachelor's degree
17-2112	Industrial Engineers	2,220	$114,810	Bachelor's degree
13-1111	Management Analysts	2,050	$119,390	Bachelor's degree
11-3051	Industrial Production Managers	1,760	$145,570	Bachelor's degree
17-2141	Mechanical Engineers	1,720	$112,970	Bachelor's degree
13-1199	Business Operations Specialists, All Other	1,660	$96,850	Bachelor's degree
51-4041	Machinists	1,510	$65,800	High school diploma or equivalent
51-2090	Miscellaneous Assemblers and Fabricators	1,200	$46,870	High school diploma or equivalent
51-9161	Computer Numerically Controlled Tool Operators	1,030	$81,050	High school diploma or equivalent
	All Other Occupations	*24,740*		
	Total	**77,420**		

Sources: Washington State Employment Security Department, 2023; Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.

Exhibit 9 presents an estimated breakdown of wages for aerospace occupations based on occupational wage data by percentile. As of 2023, an estimated 72% of aerospace workers earn between $50,000 and $175,000. An estimated 15% earn less than $50,000 annually.

Exhibit 9. Aerospace Occupations Wage Breakdown, 2023 (2023$)

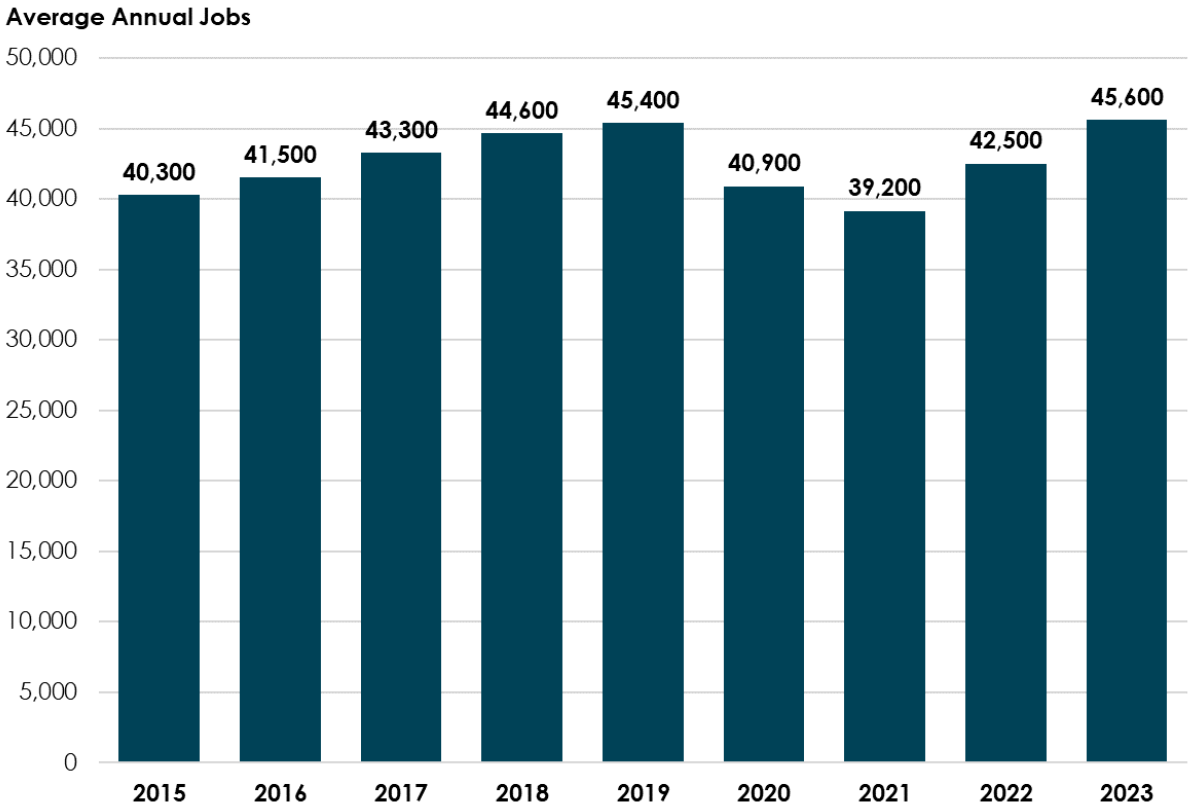


Sources: Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.
Note: Undisclosed captures occupations with suppressed data.

Related Industries

Employment levels in aerospace-related industries, defined in **Appendix A**, have totaled 39,000 jobs to 46,000 jobs throughout the state since 2015. The aggregate employment level of these industries has increased since 2021, increasing by about 6,000 jobs from 2021 to 2023. Employment in aerospace's related industries has been rebounding, reaching 45,600 jobs in 2023 (**Exhibit 10**).

Exhibit 10. Aerospace Related Industries Employment, Annual Averages, Washington, 2015 – 2023



Sources: Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.

The five related industries with an average annual employment level greater than 2,000 in 2023 include passenger air transportation, machining shops, other airport operations, relay and industrial control manufacturing, and additional air support activities such as passenger screening and maintenance. From 2015 to 2023, both passenger air and other airport operations have seen gains in total employment, with compound annual growth rates of 4.9% and 10.1%, respectively. Other adjacent industries have experienced smaller margins of growth, and machining shops and other air support activities have declined incrementally in total employment over the past eight years (**Exhibit 11**).

Exhibit 11. Top 5 Related Industries, Growth Rates, Washington, 2015-2023

Related Industry	2015	2023	Growth	CAGR
Passenger Air (NAICS 481111)	11,900	17,460	5,560	4.9%
Machine Shops (NAICS 332710)	4,970	4,460	(510)	-1.3%
Other Airport Operations (NAICS 488119)	2,050	4,420	2,370	10.1%
Relay & Industrial Control Mfg (NAICS 335314)	2,460	2,900	440	2.1%
Other Air Support Activities (NAICS 488190)	2,340	2,250	(90)	-0.5%
Top 5 Related Industries	**23,720**	**31,490**	**7,770**	**3.6%**

Sources: Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.

ECONOMIC IMPACTS

The extent of economic impacts generated by the aerospace industry in Washington can be measured by the total volume of business revenues, employment, and labor income produced by business entities operating directly in the aerospace sector. Additionally, business revenues supported through upstream business-to-business transactions (indirect impacts) and expenditures generated via worker earnings (induced impacts) are also captured. Impact calculations were carried out through the utilization of the Washington State Input-Output (I-O) Model, which is produced and maintained by the Washington State Office of Financial Management.

