

Economic Impact of Aviation and the Aerospace Industry in Oklahoma

Final Report

for the

Oklahoma Aeronautics and Space Commission
Oklahoma Department of Transportation

David A. Penn, Associate Director
Center for Economic and Management Research
Michael F. Price College of Business
The University of Oklahoma

September 1999

Economic Impact of Aviation and the Aerospace Industry in Oklahoma

Introduction

The aviation and the aerospace sectors are very important sources of jobs and income in Oklahoma. This study quantifies the impact of these sectors on the Oklahoma economy. Using proprietary employment and payroll data and a survey of airport operators, the study estimates the industrial output, employment, payroll, and state tax revenue that can be attributed to the Oklahoma aviation and aerospace sectors.

In addition to estimating the size of the aviation and aerospace sectors in Oklahoma, the report also examines the rate of growth of these sectors in terms of employment growth and the rate of growth of fuel consumption.

The economic impact of aviation and aerospace can be divided into three major sectors:

Air transportation – including civilian airports, airlines, airline aircraft maintenance centers, air freight and air cargo, airline reservation centers, and local spending by commercial airline passengers.

Aircraft manufacturing – including private sector manufacturing of aircraft, aircraft engines, and aircraft parts.

Federal Government and Military Aviation – including civilian, military, and federal government employment at Tinker Air Force Base, Altus Air Force Base, Vance Air Force Base, Henry Post Field at Ft. Sill, Air National Guard facilities and the Mike Monroney Aeronautical Center.

Impact on Oklahoma Employment and Income

The aviation and aerospace industry in Oklahoma generates a significant amount of economic activity in Oklahoma. Estimated economic impacts are:

\$11.7 billion in industrial output,

\$4.7 billion in payroll,

143,700 jobs,

\$77.0 million in state income tax revenue, and

\$60.6 million in state sales tax revenue.

Oklahoma aviation and aerospace generate, directly or through the economic multiplier effect, 10.0 percent of industrial output, 7.6 percent of employment and 10.3 percent of payroll in the state economy.

Impacts by Major Sector

Impacts on Oklahoma industrial output, personal income, employment, and state tax revenue are shown below for the three primary aviation and aerospace sectors. A brief explanation of the methodology of impact analysis is presented in Appendix A. An explanation of the estimates of tax revenues can be found in Appendix B, while Appendix C explains the estimate of spending by commercial airliner passengers.

Air transportation –

\$6.6 billion in industrial output

\$2.0 billion in personal income

64,400 jobs

Aircraft manufacturing -

\$1.7 billion in industrial output

\$552 million in personal income

15,800 jobs

Federal Government and Military Aviation –

\$3.5 billion in industrial output

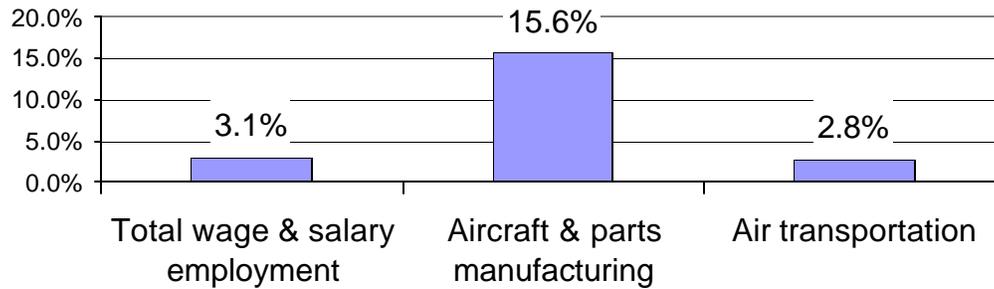
\$2.1 billion in personal income

63,400 jobs

Aircraft Manufacturing is Growing Rapidly in Oklahoma

The Oklahoma aerospace industry has experienced relatively rapid rates of growth in recent years: employment in aircraft and parts manufacturing in Oklahoma grew by an average annual rate of 15.6 percent from 1996 to 1999, much faster than the 3.1 percent rate of growth of total wage and salary employment. Also, employment in air transportation increased at robust 2.8 percent annual rate of growth.

