
A Snapshot of the Texas Aerospace Industry and a Comparison of Competitor States



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Table of Contents

List of Figures	v
List of Tables.....	vi
Executive Summary.....	viii
Texas Overview	
Introduction	1
Economic Development	2
Human Capital.....	8
Aviation	19
Aerospace Manufacturing	24
Space.....	29
Military	36
State Briefings	
Introduction	41
Alabama.....	43
Arizona	51
California.....	59
Florida.....	71
Georgia	80
Kansas.....	90
Mississippi.....	97
Oklahoma	104
Virginia.....	110
Washington.....	115
Summary	123
Appendix A	
SIC Classifications	A-1
Alabama.....	A-2
Arizona	A-3
California	A-4
Florida.....	A-5

Georgia	A-6
Kansas.....	A-7
Mississippi.....	A-8
Oklahoma	A-9
Texas.....	A-10
Virginia.....	A-11
Washington.....	A-12
Boeing Educational Requirements	A-13
Certifications Required for Operators and Engineers in El Paso	A-16

List of Figures

Figure 2-A. State Aerospace Industry as Percentage of Total Non-farm, Non-agricultural Workforce 1996-2000	13
Figure 2-B. Aerospace Employment by State 1996-2000.....	15
Figure 2-C. Average Wage by State 1996-2000	17
Figure 4-A. Aerospace Industry Sales	24
Figure 5-A. NASA FY 2001 Procurement Distribution	30
Figure 5-B. NASA Procurements by % of Total	30
Figure 5-C. Projected Distribution of Full Time Equivalent Workers FY 2003.....	31
Figure 5-D. JSC Economic Impact FY2000.....	32
Figure 5-E. JSC Job Impact FY2000.....	32
Figure 6-A. Military Contracts	36
Figure 6-B. Military Payroll	36
Figure 8-A. Arizona Workforce Trend Compared to Total Workforce	53
Figure 8-B. Year to Year Percentage Change in Arizona, Phoenix-Mesa MA, and Tucson MA Nonfarm Employment, Qtr. 3 1998-Qtr. 2001.....	53
Figure 9-A. NASA FY2001 Procurement Distribution.....	68
Figure 9-B. NASA FY2001 Procurement Activity by Facility	68
Figure 16-A. Washington State Annual Aerospace Employment	118
Figure 16-B. Aerospace Employment as a Percentage of Total State Employment	119
Figure 16-C. Active Aircraft Population	120
Figure 16-D. Total NASA FY2001 Procurement.....	121

List of Tables

Table 1-A. Key Benefits and Challenges for Industry Clusters	6
Table 2-A. Comparison of State Grades	10
Table 2-B. Percent of Population over 25 who graduated from High School, 1999	10
Table 2-C. Total Fall Enrollment in Degree Granting Institutions by State	11
Table 2-D. Graduate Enrollment in Aerospace Engineering	11
Table 2-E. Total Bachelor’s and Master’s Degrees Conferred by Degree Granting Institutions	12
Table 2-F. Total Computer Science and Engineering Bachelor’s and Master’s Degrees Conferred by Degree Granting Institutions	12
Table 2-G. Comparison of Aerospace Industry as Percentage* of Total Non-farm Non-agricultural Workforce	14
Table 2-H. Number Employed in Aerospace Industry as Defined by SIC Codes.....	16
Table 2-I. Average Wage for Aerospace Industry by State.....	17
Table 3-A. Economic Impact of Aviation	19
Table 3-B. Major Airports in the U.S.- 1998.....	21
Table 3-C. Data for the U.S. Scheduled Airline Industry By State- 1998.....	22
Table 3-D. 1999 General Aviation Measures	23
Table 3-E. Growth in Texas General Aviation.....	23
Table 4-A. Aerospace sales and the National Economy.....	25
Table 4-B. Major Texas Aerospace Counties.....	27
Table 4-C. International Export Markets for Texas	28
Table 7-A. Alabama Aerospace Employment	45
Table 7-B. Alabama General Aviation Measures.....	46
Table 7-C. Alabama NASA Procurements	47
Table 8-A. Arizona General Aviation Measures	54
Table 8-B. Arizona NASA Procurements	55
Table 9-A. California Aerospace Employment	65
Table 10-A. Florida Aerospace Employment	74
Table 10-B. Florida General Aviation Measures.....	75

Table 10-C. Florida NASA Procurement	76
Table 11-A. Georgia State-Administered Financial Incentive Programs	81
Table 11-B. Financial Incentives Provided For Business By Georgia 1996	82
Table 11-C. Total Georgia Fall Enrollment in Degree Granting Institutions.....	84
Table 11-D. Georgia Aerospace Employment and Wage Statistics	85
Table 11-E. Aircraft Population by State Rankings	86
Table 11-F. Georgia General Aviation Measures.....	86
Table 12-A. Kansas General Aviation Measures.....	93
Table 13-A. Mississippi Aerospace Employment	99
Table 14-A. Oklahoma General Aviation Measures	106

Executive Summary

This report was undertaken through a cooperative agreement between the Texas Aerospace Commission and a team of seven students and two faculty advisors from the George Bush School of Government and Public Service at Texas A&M. The Texas Aerospace Commission (TAC) was formed to identify and capitalize on economic development opportunities presented by the aerospace industry. As part of the Commission's strategic planning process, the Commission identified research needs and recruited the Bush School to fill some of those needs.

The following report consists of two major components. The first section of the report analyzes the factors that will affect the ability of the state of Texas to attract and retain aerospace-related concerns. This section of the report analyzes the following factors: statewide economic development policy, human capital, aviation, space and military. The second portion of the report provides a comparative analysis of ten states with which Texas will be competing for future aerospace-related economic development opportunities.

The table below ranks the eleven states examined in this report in categories directly or indirectly related to current and future aerospace-related opportunities. Additional data and rankings can be found in each individual state's respective briefing.

Rankings of 11 States on Selected Aerospace and Economic Development Benchmarks

	California	Texas	Florida	Virginia	Washington	Arizona	Georgia	Alabama	Kansas	Oklahoma	Mississippi
Average Ranking (Aerospace related)	1.4	2.2	2.7	4.5	4.6	4.9	5.0	5.8	6.4	6.5	7.9
Aerospace Employed (98-00 avg)	1	2	3	8	4	7	5	9	6	10	11
Aerospace as % of Workforce (98-00 avg)	4	6	7	10	2	3	5	9	1	8	11
Military Contract (00)	1	3	4	2	8	5	6	7	11	10	9
Military payroll (00)	2	3	4	1	6	9	5	8	11	7	10
Aircraft Population (99)	1	2	3	9	4	5	6	10	8	7	11
Aircraft Active (99)	1	2	3	8	4	5	6	10	9	7	11
Percentage Active (99)	4	5	3	2	7	10	11	1	6	8	9
Estimated Hours Flown (99)	1	3	2	10	4	5	7	9	6	8	11
NASA FY 01 Procurement	2	1	3	5	8	7	9	4	11	10	6
Comp Sci & Eng BA	1	2	3	4	8	7	5	6	10	9	11
Comp Sci and Eng MA	1	2	3	4	9	6	5	8	10	7	11

	California	Texas	Florida	Virginia	Washington	Arizona	Georgia	Alabama	Kansas	Oklahoma	Mississippi
Average Ranking (Economic related)	4.1	5.4	5.7	2.8	2.7	7.0	5.8	7.8	5.8	8.0	11.0
Avg Annual Salary (98)	1	3	7	4	2	6	5	8	9	10	11
Per Capita Income (99)	2	7	4	3	1	8	5	9	6	10	11
Median Household Income (98)	3	8	9	2	1	5	4	7	6	10	11
Percent Below Poverty (98)	9	8	4	1	2	10	5	7	3	6	11
Average Per Pupil Spending (99)	8	4	6	3	1	9	5	10	2	7	11
HS Graduate Plus (99)	9	10	6	3	1	5	8	7	2	4	11
College Graduate Plus (99)	3	5	9	1	2	6	10	8	4	7	11
Total BAs	1	2	3	4	6	8	5	7	10	9	11
Total MAs	1	2	3	4	8	6	5	7	10	9	11

Texas Overview

We recognize that many factors will affect the evolution of the aerospace industry in Texas. In the following five sections we have identified what we believe to be the major factors and have gathered data within those areas.

Economic Development

Economic development in the state of Texas is highly decentralized, with a considerable emphasis on local control of economic development efforts. However, two significant statewide economic development initiatives are underway. The governor has appointed the Governor's Task Force for Economic Growth, and the Texas Department of Economic Development is scheduled to publish the Texas Statewide Economic Development Plan on September 1, 2002.

- *Strategies*

Industry Clusters: Texas, along with many other states is considering developing industry clusters that focus on certain economic sectors.

