

Aerospace Manufacturing Skills

Coordination and evaluation of workforce training for aerospace and materials manufacturing.

**A Legislative Report
requested by House Bill 2156**

September 2012

Workforce Training and Education Coordinating Board
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This report was produced jointly by Washington's Workforce Training & Education Coordinating Board and State Board for Community and Technical Colleges at the direction of House Bill 2156 (2012 Legislative Session). The following staff contributed to this report:

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Report History

Second Substitute House Bill 2156 was passed in the 2012 Legislative session. The bill relates to the “coordination and evaluation of workforce training for aerospace and materials manufacturing.” The Legislature wanted to improve the state aerospace training system, so it would be better aligned with the industry’s immediate and long term training needs. The legislation also seeks to “increase jobs available for Washington’s citizens” by increasing their skill development and training.

The State Board for Community and Technical Colleges (SBCTC) is to “facilitate coordination and alignment of aerospace training programs to the maximum extent possible.” This is to be done through coordination with other training and apprenticeship program providers. The alignment activities include:

- Providing current information about the state’s programs.
- Providing information about grants and partnerships.
- Coordinating professional development of faculty and training providers.
- Evaluating programs identified by the Aerospace Pipeline Advisory Committee (see below).
- Making specific budget recommendations to the Governor and the Legislature for aerospace and advanced materials manufacturing programs.

SBCTC is empowered to “establish an aerospace and advanced materials manufacturing pipeline advisory committee” (Aerospace Pipeline Advisory Committee) with the majority of the 11-15 members coming from the industry. Labor representation (2) from the industry is also included. The Aerospace Pipeline Advisory Committee’s duties include:

- Providing direction for a skills gap analysis produced with the Workforce Training and Education Training Board (Workforce Board) using data developed from the Education Research and Data Center (ERDC) that is consistent with *A Skilled and Educated Workforce—Joint Report*¹ by the Washington Student Achievement Council, SBCTC, and the Workforce Board providing the “number and type of higher education and training credentials required to match employer demand for a skilled and educated workforce.”
- Establishing goals for students served, program completion rates, and employment rates.
- Coordinating and disseminating industry advice from aerospace and advanced materials programs.
- Recommending training programs for review by the Workforce Board in coordination with SBCTC.

¹ A Skilled and Educated Workforce, 2011. A Joint report prepared by the Workforce Board, SBCTC & Washington Student Achievement Council, formerly HECB. <http://www.wsac.wa.gov/sites/default/files/SkilledEducatedWorkforce2011.pdf>

On September 1, 2012 and each September thereafter, a report is due that evaluates “the programs recommended for review” by the Aerospace Pipeline Advisory Committee. The evaluation, to be performed by the Workforce Board working with SBCTC, is to include “outcome results both for the persons receiving training and the employers.”

The first meeting of the Aerospace Pipeline Advisory Committee (See Appendix A) was on July 19, 2012 and the next meeting is scheduled for October 22, 2012 (See Appendix B and C for each meeting agenda). The committee was given an introduction to the skill gap analysis and employer survey that were required as part of the bill. They did not recommend specific programs for review at that time. It was thought that a report containing more of a program baseline would be helpful to the committee in later identifying and recommending programs for review. This report attempts to meet that need. Since that meeting, an Executive Order from the Governor’s Office disbanded the Governor’s Washington Council on Aerospace.

While the bill indicated that the ERDC's data should be used for the report, due to the limited timeframe to produce this report and the long history of WTECB and SBCTC sharing data, ERDC was consulted and all agreed that the most efficient path was to use SBCTC's data warehouse to produce the report, with data analyzed by Workforce Board and SBCTC research staff. It is anticipated that the ERDC will provide the full data set needed for the next report.

Aerospace Employer Survey

A survey of over 900 aerospace employers compiled from various contact lists by the Workforce Board, will go into the field in the next week. This is a web-based survey, which will be distributed through the AFA and PNAA aerospace employer association email lists, as well as the industry lists of the Association of Washington Business and Impact Washington. Employers will also have the option of requesting a paper version of the survey be mailed to them, and the small number of firms lacking a web presence will have a paper copy of the survey mailed to them, along with paid return postage.

The reason for the survey is to provide a more nuanced understanding of the anticipated hiring needs of employers and how the state can better prepare the labor force for increases in aerospace production over the coming years.

