



Department of
Job and Family Services

TO STRENGTHEN OHIO'S FAMILIES WITH SOLUTIONS TO TEMPORARY CHALLENGES

Aerospace and Aviation Industry Cluster



Ohio Employment Trends

November 2015

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Executive Summary

- The aerospace and aviation cluster consists of five industries responsible for manufacturing aerospace equipment, air transportation and satellite telecommunications.
- In 2013, the aerospace and aviation industry cluster's employment of more than 36,500 accounted for 0.7 percent of total Ohio employment.
- Nonscheduled air transportation has a higher employment concentration in Ohio, compared to the U.S. as a whole.
- The aerospace product and parts manufacturing industry makes up the largest share of the cluster, at 44.6 percent, and the largest workforce, with employment exceeding 16,200.
- One industry in the cluster is expected to have job growth greater than 2,000 from 2012 to 2022: nonscheduled air transportation (2,337).
- About 61 percent of the workers in the aerospace and aviation cluster are 45 or older, compared to 45 percent for all Ohio workers.
- Typical education at entry for 12 of the 25 most concentrated occupations in the aerospace and aviation cluster is a high school diploma or less, and about half of these occupations require on-the-job training.

Introduction

Aerospace and aviation consists of aerospace equipment manufacturing, air transportation and satellite telecommunications. Figure 1 shows employment figures for the five industries in the aerospace and aviation cluster, displayed according to their North American Industry Classification System (NAICS) codes. In 2013, the aerospace and aviation cluster employed more than 36,500 workers, about 0.7 percent of Ohio's total employment.

Figure 1. Aerospace & Aviation Cluster Industries

		2013
NAICS Code	Industry Title	Employment
3345	Electronic instrument manufacturing	9,862
3364	Aerospace product and parts manufacturing	16,267
4811	Scheduled air transportation	4,883
4812	Nonscheduled air transportation	5,433
5174	Satellite telecommunications	56

Source: Quarterly Census of Employment and Wages

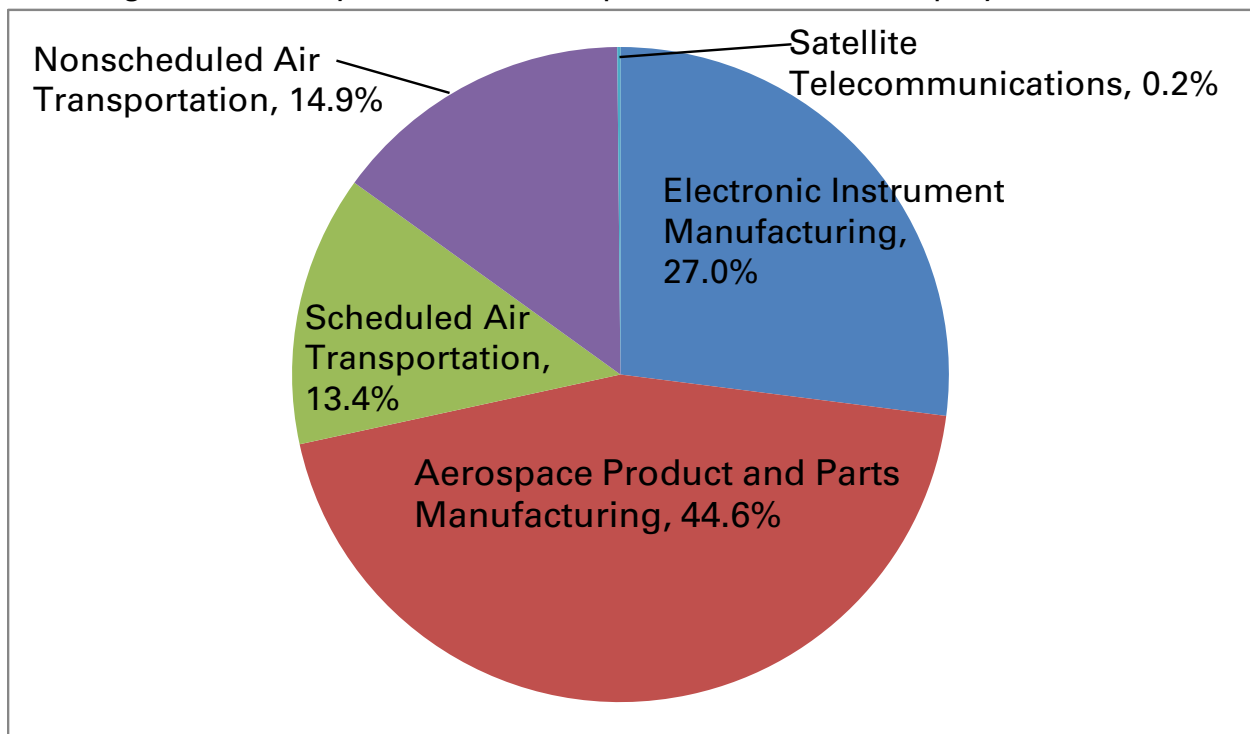
Ohio is in a good and strategic location for aerospace and aviation industries. These industries are highly reliant on air, road, rail and water port infrastructure. Ohio has 123,000 miles of roadways (seventh in the nation), putting Ohio firms within 600 miles of more than half of the U.S. and Canadian populations and within 61 percent of all U.S. and Canadian manufacturing locations.¹

¹ Ohio Department of Development, Ohio's World-Class Transportation, Distribution, and Logistics Industry (2011).