Incentives: **Texas provides economic development incentives on both the state and local levels. However, Texas is not as aggressive as other states concerning the use of statewide incentive programs.**

- *Role of Texas Aerospace Commission*

Given the current focus on statewide economic development policy, the Texas Aerospace Commission has an opportunity to develop a strategic vision for the agency that can fit within the statewide economic development vision.

Human Capital

Texas compares well with the other states in the study in terms of both the total number of degrees granted by institutions of higher education and the total number of aerospace related degrees. Texas ranks 2nd behind California in the number of people employed in aerospace-related activities. Aerospace-related employees make up approximately 2% of the workforce.

The Texas Space Grant Consortium is comprised of 34 institutions that participate in various activities targeted towards the aerospace industry including Space Explorers, San Antonio Best, and NASA MarsPort Engineering Project.

Aviation

Texas has numerous aviation assets including five of the 55 most active airports and the most plane departures of any of the states studied in this report. Texas ranks 3rd behind California and Florida in both its aircraft population and number of active aircraft.

Aerospace Manufacturing

Texas is home to numerous aerospace manufacturing companies and these companies are enjoying significant growth in their exports, especially exports destined for Mexico.

- Impacts of September 11th

The national aerospace industry was thriving before September 11th, as demonstrated by a significant backlog of orders. However, the events of September 11th have caused a cancellation of aircraft orders and have created a belief that a recovery in aviation manufacturing may take many years.

Space

Texas is a major beneficiary of federal support for NASA. Texas received approximately \$3.7 billion in NASA funds in FY2001, the most of any state. The Johnson Space Center employs approximately 2,975 FTE employees, with the total number of jobs generated by the JSC totaling almost 50,000.

- Future

NASA is planning to decrease the level of funding for the Johnson Space Center over the next two years. In addition, federal budget cutbacks and an increase in other budget items may cause additional cuts.

Military

Texas receives approximately \$41.3 billion in economic benefit from military expenditures. In addition, Texas ranks behind only Virginia and California in terms of military appropriations.

- BRAC

The next Base Realignment and Closing recommendations will not be released until 2005. However, two military installations are losing employees, a potential signal that those bases may be slated to close.

State Briefings

Ten states were selected to provide comparisons to Texas. The research team attempted to compile both quantitative and qualitative data that would be helpful in identifying potential strategies for the development of the aerospace industry in Texas. The quantifiable data is summarized in the table of rankings found on page vii. In this section, the most relevant distinctive features of each of the competitor states are highlighted.

Alabama

Alabama has shown an ability to recruit large corporations, highlighted by recent plant openings by Boeing and Hyundai. In addition, the governor and legislature have shown the ability to work together (including passing legislation) to stimulate growth in aerospace-related opportunities.

Arizona

The state of Arizona has three state organizations focused on aerospace-related activities. The state is employing a cluster-based economic development strategy and offers numerous statewide economic development incentives.

California

The state has taken an active role in both encouraging and assisting local groups to develop strategies to stave off military base closings. In addition, companies in the state have found ways to alter their production from defense-related output to high technology-related output. From a structural perspective, the state has a California Space and Technology Alliance that is focused on developing a Space Infrastructure Master Plan.

Florida

Florida has numerous public and private agencies that promote the aerospace industry and has adopted a centralized approach to economic development planning. In addition, the Kennedy Space Center, because of its location and function, will continue to make Florida a significant player in any space-based economic development in the future.

Georgia

Georgia does not have a statewide agency dedicated to aerospace-related development. However, Georgia has many educational programs at both the primary, secondary and collegiate level that focus on aerospace-related learning. Also, the state does provide economic development incentives and contains manufacturing facilities for many large aerospace manufacturers.

Kansas

Kansas' aerospace-related companies are assisted by statewide agencies in developing both foreign and domestic markets. In addition, policymakers in Kansas have shown a willingness to work directly with industry officials to develop policies that benefit the aerospace industry in the state.

Mississippi

Mississippi has provided generous tax incentives through both general statewide policy and through specific legislation targeted toward a single company. The state is attempting to adopt a cluster-based economic development strategy with its encouragement of an information technology cluster and providing incentives for companies to locate near the Stennis Space Center. Finally, Senator Trent Lott has shown a willingness to push hard for federal aerospace contracts to be granted to Mississippi companies.

Oklahoma

Policymakers in Oklahoma have shown a willingness to work with the aerospace industry to promote economic development in the state. The legislature has passed economic development incentive packages that will assist both the entire aerospace industry and specific aerospace companies.

Washington

In 2001, Boeing, the world's leading commercial jet manufacturer, moved its corporate headquarters out of Washington. In 2002, the state legislature passed a resolution establishing a select committee to focus on retaining and expanding the aerospace industry in Washington. More generally, the state has numerous economic development-related state agencies, provides numerous tax incentives and has a governor that has pledged to act on regulatory reform and long-range economic development planning.

Virginia

Virginia has created statewide economic development policymaking bodies to position Virginia as a leader in high technology. The state has also created a public/private partnership focused on promoting economic development within the state. Virginia also offers numerous tax incentives for businesses.

Texas Overview

Introduction

The aerospace industry, as a tool for economic development, is of particular interest to the Texas Aerospace Commission. In order to promote the development of the aerospace industry, it is important to understand some of the conditions and situations that surround the industry as a whole. The following section provides information on some major components of the aerospace industry as they relate to Texas including aviation, manufacturing, space, and military. The best place to start this discussion is to first define aerospace.

Aerospace can be defined narrowly or broadly. This report will base its definition of aerospace on one given by the Aerospace Industry Association (AIA), Kansas Commission on Aerospace Education. Broadly defined, aerospace “describes items used and activities performed above the earth’s surface.”¹ A more specific definition of the aerospace *industry* is that it includes “research, development, and manufacture of aerospace systems including: manned and unmanned aircraft, missiles, spacecraft, space launch vehicles, propulsion, guidance and control units for all of the foregoing, and a variety of airborne and ground-based equipment essential to the test, operation, and maintenance of flight vehicles.”²

This section will provide information regarding Texas and some major components of the aerospace industry. The following components have been studied:

- Economic Development
- Human Capital
- Aviation
- Aerospace Manufacturing
- Space
- Military

Each section will present data comparing Texas to ten key competitor states, and will highlight Texas’ strengths in that particular aspect of the aerospace industry.

¹ “Brochure.” *Kansas Commission on Aerospace Education*. Online. Available at: <http://www.kcae.org/>

² “Glossary.” *Aerospace Industry Association*. Online. Available at: http://www.aia-aerospace.org/stats/facts_figures/ff_00_01/Ff00p157-163.pdf

Economic Development

Introduction

“Economic development is fundamentally about enhancing the factors of productive capacity – land, labor, capital and technology – of a national, state or local economy”³

This section will outline the recent history of statewide economic development efforts and suggest areas in which the Texas Aerospace Commission (TAC) may be able to create a niche for itself. In addition, the section will highlight the strengths and weaknesses of statewide economic development as it is currently planned and then suggest some economic development strategies that the TAC may consider advocating to both the legislature and aerospace concerns.

Key Points

- The Texas Aerospace Commission has the opportunity to significantly impact future economic development efforts in Texas because of recent legislation and government appointments.
- The Texas Aerospace Commission must find innovative ways to balance the desire for local control of economic development initiatives and the need for statewide advocacy for significant economic development projects.

³ “What is Economic Development.” *United States Department of Commerce*. Online. Available at: http://www.doc.gov/eda/html/2a1_whatised.htm. Viewed 25 March 2002.

Strategy

Recent Steps Toward Statewide Economic Development Efforts in Texas

Texas Strategic Economic Development Planning Commission

In 1998, the Texas Strategic Economic Development Planning Commission presented a plan that was designed to “strengthen the state’s economic development resources.”⁴ The Commission found that the most significant challenge facing the state was the education and training of its workforce and argued “education and workforce development should be Texas’ top priority.”⁵ The Commission identified problems with the delivery of workforce development training by state agencies, but insisted that “the thrust of workforce development in Texas continues to be local.” The Commission went on to argue that Texas “needs a comprehensive vision and plan.”⁶

Texas Statewide Economic Development Plan

The 77th Texas Legislature passed HB 931, calling for the development of a statewide economic development plan. The plan calls for the Texas Department of Economic Development, in consultation with the Comptroller, to “develop a comprehensive statewide economic development plan to be updated every five years.”⁷ The bill requires that the first five-year plan be adopted no later than September 1, 2002.⁸

Governor’s Task Force for Economic Growth

On February 26, 2002, Governor Perry announced the formation of the Governor’s Task Force For Economic Growth to advise him “on ways to ensure long-term economic growth in Texas.”⁹ TAC should take special note of four individuals on the 29-member Task Force:

Dain Hancock: Corporate Vice President and President of the Aeronautics Company for Lockheed Martin.

David Lund: Director of the Aerospace Vehicle Systems Institute at the Texas Engineering Experiment Station at Texas A&M University.

⁴ Stephens, F.L. “Texas Strategic Economic Development Plan 1998-2008.” *The Texas Strategic Economic Development Planning Commission*. 10 October 1998.