Currently, the only available data on aerospace industry employment patterns comes from the Employment Security Department’s Labor Market and Economic Analysis (LMEA) unit. Unfortunately, official state occupational forecasts from LMEA rely on national industry employment projections and are not reflective of recent trends in occupational mix and overall employment growth, and use national, rather than state-specific data for factors such as demand resulting from retirements. Importantly, the forecasts do not reflect changes that are in

process or highly likely, except to the extent that they show up in aggregate statistics (with considerable time lag). Accordingly, LMEA did not increase the aerospace industry forecasts until Boeing's hiring boost showed up in their statistical pipeline. Due to the general practice they follow, we anticipate projections could be placing too much emphasis on metal-related occupations, and too little on composite-related ones.

To remedy these problems and increase the effectiveness of training and education efforts, we need input from across the industry and its suppliers. We have identified several key questions that we are unlikely to be able to answer very well from any source other than the employers themselves. The survey instrument is appended at the end of this report (Appendix C).

Survey results will be included in an updated version of this report as soon as they are available.

Defining the Aerospace Industry

Based on an examination by the Workforce Board of the aerospace industry in trade publications and strategic workforce development plans from several states, this report defines the aerospace industry according to the North American Industry Classification System (NAICS) code for aerospace manufacturing, 3364.²

More precise information may be gleaned from the aerospace employer survey, as we asked which NAICS code employers use to identify their business, as well as what percentage of their business is exclusive to aerospace. Until survey results are available, the NAICS 3364 is used, which captures the following areas:

Aerospace Industry Definition Table by Industry Classification Codes	
NAICS	Industry Description
3364xx	Aerospace Product and Parts Manufacturing
336411	Aircraft Manufacturing
336412	Aircraft Engine and Engine Parts Manufacturing
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing
336414	Guided Missile and Space Vehicle Manufacturing
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing

² NAICS is the standard used by federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. This information is from <http://www.census.gov/cgi-bin/sssd/naics/naicsrch>

The analysis for this report centered on three cohort years based on the 3364 NAICS code (2001-02, 2005-06, and 2010-11- *the most recent data available*). These years were selected to present a cohort that had been out of training for several years, but we also wanted to examine the recent graduates in light of the industry's increased hiring activities. In doing so, we assess the number of program exiters and the number employed 3-quarters after program exit by the aerospace industry (according to NAICS 3364). We also assess the median annual earnings of those program exiters at the same point in time.

Employment

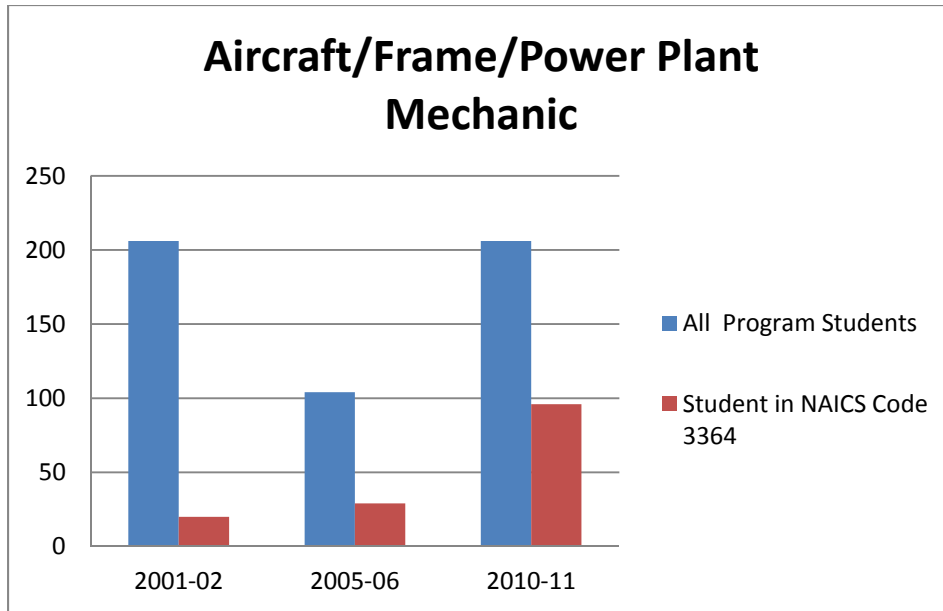
The programs providing the greatest number of employees to the aerospace industry (NAICS 3364) are shown in the table below. They are not all manufacturing programs. However, it is important to note the wide range of programs that prepare employees to work in the aerospace industry. Due to the regulations under the Family Educational Rights and Privacy Act (FERPA), only groups of 10 or more students are allowed to be reported. So while other programs may prepare students to work in the industry, only those with at least 10 in the NAICS 3364 were included in this report. The table below identifies program participants who went to work in the industry after training.