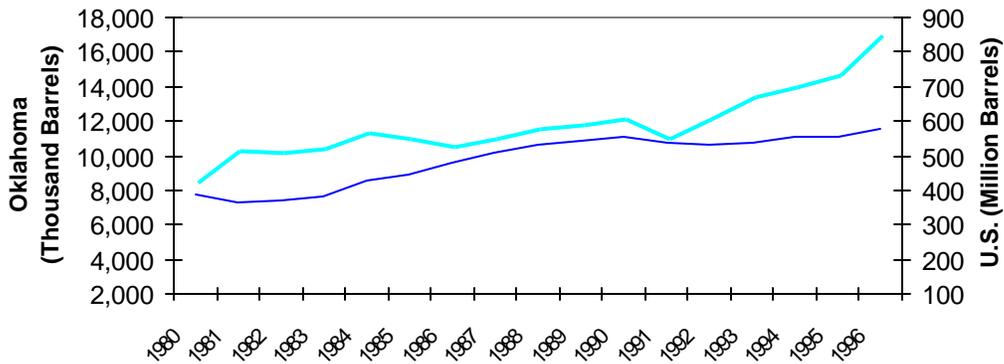
Annual Average Rates of Employment Growth, 1996-1999, January - January



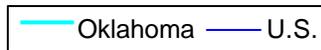
Consumption of jet fuel is growing rapidly.

The more miles flown by aircraft in and out of Oklahoma, the higher the consumption of fuel. Thus, a good way of judging the rate of growth of a transportation industry consists of examining consumption of fuel over time. During the 1980s consumption of jet fuel in Oklahoma grew at about the same pace as in the U.S. (graph). During the 1990s, however, consumption of jet fuel rose by an average of 6.0 percent annually in Oklahoma compared with just 0.6 percent annual growth for the U.S.

Consumption of Jet Fuel, Oklahoma and the U.S., 1980 - 1996



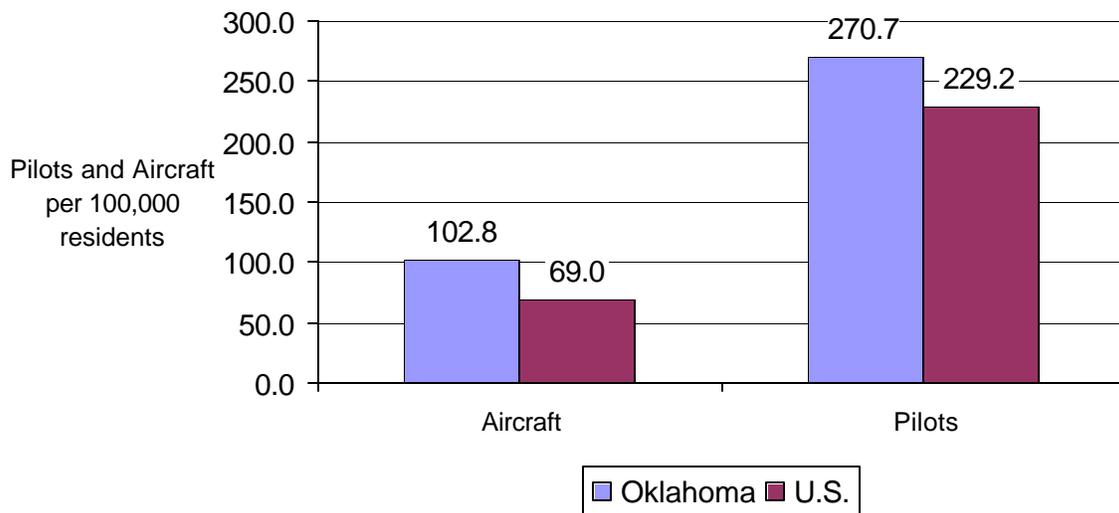
Source: Data from the U.S. Energy Information Administration



General Aviation is Important in Oklahoma

Oklahoma enjoys a higher concentration of pilots and general aviation aircraft than does the U.S. on a per capita basis. Using data compiled by the Federal Aviation Administration for 1996, Oklahoma has 103 general aviation aircraft per 100,000 population compared with just 69 general aviation aircraft per 100,000 population in the U.S. Oklahoma also has more pilots per capita than in the U.S.

Pilots and General Aviation Aircraft, Oklahoma and U.S.



Appendix A: The Methodology of Economic Impact Analysis

The economic impact of an industry consists of direct, indirect, and induced impacts. Direct impacts are the immediate economic effects of new hiring and spending in the industry providing the good or service. Using the construction industry as an example, the sum of spending for materials and supplies, payroll, taxes, and profit is the direct effect.

Indirect impacts occur in sectors that supply materials, goods, and services to the business that initiated the direct impact. For example, in order to build a new structure the construction firm purchases inputs from a variety of other firms including electrical wiring, plumbing and heating equipment, fixtures, furniture, cement, and carpeting. These supplying firms in turn increase purchases from their suppliers, and so on. The sum of these impacts is the indirect effect.