⁵ Ibid.

⁶ Ibid, p.23.

⁷ “House Bill 931.” 77th Texas Legislature. Online. Available at: <http://www.capitol.state.tx.us/cgi-bin/db2www/tlo/billhist/billhist.d2w/report?LEG=77&SESS=R&CHAMBER=H&BILLTYPE=B&BILLSUFFIX=00931>

⁸ Ibid.

⁹ Press Release. *Office of Governor Rick Perry*. 26 February 2002.

Terrance P. O’Mahoney: Commissioner Representing Labor for the Texas Workforce Commission, and retired pilot.

Russell Turner: President of United Space Alliance.

The TAC should attempt to work with these natural allies to gain insight into the process through which recommendations will be made. In turn, TAC can play a more active role in forming a statewide strategic vision.

Overview of Current Economic Development Landscape in Texas

Economic development in the state of Texas is far more decentralized than in other states. The decision to decentralize economic development in the state was a conscious and statutory decision. This is evidenced by the philosophy of Texas state government, noted in the Texas Department of Economic Development’s strategic plan: “The best form of government is one that is closest to the people. State government should respect the right and ability of local communities to resolve issues that affect them.”¹⁰

Local Economic and Community Development Taxes

This commitment to decentralization is statutorily enforced. In 1979, the state legislature passed the Development Corporation Act that allows local municipalities to create an economic development corporation and fund that entity with a sales tax.¹¹ The money generated from this tax would be used to promote economic development in the area.¹² In 1991, the legislature amended this law, allowing for the creation of community development corporations, also funded by sales tax revenue.¹³ This was done to allow municipalities to fund a wider variety of programs. These two taxes are commonly known as Section 4A and Section 4B, respectively.

Policy Implications of the Current Structure on the Aerospace Industry

We recognize the state’s commitment to allowing local government considerable latitude when determining economic development policy. However, policymakers must be aware of both the potential benefits and costs of the current structure. Although the current structure allows for localities to allocate funds as they see fit, such a structure can also lead to intercity conflict between localities competing for a development project. More importantly, state policymakers must be cognizant of the level of policy commitment put forth by other states towards economic development within the aerospace industry.

¹⁰ *Texas Department of Economic Development Strategic Plan*. 13 July 2000. Online. Available at: <http://www.tded.state.tx.us/agencyreports/plana2.pdf> . Viewed April 28, 2002. Page 2.

¹¹ *Handbook on Economic Development Laws for Cities*. Volume 1. Office of the Attorney General: 2000, p.2.

¹² *Ibid*, p.2-3.

¹³ *Ibid*, p.3.

Competitive Disadvantages

In 2001, Boeing decided to relocate their headquarters to Chicago, instead of within the Dallas-Fort Worth Metroplex. After Boeing had decided to locate in the state, the Illinois Legislature provided the company with approximately \$30 million in economic incentives.¹⁴ The appropriateness of incentives will be discussed later, but the important points to note are: 1) a competitor state was willing to pass statewide legislation to assist a specific region attracting a major corporation, and 2) the biannual nature of the Texas legislature may prevent the legislature from acting to lure a company to the state within a suitable timeframe.

Strategies to Guide Economic Development in Texas

Numerous theories exist to describe, explain and predict various economic development strategies and their respective costs, benefits, tradeoffs and desired outcomes. The most important decision for policymakers is to decide what tradeoffs and sacrifices are worth making in an attempt to realize certain economic benefits.

Industry Clusters

As mentioned earlier, those involved with the Texas Strategic Economic Development Planning Commission in 1998 cited strong industry clusters as a strategic asset to Texas. By definition, “industry clusters are geographic concentrations of competing, complementary or interdependent firms that do business with each other and/or have common needs for talent, technology and infrastructure.”¹⁵ In Texas, for example, the Clear Lake/Houston area has a concentration of space-related industries, while San Antonio houses maintenance, repair, and overhaul facilities, and the Dallas/Fort Worth area has a cluster of commercial air-related industries.

Benefits and Drawbacks to Clusters

Numerous benefits are afforded to areas that have focused on developing industry clusters. The following chart notes some of the benefits and challenges of industry clusters. (see next page)

¹⁴ “Governor Ryan, Mayor Daley Welcome Boeing Home.” *Governor George H. Ryan Press Release*. 5 September 2001.

¹⁵ Munnich, Lee W., Jr. “Industry Clusters: An Economic Development Strategy for Minnesota.” January 1999. Online. Available at: <http://www.hhh.umn.edu/centers/slp/edweb/ic-rep.htm>. Viewed on 24 March 2002.

Table 1-A. Key Benefits and Challenges for Industry Clusters

Benefits	Challenges
<ul style="list-style-type: none"> • Creates a framework for collaboration • Relies on an existing organizational infrastructure • Helps build a common agenda • Helps achieve economies of scale • Uses workforce shortage to focus on higher wage and competitive advantage industries • Focuses and coordinates existing resources • Provides information for educators (job descriptions) • Facilitates developing a higher competence level • Mitigates inter-industry competitive fears (builds trust and cooperation) once implemented 	<ul style="list-style-type: none"> • Needs to be industry driven • Defining the industry could be a challenge • Difficulty in selecting scale of strategy (state, regional, local) • Do not want to create factions in the business community • There may be private industry skepticism • The nature of the political system and traditional educational institutions may be a challenge • There may be a risk of dominance by big business • Public sector response must be quick • There may be institutional barriers to implementing such a strategy • Risks picking winners and losers • Defining government's role • Setting the criteria to define a cluster

Source: "Industry Clusters: An Economic Development Strategy for Minnesota"
<http://www.hhh.umn.edu/centers/slp/edweb/ic-rep.htm>

Throughout the research on industry clusters, there is little discussion concerning a major drawback of industry clusters: a lack of diversification. If Texas were to undertake a strategy based on the establishment and development of industry clusters, it should keep in mind the potential consequences if one of the clustered industries suffers a severe recession. As proponents of clusters point out, interdependent linkages between businesses have a positive effect when the industry is doing well. However, if the industry falters, will the entire regional economy falter as well?

Incentives

Many other states have used economic development incentives as tools to generate growth. The 1998 Directory of Incentives, a database of incentives offered by states to businesses, categorizes incentives into three categories:

Direct Financial Incentives: Grants and loans made directly to companies¹⁶

Indirect Incentives: Incentives targeted to assist certain business or the business community in general, such as infrastructure improvements, increased spending on education, etc.¹⁷

Tax Incentives: Reduction of the amount of tax a jurisdiction will collect from a business. Tax incentives can be categorized into five areas: credits, abatements/reductions, exemptions, refunds and other types of tax treatments.¹⁸

In 1998, states spent approximately \$10.9 billion in various incentive programs: \$4.6 billion in foregone state tax revenues and \$6.3 billion in loans, grants, guarantees and other non-tax programs.¹⁹ These figures do not include “mega projects that require legislative approval.”²⁰

Outcomes of Incentives

The key issue when attempting to create an incentive policy or program is determining what outcomes the state wishes to achieve and what measurements will be used to achieve them. In a report prepared for the U.S. Department of Commerce Economic Development Administration, a research team analyzed the research concerning the use of incentives.²¹ What became clear throughout the report is that numerous techniques, methods and evaluative procedures can be adopted to evaluate the effectiveness of incentives.²² Economic development policymakers must heed the advice of the authors:

Different stakeholders often expect widely differing outcomes from the same development incentives. For example, some expect solutions to deep-seated poverty and unemployment problems. Others expect to create specific types of jobs for certain segments of the population. And yet others look to these programs to overcome inherent deficiencies in state and local business climates²³

If Texas wishes to use statewide economic development incentives, policymakers must be clear as to what constitutes a successful investment: increases in personal income, increases in tax revenue, higher employment levels, etc.

¹⁶ Poole, Kenneth, et. al. “Evaluating Business Development Incentives.” *National Association of State Development Agencies, prepared for the United States Department of Commerce, Economic Development Administration, Project#99-07-13794*. Page 13.

¹⁷ Poole, Kenneth, et. al. “Evaluating Business Development Incentives.” *National Association of State Development Agencies, prepared for the United States Department of Commerce, Economic Development Administration, Project#99-07-13794*. Page 13.

¹⁸ Ibid.

¹⁹ Ibid, p.i.

²⁰ Ibid.

²¹ Ibid.

²² Ibid, see Table of Contents.

²³ Ibid, p.111-112.

Human Capital

Introduction

The aerospace industry is highly technical and employers need well-informed, knowledgeable employees who are able to keep up with rapid technological advancements.²⁴ Therefore, skilled production, professional specialty, and technical jobs make up the bulk of employment.²⁵ Some of the jobs available in aerospace consist of various types of engineers including analytical, design, systems, software, manufacturing, flight research, as well as scientists, and technicians.²⁶ These engineers are responsible for designing massive machines, developing new technologies, and mastering Computer Aided Design, robotics and lasers.²⁷

In the 2002-2003 Occupational Outlook Handbook, The Bureau of Labor Statistics estimates that employment for aerospace engineers will grow as fast as the average for all other occupations through 2010.²⁸ With this growth, advancements in technology, and increasing demands placed on aerospace workers, Texas must continue to develop in these areas. It is essential that its future labor force be educated to fulfill this demand.

