Aerospace Manufacturing in California’s Economy

Aerospace is one of the nation’s standout industries. Its workforce is highly skilled and well paid; its exports grow our economy; and it is a continuing source of innovation. California has been fortunate to enjoy an outsize role in the industry, with a large number of firms located in the state. Aerospace encompasses a diverse range of productive activities, including the manufacturing of both civilian and military aircraft, space vehicles, guided missiles and associated parts. This Briefly Stated provides an overview of the aerospace industry in California; compares it to similar manufacturing sectors in the state; compares California to other states; and considers California’s position in two newly emerging areas of the industry—commercial spaceflight and drone manufacturing.

AEROSPACE IN CALIFORNIA

In 2011, California’s aerospace industry produced over $31 billion worth of goods. California’s other transportation manufacturing industries are much smaller. Automotive vehicles and parts manufacturing produced less than $7 billion in vehicles and parts over the same period. Ship and boat building produced $2.3 billion, while miscellaneous transportation manufacturing added another $1.2 billion. Overall, aerospace represented more than 72 percent of all transportation equipment manufacturing in California in 2011.

Across all manufacturing sectors, aerospace contributed more than 6.3 percent of the $495 billion in manufactured goods produced in California in 2011. Figure 1 lists total shipments for the eight largest manufacturing subsectors in 2011. Transportation equipment manufacturing (of which aerospace is the most significant part) was the fifth largest subsector in California that year. Only petroleum and coal production, food processing, computers and electronics, and chemical manufacturing were larger. In fact, if Aerospace were its own 3-digit North American Industrial Classification System (NAICS) subsector, it would still be the fifth largest manufacturing subsector by itself.

When looking at all 4-digit industry groups, only petroleum and coal products manufacturing ($96.5 billion) and pharmaceutical and medicine manufacturing ($36.2 billion) had larger total shipments in 2011 than aerospace. For a better contrast, Figure 2 compares California’s aerospace industry with the industry groups from the large “Computer and Electronic Product Manufacturing” sub-sector.
Aerospace is particularly attractive for economic development due to the various “spillover effects” the industry brings with it. This can represent the promotion of related industries through the supply chain, such as engine and engine parts, electrical components, hydraulics and fluid power subassemblies, intake and exhaust systems, even including seating and interior trim manufacturing. Other support services such as transportation and logistics support, managerial services, construction, and utilities also see an increase in demand due to California’s large aerospace industry. Economic multipliers are used to measure the broader impacts of specific economic development. In general, California’s aerospace industry provides fairly large multipliers, compared to other industrial manufacturing sectors. Table 1 contains the California Benchmark Series Multipliers provided by the U.S. Bureau of Economic Analysis’ Regional Input-Output Modeling System (RIMS II). These provide the current best estimates of the impact that additional economic activity in the aerospace industry would have on the wider regional economy.

**AEROSPACE IN THE UNITED STATES**

Nationally, the aerospace industry produced more than $183 billion in goods in 2011. California represented 17 percent of this total. This was a slight increase over recent years. Figure 3 shows the historical trend line of California’s aerospace production as a percentage of the national total. California’s aerospace production peaked in 2005—both nominally and as a percentage of the national total—and then declined in 2006 and 2007. Since then, California’s production has returned to trend. Nominally, California’s aerospace industry produced $4.5 billion more in 2011 than in 2005, but in 2005 represented 19.7% of the national total versus 17.2% in 2011.

Figure 4 maps aerospace production across the country, comparing California’s production with that of other states. California’s largest competitor is Washington State; unfortunately, the aggregate data for Washington is suppressed by the U.S. Census Bureau to prevent the disclosure of private information—likely because Boeing plays such an outsized role in that state’s aerospace industry. The next largest producer is Texas, which produced over $14 billion in aerospace shipments in 2011. Connecticut, Kansas, and Arizona each manufactured about $12 billion in aerospace products that year.

**EMERGING SECTORS**

New technological trends are diversifying aerospace beyond the military/defense and commercial air travel markets. The expansion of unmanned aerial vehicles (UAVs, or drones) from purely military to law enforcement and civilian uses is one such trend. The other is the growth of commercial spaceflight. The use of drones in the United States has been highly controversial, but the Federal Aviation Administration (FAA) has been moving forward with plans to integrate drones into the U.S. air traffic control system, and has recently announced the selection of six states as initial test site operators to begin studying issues related to the wider use of drones.9