In 2023, the aerospace industry directly supported more than 77,000 workers, earning approximately $11.3 billion in labor income (including benefits) in total income, while generating business revenues exceeding $55 billion. In total, the aerospace industry facilitated and supported 194,000 jobs through direct and indirect business operations, generating $19.4 billion in labor income, and $81 billion in total business revenues (**Exhibit 12**).

Exhibit 12. Aerospace Economic Impacts, Washington State, 2023

	Business Revenues (millions 2023$)	Jobs	Labor Income (millions 2023$)
Direct	$57,200	77,400	$11,300
Indirect	$4,900	19,400	$1,800
Induced	$19,100	97,200	$6,300
Total	**$81,200**	**194,000**	**$19,400**

Sources: Washington State Department of Revenues, 2024; Washington State Office of Financial Management, 2024; Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.

Economic impact multipliers, as shown on **Exhibit 13**, represent the magnitude of economic impacts generated across each industry measure. For instance, every dollar of direct business revenue in the aerospace industry

supports an additional $0.40 in economic activity throughout the state. Furthermore, every job in aerospace supports a total of 2.5 jobs across the state.

Exhibit 13. Aerospace Economic Multipliers, Washington State, 2023

Type	Multiplier
Total output per $ final demand	1.4
Total jobs per direct job	2.5
Total compensation per $ direct income	1.7
Total jobs per $ mil final demand	3.4

Sources: Washington State Department of Revenues, 2024; Washington State Office of Financial Management, 2024; Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.

Boeing is the most significant producer within Washington's aerospace industry, as it represented 83% of total direct employment of the industry in Washington in 2023. In 2023, Boeing averaged a total workforce of 64,200 employees, who earned $8.6 billion in wages and benefits, while generating an estimated $47.6 billion in total business revenues. In total, Boeing supported nearly 154,900 jobs, approximately $14.9 billion in labor income, and $66.4 billion in total business revenues throughout the state, which includes all direct, indirect, and induced impacts (**Exhibit 14**).

Exhibit 14. Boeing Economic Impacts, Washington State, 2023

	Business Revenues (millions 2023$)	Jobs	Labor Income (millions 2023$)
Direct	$47,600	64,200	$8,600
Indirect	$4,100	16,100	$1,500
Induced	$14,700	74,600	$4,800
Total	**$66,400**	**154,900**	**$14,900**

Sources: Washington State Department of Revenues, 2024; Washington State Office of Financial Management, 2024; Boeing, 2023; Community Attributes Inc., 2024.

FISCAL IMPACTS

As a core industry in Washington, the aerospace industry generates sizeable fiscal impacts each year. In 2024, aerospace directly generated an estimated $208.6 million in tax revenues for the state of Washington. The state's B&O tax represents the majority of these estimated revenues, totaling more than $173 million in direct B&O taxes in 2023, as published by the Washington State Department of Revenue. Total fiscal impacts, which include indirect and induced, are estimated at more than $586 million in tax revenues for the state (**Exhibit 15**).

Exhibit 15. Aerospace Statewide Fiscal Impacts, 2023

Fiscal Impacts (millions 2023$)	Direct	Secondary	Total
B&O	$173.1	$119.7	**$292.8**
Sales & Use Taxes	$35.5	$227.9	**$263.4**
Other	$0.0	$30.5	**$30.5**
Total	**$208.6**	**$378.2**	**$586.7**

Sources: Washington State Department of Revenue, 2024; Washington State Office of Financial Management, 2024; Bureau of Labor Statistics, 2024; Community Attributes Inc., 2024.

The aerospace industry is one of the major B&O taxpayers in Washington State. Among industry groups, which include an aggregation of individual industries, aerospace's total B&O taxes paid annually remain near the highest amounts in Washington. Other high-paying industry groups include management, scientific, and technical consulting services; computer systems design and related services; and offices of physicians.

In addition to tax revenues for the state, the aerospace industry generates revenues for county and city governments. While county and city revenues are difficult to estimate given the complex nature of each individual jurisdiction's tax code, aerospace businesses and employees generate tax revenues for the county and cities within which they operate and live through sales and use, B&O, and other taxes depending on the jurisdiction and their adopted taxes.

COMMUNITY IMPACTS

Aerospace workers live throughout the region, and many of the benefits the industry provides are visible and significant in communities close to workers' homes. Beyond their hometowns, aerospace workers are valued at regional events and community institutions, such as schools, churches and other nonprofits that serve broad swaths of the region.

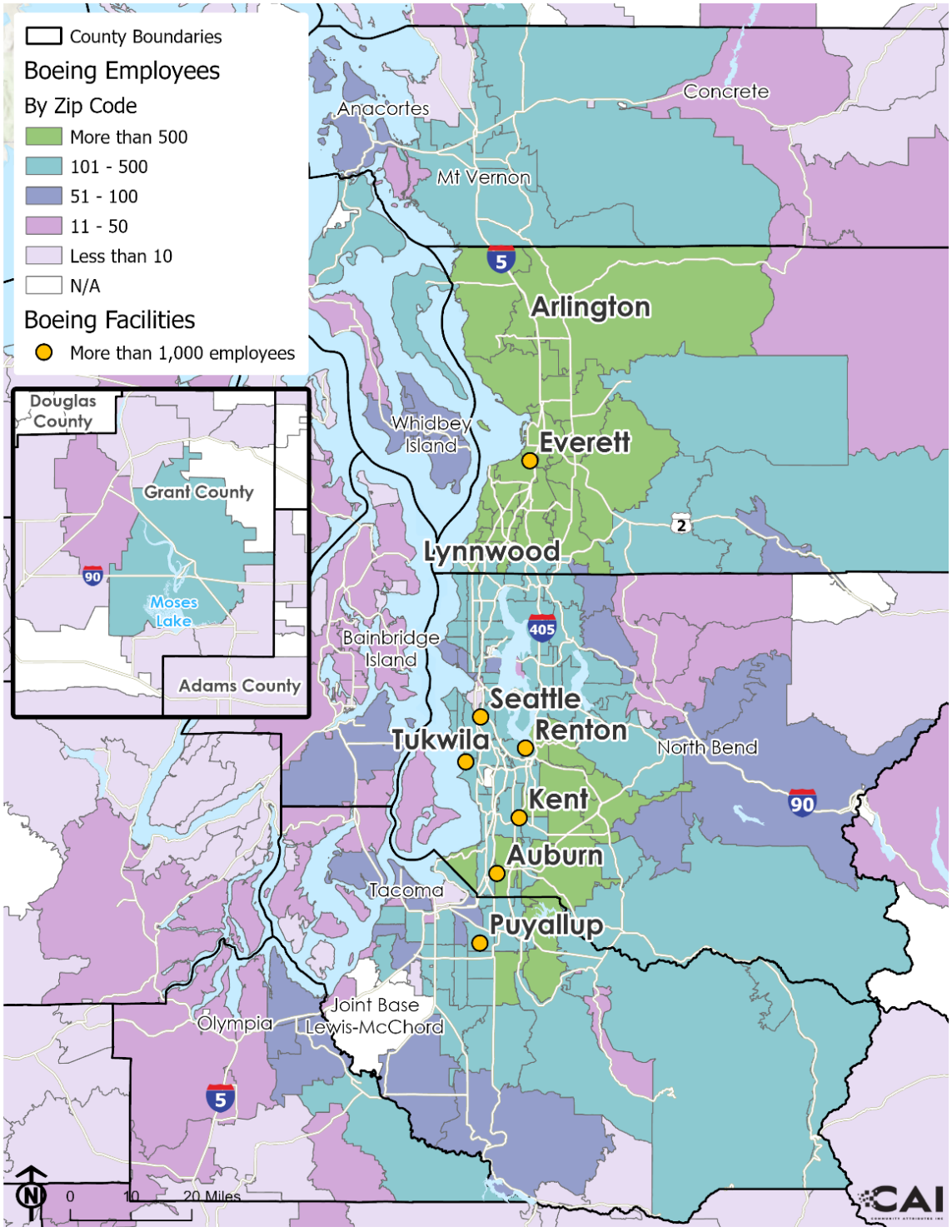
The following section discusses the community impacts of the aerospace industry and Boeing, including estimated aerospace worker spending throughout communities with concentrations of aerospace workers, Boeing and Boeing employee charitable giving, and workforce development efforts conducted by Boeing and other Washington aerospace firms.