Cluster Composition

Figure 2 shows each industry's share of the aerospace and aviation cluster's total private employment in 2013. Aerospace product and parts manufacturing had the largest share of aerospace and aviation employment, at 44.6 percent. It was followed by electronic instrument manufacturing (27.0 percent), nonscheduled air transportation (14.9 percent), scheduled air transportation (13.4 percent) and satellite communication (0.2 percent). The two manufacturing industries make up the majority of the cluster employment, at 71.6 percent.

Figure2. Industry Shares of Aerospace and Aviation Employment, 2013



Source: Quarterly Census of Employment and Wages

Industry Employment Concentration

An industry's location quotient is a measure of how significant that industry is to a particular region's economy. Figure 3 lists the aerospace and aviation industries and their location quotients for Ohio. Values greater than 1.2 mean the industry's concentration of employment in Ohio is significantly greater than the U.S. average. This suggests that these establishments serve aerospace and aviation demand beyond their local areas. In 2013, only nonscheduled air transportation had a location quotient greater than 1.2.

Figure 3. Industry Location Quotients, 2013

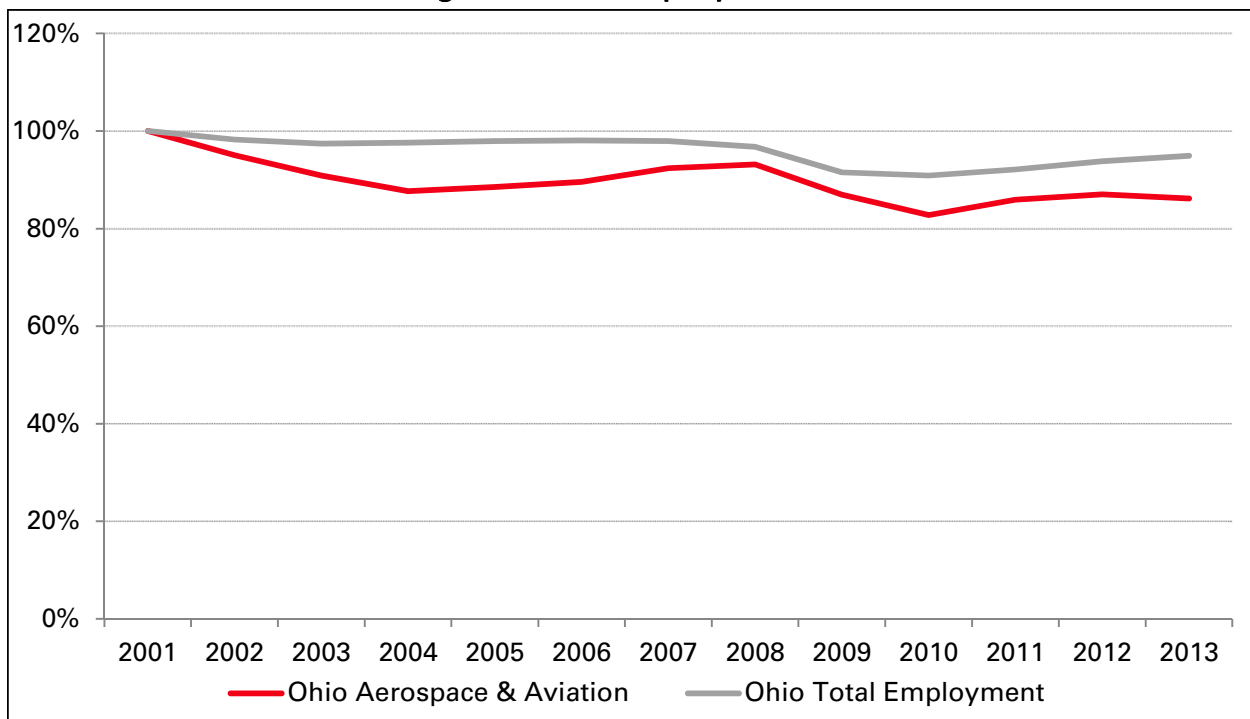
NAICS Code	NAICS Title	Location Quotient
4812	Nonscheduled air transportation	3.61
3364	Aerospace product and parts manufacturing	0.84
3345	Electronic instrument manufacturing	0.64
4811	Scheduled air transportation	0.31
5174	Satellite telecommunications	0.15

Source: U.S. Bureau of Labor Statistics

Cluster Employment Trends

Figure 4 shows the percent change in annual employment for the aerospace and aviation cluster and Ohio total employment from 2001 to 2013. Both experienced declines following the 2001 recession. From 2006 to 2008, Ohio aerospace and aviation experienced a small amount of recovery, but employment declined again after the most recent recession. The same was true for Ohio total employment. From 2008 to 2010, Ohio aerospace and aviation declined 10.4 percent, and Ohio total employment declined 5.9 percent. In 2013, Ohio aerospace and aviation employment was at 86.2 percent of its 2001 employment level; Ohio total employment was at 95.0 percent of its 2001 level.