The number of program students going to work in the aerospace industry (NAICS 3364) increased 185 percent between 2002 and 2011, with a total of 715 employed in this industry code. In 2011, the program feeding the largest number of students was Airframe Mechanic. Some 73 percent (193) of all the program students went to work in aerospace (NAICS 3364). There were no students in that program in the two prior cohorts who went to work in NAICS 3364.

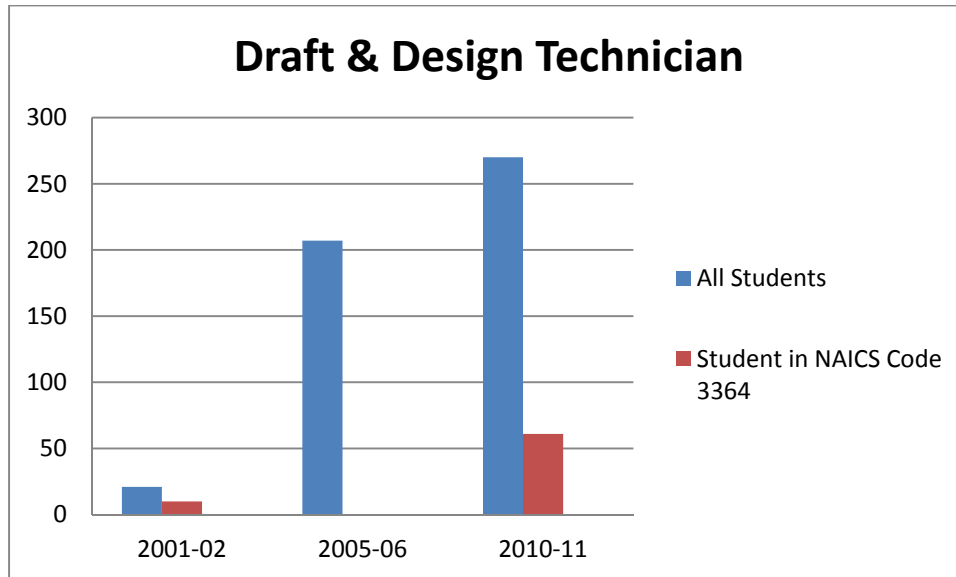
2010-11 Cohort

Program Code	Program Title	All Students	Aerospace Industry (NAICS 3364xx)	% of All Students
470607	Airframe Mechanic	265	193	73%
470687	Aircraft/Frame/Power Plant Mechanic	206	96	47%
151301	General Draft & Design Technician	270	61	23%
480508	Welding Technician	1121	43	4%
480501	Machine Tool Tech	243	40	16%
520302	Accounting Technician & Bookkeeping	1618	32	2%
520201	Business Administration & Management	1182	31	3%
110901	Computer System Network/Telecomm	734	29	4%
470604	Auto Mechanics	824	23	3%
150303	Electrical/Electrician & Communication Technician	163	21	13%
151302	Computer Aided Drafting/Design Technician	78	17	22%
110201	Computer Programming	320	15	5%
430203	Fire Fighting	494	15	3%
510801	Medical/Clinical Assistant	1230	15	1%
110301	Information Processing	319	14	4%
470201	Heating/Air Conditioning/Ventilation/ Refrigeration Maintenance	200	13	7%
220302	Legal Assistance/Paralegal	508	13	3%
111003	Computer & Information Systems Security	182	12	7%
430103	Criminal Justice/Law Enforcement	713	12	2%
520401	Administrative Assistant & Secretarial Science	216	10	5%
470605	Diesel Mechanics Technician	317	10	3%
Total		11203	715	6%