Local Impacts

Quantifying these benefits on a local scale relies on testimonials from local businesses and institutions. Determining precisely where aerospace workers live is difficult, but data from Boeing provides a helpful understanding of highly localized impacts. At geographies smaller than countywide, reliable, industry-wide, place-of-residence data is not available from state or federal data providers. Representing roughly 75% of aerospace jobs, aggregated data from Boeing about their workforce residences sheds light on the local importance of the industry.

Exhibit 16 shows the distribution of workers employed by Boeing throughout the Puget Sound region, based on their place of residence. There are dense clusters of employment in both Everett and the regions immediately surrounding Seattle to the south, including Kent, Auburn, Puyallup, Renton, and Tukwila, all of which have Boeing facilities with more than 1,000 employees. Everett represents the most prominently concentrated area with Boeing employees and is home to about half of all Boeing workers in Washington. The extent of Boeing's operations and influence are far-reaching throughout the region and beyond, as evidenced by concentrations of Boeing employees residing in outlying regions in both Pierce and Skagit counties.

Exhibit 16. Boeing Workers by Place of Residence



Sources: Boeing, 2023; Community Attributes Inc., 2023.

Local Industry Connections

The connections to the aerospace industry in communities across the region span every industry in the economy. Some businesses are more a part of the industrial supply chain, as generally covered in the Related Industries section. Other local businesses provide important services to aerospace companies, such as a variety of services for company events, financial services and benefits provided to workers from their employers.

Many more local businesses interact with aerospace workers in all aspects of life and local economies. As with most small businesses, many local business owners know their customers well, and they attest to the significance of aerospace companies and industry workers to their business. They can viscerally feel the benefits and challenges associated when aerospace employment rises and falls throughout business cycles.

Below are snapshots that illustrate how aerospace connects to local and regional businesses, outside of the manufacturing supply chain.

Kaspars Catering & Events
Kaspars is a Seattle-based catering company, established in 2005, evolving from a beloved local restaurant founded in 1989. The company serves Boeing company events, particularly celebrations, often at Boeing facilities. The benefits of working with Boeing include year-round opportunities – less seasonal than other catering market segments.

Angel of the Winds Arena
Angel of the Winds Arena is a regional anchor for major entertainment. The arena is smaller than the major sports venues in Seattle, but large enough to attract nationwide touring events and various sports and entertainment activities. It fills a niche, being too large for most local events yet perfectly sized to serve as a regional anchor. Boeing has been a suite lease holder since it opened in 2002 as the Everett Events Center. Boeing employees sometimes receive event tickets and special offers as part of worker incentive programs. Arena representatives cite the size of the aerospace workforce as a demographic segment that is reliable for event programming and promotion. The venue is an important part of downtown Everett and all of Snohomish County. Events that draw aerospace workers (and maritime and naval station workers) sustain year-round entertainment.

"When Boeing is going strong and employment is up, you can see it everywhere in the community. Sales are up, restaurants are busy, coffee shops are busy, there is definitely a financial impact in the community and when things are down and when Boeing isn't hiring or they are laying off, you can just tell, it is visually obvious in how the community spends money."
Scott Pattison, Everett Special Projects Manager

City of Everett Community Events
Located in the Mayor's Office, the City has a Special Projects Manager who coordinates events throughout the city. Events include fairs, concerts, car shows, and anything that requires concerted efforts for traffic and parking management, community safety and other considerations. With a large share of aerospace workers living in and near Everett, the City can correlate attendance at these events with aerospace workforce cycles.

Dwayne Lane's Auto Family
As proudly stated on its website, "Dwayne Lane's Auto Family has been serving the community since 1954. The locally owned company has five locations in Everett, Arlington and Burlington." As a locally owned auto dealer, Dwayne Lane's business symbolizes much of the current and historic connections to aerospace in the region. Company leadership reports Boeing employees are their most consistent customer, reflecting strong loyalty to the region and their communities to "buy local" and keep their local economies strong. In return, Lane's offers support such as a shuttle service back and forth to the plant for workers who drop vehicles off at Lane's repair shop. Lane's reports, "They are the number one stop for our shuttle service."

Lane's is also a strong corporate citizen in Snohomish County, and like so many engaged leaders, they report, "Very rarely do I attend a charity event where Boeing is not the lead sponsor for the event." The Boeing Employees Community Fund is equally visible in the community, they report.

As a car dealer, perhaps more than most businesses, it is directly affected by fluctuations in the aerospace workforce. The silver lining is that when car sales slow along with reductions in aerospace workforce, then repair services grow as workers maintain older vehicles. But overall, Dwayne Lane's connections to a large workforce serve the company well, "We have peers across the country in other markets that don't have the confidence in jobs and in employment that we do, because of our confidence in the aerospace industry."