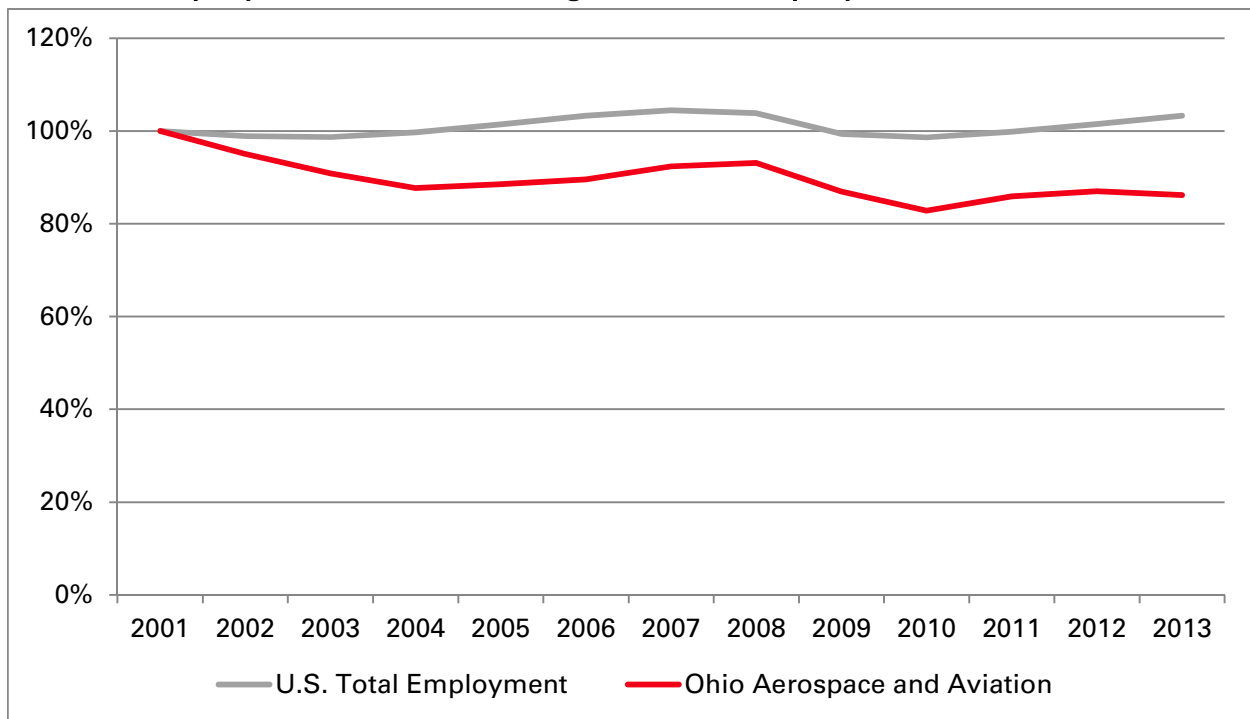
Figure 4. Ohio Aerospace and Aviation Cluster and Ohio Total Employment as a Percentage of 2001 Employment, 2001-2013



Source: Quarterly Census of Employment and Wages

Figure 5 shows the percent change in annual Ohio aerospace and aviation cluster employment and U.S. total employment from 2001 to 2013. The Ohio aerospace and aviation cluster lost more employment overall compared to U.S. total employment. Ohio aerospace and aviation has not returned to 2001 employment levels, whereas U.S. total employment started to exceed 2001 levels of employment in 2012.