For the purpose of this study the aerospace industry is defined as “research, development, and manufacture of aerospace systems including: manned and unmanned aircraft, missiles, spacecraft, space launch vehicles, propulsion, guidance and control units for all of the foregoing, and a variety of airborne and ground-based equipment essential to the test, operation, and maintenance of flight vehicles.”²⁹ Air transportation, airports and fields have also been included to ensure a more complete representation of the aerospace industry.

In order to quantify the aerospace industry, Standard Industrial Classification (SIC) codes associated with the definition were requested from each state. Under general headings these include manufacturing for electronic & other electric equipment, transportation equipment, instruments & related products, and transportation by air (See Appendix 1 for full list). However, this is not an exhaustive list. The aerospace industry is dominated by a few large companies that contract and subcontract with other companies that produce smaller components.³⁰ Due to the nature of manufacturing it would require an extensive and less exclusive list to include all parties involved. Therefore, it must be noted that any representation of the aerospace industry within this report is a conservative estimate.

²⁴ “Career Guide.” *Bureau of Labor Statistics*. Online. Available at: <http://www.bls.gov/oco/pdf/cgs006.pdf>. Page 39.

²⁵ *Ibid.*

²⁶ “Types of Jobs.” *NASA*. Online. Available at: <http://quet.arc.nasa.gov/aero/background/careers/>

²⁷ “Occupational Outlook Handbook.” *Bureau of Labor Statistics*. Online. Available at: <http://www.bls.gov/oco/ocos028.htm>. Page 106.

²⁸ *Ibid.*

²⁹ *Aerospace Industries Association*. Online. Available at: <http://www.aia-aerospace.org/>

³⁰ “Career Guide.” *Bureau of Labor Statistics*. Online. Available at: <http://www.bls.gov/oco/pdf/cgs006.pdf>. Page 39.

Education

Education is a key factor in any economic development endeavor, especially the development of the aerospace industry. Many people focus specifically on post-secondary education. Although this is an integral part of providing the labor force with qualified workers, elementary and secondary educations are the building blocks for higher education.

Within Texas there are several opportunities for extra-curricular activities and hands-on learning. A full discussion will have to be left for another report. However, the fact that the Johnson Space Center is in Texas allows close access to the many programs it provides. In addition, the Texas Space Grant Consortium, which is comprised of 34 institutions including universities, industrial organizations, non-profit organizations, and government agencies within Texas, administers several different programs aimed toward K-12 and higher education.³¹ One of these is Space Explorers, which aids middle school teachers with curriculum geared toward mathematics, language arts, social studies, science, computer technology, theater, health, physical education, and art.³² They also provide competitions for varying educational levels. San Antonio Best, for example, is a competition where high school students design a remote controlled machine that is intended to accomplish a certain task.³³ Additionally, there are competitions for college students with the NASA MarsPort Engineering Project.³⁴

State Comparisons of Educational Excellence

For the past six years *Education Week* has provided a yearly “Quality Counts” report. Within this report each state is graded based on more than 80 indicators in the categories of student achievement, standards and accountability, efforts to improve teacher quality, school climate, and resources.³⁵ Table 2-A outlines how each state compares since 1999. Excluding California and Oklahoma, it appears that over time states are earning poorer grades. However, Texas has not decreased as drastically as Florida or Kansas and ranks third in the average of 1999-2002.

³¹ *Texas Space Grant Consortium*. Online. Available at: <http://www.tsgc.utexas.edu/>

³² “Space Explorers.” *Texas Space Grant Consortium*. Online. Available at: <http://www.tsgc.utexas.edu/>

³³ “SA Best.” *Texas Space Grant Consortium*. Online. Available at: <http://www.tsgc.utexas.edu/>

³⁴ “NASA MarsPort Design Student Competition.” *Texas Space Grant Consortium*. Online. Available at: <http://www.tsgc.utexas.edu/>

³⁵ “How we graded the states.” *Education Week*. Online. Available at: <http://www.edweek.org/sreports/qc00/templates/article.cfm?slug=grading.htm#stand>

Table 2-A. Comparison of State Grades

	1999	2000	2001	2002	4 Yr Avg.
Florida	92	91	84	90	89
Virginia	92	92	86	86	89
Texas	88	88	84	82	86
California	80	89	85	85	85
Kansas	90	90	83	77	85
Alabama	88	88	79	79	84
Georgia	89	89	78	80	84
Arizona	86	87	77	77	82
Oklahoma	70	91	83	83	82
Washington	77	77	67	68	72
Mississippi	77	77	62	67	71

Source: Compilation of 1999-2002 *Quality Counts* Yearly Reports, Education Week

Table 2-B: Percent of Population over 25 who graduated from High School, 1999

US Average	83.40%
Washington	91.20%
Kansas	87.60%
Virginia	87.30%
Oklahoma	83.50%
Arizona	83.10%
Florida	82.70%
Alabama	81.10%
Georgia	80.70%
California	80.40%
Texas	78.20%
Mississippi	78.00%

Source: U.S. Census Bureau, 1990 Census of Population

Higher Education Fall Enrollment in Competitor States

Total fall enrollment for years 1996 to 1999 was provided in the National Center for Education Statistics, Digest of Education Statistics, Table 2-C. In order to compare the states in a more meaningful manner, for each state, the average of the four years was divided by the total population for each state. Census 2000 data was used due to the lack of 1996-1999 totals. This provides a conservative estimate of the percentage of the population enrolled in degree granting institutions. As indicated in Table 2-C, among the eleven states compared,

Texas ranks 8th for percent of population enrolled in degree granting institutions. Several factors could contribute to this. For example, a large proportion of Texans may not fall into the age category usually associated with those in higher education. A more troubling explanation may be that Texans just are not continuing their education. Additional research is needed to determine a plausible explanation.

Table 2-C. Total Fall Enrollment in Degree Granting Institutions by State

	1996*	1997*	1998*	1999*	Avg. (96-99)	2000	% of 2000
Kansas	173,865	177,544	177,561	176,737	176,427	2,688,418	6.56%
Arizona	288,036	292,730	302,123	326,159	302,262	5,130,632	5.89%
California	1,900,099	1,958,200	1,949,508	2,017,483	1,956,323	33,871,648	5.78%
Washington	303,450	315,281	298,874	306,723	306,082	5,894,121	5.19%
Virginia	355,190	364,904	370,142	377,970	367,052	7,078,515	5.19%
Oklahoma	177,166	177,157	178,507	179,055	177,971	3,450,654	5.16%
Alabama	220,711	218,785	216,241	223,144	219,720	4,447,100	4.94%
Texas	959,698	969,283	978,550	990,587	974,530	20,851,820	4.67%
Mississippi	126,027	130,561	132,438	133,170	130,549	2,844,658	4.59%
Florida	645,832	658,259	661,187	684,745	662,506	15,982,378	4.15%
Georgia	300,795	306,238	303,685	311,812	305,633	8,186,453	3.73%

^ U.S. Census Bureau

Source: "Digest of Education Statistics." National Center for Education Statistics, 2001.

As illustrated in Table 2-D total enrollment has been increasing, compared to the decrease in the enrollment of graduate aerospace engineering.

Table 2-D. Graduate Enrollment in Aerospace Engineering

Year	Number Enrolled
1990	3,934
1991	4,120
1992	4,036
1993	3,940
1994	3,715
1995	3,343
1996	3,208
1997	3,083
1998	3,137
1999	3,349

Source: National Center for Education Statistics, Digest of Education Statistics, 2001

Tables 2-E and 2-F provide a snapshot comparison of the total number of bachelor's and master's degrees conferred and more specifically, bachelor's and master's in computer science and engineering.

Table 2-E. Total Bachelor's and Master's Degrees Conferred by Degree Granting Institutions

State	Total	
	BA	MA
Alabama	21,293	8,021
Arizona	20,865	10,234
California	121,546	44,257
Florida	51,333	17,901
Georgia	29,219	10,410
Kansas	14,234	4,908
Mississippi	10,988	3,263
Oklahoma	15,578	5,359
Texas	75,834	24,756
Virginia	33,599	11,149
Washington	24,002	7,436

Source: National Center for Education Statistics, Digest of Education Statistics, 2001

Table 2-F. Total Computer Science and Engineering Bachelor's and Master's Degrees Conferred by Degree Granting Institutions

State	Computer Science & Engineering	
	BA	MA
California	10,431	4,801
Texas	6,052	2,746
Florida	4,592	1,535
Virginia	3,381	1,332
Georgia	3,192	1,221
Alabama	2,012	481
Arizona	2,002	568
Washington	1,705	466
Oklahoma	1,390	484
Kansas	1,325	299
Mississippi	836	190

Source: National Center for Education Statistics, Digest of Education Statistics, 2001

Workforce

Figure 2-A provides a graphical representation of aerospace employees as a percentage of the total non-farm, non-agricultural work force. Kansas and Washington lead the other states by over one full percentage point. Texas is very comparable to Florida and Georgia. Table 2-G provides data from 1990 to 2000 for most states. Overall, aerospace is not a large portion of the Texas workforce. However, this information is based on individual state reporting. Some states suppressed certain SIC codes due to confidentiality issues. Each state and the codes available are outlined in the Human Capital Appendix.