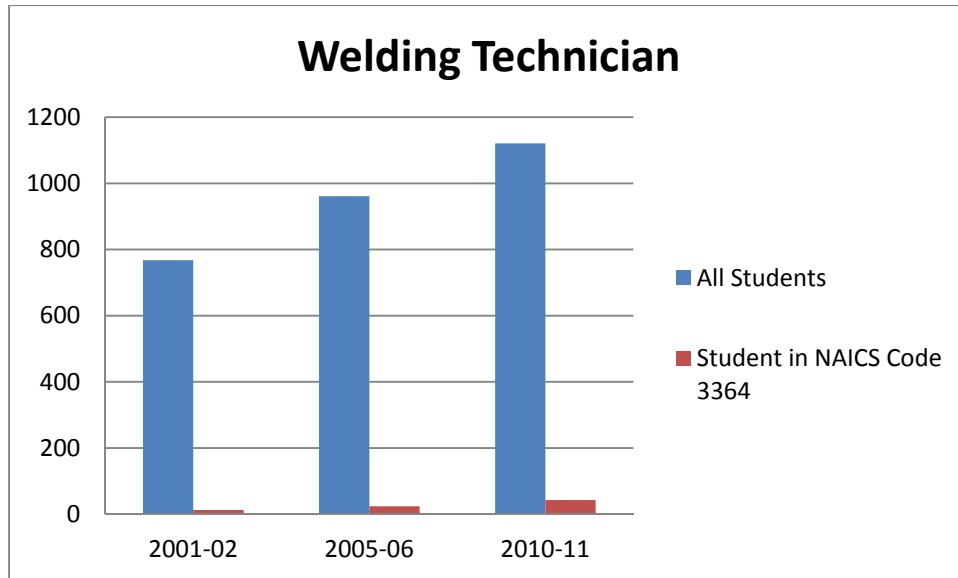
The next highest feeder program to the aerospace industry (NAICS 3364) was Aircraft/Frame/Power Plant Mechanics. The number of students going to work in aerospace firms increased over the three cohorts, as shown in the next table increasing from 20 exiters in 2002 to 96 exiters in 2011.



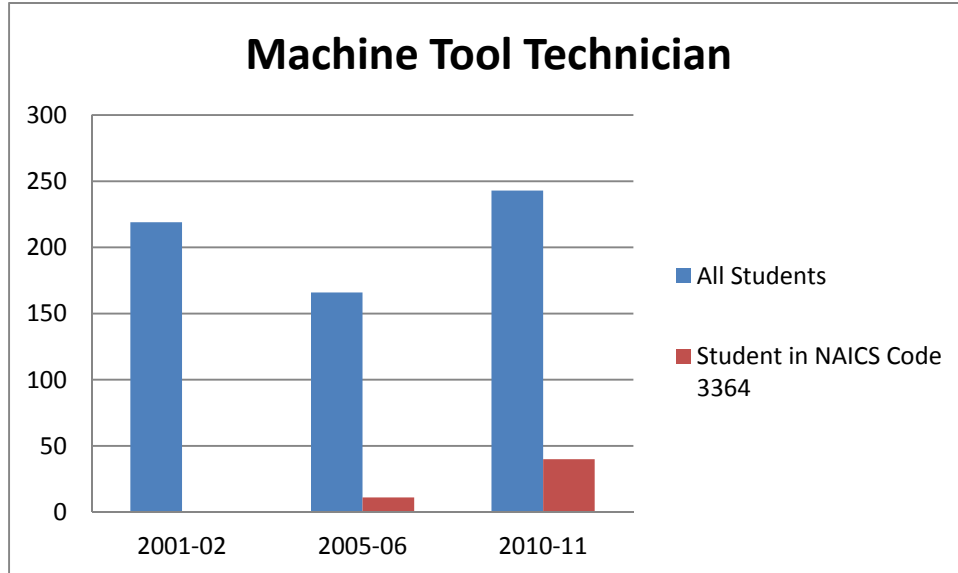
The program with the third highest number of students employed in the aerospace industry (NAICS 3364) was a general program for Draft & Design Technicians. The number of students grew over the three cohorts, increasing from 10 of the exiters in 2002, to 61 as of 2011, as displayed in the table below (no students went to work from this program in 2006 in the industry).



The program with the fourth highest number of students in the aerospace industry was Welding Technical. The number of students going to work in aerospace (NAICS 3364) increased over the three cohorts, increasing from 13 exiters in 2002 to 43 of the exiters in 2011, as shown in the next table.



Finally, the fifth highest program to supply employees to aerospace employers (NAICS 3364) was Machine Tool Technician. The numbers going to work in aerospace increased over the three cohorts, as shown in the table below, increasing from a cohort too small to report of 2002 exiters to 40 of the exiters in 2011.



Annual Earnings – Current Data

The table below depicts median annual earnings in the third quarter after completing training for the programs providing the greatest number of employees to the aerospace industry (NAICS 3364), as introduced in the prior section.