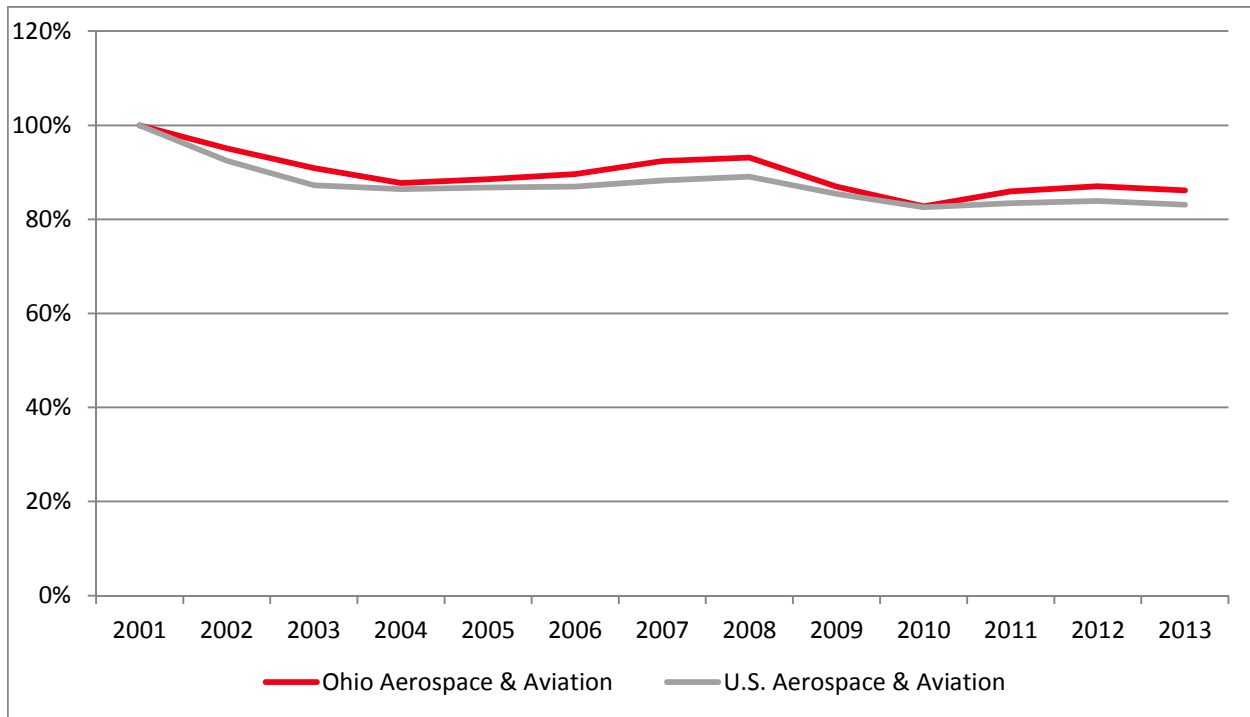
Figure 5. U.S. Total Employment and Ohio Aerospace and Aviation Employment as a Percentage of 2001 Employment, 2001-2013



Source: U.S. Bureau of Labor Statistics

Figure 6 shows the percent change in annual employment from 2001 to 2013 for the Ohio aerospace and aviation cluster and the U.S. aerospace and aviation cluster. Both Ohio and U.S. aerospace and aviation employment have declined from 2001 levels; the U.S. aerospace and aviation has declined a bit more. Ohio was affected more by the recession of 2007 to 2009, when the state's aerospace and aviation employment declined by 10.3 percent. At the same time, U.S. aerospace and aviation employment declined by 6.5 percent. From the end of that recession through 2013, Ohio aerospace and aviation employment recovered by 3.7 percent; U.S. aerospace and aviation employment recovered by only 0.5 percent.

Figure 6. U.S. Aerospace and Aviation and Ohio Aerospace and Aviation Employment as a Percentage of 2001 Employment, 2001-2013



Source: U.S. Bureau of Labor Statistics

Industry Employment Trends

This section presents annual employment data from 2000 through 2013 for each of the industries in the aerospace and aviation cluster. During this period, the nation experienced two recessions: one in 2001 and another from 2007 to 2009. Each aerospace and aviation industry responded differently to each recession.

Electronic Instrument Manufacturing, NAICS 3345

This industry is primarily engaged in manufacturing search, detection, navigation, guidance, aeronautical and nautical systems and instruments.² Electronic instrument manufacturing employment declined from 2000 through 2013, losing 4,942 jobs (-33.4 percent) and four establishments (-1.3 percent). From 2008 to 2013, the industry lost 225 jobs (-2.2 percent).

Figure 7. Electronic Instrument Manufacturing

Year	Establishments	Employment
2000	301	14,804
2001	303	13,901
2002	303	12,500
2003	299	11,937
2004	282	10,283
2005	279	9,824
2006	268	9,534
2007	275	10,179
2008	273	10,087
2009	286	9,533
2010	288	9,341
2011	296	9,652
2012	294	9,958
2013	297	9,862
Net Change	(4)	(4,942)
Percent Change	-1.3%	-33.4%

Source: Quarterly Census of Employment and Wages

² All industry descriptions are taken from U.S. Office of Management and Budget, North American Industry Classification System, United States, 2012 (Lanham, MD: Bernan Press, 2012).

Aerospace Product and Parts Manufacturing, NAICS 3364

This industry manufactures complete aircrafts, aerospace engines, any auxiliary equipment or parts, aircraft conversions, and complete aircraft overhaul and rebuilding. Employment declined by 692 (-4.1 percent) from 2000 through 2013. The largest decline took place between 2000 and 2003, when the industry lost 2,792 jobs (-16.5 percent). From 2003 through 2013, employment increased by 2,100 jobs (14.8 percent). From 2000 through 2013, the number of establishments increased by 11 (9.4 percent).