> *"Very rarely do I attend a charity event where Boeing is not the lead sponsor for the event."*
>
> *"We always hang a hat on the backlog at Boeing and the number one thing we look at is the jobs report."*
>
> *"We have peers across the country in other markets that don't have the confidence in jobs and in employment that we do, because of our confidence in the aerospace industry."*
>
> Tom Lane, Dwayne Lane's Auto Family

Boeing Customer Events

Many companies and entertainment venues throughout the region have events and activities they call Boeing Night, Boeing Day or similar. These events often come with price discounts or special offers for Boeing employees, and they demonstrate the importance of the Boeing workforce to these businesses. A few examples follow:

- **Professional and Amateur Sports Events.** Every major sports team honors Boeing and its workforce, sometimes multiple times per season, and Boeing employees show up in high numbers to celebrate the region and Boeing's support. Of course, much of this includes Boeing sponsorship, as covered elsewhere in this report, but many events are altruistically Boeing appreciation events. This extends to spectator sports statewide at amateur and professional levels.
- **Boeing Night at Summit at Snoqualmie.** One night each winter, this ski venue, an hour outside of Seattle, closes the slopes to everyone except Boeing workers and families.
- **Boeing Employee Discount Programs.** Boeing workers are highly valued by retailers and service providers. These businesses sign up to offer discounts to Boeing workers, which are then promoted internally at Boeing.

Local Retail Spending

Based on employment by place of residence, five regions are assessed for aerospace worker impacts: Lynnwood-Everett, North of Everett to Arlington, Auburn-Renton, Pierce County and South King County, and Seattle and the Eastside. The regions are defined by a group of ZIP codes listed in **Appendix B**. Estimated aerospace employment among the regions ranges from 7,400 to 17,500, with Lynnwood-Everett representing the region with the most aerospace employment. **Exhibit 17** presents the estimated aerospace workforce, aerospace worker earnings, and personal consumption expenditures for each region.

Exhibit 17. Summary of Workers, Wages, and Spending by Area, 2023

	Lynnwood-Everett	North of Everett to Arlington	Auburn-Renton	Pierce and South King County	Seattle and Eastside
Total Aerospace Workers	17,500	9,800	12,500	7,400	9,300
Worker Earnings (millions 2023$)	$2,337.0	$1,311.4	$1,663.5	$981.2	$1,239.5
Personal Consumption Expenditures (millions 2023$)	$1,007.5	$606.7	$716.8	$491.5	$825.8

Sources: Boeing, 2023; Bureau of Economic Analysis, 2023; Bureau of Labor Statistics, 2023; Washington State Department of Revenue, 2023; Community Attributes Inc., 2023.

Aerospace workers throughout Washington take their earnings and spend them within their communities, positively impacting the local businesses they frequent. One boost to discretionary spending is the bonuses earned by aerospace employees, which many companies pay out annually. Boeing pays bonuses annually, which contributed to the nearly $9 billion in wages paid by Boeing to Washington employees in 2023.

Estimated aerospace worker personal consumption expenditures by region is shown in **Exhibit 18.** These figures represent the share of spending within each region, based on the share of worker personal income expenses. The local spending proportions for each region are estimated by calculating total taxable retail sales for each region, divided by taxable retail sales per capita for the Puget Sound region and lastly multiplying by the ratio of each region's per capita income relative to income per capita for the Puget Sound region. The local spending proportion assumptions are as follows:

- Lynnwood-Everett: 65%
- North of Everett to Arlington: 70%
- Auburn-Renton: 65%
- Pierce County and South King County: 75%
- Seattle and Eastside: 100%

Exhibit 18. Aerospace Worker Estimated Personal Consumption Expenditure by Resident Region, 2023

Personal Consumption Expenditures (millions 2023$)	Lynnwood-Everett	North of Everett to Arlington	Auburn-Renton	Pierce and South King County	Seattle and Eastside
Goods	$329.0	$198.1	$234.0	$160.5	$269.6
Durable goods	$130.9	$78.8	$93.1	$63.8	$107.3
Motor vehicles and parts	$36.5	$22.0	$26.0	$17.8	$29.9
Furnishings and durable household equipment	$26.9	$16.2	$19.2	$13.1	$22.1
Recreational goods and vehicles	$53.5	$32.2	$38.0	$26.1	$43.8
Other durable goods	$14.0	$8.4	$9.9	$6.8	$11.5
Nondurable goods	$198.1	$119.3	$140.9	$96.6	$162.4
Food and beverages purchased for off-premises consumption	$80.5	$48.5	$57.3	$39.3	$66.0
Clothing and footwear	$25.9	$15.6	$18.4	$12.6	$21.2
Gasoline and other energy goods	$22.9	$13.8	$16.3	$11.2	$18.7
Other nondurable goods	$68.9	$41.5	$49.0	$33.6	$56.4
Services	$691.7	$416.5	$492.1	$337.4	$566.9
Household consumption expenditures (for services)	$652.2	$392.7	$464.0	$318.1	$534.5
Housing and utilities	$190.6	$114.8	$135.6	$93.0	$156.2
Health care	$147.7	$88.9	$105.1	$72.0	$121.1
Transportation services	$45.6	$27.5	$32.5	$22.3	$37.4
Recreation services	$45.4	$27.4	$32.3	$22.2	$37.2
Food services and accommodations	$65.8	$39.6	$46.8	$32.1	$53.9
Financial services and insurance	$64.3	$38.7	$45.8	$31.4	$52.7
Other services	$92.7	$55.8	$65.9	$45.2	$75.9
Total PCE	**$1,020.7**	**$614.6**	**$726.1**	**$497.9**	**$836.6**

Sources: Boeing, 2024; Bureau of Economic Analysis, 2024; Bureau of Labor Statistics, 2024; Washington State Department of Revenue, 2024; Community Attributes Inc., 2024.

To provide further context into the extent of spending by aerospace workers across the state, **Exhibit 19** presents a snapshot of spending across four key industries by aerospace workers. These four industries represent only a portion of the total personal consumption expenditures among aerospace workers. For example, aerospace workers in the Lynnwood-Everett region spent an estimated $36.5 million on automobile purchases, equivalent to 1,160 cars sold, or the combined sales at approximately four dealerships in the area. In the Auburn-Renton region, aerospace employees were responsible for an estimated 2.4% of all restaurant sales in the region, directly supporting 420 restaurant jobs or the equivalent of 35 restaurants. Spending on health care was most prolific in the Lynnwood-Everett region, at $147.7 million, which supported 680 health care occupations and the equivalent of 35 clinics. Finally, retail sales in the Seattle and Eastside region were just shy of an estimated $270 million, which sustained more than 1 million square feet of retail space in the region.