This past decade has seen tremendous innovation in commercial spaceflight. The industry is being driven by
<table>
<thead>
<tr>
<th>Description</th>
<th>Final Demand</th>
<th>Direct Effect</th>
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<tbody>
<tr>
<td></td>
<td>Output ($/$/)</td>
<td>Earnings ($/$/)</td>
</tr>
<tr>
<td>Aircraft Manufacturing</td>
<td>2.4318</td>
<td>0.6273</td>
</tr>
<tr>
<td>Aircraft Engine and Engine Parts Manufacturing</td>
<td>1.9056</td>
<td>0.4723</td>
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<tr>
<td>Other Aircraft Parts and Auxiliary Equipment</td>
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<td>0.6990</td>
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<tr>
<td>Guided Missile and Space Vehicle Manufacturing</td>
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<tr>
<td>Guided Missile and Space Vehicle Propulsion Unit</td>
<td>2.5218</td>
<td>0.8179</td>
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The multipliers are broken out between direct effects of aerospace production, and impacts on final demand, which takes into account that additional growth in a spillover industry is itself subject to multipliers. The values in each column mean as follows:

**Final Demand: Output**—The first column provides the total additional output that occurs in all industries as a result of an additional dollar of production in that aerospace category. For example, an additional dollar of production in aircraft manufacturing in California also leads to another $1.4318 in production in other industries in the state, for a combined $2.4318 in total output.

**Final Demand: Earnings**—The second column provides the total change in household earnings as a result of an additional dollar of production in that aerospace category. For example, an additional dollar of production in aircraft manufacturing in California leads to an addition $0.6273 in household earnings in the state.

**Final Demand: Employment**—The third column provides the total number of additional jobs across all industries as a result of an addition $1 million of production in that aerospace category. For example, an additional $1 million in production in aircraft manufacturing in California leads to an additional 11.3128 jobs in the state.

**Final Demand: Value-Added**—The fourth column provides the total change in value added—defined as the value of the final product minus the value of material inputs—across all industries as a result of an additional dollar of production in that aerospace category. For example an additional dollar of production in aircraft manufacturing in California leads to an additional $1.0367 in value-added across all industries in the state.

**Direct Effect: Earnings**—The fifth column provides the total change in household earnings as a result of an additional dollar of earnings paid to households directly by employers in that aerospace category. For example, for each additional dollar of earnings paid to households in California by employers in aircraft manufacturing, another $1.9680 will be paid to households by other employers in the state, for a combined $2.9680 in total pay across all households.

**Direct Effect: Employment**—The sixth column provides the total change in the number of additional jobs across all industries as a result of an additional job in that aerospace category. For example, for every additional job in aircraft manufacturing in California, another 4.0388 new jobs will be created in other industries in the state, for a combined total of 5.0388 new jobs across all employers.
three potential markets: payload delivery, terrestrial travel, and space tourism. Two big names in commercial space are SpaceX and Scaled Composites, both of which were founded in and are based in California, with significant manufacturing facilities located here. SpaceX has a number of milestones under its belt. It was the first private entity to launch a liquid fueled rocket into orbit, the first to successfully attach a craft to the International Space Station (ISS), and is currently fulfilling a $1.6 billion contract to supply the ISS.10

The first facility in the country to be certified by the FAA as a spaceport is also in California, the Mojave Air & Space Port. This has been the test site for many competitors in the Ansari X Prize—a $10 million prize for the first nongovernmental organization to successfully launch and recover a reusable manned spacecraft twice within a two-week period. The winner of the X Prize, Scaled Composites, is based in Mojave, and uses the spaceport as the initial test site for its projects. A spin-off called the Spaceship Company is currently under contract with Virgin Galactic to build the first private fleet of space vehicles for space tourism.

FURTHER READING


ENDNOTES

1. For purposes of this report, NAICS code 3364 is used to define the industry. Other codes, in particular 33451: “Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing” have been omitted because data is not available at the level of detail necessary for comparison. The NAICS website is at http://www.census.gov/naics/.

2. NAICS codes 3361 and 3363.

3. NAICS codes 31-33.

4. United States Census Bureau, 2011. Annual Survey of Manufacturers: General Statistics: Statistics for Industry Groups and Industries: 2011 REFRESH. Information on aerospace shipments for 21 states were suppressed to prevent disclosure of confidential data, or no aerospace establishments from those states were selected to be part of the survey’s sample population: AK, DE, DC, HI, ID, IA, LA, ME, MS, MO, MT, NE, NV, NH, NM, ND, RI, SD, WA, WI, and WY.

5. NAICS 3241 and 3254, respectively. Petroleum and Coal Products is both a 3-digit and 4-digit NAICS, encompassing the same economic activity.

6. NAICS codes 3341-3346.


This Briefly Stated was prepared at the request of the Assembly Select Committee on Aerospace.

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