Induced effects are created by the increase in consumer spending generated by increased payrolls in the direct and indirect effects. Increased payroll in the construction firm increases household income among the employees, causing higher consumer spending for items such as housing, food, clothing, entertainment, transportation, and so on. In addition, businesses that supply goods and materials to the construction firm increase their payrolls, resulting in additional consumer spending. The sum of the payroll, output, and employment caused by increased payrolls is the induced effect.

Multipliers used in this study were generated by the IMPLAN system, widely used by practitioners of economic impact analysis. The IMPLAN model uses inter-industry transaction information for 1993. IMPLAN employment multipliers were updated to adjust for inflation since 1993.

A multiplier shows the total amount of economic activity that results from a change in final demand for goods and services. For example, the IMPLAN Type III output multiplier for the Aircraft Manufacturing sector is 1.725 (A Type III multiplier estimates the direct, indirect, and induced impacts for a change in final demand). This means that an increase in output of \$10 million in the aircraft manufacturing sector will cause industrial output in other Oklahoma sectors to rise by \$7.25 million, for a total impact of \$17.25 million.

Appendix B: Estimating Impacts on State Tax Revenues

This study estimates impacts on two types of tax revenues: personal income taxes and sales taxes. Estimated tax revenues are defined as follows:

Oklahoma Income Tax Revenue

Oklahoma income tax revenue = OKPI * OKRATE, where OKPI is Oklahoma personal income and OKRATE is the average Oklahoma income tax rate.

In order to determine the Oklahoma average tax rate relevant to the study, average pay per worker was calculated for the direct, indirect, and induced impacts of each of the four aviation and aerospace sectors (Military, Air transportation, Aircraft manufacturing, and Other). Using information from the Internal Revenue Service Statistics of Income publication and from the Public Use Micro Sample from the 1990 Census of Population for Oklahoma, estimates of household income were determined for married, single, and head of household workers. Standard deductions were assumed for each filing status. Exemptions were assumed to be an average of 3.5 for married workers, 2.4 for heads of households, and 1.0 for single workers. Resulting taxable income estimates were used to determine federal and state income tax liability using the appropriate tax tables.

Average tax rates were determined by dividing estimated household tax liability by estimated household income. These average tax rates were then multiplied by payroll generated by each of the four sectors, resulting in estimated income tax revenue.

<u>Sector</u>	<u>Estimated Avg. Income Tax Rates*</u>	
	<u>Federal</u>	<u>State</u>
<i>Direct Impacts</i>		
Military	7.61	1.65
Air transportation	10.52	3.51
Aircraft manufacturing	12.55	4.17
Other	8.64	2.39
<i>Indirect Impacts</i>		
Military	10.90	3.52
Air transportation	9.52	2.80
Aircraft manufacturing	9.17	2.51
Other	9.80	2.57
<i>Induced Impacts</i>	7.38	1.52

*Applied to gross income

Oklahoma Sales Tax Revenue

Oklahoma sales tax revenue =

$$\text{OKPI} * (1 - \text{FICA} - \text{OKRATE} - \text{FEDRATE}) * 0.5 * \text{SALESRATE}$$

Where

OKPI – Oklahoma personal income,

FICA – social security / Medicare tax rate (7 %),

OKRATE – average Oklahoma income tax rate,

FEDRATE – average Federal income tax rate, and

SALESRATE – Oklahoma sales tax rate (4.5%).

Oklahoma sales tax revenues are estimated by calculating disposable income, consisting of Oklahoma personal income less federal and state taxes. Next, since just one-half of disposable income is spent for sales-taxable items, disposable income is multiplied by 0.5. Finally, this amount is multiplied by the Oklahoma sales tax rate.

Appendix C: Estimating Spending by Commercial Airline Passengers

Local spending by visitors was estimated based on methodology developed by the Federal Aviation Administration¹. The methodology involves multiplying an estimate of the number of visitors by average spending per visit.

Of the more than 3.5 million deplanements in Oklahoma commercial airports, 25% are assumed to be visitors to Oklahoma. This percentage is a conservative estimate of the number of visitors. Using the FAA guidelines updated to 1998 prices, the average visitor will spend \$84 for lodging, \$60 for food, \$76 for transportation including rental cars, and \$24 for retail spending for a total of \$244 per visitor.

In order to be consistent with definitions in IMPLAN, retail sales are converted from revenue to net retail margin, or sales less the cost of inventory. Using 33 percent as the margin rate, retail final demand is \$7.90 per visitor and total final demand is \$228 per visitor. Spending estimates for lodging, food, transportation, and retail are multiplied by the number of visitors to estimate the aggregate change in final demand attributable to local spending by airline passengers.

¹ *Estimating the Regional Economic Significance of Airports*, U.S. Department of Transportation, Federal Aviation Administration, September 1992.