Figure 8. Aerospace Product and Parts Manufacturing

Year	Establishments	Employment
2000	117	16,959
2001	116	16,946
2002	111	15,212
2003	119	14,167
2004	118	14,360
2005	115	14,889
2006	116	15,817
2007	115	16,145
2008	115	16,819
2009	120	15,992
2010	122	15,220
2011	125	15,786
2012	123	16,124
2013	128	16,267
Net Change	11	(692)
Percent Change	9.4%	-4.1%

Source: Quarterly Census of Employment and Wages

Scheduled Air Transportation, NAICS 4811

This industry transports passengers and/or cargo over regular routes and on regular schedules. Scheduled air transportation employment declined from 2002 to 2012 but increased by 256 (5.5 percent) from 2012 to 2013. Between 2000 and 2013, the industry lost 3,529 jobs (-42.0 percent) and 29 establishments (-39.7 percent)

Figure 9. Scheduled Air Transportation

Year	Establishments	Employment
2000	73	8,412
2001	67	8,546
2002	68	8,794
2003	63	8,480
2004	66	8,539
2005	66	8,415
2006	64	7,793
2007	62	7,660
2008	60	7,117
2009	58	5,848
2010	48	5,443
2011	46	5,362
2012	41	4,627
2013	44	4,883
Net Change	(29)	(3,529)
Percent Change	-39.7%	-42.0%

Source: Quarterly Census of Employment and Wages

Nonscheduled Air Transportation, NAICS 4812

This industry transports passengers and/or cargo with no regular routes or regular schedules. Employment grew from 2000 through 2009 and again from 2011 to 2012. From 2000 to 2013, the industry gained 3,070 jobs (129.9 percent) and 12 establishments (15.4 percent).

Figure 10. Nonscheduled Air Transportation

Year	Establishments	Employment
2000	78	2,363
2001	77	2,912
2002	78	3,669
2003	82	3,810
2004	89	3,861
2005	86	4,297
2006	88	4,757
2007	95	5,101
2008	90	5,391
2009	87	5,417
2010	95	5,012
2011	96	5,516
2012	94	6,063
2013	90	5,433
Net Change	12	3,070
Percent Change	15.4%	129.9%

Source: Quarterly Census of Employment and Wages

Satellite Telecommunications, NAICS 5174

This industry provides telecommunications services to other establishments by forwarding and receiving communication signals via a system of satellites or by reselling satellite telecommunications. This industry accounts for the smallest portion of employment in the aerospace and aviation cluster. It lost 165 jobs (-73.0 percent) after the first year in this series and as of 2013 had not recovered. Overall, the industry lost a total of 170 jobs (-75.2 percent) and gained three establishments (15.8 percent) from 2000 to 2013.

Figure 11. Satellite Telecommunications

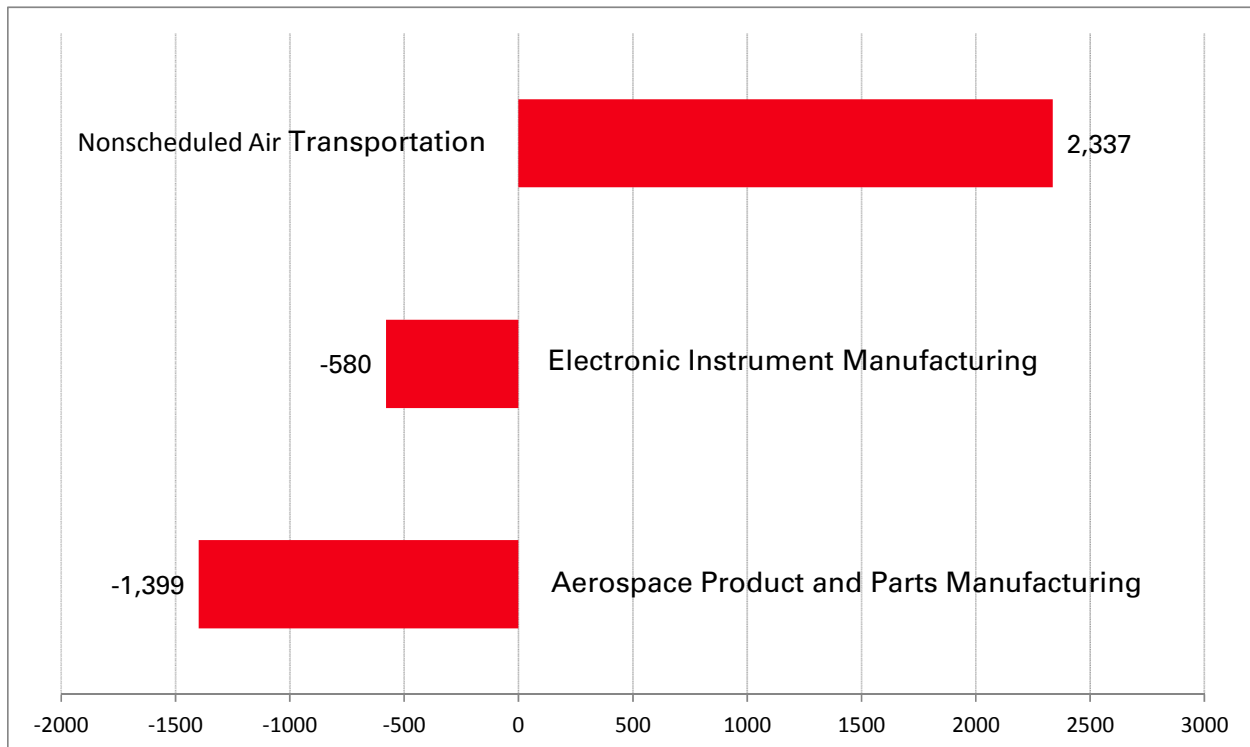
Year	Establishments	Employment
2000	19	226
2001	26	61
2002	35	101
2003	32	110
2004	34	103
2005	25	70
2006	20	51
2007	19	47
2008	18	50
2009	16	39
2010	15	60
2011	18	93
2012	22	103
2013	22	56
Net Change	3	(170)
Percent Change	15.8%	-75.2%