Number of Employees

Figure 2-A. State Aerospace Industry as Percentage of Total Non-farm, Non-agricultural Workforce 1996-2000

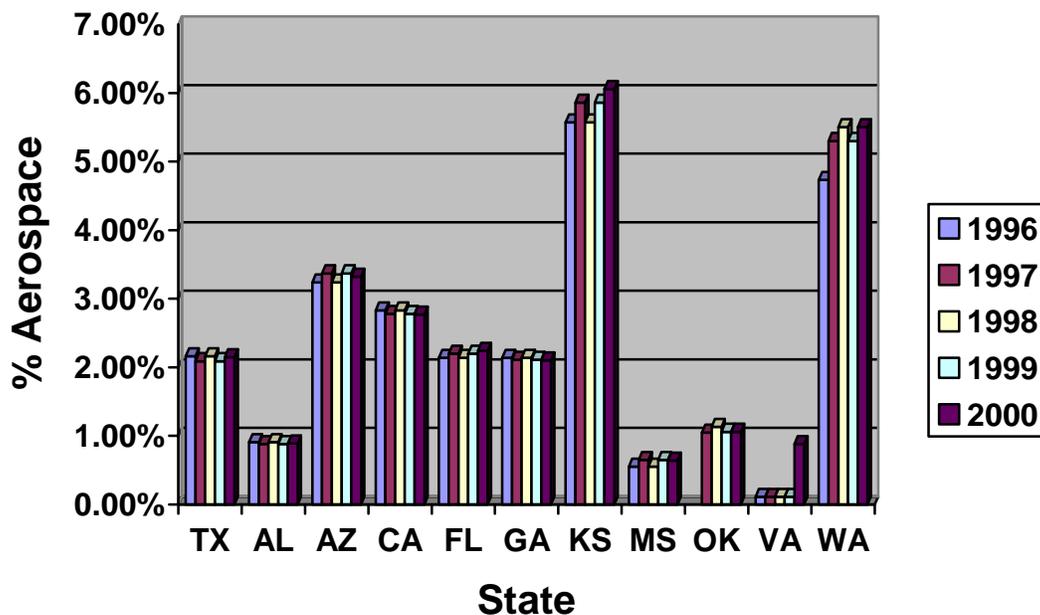


Table 2-G. Comparison of Aerospace Industry as Percentage* of Total Non-farm Non-agricultural Workforce

	Texas	Alabama	Arizona	California	Georgia	Florida	Kansas	Oklahoma	Mississippi	Virginia	Washington
1990	2.53%		3.68%	4.01%		2.32%	5.83%		0.54%	0.12%	6.42%
1991	2.48%		3.48%	3.81%		2.20%	5.78%		0.30%	0.11%	6.28%
1992	2.36%	0.99%	3.31%	3.55%		2.08%	5.65%		0.25%	0.10%	5.98%
1993	2.40%	0.89%	3.24%	3.15%		2.03%	5.19%		0.25%	0.10%	5.45%
1994	1.99%	0.80%	3.12%	2.80%		1.92%	4.99%		0.48%	0.10%	4.81%
1995	1.02%	0.79%	3.26%	2.61%		2.05%	4.94%		0.28%	0.10%	4.27%
1996	2.16%	0.91%	3.24%	2.83%	2.14%	2.14%	5.57%		0.55%	0.11%	4.73%
1997	2.09%	0.88%	3.37%	2.78%	2.20%	2.11%	5.86%	1.05%	0.65%	0.11%	5.30%
1998	2.15%	0.89%	3.32%	2.77%	2.24%	2.10%	6.06%	1.13%	0.64%	0.88%	5.50%
1999	2.15%	0.98%	3.29%	2.59%	2.21%	2.00%	6.07%	1.06%	0.61%	0.92%	4.97%
2000	1.91%	1.02%	3.17%	2.46%	2.17%	1.94%	5.86%	1.06%	0.61%	0.94%	4.43%

*Calculated using data provided from each state and Bureau of Labor Statistics
Data available through state agencies listed in Appendix A (A-1)

Figure 2-B is supplemental to Figure 2-A; it provides a graphical representation of the total number of employees in the aerospace industry. Although this is an important fact, it does not allow for the comparison that Figure 1 and Table 6 provide. Overall, the larger states and those that have major space facilities (e.g., Florida) have a greater number of people employed in the aerospace industry.

Figure 2-B. Aerospace Employment by State 1996-2000

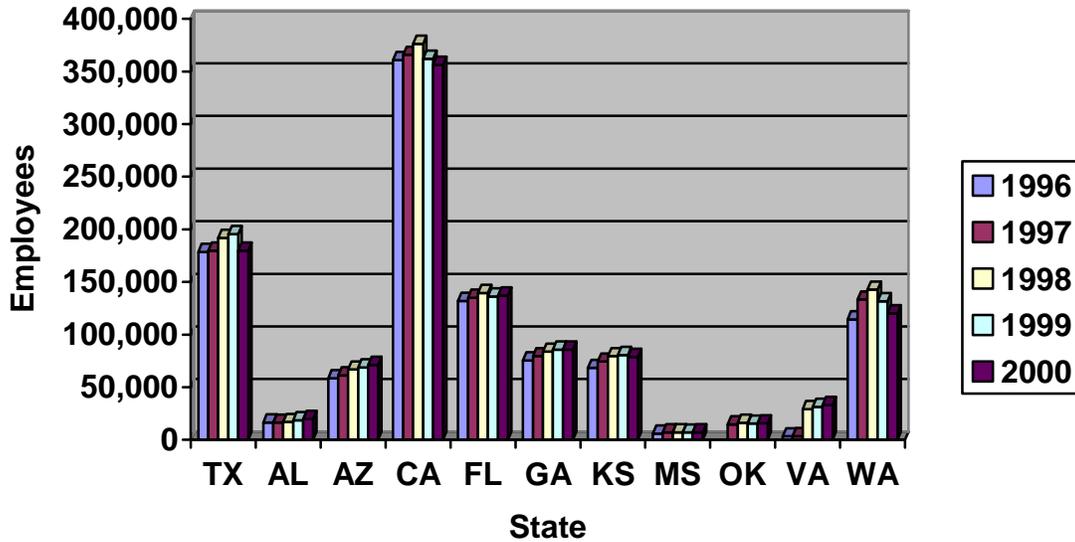


Table 2-H outlines the number of aerospace employees from 1990 to 2000. As noted earlier, this may not be a true representation of the total number of aerospace employees due to the suppression of certain SIC codes.

Table 2-H. Number Employed in Aerospace Industry as Defined by SIC Codes

Year	National	Texas***	Alabama#	Arizona	California	Florida	Georgia#	Kansas	Mississippi#	Virginia	Washington#
1990	1,302,000	179,837	N/A	54,938	500,700	125,100	N/A	63,474	5,028	3,480	137,677
1991	1,214,000	178,231	N/A	54,575	471,100	116,271	N/A	63,257	2,855	3,170	136,695
1992	1,100,000	171,733	16,646	51,833	431,700	111,697	N/A	62,946	2,417	2,952	132,818
1993	966,000	179,837	15,228	50,224	379,500	112,860	N/A	58,784	2,513	2,969	122,743
1994	855,000	154,283	14,137	51,305	340,900	111,077	N/A	58,134	5,028	3,129	110,826
1995	796,000	143,636	14,325	52,834	323,600	112,672	N/A	59,163	5,028	3,109	100,107
1996	796,000	178,581	16,513	58,501	360,800	132,059	75,384	68,358	6,023	3,353	114,355
1997	859,000	179,837	16,410	61,228	365,800	135,091	79,549	74,405	7,231	3,535	133,353
1998	896,000	191,834	16,964	66,821	376,300	139,602	83,749	79,507	7,249	29,169	142,735
1999	847,000	195,511	18,718	68,914	362,100	136,264	85,751	80,536	7,004	31,251	131,655
2000	800,000	179,837	19,781	71,164	356,300	137,084	85,665	78,708	7,079	33,079	120,157
2001	794000*	70,056^	N/A	72771^	353,700	135608^	N/A	N/A	N/A	N/A	N/A

* Year to date as of 12/4/01 AIA report

*** Average of the four quarters

^Average of first two quarters

Some codes were omitted due to confidentiality

Data available through state agencies listed in Appendix A

Wages of Aerospace Employees

Not every state provided wage information; Figure 2-C and Table 2-I compare the five states for which information was available. Texas ranks below Washington and Florida in average wage.