2010-11 Cohort

Program Code	Program Title	Median Earnings
470607	Airframe Mechanic	\$47,531
470687	Aircraft/Frame/Power Plant Mechanic	\$58,475
151301	General Draft & Design Technician	\$55,657
480508	Welding Technician	\$50,921
480501	Machine Tool Tech	\$35,787
520302	Accounting Technician & Bookkeeping	\$72,220
520201	Business Administration & Management	\$56,823
110901	Computer System Network/Telecomm	\$66,713
470604	Auto Mechanics	\$44,754
150303	Electrical/Electrician & Communication Technician	\$59,593
151302	Computer Aided Drafting/Design Technician	\$53,968
110201	Computer Programming	\$68,779
430203	Fire Fighting	\$49,541
510801	Medical/Clinical Assistant	\$43,561
110301	Information Processing	\$59,529
470201	Heating/Air Conditioning/Ventilation/ Refrigeration Maintenance	\$70,965
220302	Legal Assistance/Paralegal	\$59,248
111003	Computer & Information Systems Security	\$97,804
430103	Criminal Justice/Law Enforcement	\$52,881
520401	Administrative Assistant & Secretarial Science	\$29,301
470605	Diesel Mechanics Technician	\$55,345
Group Median		\$52,272

Among exiters in these programs, the median annual earnings were \$52,272. The highest median earners were those completing programs in computer and information systems security (\$97,804) and the lowest median earners were those from the administrative assistant program (\$29,301). The program feeding the largest number of students into the aerospace industry--airframe mechanic --

had median annual earnings just short of \$48,000, while the next highest program, aircraft/frame/power plant mechanics, had median annual earnings of nearly \$59,000.

Annual Earnings – Historical Comparison

We contextualize earnings among the 2010-11 identified aerospace feeder program exiters in two ways. First, we examine annual earnings for all individuals employed in the manufacturing sector and all program exiters regardless of where they were employed. Second, we do this across three separate cohorts: 2001-02, 2005-06, and 2010-11.

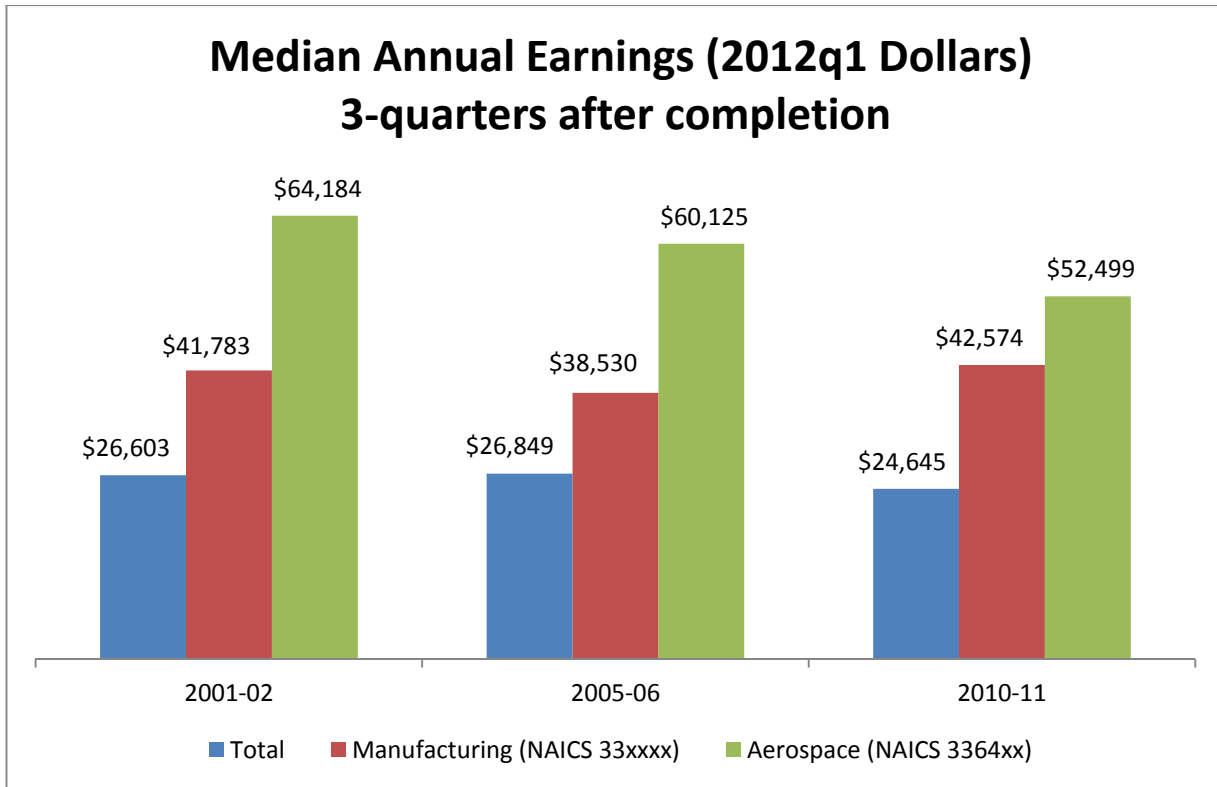
For each of the three cohorts, we assess the annual earnings of program exiters—three quarters, (or seven to nine months), after leaving the program. This is done for:

- All program exiters, regardless of industry they were employed by.
- For those employed in the manufacturing sector.
- Specifically for program exiters working in the aerospace industry.