Source: Quarterly Census of Employment and Wages

Projected Employment Change, 2012-2022

Figure 12 shows the long-term employment projections for three industries in the aerospace and aviation cluster³. Overall, the aerospace and aviation cluster is expected to decline by 206 jobs from 2012 to 2022. The largest growth is expected to occur in the nonscheduled air transportation industry, which could add as many as 2,337 jobs (38.6 percent). Electronic instrument manufacturing is expected to continue shrinking, with a decline of 1,399 jobs (-8.7 percent).

Figure 12. Projected Employment Change, 2012-2022



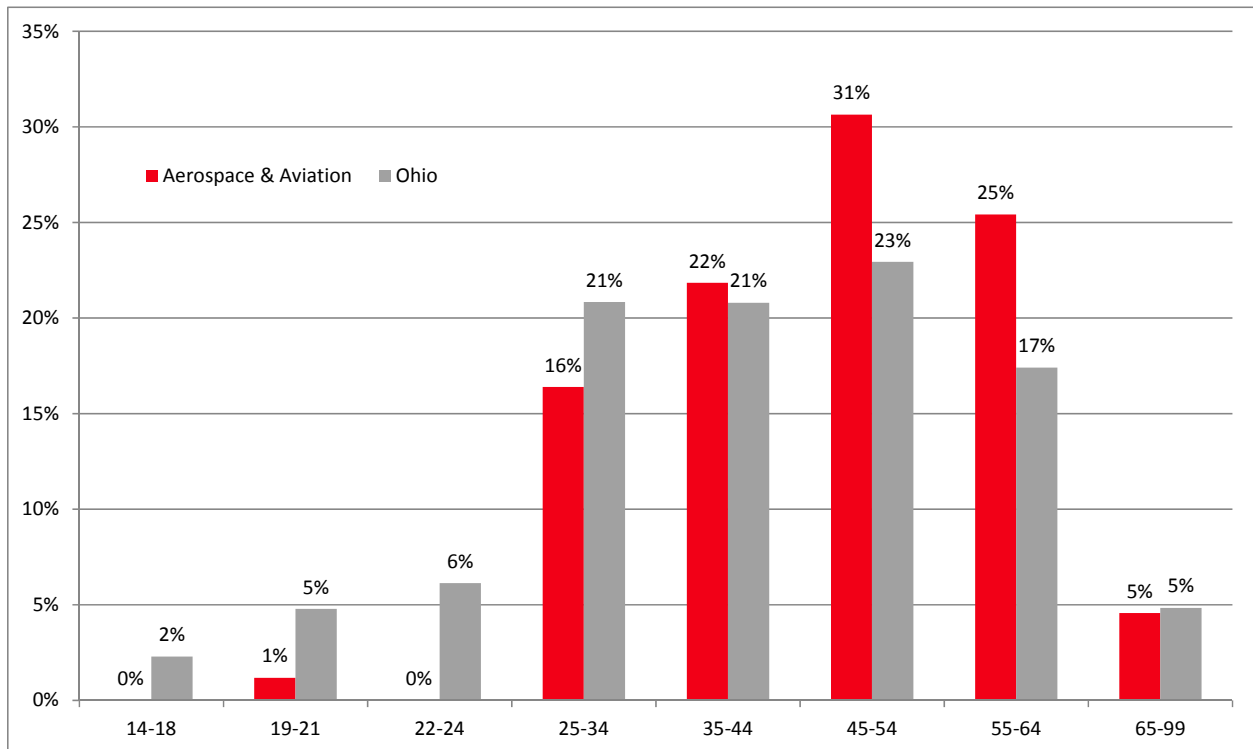
Source: Ohio Bureau of Labor Market Information

³ The employment projections for the other industries are very small.

Age Distribution of Ohio Workers

Figure 13 shows the age distribution of workers in the aerospace and aviation cluster compared to all Ohio workers for the fourth quarter of 2013. Workers tend to be older in the aerospace and aviation cluster than workers in other Ohio industries. About 61 percent of cluster workers are age 45 or older, compared to 45 percent for all Ohio workers. No data is available for cluster workers ages 14 to 18 and 22 to 24 because the data does not meet the U.S. Census Bureau's publication standards.