Figure 2-C. Average Wage by State 1996-2000

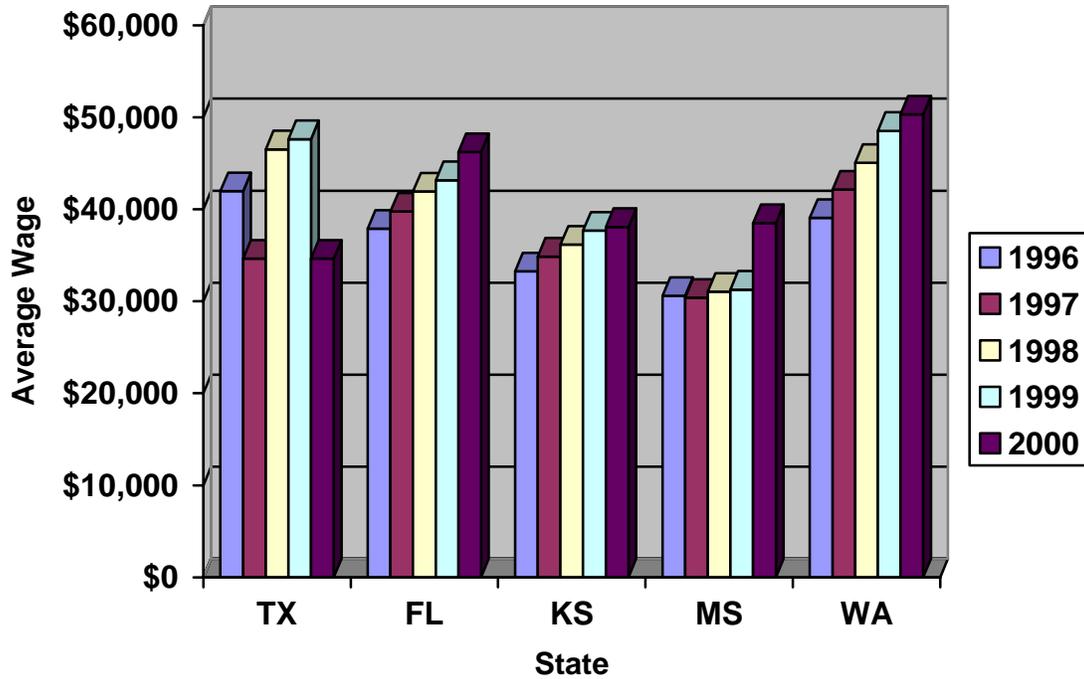


Table 2-I. Average Wage for Aerospace Industry by State

	National**	Texas^	Florida	Georgia#	Kansas	Mississippi#	Washington#
1990	\$32,448		\$30,696	N/A	\$25,846	\$27,215	\$30,489
1991	\$33,696		\$32,703	N/A	\$27,073	\$24,228	\$32,832
1992	\$35,620		\$34,739	N/A	\$29,308	\$27,130	\$34,834
1993	\$37,128		\$35,210	N/A	\$29,468	\$27,847	\$34,946
1994	\$39,208		\$36,176	N/A	\$30,679	\$27,215	\$35,786
1995	\$39,416		\$37,131	N/A	\$31,210	\$27,215	\$37,613
1996	\$41,652		\$37,874	\$40,748	\$33,252	\$30,585	\$39,053
1997	\$43,888		\$39,745	\$44,258	\$34,857	\$30,382	\$42,133
1998	\$44,044		\$41,934	\$48,111	\$36,163	\$31,029	\$45,052
1999	\$43,784		\$43,161	\$55,339	\$37,675	\$31,267	\$48,517
2000	\$46,124 *		\$46,225	\$53,326	\$38,077	\$38,491	\$50,292

* Year to date as of 12/4/01 AIA report

** For production workers only. Given as weekly then multiplied by 52.

^Texas figures were unavailable

Some codes were omitted due to confidentiality

Data available through state agencies listed in Appendix A

Summary Highlights

1. Texas, in comparison to the other ten states, fares well with regard to the standards of Education Week's *Quality Counts* report. Texas also compares well with the other states in both the total number of degrees granted by institutions of higher education and the total number of aerospace related degrees.
2. Aerospace only represents 2 percent of the Texas workforce, in comparison to Washington at approximately 4.5 percent. Texas' average wages in the aerospace industry declined over \$10,000 per worker in 2000.
3. Texas' total fall enrollment in degree granting institutions has risen from 959,698 in 1996 to 990,587 in 1999.

Aviation

Introduction

Civil aviation is typically broken down into two main categories: general aviation and commercial aviation. The International Civil Aviation Organization (ICAO) defines general aviation as “all civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire.”³⁶ This definition typically entails most private aviation activities, including private transport and sport aviation activities. Commercial aviation is commonly defined as the use of large aircraft for passenger service and cargo transport by for-profit companies and corporations. The distinction between the two allows for the related but diverse needs and requirements of both aspects of civil aviation.

Economic Impact of Civil Aviation

The economic impact of the aviation industry in the United States is widely measured, as the industry represents one of the largest business enterprises in the nation. MCA Research and the Federal Aviation Administration (FAA) asked Wilbur Smith Associates to provide a study of the estimated economic impact of the aviation industry in the U.S. During Fiscal Year 1998, they determined that the estimated total annual impact of the industry was \$975.7 billion.³⁷ Of that sum, an estimated \$911.2 billion was produced by commercial aviation, and \$64.5 billion by general aviation.³⁸

The study broke down the impacts a different way, looking at direct impacts, indirect impacts, and induced impacts:

Table 3-A. Economic Impact of Aviation

<u>Direct Economic Impacts</u>	<u>Indirect Economic Impacts</u>
Airline operations \$84.1 b.	Airline passengers \$179.6 b.
Airport operations 13.8 b.	G.A. passengers 2.8 b.
General aviation 9.7 b.	Travel arrangements 5.8 b.
Aircraft manuf. 42.5 b.	Other G.A. 1.4 b.
Total.....\$150.1 b	Total.....\$189.6 b.
<u>Induced Economic Impacts</u>	
From Direct Impacts \$296.0 b.	
From Indirect Impacts 340.0 b.	
Total.....\$636.0 b.	
Total Annual Impact..... \$975.7 billion	

Source: “Aviation’s 1998 Economic Activity Impacts.” *Economic Impact of Civil Aviation*.

³⁶“IAOPA Contributions.” *IAOPA*. Online. Available at <http://www.iaopa.org/welcome/contrib.html>

³⁷ “Aviation’s 1998 Economic Activity Impacts.” *Economic Impact of Civil Aviation*. Wilbur Smith Associates.

³⁸ Ibid.

One important observation that must be made in reviewing this basic examination of economic activity generated by aviation is that manufacturing plays a minimal role in the overall economic impact of aviation. The \$42.5 billion³⁹ generated by aviation manufacturing annually is a small slice of the total annual economic impact of aviation across the U.S. While that figure is in no way inconsequential, it is dwarfed by the \$179.6 billion in economic activity generated in 1998 by airline passengers.⁴⁰ Once induced economic impacts are included, the total economic impact of aircraft manufacturing only represents \$126.9 billion out of a total \$975.7 billion in aviation economic impacts, still much smaller than the annual economic impact of passenger traffic.⁴¹

One conclusion that can be drawn from these figures is that while manufacturing may seem to present the greatest opportunity for economic growth, a focus on passenger traffic may in the long run represent the best opportunity for a state to obtain and maintain a steady revenue stream from aviation.

Activity at Major Airports

The vast economic potential represented by passenger traffic is felt in Texas. Texas has several of the nation's largest airports, thus positioning itself to take advantage of the high volume of economic activity generated by the traveling public. All of the major airports in Texas serve as either national or regional hubs for some of the biggest airlines in the country. Dallas/Fort Worth Airport (DFW) serves as American Airlines' main hub. DFW also serves as one of Delta's largest regional hubs. Houston Intercontinental Airport (IAH) serves as Continental's main hub. Both Dallas Love Field and Houston Hobby Airport serve as major hubs for Southwest Airlines.⁴²

Texas has five of the 55 most active airports in the country when measured by annual passenger traffic, including DFW (4), Houston International (12), Houston Hobby (41), Dallas Love Field (49), and Austin (53). The total annual passenger traffic at those five airports is 113,040,984 passengers. Table 3-B lists the top fifteen airports in the nation in terms of annual passenger traffic.

³⁹ Ibid.

⁴⁰ Ibid.

⁴¹ Ibid.

⁴² "How Airline Hubs Work." *Roberts Roach & Associates*.