This data is depicted in the figure below.

Wages across the three cohorts were relatively stable over the past decade, with the exception of employment in the aerospace industry. Overall, program exiters have median annual earnings in the range of \$25,000 to \$27,000. Program exiters employed in the manufacturing sector have median annual earnings 42-73 percent higher, in the area of \$39,000 to \$43,000. Manufacturing wages are among the highest of the 21 separate major NAICS industries, ranking 4th in 2001-02, 5th in 2005-06 and 4th in 2010-11.

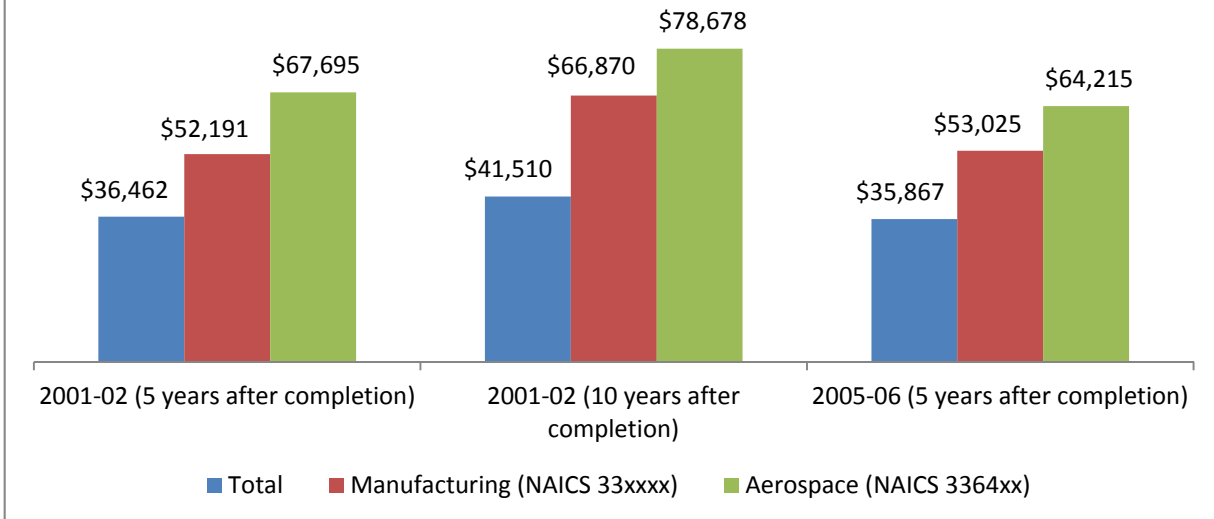
Higher still, program exiters working in the aerospace industry earn well over twice the amount of overall program exiters, placing them in the top 5 percent of median annual earnings by 4-digit NAICS industry codes. However, while the median annual earnings for aerospace industry employees were approximately \$64,000 in 2001-02, and \$60,000 in 2005-06, the median annual earnings dropped to short of \$53,000 for the 2010-11 cohort.



We also assessed earnings over the long-term, observing the wages five-years after program exit for the 2001-02 and 2005-06 cohorts, and 10-years after program exit for the 2001-02 cohort (figure below). For each of these long-term assessments, wages remained among the highest for program exiters in manufacturing out of the 21 separate major NAICS industries (3rd for the 2001-02 cohort five-years after exit, 3rd for the 2005-06 cohort five-years after exit, and 1st for the 2001-02 cohort 10-years after exit). For those employed in the aerospace industry, wages remained in the top 5 percent of 4-digit NAICS industry codes.

Looking at median annual earnings five-years after program completion for both cohorts, earnings for overall program exiters increased \$10,000. Among those employed in the manufacturing sector, earnings increased \$10,000 for the 2001-02 cohort and by \$15,000 for the 2005-06 cohort. In the aerospace industry five-years after program exit, median annual wages increased by \$4,000 for the 2001-02 and the 2005-06 cohort.

Median Annual Earnings (2012q1 Dollars) 5 & 10 years after completion



Ten-years after program exit, median annual earnings for the 2001-02 cohort continued to grow. Overall, earnings for program exiters increased to almost \$42,000, which is 56 percent higher than at the beginning of their career.

For program exiters working in the manufacturing sector, earnings increased by 60 percent to nearly \$67,000. While the percentage increase in median annual earnings over 10-years was smaller for program exiters working in the aerospace industry, at 23 percent, earnings did increase by \$15,000 to just shy of \$79,000 annually—among the top 4 percent of median annual earnings for exiters by 4-digit NAICS industry classification codes.