Figure 13. Age Distribution of Ohio Workers



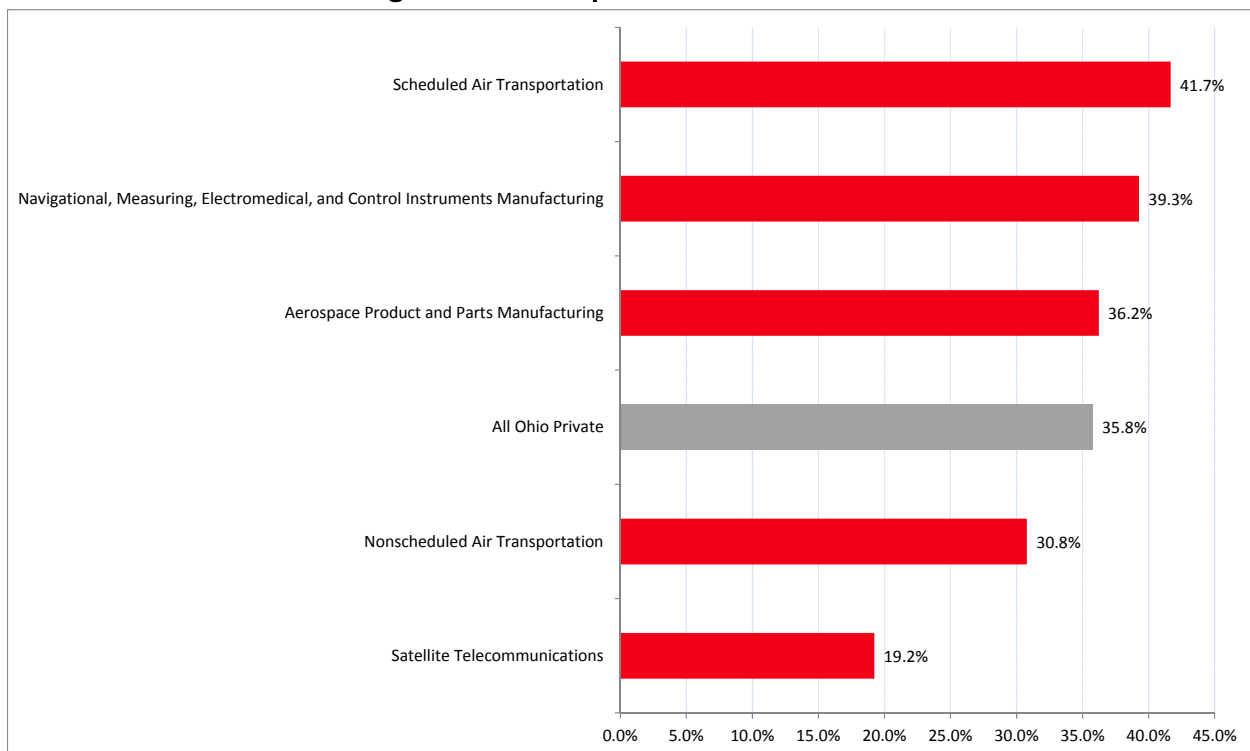
Source: U.S. Census of Quarterly Workforce Indicators, 2013 Q4

Aerospace and Aviation Education and Training Needs

Figure 14 shows the educational attainment of workers within the aerospace and aviation industry cluster, specifically the percentage of workers 25 and older with a high school diploma or less.

Across all Ohio private industries, an average of 35.8 percent of workers had a high school diploma or less in 2013. Three industries had a higher percentage of employees with a high school diploma or less; scheduled air transportation (41.7 percent), navigational, measuring, electromedical, and control instruments manufacturing (39.3 percent), and aerospace product and parts manufacturing (36.2 percent). The two industries lower than the statewide rate were nonscheduled air transportation (30.8 percent) and satellite telecommunications (19.2 percent).

Figure 14. Percent of Aerospace and Aviation Workers 25 and Older with a High School Diploma or Less, 2013



Source: U.S. Census Quarterly Workforce Indicators, 2013

Figure 15 shows the typical education levels needed for entry, on-the-job training (OJT) and related work experience for the 25 most concentrated occupations in the aerospace and aviation cluster, listed by their Standard Occupational Classification (SOC) codes. Sixteen of these occupations require a high school diploma or less. Fourteen require only short-, moderate- or long-term OJT.⁴

⁴ Short-term OJT lasts less than one month. Moderate-term OJT lasts one to 12 months and may include informal training. Long-term OJT lasts more than 12 months and combines work experience with formal classroom instruction.