Exhibit 19. Spending Impacts from Aerospace Workers by Region

Personal Consumption Expenditures (2023$)	Lynnwood-Everett	North of Everett to Arlington	Auburn-Renton	Pierce and South King County	Seattle and Eastside
Car sales supported by aerospace workers	$36,503,500	$21,980,800	$25,968,500	$17,805,500	$29,918,200
Equivalent number of cars sold	1,160	700	830	570	950
Equivalent car dealerships	4	2	3	2	3
Restaurants					
Estimated sales	$59,430,600	$37,570,100	$38,323,900	$28,545,800	$40,489,800
Estimated % all restaurant sales in region	6.56%	10.99%	2.39%	2.11%	0.78%
Jobs supported by aerospace workers	650	410	420	310	450
Estimated restaurants supported by aerospace workers	55	35	35	25	35
Doctor and dentist offices, including labs and outpatient clinics					
Estimated spending	$147,710,000	$88,944,600	$105,080,500	$72,049,300	$121,062,900
Estimated % all healthcare revenues in region	3.0%	4.9%	1.7%	1.0%	1.0%
Jobs supported by aerospace workers	680	410	480	330	550
Estimated offices supported by aerospace workers	35	20	25	15	25
Retail					
Estimated sales	$328,982,300	$198,099,000	$234,037,200	$160,469,300	$269,633,300
Sqft supported by aerospace workers	1,223,600	736,800	870,500	596,800	1,002,900

Sources: Bureau of Economic Analysis, 2024; Bureau of Labor Statistics, 2024; Washington State Department of Revenue, 2024; Community Attributes Inc., 2024.

Local Business Support

Representatives from local businesses provided perspectives on the significance of aerospace workers who patronize their businesses. Findings from the interviews are summarized as follows, with some testimonials provided with their permission.

- *We always hang a hat on the backlog at Boeing and the number one thing we look at is the jobs report…. and (when hiring is down at Boeing) they keep the car a little longer, and then they come into the shop more often for service.*
- *We are heavily involved in local charities, and have been for 70 years. Very rarely do I attend a charity event where Boeing is not the lead sponsor for the event.*
- *"We have peers across the country in other markets that don't have the confidence in jobs and in employment that we do, because of our confidence in the aerospace industry.*
  – Snohomish County car dealership
- ***"****We are glad that production went up again at Boeing in 2023, and we hope it stays up. We can tell a difference right away.* ***– Seattle-based food business***
- *"When Boeing is going strong and employment is up, you can see it everywhere in the community."* ***– City of Everett***

Donations & Contributions

All Aerospace

Toray Composite Materials, an aerospace firm with a plant in Tacoma, Washington, specializes in the manufacturing of composite materials for use in aerospace, defense, industrial, and automotive industries around the world. Toray reports on its involvement in the communities within which their team members reside, highlighting civic, environmental, and economic development efforts. As part of these efforts, Toray employees volunteered at the Pierce County Skills Center Aerospace Composites program in 2022. The program is a one to two-year course where high school juniors and seniors can earn a locally developed manufacturing certificate. Toray employees volunteered throughout the year to mentor the program's students and share how the skills they are learning apply in real work settings.[3] Toray's Tacoma employees also come together every year to donate school supplies to the local Bethel School District. In 2022, a total of 520 items worth more than $1,300 in school supplies were donated.[4]

Firland Foundation & Workshop is a nonprofit founded in 1993 with a board of directors comprised of local community leaders in the field of business improvement, medical professionals from the University of Washington and other local research organizations. Participating in the Boeing Community Manufacturing Partnership, Firland aims to hire employees with disabilities through its Firland Workshop, and to use the funds generated from the workshop to provide grants to fund the research and treatment of tuberculosis and other respiratory and pulmonary diseases. The Firland Workshop specializes in the manufacturing of precision machine parts, sheet metal fabrication, and the assembly of aircraft parts. Between 1995 and 2017, Firland Foundation & Workshop has awarded more than $2 million in grants to fund research that aims to control and end tuberculosis and chronic pulmonary problems in pediatric and adult populations.[5]

Boeing

Charitable giving by Boeing's Washington employees, independent of Boeing, totaled nearly $44 million in 2023. On a per-worker basis, average contributions have increased since 2016, which is the first year data are available. Charitable contributions per employee totaled roughly $730 in 2023 compared to $580 per employee in 2016, after accounting for inflation. Boeing employee giving in 2023 was spread across many causes, with $5 million going to Boeing's Employees Community Fund (ECF). ECF is a pooled

[3] https://www.toraycma.com/pierce-county-skills-center-cma-tacoma-ta-visit/
[4] https://www.toraycma.com/annual-bethel-school-district-supply-drive-tacoma-ta-plant-headquarter-hq/
[5] https://firland.org/grants-overview/

fund of recuring contributions by Boeing employees. The funds go towards local nonprofits that help thousands of families and individuals throughout the Puget Sound region.[6] In 2024, the ECF celebrated its 75th anniversary in Seattle marking more than $650 million to Washington nonprofits.[7]

In addition to its employee's charitable giving, Boeing distributes charitable contributions in the form of grants, company gift matches, company contributions, and in-kind contributions

Boeing employees also donate hundreds of thousands of hours of their time to volunteer efforts in their communities each year. At the end of 2023, Boeing estimated that its Washington employees donated nearly 190,000 hours to a range of volunteer efforts throughout the state.

Workforce Development and Education

All Aerospace

Pioneer Industries' parent company, Pioneer Human Services, is a nonprofit organization that focuses on offering a range of workforce development and social services. Pioneer Human Services focuses on counseling, treatment, housing, residential reentry, and other social services for people involved in the criminal legal system and those battling substance abuse or mental health issues. Its workforce development programs include an apprenticeship program and job readiness program (Roadmap to Success) and work to serve formerly incarcerated individuals throughout Washington state. The Roadmap to Success is a training program helping participants obtain and retain employment. This program is currently offered in Seattle and Spokane.

Orion Industries, parent company to Orion Aerospace, is a nonprofit manufacturer specializing in precision-machined parts and sub-assemblies for aerospace and defense companies. Orion Industries provides pathways to employment for individuals with barriers such as learning disabilities, low incomes, homelessness, and mental health concerns. Orion's Transitional Employment Model is nationally recognized and uses its aerospace manufacturing division, Orion Aerospace, as a platform to teach job skills through a combination of classroom instruction and paid training.[8] It was recognized for its work in 2021 with Pacific Northwest Aerospace Alliance's Inspire Award.