Appendix A

Aerospace Pipeline Advisory Committee

Membership Roster Industry Representatives (Four Year Term)

<i>Name</i>	Frank Nichols
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**Industry Representatives
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<i>Membership Term</i>	July 1, 2012 – June 30, 2014

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<i>Membership Term</i>	July 1, 2012 – June 30, 2016

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Appendix B

Meeting of the Aerospace Pipeline Advisory Committee

State Board for Community and Technical Colleges
1300 Quince Avenue SE
Olympia, WA 98502

July 19, 2012
11:30 AM-1:30 PM
4th Floor – Cascade A&B

Agenda

Time Estimate	Description
11:30 a.m. Charlie Earl	Call to Order <ul style="list-style-type: none">Welcome and IntroductionsPurpose and responsibilities of the Aerospace Pipeline Advisory Committee and 2SHB 2156
12:00 p.m. Alex Pietsch John Walstrum	Working Lunch State Progress in Aerospace Workforce Development <ul style="list-style-type: none">Overview the Governor's initiatives in aerospace and the Aerospace Council Alex PietschDepartment of Labor grants and Air Washington John WalstrumFarnsborough Air Show – implications for the pipeline
12:30 p.m. Tina Bloomer Bryan Wilson	The Aerospace Pipeline Research <ul style="list-style-type: none">Gap Analysis: How many, where and when? Tina BloomerEmployer survey Bryan Wilson
1:00 p.m. All	Work Plan and Timeline for the Pipeline Advisory Committee
1:15 p.m. All	Next Meeting <ul style="list-style-type: none">Election of chairAdoption of work planDate and location for meeting
1:30 p.m.	Adjourn

Appendix C

Meeting of the Aerospace Pipeline Advisory Committee

General Plastics
4910 Burlington Way
Tacoma, WA 98409

October 22, 2012
10:00 AM-12:00 PM

Draft Agenda

Time Estimate	Description
10:00 a.m. Marty Brown, SBCTC Jim Crabbe, SBCTC	Call to Order <ul style="list-style-type: none">• Welcome and Introductions• Review of purpose and responsibilities for the Aerospace Pipeline Advisory Committee and 2SHB 2156
10:15 a.m. Alex Pietsch, Governor's Office	Gov. Executive Order 12-05 <ul style="list-style-type: none">• WAAMMW Pipeline Committee• Joint Center for Aerospace Technology Innovation• The Washington Aerospace Partnership
10:45 a.m. Tina Bloomer, SBCTC Jon Agnone, Workforce Board	Interim Pipeline Report / Preliminary Industry Survey Results <ul style="list-style-type: none">• Review interim Pipeline Report• Review preliminary survey results
11:15a.m. Marty Brown, SBCTC	Discussion on legislative request / Gov. Recommendations
11:30 a.m. Marty Brown, SBCTC Jim Crabbe, SBCTC	Election of Committee Chair
11:45 a.m. Industry Chairperson	Review next steps <ul style="list-style-type: none">• Work Plan• Next meeting / frequency of meetings
12:00 p.m.	Adjourn

Appendix D – Aerospace Employer Survey

Workforce Needs

We are interested in knowing about the employment situation among employers in the aerospace industry and in advanced manufacturing supporting that industry. If you are not directly involved in the aerospace industry, but supplying or supporting the aerospace and/or advanced materials industry, please answer these questions about the part of your business that supplies or supports these industries.

- 1) What is your industry classification code (e.g., NAICS³)?
 - a. Aerospace (NAICS 3364XX)
 - b. Other (Please list name and code) _____

- 2) What is your company name?

- 3) What is the ZIP code for your company location?

- 4) Approximately what percent of your business is part of or supports the aerospace industry?

- 5) In which two (or more) occupations do you currently have the most employees?

	Occupation	Approximate Number of Employees
a.	_____	_____
b.	_____	_____
c.	_____	_____

- 6) How many new employees have you hired in the last twelve (12) months?

³ <http://www.census.gov/eos/www/naics/>

7) Which two (or more) occupations have you had the hardest time filling vacancies for over the past 12 months?