Figure 15. Typical Entry Education, On-the-Job Training and Related Work Experience Needs for the 25 Most Concentrated Occupations in Aerospace and Aviation

SOC Code	Occupation Title	Typical Education Level at Entry	On-the-Job Training/Related Experience
11-9041	Architectural and Engineering Managers	Bachelor's degree	None
17-2011	Aerospace Engineers	Bachelor's degree	None
17-2061	Computer Hardware Engineers	Bachelor's degree	None
17-2072	Electronics Engineers, Except Computer	Bachelor's degree	None
17-2112	Industrial Engineers	Bachelor's degree	None
17-3021	Aerospace Engineering and Operations Technicians	Associate's degree	None
17-3024	Electro-Mechanical Technicians	Associate's degree	None
17-3026	Industrial Engineering Technicians	Associate's degree	None
17-3029	Engineering Technicians, Except Drafters, All Other	Associate's degree	None
27-1021	Commercial and Industrial Designers	Bachelor's degree	None
43-4181	Reservation and Transportation Ticket Agents and Travel Clerks	High school diploma or equivalent	Short-term on-the-job training
43-5011	Cargo and Freight Agents	High school diploma or equivalent	Short-term on-the-job training
49-2091	Avionics Technicians	Associate's degree	None
49-3011	Aircraft Mechanics and Service Technicians	Postsecondary non-degree award	None
51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	High school diploma or equivalent	Moderate-term on-the-job training
51-2022	Electrical and Electronic Equipment Assemblers	High school diploma or equivalent	Short-term on-the-job training
51-2023	Electromechanical Equipment Assemblers	High school diploma or equivalent	Short-term on-the-job training
51-4061	Model Makers, Metal and Plastic	High school diploma or equivalent	Moderate-term on-the-job training
53-1011	Aircraft Cargo Handling Supervisors	High school diploma or equivalent	None
53-2011	Airline Pilots, Copilots, and Flight Engineers	Bachelor's degree	Moderate-term on-the-job training
53-2012	Commercial Pilots	High school diploma or equivalent	Moderate-term on-the-job training
53-2022	Airfield Operations Specialists	High school diploma or equivalent	Long-term on-the-job training
53-2031	Flight Attendants	High school diploma or equivalent	Moderate-term on-the-job training
53-6051	Transportation Inspectors	High school diploma or equivalent	Moderate-term on-the-job training
53-6099	Transportation Workers, All Other	High school diploma or equivalent	Short-term on-the-job training

Source: Ohio Bureau of Labor Market Information

Aerospace and Aviation Industry Staffing Patterns

A staffing pattern refers to mix of occupations that are commonly found in a particular industry. The following staffing patterns show the most common occupations and their projected employment for the industries that make up the aerospace and aviation cluster. Some industries are not presented here due to limited data.

Electronic Instrument Manufacturing, NAICS 3345

Electrical and Electronic Equipment Assemblers (SOC 51-2022) is the largest occupation in this industry. All but three of the largest occupations in NAICS 3345 are expected to decline over the next 10 years.

Figure 16. Ohio Staffing Pattern for Electronic Instrument Manufacturing

SOC Code	Occupational Title	2012	2022	Numeric Change	Percent Change
51-2022	Electrical and Electronic Equipment Assemblers	979	907	-72	-7.40%
51-2023	Electromechanical Equipment Assemblers	518	480	-38	-7.30%
51-2092	Team Assemblers	356	329	-27	-7.60%
51-4041	Machinists	300	306	6	2.00%
51-9061	Inspectors Testers Sorters Samplers and Weighers	279	258	-21	-7.50%
17-2072	Electronics Engineers Except Computer	272	274	2	0.70%
17-2071	Electrical Engineers	266	268	2	0.80%

Source: Ohio Bureau of Labor Market Information

Aerospace Product and Parts Manufacturing, NAICS 3364

Industrial Engineers (SOC 17-2112) and Machinists (SOC 51-4041) are the two largest occupations in NAICS 3364, and employment in both is expected to decline. Computer-Controlled Machine Tool Operators, Metal and Plastic (SOC 51-4011) and Inspectors, Testers, Sorters, Samplers and Weighers (SOC 51-9061) are expected to increase by 4.2 percent and 9.4 percent, respectively.

Figure 17. Ohio Staffing Pattern for Aerospace Product and Parts Manufacturing

SOC Code	Occupational Title	2012	2022	Numeric Change	Percent Change
17-2112	Industrial Engineers	1,242	1,209	-33	-2.7%
51-4041	Machinists	1,115	1,066	-49	-4.4%
51-4011	Computer-Controlled Machine Tool Operators Metal and Plastic	567	591	24	4.2%
51-9061	Inspectors Testers Sorters Samplers and Weighers	532	582	50	9.4%
11-9041	Architectural and Engineering Managers	421	402	-19	-4.5%
17-3026	Industrial Engineering Technicians	372	339	-33	-8.9%
17-2141	Mechanical Engineers	328	285	-43	-13.1%

Source: Ohio Bureau of Labor Market Information

Summary

Overall, employment in the aerospace and aviation cluster is expected to decline over the next 10 years. However, two industries within the cluster are projected to grow: satellite telecommunications and nonscheduled air transportation. Education and training programs will play an important role in staffing this cluster in the future, as the two industries projected to grow have higher education and training requirements than other industries in the cluster.

Ohio Department of Job and Family Services
Office of Workforce Development
P.O. Box 1618
Columbus, OH 43216-1618



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