Table 3-B. Major Airports in the U.S.- 1998

Airport	Total Passengers
Atlanta	73,474,298
Chicago O'Hare	72,485,228
Los Angeles	61,215,712
Dallas/Fort Worth	60,482,700
San Francisco	40,060,326
Denver	36,831,400
Miami	33,935,491
Newark	32,512,106
Phoenix	31,769,113
Detroit	31,544,426
New York Kennedy	31,436,478
Houston Int'l	31,026,369
Minneapolis/St. Paul	30,347,920
Las Vegas	30,227,287
St. Louis	28,700,622

Source: "Aviation's 1998 Economic Activity Impacts." *Economic Impact of Civil Aviation*.

For comparative purposes, the total number of passengers that used DFW and Houston Intercontinental Airports in 1998 was 91,509,069. This total exceeds the 86,795,072 passengers that collectively used New York Kennedy Airport, New York LaGuardia Airport, and New Jersey Newark Airport during the same period.⁴³ Texas' airports are not normally considered to have more traffic than the New York City area airports, but the numbers demonstrate otherwise. The economic activity generated by over 90 million people traveling through Texas airports annually plays an important role in the aviation industry in Texas.

Airline Departures and Enplanements + Employment and Compensation

Commercial activity at Texas airports includes three major elements: aircraft departures, cargo ton enplanements, and passenger enplanements. The economic strength of Texas' airports is demonstrated by a survey conducted by the Air Transport Association. That study found that Texas ranks ahead of all states in terms of departures, and second behind California in terms of passenger enplanements. Coupled with Texas' ranking just behind California in total employment and total compensation, the health of the Texas aviation industry looks strong.⁴⁴

⁴³ Ibid.

⁴⁴ "State-by-State Impact of Airlines." *Aviation Economic Impact*. Online. Available at: <http://www.airlines.org/public/industry/display1.asp?nid=1175>

Table 3-C, from the study by the Air Transport Association, demonstrates Texas' strength in comparison to other competitor states.

Table 3-C. Data for the U.S. Scheduled Airline Industry By State- 1998

State	Departures	Cargo Ton Emplane	Passenger Emplane	1997 Total Compensation
Alabama	40,287	23,920	2,288,951	\$30,094,148
Arizona	189,052	119,518	15,964,941	\$984,129,218
California	763,003	1,214,619	66,526,901	\$3,988,675,847
Florida	466,832	552,354	44,789,979	\$1,987,857,566
Georgia	397,605	354,254	35,876,088	\$2,120,436,197
Kansas	13,365	7,833	565,832	34,456,535
Mississippi	23,062	4,277	736,940	\$17,702,440
Oklahoma	56,360	31,985	3,182,598	\$671,617,929
Texas	869,801	494,641	58,092,203	3,924,820,617
Virginia	205,553	186,438	15,124,215	\$922,676,462
Washington	208,863	193,673	13,826,861	\$816,714,714

Source: "State-by-State Impact of Airlines." *Aviation Economic Impact*.

Aircraft Statistics in Texas and its Competitor States

Because of the role that general aviation plays in the aviation industry, it is critical to better understand the role that general aviation plays in Texas. Key measures of general aviation activity include aircraft population, active aircraft population, and the estimated total hours flown by a state's aircraft fleet.

Texas ranks high among its competitor states in terms of general aviation aircraft. In 1999, Texas ranked second only to California in aircraft population, number of aircraft active, and total number of hours flown by those aircraft. California, Texas, and Florida are far ahead of any other states in America.⁴⁵ The climate, geography, and availability of small regional airports in those three states create a strong pro-aviation environment. With several hundred airports serving general aviation in Texas, the opportunities for an expansion of general aviation activity are abundant.

The following chart illustrates Texas' strength in general aviation.

⁴⁵ "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

Table 3-D. 1999 General Aviation Measures

State	Aircraft Population	# active	est % active	est total hrs flown	est avg hours
Alabama	3796	3227	85	540237	167.4
Arizona	7285	5432	74.6	826596	152.2
California	31219	24760	79.3	3513424	141.9
Florida	18889	15301	81	2530511	165.4
Georgia	3550	4756	72.6	621727	130.7
Kansas	4957	3821	77.1	632530	165.5
Mississippi	2425	1850	76.3	337627	182.5
Oklahoma	5850	4479	76.6	590557	131.9
Texas	19942	15681	78.6	2382366	151.9
Virginia	4868	3946	81.1	530317	134.4
Washington	8883	6834	76.9	868444	127.1

Source: "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration.*

General aviation activity in Texas is growing. From 1996-1999, the major indicators continued rising:

Table 3-E Growth in Texas General Aviation

Aircraft population: Increased 682 aircraft (3.5%)
 Active aircraft: Increased 1901 aircraft (13.8%)
 Estimated total hours flown: Increased 188,523 hours (8.6%)

Source: "General Aviation and Air Taxi Activity Survey 1996-1999."

Summary Highlights

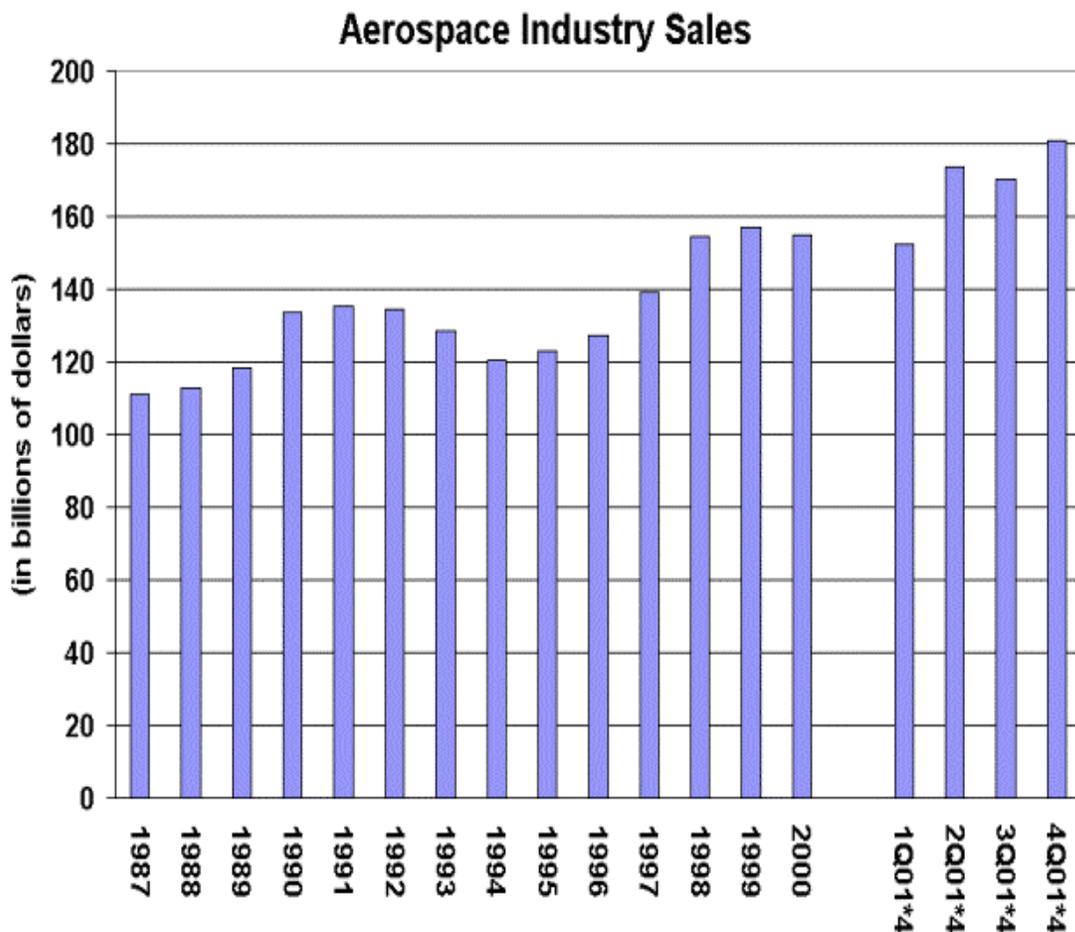
1. Passenger traffic has a larger economic impact annually than manufacturing. Texas might consider focusing on improving its share of national passenger traffic.
2. Texas is strong in passenger traffic, with two of the top twelve and five of the top fifteen highly traveled airports in the nation.
3. Texas is 3rd only to California and Florida in aircraft population, active aircraft, and total hours flown.

Aerospace Manufacturing

Introduction

The aerospace industry has seen steady growth since the late 1980s as indicated by Figure 4-A below. The Aerospace Industry Association (AIA) has reported that from 1996 to 2001 the industry has earned profits in excess of \$7 billion.⁴⁶ Further data from AIA, as seen in Figure 4-B, tracks aerospace manufacturing sales as a percentage of the national economy in current and constant US dollars. These findings indicate that despite the growth of the industry itself, aerospace sales have become a smaller percentage of the gross national product, which leads us to believe that the industry is not keeping pace with the growth of the rest of the economy.