[6] https://www.boeing.com/resources/boeingdotcom/principles/community-engagement/pdf/ecf/Washington-Puget-Sound-ECF.pdf
[7] https://www.boeing.com/company/about-bca/washington/employees-community-fund-75-years-of-impact
[8] https://www.pnaa.net/pnaa/industry-awards/2021-inspire-award

At the onset of the COVID-19 pandemic when Washington schools were forced to shift to remote learning, Orion's Human Resources Manager spearheaded an effort to organize Orion's Learning Pod. This effort formed a cooperative to provide a safe supervised space and learning resources for children of Orion employees. The pod included 20 children from 13 families and six school districts. Orion's Learning Pod allowed Orion employees to be at work while providing remote learning opportunities for their children.[9]

Pacific Northwest Aerospace Alliance is a nonprofit comprised of companies that serve the North American aerospace manufacturing sector, with an emphasis on the growing aerospace centers in the Pacific Northwest. Since 2009, it has operated and maintained a scholarship fund, where eligible students enrolled in participating aerospace programs are granted scholarships of at least $1,000. Since the program began, the alliance has raised about $359,000 to help more than 170 students pursue their aerospace career aspirations.[10]

Boeing

Boeing has undertaken workforce development initiatives throughout Washington. These include Boeing Commercial Manufacturing Workforce Development, which engages with roughly 200 talent-building organizations throughout the state. The organizations Boeing works with are diverse and include high school career and technical education programs, community and technical colleges, military installations, military career skills programs, military SkillBridge programs, and public career skills programs.

A key program Boeing helped develop and continues to support is the Core Plus Aerospace program. Core Plus Aerospace is a two-year advanced manufacturing curriculum that prepares high school students for high-demand jobs through hands-on learning.[11] Boeing has hired more than 1,000 program participants out of high school. It is estimated these participants collectively earn about $100 million in salary and benefits annually.[12]

To promote continued learning, Boeing employees have access to the company's Learning Together Program that helps employees enhance skills and learn new ones at hundreds of accredited colleges and universities. Through the program, Boeing will pay tuition and eligible expenses for individual courses, certificate programs, and degrees. It will also cover some costs related to obtaining a pilot's license and reimburse exam fees for professional certificates. There is no annual limit for eligible science,

[9] https://www.pnaa.net/pnaa/industry-awards/2021-inspire-award
[10] https://www.pnaa.net/pnaa/scholarships
[11] https://coreplusaerospace.org/about-us/
[12] https://www.seattletimes.com/education-lab/high-school-aerospace-program-produces-boeing-ready-grads-in-two-years/

technology, engineering, and mathematics degrees or certificate courses.[13] Boeing spent nearly $30 million in 2023 through the Learning Together Program to support more than 4,200 employees located in Washington in pursuing post-secondary education.

As a part of its workforce development efforts in Washington, Boeing invested $5 million in Washington State University's Voiland College of Engineering and Architecture to establish the Boeing Center for Student Success. The center provides access to mentoring, tutoring, advising, and career services for the college's 4,600 students. Boeing's partnership with Washington State University has spanned more than 50 years during which time it has invested nearly $30 million in the university.[14]

Additionally, Boeing donated $10 million in 2022 to support construction of the University of Washington's new Interdisciplinary Engineering Building. Boeing's partnership with the University of Washington dates back more than 100 years and has continued to be an important partnership for the company. Within the past five years, Boeing has hired more than 1,000 engineering graduates from the University of Washington.[15]

Boeing Sponsorships

Boeing sponsors several sports organizations and events in Washington state, primarily in the Puget Sound region. Boeing selects sponsorship opportunities that align with its purpose and support its customers, key stakeholders, employees, and the communities it serves.[16] In 2022, Boeing contributed millions of dollars sponsoring sports teams throughout the region.

Annual events sponsored by Boeing include the Boeing Apple Cup Series played between the football teams of the University of Washington and Washington State University, Seattle Seafair, the Boeing Classic (PGA Tour Champions), and the Everett 3on3 basketball tournament. Additionally, Boeing sponsors nearly every major professional sports franchise in Washington, including the Seattle Seahawks, Seattle Mariners, Seattle Kraken, Seattle Sounders FC, Seattle Storm, and the Tacoma Rainiers.

Boeing supports other Washington organizations through sponsorships ranging from chambers of commerce, economic development organizations,

[13] https://boeingbenefits.com/employee/emp-learning-together-program.html
[14] https://www.boeing.com/resources/boeingdotcom/principles/community-engagement/pdf/2023-global-engagement-portfolio.pdf
[15] https://www.boeing.com/resources/boeingdotcom/principles/community-engagement/pdf/2023-global-engagement-portfolio.pdf
[16] https://www.boeing.com/company/key-orgs/advertising-and-brand/sponsorships.page

business associations, educational organizations, industry organizations. A few organizations currently sponsored by Boeing include the Greater Seattle Business Association, College Success Foundation, Grant County Economic Development Council, Northwest Mountain Minority Supplier Development Council, Washington Employers for Racial Equity, and the South King County Scholar Athlete Fund. Boeing's executives also support a range of organizations throughout the state by serving on the board of directors. Approximately 63 of Boeing's leaders serve on the board of nonprofit organizations throughout the Pacific Northwest region.

INDUSTRY OUTLOOK

The future of commercial aerospace appears bright. Since the COVID-19 pandemic has subsided, traffic trends have rebounded and demand for commercial airplanes has risen significantly. Boeing estimates its backlog is worth eight years of work, providing promise as the centerpiece of a rebounding industry. Whether the supply chain will be able to keep pace in the upcoming years remains to be seen.

This supply chain is diverse and as such supports a range of non-aerospace industries in addition to aerospace firms including, aerospace engineering, research, and design; maintenance, repair, and overhaul; avionics and navigational systems; tooling; interiors; composites and advanced materials; and air framers and aero structures. Manufacturing operations supporting the aerospace industry also do business in other industries, including health care, energy, and recreation.

Washington's aerospace supply chain has reported capital access challenges and employment declines tied to lingering pandemic impacts, as well as early and increasing retirements.

During interviews with operators in the aerospace supply chain, several noted the compounding challenges caused by the pandemic-related layoffs and retirements. They described the loss of historical and specialized knowledge and skill has resulted in less productive operations. These workforce issues are further challenged by wage inflation. For high craftsmanship suppliers, this workforce challenge is even greater.

Workforce

One supplier that also conducts full-service job training and vocational counseling, said its hiring and training model has shifted to focus more on hiring lower skilled individuals and then making a commitment to upskill anyone who shows consistent attendance and engagement.

As employees within the supply chain become more skilled, supply chain operators must compete with Boeing or other original equipment manufacturers to keep their employees. Suppliers stated attrition to original equipment manufacturers has always been a challenge, but with workforce challenges across the industry, this attrition has become more acute.

Capital Access

The inability to keep up with investments and maintenance of equipment and tools due to high interest rates and lack of capital was also cited by supply chain operators. Some shared they had a backlog of capital investments that should have been made between 2020 and 2023. A minority of those interviewed stated they did have some success through self-financing or government grants.