Occupation	Approximate Number of Vacancies
a. _____	_____
b. _____	_____
c. _____	_____

8) How have you responded over the last year to difficulty finding qualified applicants? **PLEASE ANSWER YES OR NO FOR EACH STATEMENT.**

a.	Did not fill the job opening	Yes	No	NA/ Don't Know
b.	Hired a less qualified applicant	Yes	No	NA/ Don't Know
c.	Outsourced work or purchased services from another firm	Yes	No	NA/ Don't Know
d.	Increased overtime hours for current workers	Yes	No	NA/ Don't Know
e.	Increased recruiting efforts	Yes	No	NA/ Don't Know
f.	Increased wages to attract more applicants	Yes	No	NA/ Don't Know
g.	Engaged education providers to access skilled graduates exiting their programs	Yes	No	NA/ Don't Know
h.	Other, specify _____			

Aside from those skills specific to particular occupations, what are the general skills you **currently** have the most trouble finding among...

9) Professional level workers

- a. _____
- b. _____
- c. _____

10) Skilled trades and technical workers

- a. _____
- b. _____
- c. _____

11) Support and maintenance workers

- a. _____
- b. _____
- c. _____

- 12) Which of the following methods does your company use to help the next generation of workers prepare for careers?
- Employ interns from high school vocational programs
 - Employ interns from colleges and/or universities
 - Allow employees to mentor high school or college students on company time
 - Encourage employees to mentor high school or college students on their own time
- 13) How much do you expect job openings to increase/decrease in your sector of the aerospace industry (e.g., machining, electrical equipment)...

	over the next year	over the next 5 years
Decrease by 50% to 100%		
Decrease by less than 50%		
Remain stable		
Increase less than 20%		
Increase 20% to 40%		
Increase 40% to 60%		
Increase 60% to 80%		
Increase 80% to 100%		
Refuse/Don't Know		

- 14) Which two (or more) occupations will likely see the **largest growth** in the number of employees hired **over the next 5-10 years**?

Occupation	Current Number of Employees (Approximate)	Future Number of Employees (Approximate)
a. _____	_____	_____
b. _____	_____	_____
c. _____	_____	_____

- 15) Which two (or more) occupations will likely see the **largest decline** in the number of employees **over the next 5-10 years**?

Occupation	Current Number of Employees (Approximate)	Future Number of Employees (Approximate)
a. _____	_____	_____
b. _____	_____	_____

C. _____

- 16) Will the retiring of the baby boomers **over the next 5-10 years** create the need to hire heavily in any particular occupations?
- a. Yes
 - b. No

14b) If so, please identify which occupations.

Occupation	Approximate Number of Retirees to Replace over Decade
a. _____	_____
b. _____	_____
c. _____	_____

- 17) Other than the size and demographic mix of the labor force, what are the other biggest recent changes in your current workforce situation or employment practices **over the past year**?

- 18) Other than the size and demographic mix of the labor force, what do you project to be the biggest changes in your employment practices **over the next 5-10 years**?

- 19) Will aerospace industry expansion **over the next 5-10 years** result in any other anticipated impact on your workforce or employment practices, including outsourcing, which we have not asked about?

Company Information

- 20) What kind of work does your company primarily engage in? For example, engineering & design, composite manufacturing, fabrication of fasteners, electrical equipment & cable assemblies, machining. (If your business has a large non-aerospace component, describe your primary aerospace-related work.)

- 21) Is your firm ISO9001 and/or AS9100 certified?

- c. Yes
- d. No

- 22) Approximately what percent of your sales are to other businesses in Washington?

23) Approximately what percentage of your business is with the following major aerospace firms or their subsidiaries? **PLEASE ANSWER FOR EACH FIRM.**

	None	Less than 25%	25% to 75%	More than 75%	100%
Boeing	<input type="checkbox"/>				
Air Bus	<input type="checkbox"/>				
Bombardier	<input type="checkbox"/>				
Gulfstream	<input type="checkbox"/>				
Lockheed Martin	<input type="checkbox"/>				
Northrop Grumman	<input type="checkbox"/>				
Other	<input type="checkbox"/>				

24) How many employees does your company have?

	In Washington	In the U.S., but outside of Washington	Outside of the U.S.
a. 1-20 employees			
b. 21-50 employees			
c. 51-100 employees			
d. 100-500 employees			
e. 500 or more employees			
f. Refuse/Don't know			

25) What percentage of your workforce is unionized?

- a. None
- b. Less than 25%
- c. 25% to 75%
- d. More than 75%
- e. 100%

26) We intend to contact approximately 10 employers to participate in a short follow-up in-person interview. Are you willing to be contacted for a follow-up interview, if selected, to further elaborate on some of your responses to this survey?

- a. Yes
- b. No

24b) [IF YES] Who is the best contact for the follow-up survey and what is their phone number?

- a. Company Name: _____

- b. Contact Name: _____
- c. Phone: _____
- d. Email: _____

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