Materials

Additionally, stakeholders in the supply chain also cited materials availability and extraordinarily high prices have limited their ability to meet demand. In one example, a supplier noted that a part that cost $45 pre-pandemic is now $135. Many of the suppliers have multi-year, fixed price contracts with customers, which create challenges when material costs fluctuate. Attempts to mitigate these challenges include implementing strategic sourcing practices, diversifying supplier bases, or negotiating contract terms that allow for pricing adjustments based on material cost fluctuations. Despite these efforts, the delicate balance between meeting demand and maintaining profitability remains a constant concern for suppliers.

Industry Stability

Other influences impacting the supply chain's ability to keep up with the new rush in commercial airplane demand include a perceived lack of stability within the industry. As one representative from a trade association said the industry is cyclical in nature. Whereas historically the cycle was approximately eight years, it now appears to be annual. Suppliers interviewed confirmed hedging against fluctuations in the industry. Currently, companies need many people, but they don't want to hire to that full need because of uncertainty and avoiding potential layoffs.

Each supply chain operator interviewed shared a goal or plans to expand their enterprise to meet the demand from Boeing, but all were hindered by their inability to hire the needed workforce or have ready equipment. However, with the large demand in commercial aerospace, the industry is poised to regain stability and enjoy the benefits of that stability for years to come.

SUMMARY AND CONCLUSION

Washington's aerospace industry, led by Boeing, has continued to recover from the COVID-19 pandemic with business revenues and employment growing from recent lows experienced in 2020 and 2021. Statewide aerospace business revenues totaled more than $57 billion in 2023, while average annual employment reached 77,400. Total economic impacts generated by the aerospace industry in 2023 included more than $81 billion in business revenues, 194,000 jobs, and $19.4 billion in labor income.

Reaching beyond the broader industry driven impacts are the impacts generated by aerospace workers throughout the communities where they live. Analysis of aerospace spending in employees' places of residence, in addition to the charitable giving and volunteer hours donated, illustrates the positive impacts aerospace workers have on their local communities.

APPENDIX A: INDUSTRY DEFINITION

Exhibit 20. Aerospace Industry Definition

	NAICS Code	Description
Aerospace Industries	3364	Aircraft Product and Parts Manufacturing
	927110	Space Research and Technology
Related Industries	325211	Plastics material and resin manufacturing
	332710	Machine Shops
	332813	Electroplating, anodizing, and coloring
	332999	Miscellaneous fabricated metal product manufacturing
	333512	Machine Tool Manufacturing
	333514	Special Die and Tool Manufacturing
	333517	Machine tool manufacturing
	333611	Turbine and turbine generator set units
	333612	Speed changer, drive, and gear manufacturing
	333613	Mechanical power transmission equipment
	333618	Other engine equipment manufacturing
	334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
	334417	Electronic Connector Manufacturing
	334419	Other Electronic Component Manufacturing
	334511	Search, Detection, Navigation, Guidance, and Nautical System Manuf.
	334513	Instruments and Related Products Manufacturing
	334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
	334519	Other Measuring and Controlling Device Manufacturing
	335311	Power, Distribution, and Specialty Transformer Manufacturing
	335314	Relay and Industrial Control Manufacturing
	335921	Fiber Optic Cable Manufacturing
	335991	Carbon and Graphite Product Manufacturing
	335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
	481111	Scheduled passenger air transportation
	481112	Scheduled freight air transportation
	481211	Nonscheduled air passenger chartering
	481212	Nonscheduled air freight chartering
	481219	Other nonscheduled air transportation
	488111	Air traffic control
	488119	Other airport operations
	488190	Other support activities for air transport
	611512	Flight Training

Sources: Governor's Office of Aerospace, 2013; Washington State Employment Security Department, 2013; Community Attributes Inc., 2023.

Aerospace Supply Chain

Washington's aerospace supply chain is diverse and as such supports a range of non-aerospace industries in addition to aerospace firms. These firms are spread amongst many specialty areas including:

- Aerospace engineering, research, and design
- Maintenance, repair, and overhaul
- Avionics and navigational systems
- Tooling
- Interiors
- Composites and advanced materials
- Air framers and aero structures.

Manufacturing operations supporting the aerospace industry do business in other industries, including health care, energy, and recreation. Notably, some of these suppliers also maintain strong philanthropic arms within the business that emphasize social service and workforce development.

Health Care
The products manufactured by *Aero-Plastics, Inc.* (NAICS code 3399) out of Renton, have been supplying aerospace operations with machined materials and groundbreaking plastics since 1945. The company also crafts non-metallic components for medical devices, including diagnostic equipment, monitors, and prosthetics. Based in Vancouver, *Silicon Forest Electronics* manufactures electrical systems and components (NAICS codes 4492 / 3343) that fuel new technologies in the aerospace industry. Their systems also provide value for the medical industry's electronic equipment.

Energy
In addition to supplying medical and aviation industries, Aero-Plastics is also equipped to manufacture high-performance commercial materials. These plastics are used in highly regulated industries such as energy, communications, and transport. Similarly, Janicki Industries out of Sedro-Woolley develops tools and parts (NAICS code 3335) that service not only the aerospace industry, but also the renewable energy market. Their tool products are also used in architecture and in the maritime industry.

Recreation
The carbon fiber products developed by Toray Composite Materials (NAICS code 3252) provide the aerospace industry with fibrous materials for aircraft interiors. These products also supply sports and recreation enterprises with a variety of production materials to make products such as golf club shafts, fishing rods, and bicycle parts. Hexcel (NAICS code 3261[17]) also provides

[17] https://www.naics.com/company-profile-page/?co=16015

composites that cater to both the aerospace industry and recreation applications, including skis and surfboards.

Philanthropy
Since the 1950s, Boeing's Community Manufacturing Partnership program with nonprofit organizations in Washington has provided treatment, housing, job skills training, and employment to people who are chronically under-employed, were formerly incarcerated, and in recovery from substance use disorders. In addition to the social enterprise mission of the organizations, these manufacturers are suppliers to Boeing and include Lighthouse for the Blind, PROVAIL, Skills Inc., Workforce Development Center, Firland Foundation & Workshop, Diversified Industrial Services, Chinook Enterprises, Bridgeways Enterprises, Orion Industries, and Pioneer Industries.

As an example, Pioneer Industries provides machining services (NAICS code 3327) for the Washington aerospace industry, including the fabrication of sheet metal, finishing, and assemblage. In 2022, 57% of the Pioneer Industries manufacturing workforce had a conviction history or was recovering from substance abuse.[18] Other arms of the Pioneer Human Services parent organization focus on counseling and treatment, housing, residential reentry, and other social services for people involved in the criminal legal system or those battling substance abuse or mental health issues.

Additionally, with manufacturing facilities in Auburn and Mukilteo, Orion Industries serves as one of Boeing's main suppliers of fabricated metal, machining, and wire/harness assemblies. The firm is classified under NAICS code 3323, architectural and structural materials manufacturing. However, the firm also houses a second division focused exclusively on workforce development programs. These programs provide training for a variety of jobs, including manufacturing, clerical customer service, and programs tailored to community members with developmental disabilities. Participants in these development programs are empowered with new skills and experience to help them secure employment at other firms outside of Orion Industries.

Other Related Industries

In addition to the aerospace supply chain, there are a number of professional service, trade groups, and educational institutions that work with or have partnered with major aerospace entities in Washington. These organizations

[18] https://pioneerhumanservices.org/manufacturing-enterprises/pioneer-industries-manufacturing/manufacturing

work to forward the development of aerospace talent and industry in the state of Washington.

Professional Service Firms
A range of consultancies, finance, and legal firms offer their services to aerospace clients in the state. Moss Adams, LLP (NAICS code 5412) has multiple offices across Washington state and, in total, provides comptroller and consulting services to over 300 clients in the aerospace industry. SAP (NAICS 5415) maintains a global consulting, technology, and analytics practice spanning 78 countries. The company's aerospace and defense offering equips clients with resources in cybersecurity, automation, and compliance procedures. A representative of SAP is currently a member of the Pacific Northwest Aerospace Alliance.

Trade Organizations
Based in Redmond, the Pacific Northwest Aerospace Alliance (NAICS code 8134) is a nonprofit organization that serves as the professional organization for the regional aerospace industry. The alliance is responsible for stewarding awards and events, sponsorship and scholarship, and professional development resources. Boeing is a lead sponsor and its board is comprised of leaders and executives from across the Pacific Northwest aerospace industry. The Aerospace Futures Alliance also serves as an important resource and advocate for the Washington state aerospace industry (NAICS code 5416). This organization builds connections between its member companies to foster new business relationships and serves as the collective voice for the industry on issues of policy at all levels of government.

Educational Institutions
Partnerships and instructional programs have been established across the state of Washington to strengthen relationship between academic institutions and aerospace firms. One such partnership is The Joint Center for Aerospace Technology Innovation. This partnership leverages academic scholarship and expertise in engineering to support Washington aerospace companies pursuing new innovations. The center hosts research symposiums and provides funding for novel aerospace research.

Several universities across the state also offer programs tailored to aerospace engineering, including Washington State University and University of Washington. Smaller colleges and community colleges have also established institutes and centers to promote aerospace education, including Everett Community College's Center for Excellence for Aerospace and Advanced Manufacturing and Edmonds College's Washington Aerospace Training and Research Center[19].

[19] https://www.sbctc.edu/colleges-staff/programs-services/aerospace/

APPENDIX B: LOCAL IMPACTS REGIONS DEFINITION

Exhibit 21. Regional Definitions

Region	Auburn-Renton	Lynnwood-Everett	North of Everett to Arlington	Pierce and South King County			Seattle and Eastside		
ZIP Codes	98059	98208	98258	98424	98332	98333	98103	98075	98053
	98001	98012	98223	98374	98360	98304	98115	98117	98107
	98031	98275	98292	98418	98466	98443	98006	98112	98126
	98055	98021	98270	98371	98422	98396	98116	98052	98119
	98058	98203	98271	98404	98580	98385	98007	98040	98199
	98391	98296		98338	98373	98303	98122	98008	98104
	98030	98201		98372	98010	98351	98354	98028	98121
	98092	98037		98335	98445	98403	98033	98102	98134
	98056	98087		98375	98444	98465	98072	98136	
	98168	98036		98394	98387	98558	98144	98077	
	98038	98290		98446	98498	98330	98106	98005	
	98003	98204		98051	98329	98438	98034	98164	
	98042	98043		98406	98388	98421	98146	98109	
	98390	98020		98321	98467		98074	98178	
	98032	98026		98022	98409		98108	98101	
	98057	98207		98408	98349		98004	98039	
	98002			98327	98328		98029	98027	
	98023			98407	98405		98118	98133	
	98047			98499	98402		98105	98177	

Sources: Community Attributes Inc., 2023.

APPENDIX C: DATA & METHODOLOGY

Gross Business Income

Per the Department of Revenue, gross business income represents a firm's combined reported gross income for retail sales, business and occupation (B&O), and public utility taxes. Gross business income excludes revenues from many small firms, agricultural firms, and select industries that are not required to report taxes due to exemptions and filing thresholds.

Additionally, some firms may be exempt from B&O taxes but are required to report the portion of their revenues applicable for sales and use taxes. Lastly, B&O tax applies at various stages throughout the chain of production including manufacturing, wholesaling, and retailing. Therefore, the income from the sale of a product could be counted and taxed three times and cause published GBI figures to not be compatible with other published data on income.[20]

Methodology and Assumptions

The following section presents key assumptions and methodology used in the report's analysis.

Economic Impacts

Direct impacts for the aerospace industry utilized publicly available gross business revenues data published by the Department of Revenue, while employment and wages utilized publicly available data published by the Bureau of Labor Statistics.

To estimate Boeing impacts, employment and wage data were provided by Boeing. To ensure total aerospace business revenues and Boeing revenues data remained consistent, Boeing's business revenues for the sake of this analysis were estimated by applying Boeing's 2023 share of total aerospace employment to total aerospace gross business revenues.

Spending Impacts

To estimate employment by zip code, Boeing employee data by zip code was utilized alongside a ratio of Boeing employment to total aerospace employment to arrive at an industry-wide distribution of employees by zip code. Additional spending metrics are defined below:[21]

[20] https://dor.wa.gov/about/frequently-asked-questions#:~:text=The%20taxable%20amount%20equals%20the,derive%20the%20total%20tax%20due.

[21] Note: All data is for Washington State unless otherwise noted.

Total personal consumption expenditures (PCE) = total aerospace workers * statewide average aerospace wage (from BLS) * share of income spent on PCE (calculated using BEA data).

Share of income spent on PCE = per capita personal income (from BEA) / total PCE (from BEA).

Equivalent cars sold = PCE / Average Cost of New Vehicle (from BEA).

Equivalent car dealerships = Equivalent cars / average cars sold per dealership (nationwide from Bureau of Transportation Statistics).

Restaurant jobs supported by aerospace workers = PCE / GBI per restaurant worker (from DOR).

Estimated restaurants supported by aerospace workers = PCE / average retail sales per restaurant (DOR retail data and BLS restaurant count).

Health care jobs supported by aerospace workers = PCE / GBI per healthcare worker (from DOR).

Health care offices = % of regional spending (DOR) * statewide offices (BLS).

Square feet supported by retail sales = PCE / (Retail taxable retail sales (from DOR) / total retail square feet (from CoStar)).