Figure 4-A.



Source: "2001 Year-End Review and 2002 Forecast -- An Analysis." *Aerospace Industries Association*.

⁴⁶ Napier, David H. "2001 Year-End Review and 2002 Forecast -- An Analysis." *Aerospace Industries Association*. Online. Available at: http://www.aia-aerospace.org/stats/yr_ender/yrendr2001_text.pdf

Table 4-A.

AEROSPACE SALES AND THE NATIONAL ECONOMY

Calendar Years 1985-1999

(Billions of Dollars)

Year	Gross Domestic Product ^f	Industry Sales			Aerospace Sales As Percent of			
		Manufacturing	Durable Goods	Aerospace	GDP	Manufacturing	Durable Goods	
CURRENT DOLLARS								
1985	\$4,213.0	\$2,332.7	\$1,214.5	\$ 96.6	2.3%	4.1%	8.0% ^f	
1986	4,452.9	2,334.6	1,237.8	106.2	2.4	4.5	8.6	
1987	4,742.5	2,474.0	1,296.2	110.0	2.3	4.4	8.5	
1988	5,108.3	2,694.0	1,420.5	114.6	2.2 ^f	4.3	8.1	
1989	5,489.1	2,837.8	1,475.9	120.5	2.2	4.2	8.2	
1990	5,803.2	2,909.0	1,483.1	134.4	2.3	4.6	9.1 ^f	
1991	5,986.2	2,878.8	1,453.2	139.2	2.3 ^f	4.8	9.6	
1992	6,318.9	3,003.4	1,541.7	138.6	2.2	4.6	9.0	
1993	6,642.3	3,125.8	1,629.3	123.2	1.9	3.9	7.6	
1994	7,054.3	3,347.3	1,789.3	110.6	1.6	3.3	6.2	
1995	7,400.5	3,593.3	1,925.8	107.8	1.5	3.0	5.6	
1996	7,813.2	3,713.6	2,002.8	116.8	1.5	3.1	5.8	
1997	8,318.4	3,928.3	2,157.7	131.6	1.6	3.3	6.1	
1998	8,790.2	4,049.2	2,271.5	148.0	1.7	3.7	6.5	
1999	9,299.2	4,258.3	2,408.6	151.1	1.6	3.5	6.3	
CONSTANT DOLLARS^{af}								
					Real Annual Growth^{br}			
					GDP	Mfg.	Durs.	Aero.
1985	\$5,716.4	\$3,165.2	\$1,647.9	\$ 97.8	3.8%	(1.2)%	0.2%	17.0%
1986	5,913.5	3,100.4	1,643.9	106.4	3.4	(2.0)	(0.2)	8.7
1987	6,111.5	3,188.1	1,670.3	110.0	3.3	2.8	1.6	3.4
1988	6,369.5	3,359.1	1,771.1	112.9	4.2	5.4	6.0	2.6
1989	6,589.6	3,406.7	1,771.8	114.3	3.5	1.4	0.0	1.2
1990	6,708.9	3,363.0	1,714.5	123.7	1.8	(1.3)	(3.2)	8.3
1991	6,673.6	3,209.3	1,620.1	125.0	(0.5)	(4.6)	(5.5)	1.0
1992	6,883.3	3,271.7	1,679.4	118.6	3.1	1.9	3.7	(5.2)
1993	7,058.8	3,321.8	1,731.4	102.5	2.5	1.5	3.1	(13.6)
1994	7,348.2	3,486.8	1,863.8	90.1	4.1	5.0	7.6	(12.1)
1995	7,543.8	3,662.9	1,963.1	86.7	2.7	5.0	5.3	(3.9)
1996	7,813.2	3,713.6	2,002.8	92.2	3.6	1.4	2.0	6.5
1997	8,163.3	3,855.0	2,117.4	103.0	4.5	3.8	5.7	11.7
1998	8,525.9	3,927.5	2,203.2	115.3	4.4	1.9	4.0	12.0
1999	8,890.2	4,071.0	2,302.7	116.8	4.3	3.7	4.5	1.2

Source: Council of Economic Advisors, "Economic Indicators" (Monthly); Bureau of Census and Aerospace Industries Association.

a Aerospace industry constant dollar sales based on AIA's aerospace composite price deflator, 1987=100. Others based on GDP deflator, 1996=100.

b Parentheses indicate negative real annual growth.

f Revised.

Source: "Aerospace Facts & Figures 2000/2001." 2001. *Aerospace Industries Association*.

Impacts of 9/11 on Aerospace Manufacturing

Prior to the September 11th tragedy, the forecasts for the industry nationally were relatively positive. The Bureau of Labor Statistics had predicted that employment in the aerospace industry was expected to grow by 19 percent over the 2000 to 2010 period, compared with the 15 percent increase for all industries combined.⁴⁷ AvStat Associates and Stanford Transportation Group predicted that commercial aircraft deliveries would steadily increase during this decade and further increase into the year 2020.⁴⁸ According to the AvStat data, during the period from 1991 to 2000, 9,697 new aircraft were produced. Between 2001 and 2010, 11,799 were forecasted to be delivered and an additional 14,186 were expected between 2011 and 2020.

However, preliminary data after the terrorist attacks indicate that the aerospace manufacturing industry was one of the hardest hit sectors of the economy. According to testimony given before the House Armed Services Subcommittee on Military Procurement by John W. Douglas, the President and Chief Executive Officer of the Aerospace Industries Association of America, Inc.:

The Subcommittee should be aware of the enormous impact the terrorist attacks that occurred last September had on the Aerospace industry. We estimate a resulting loss to aerospace manufacturing of \$2 billion in 2001, \$6 billion in 2002, and an additional loss of \$7 billion in 2003 before commercial demand begins to reassert itself in 2004 and beyond. This loss is in addition to the large losses being experienced by the airlines.⁴⁹

This argument is supported by the record number of cancellations of ordered aircraft since the attack. Assuming the attack had not occurred, the domestic commercial aircraft fleet (including vehicles on order) would have totaled 4,771. Aircraft production cancellations have been tallied at 682, which is a decrease of the projected fleet by roughly 14 percent.⁵⁰

Overview of Texas Aerospace Manufacturing

According to the Bureau of Labor statistics, firms that produce aircraft, propulsion units, aircraft engines, space vehicles, guided missiles, and related parts comprise the aerospace manufacturing industry. The importance of Texas as a key aerospace manufacturing state is supported by the U.S. Census Bureau's 2000 Survey of Manufacturers that indicated that Texas ranks:

⁴⁷ "Aerospace Manufacturing." *Bureau of Labor Statistics*. Online. Available at: <http://www.bls.gov/oco/cg/cgs006.htm>

⁴⁸ Douglass, John. W. "Statement before the Armed Services Subcommittee on Military Procurement, March 19, 2002." *Aerospace Industries Association*. Online. Available at: http://www.aia-aerospace.org/aianews/speeches/2002/tst_jwd_03_19_02.pdf

⁴⁹ Ibid.

⁵⁰ "Fleet Announcements Since September 11." *Speed News*. Online. Available at: <http://www.speednews.com/lists/Fleet0911.html>

- 3rd in number of employees
- 3rd in production workers
- 3rd in value added
- 4th in value of shipments
- 4th in total capital expenditures⁵¹

This data also indicated that:

- The value of Texas transportation equipment exports grew 75 percent from 1996 to 2000.
- The transportation equipment sector was Texas' fourth largest exporting industry in 2000.
- In 2000, Texas accounted for almost 9 percent of total U.S. transportation equipment industry exports.⁵²

Texas' aerospace manufacturing occurs primarily in twelve counties as noted in Table 4-B⁵³:

Table 4-B. Major Texas Aerospace Counties

Bexar	Hays	Tarrant
Cameron	Hunt	Travis
Dallas	Kerr	Wichita
Harris	McLennan	Young

According to the U.S. Business and Industry Data Center and the Gale Group Business and Company Resource Center, the major aircraft and parts manufacturing employers in Texas are:

- Lockheed Martin Aeronautics Company (Fort Worth)
- Bell Helicopter Textron, Inc. (Fort Worth)
- Tracor, Inc. (Austin)
- Tracor Aerospace, Inc. (Austin)
- Chromalloy Gas Turbine Corp. (San Antonio)
- Vought Aircraft Industries, Inc. (Dallas)⁵⁴

⁵¹ "2000 Survey of Manufacturers." US Census Bureau and "Texas Aerospace Manufacturing Industry." *U.S. Business and Industry Data Center and the Gale Group Business and Company Resource Center*. Online. Available at: <http://www.bidc.state.tx.us/proaerospace.htm>

⁵² Ibid

⁵³ "1999" Survey of Manufacturers." US Census Bureau.

⁵⁴ "2000 Survey of Manufacturers." US Census Bureau and "Texas Aerospace Manufacturing Industry." *U.S. Business and Industry Data Center and the Gale Group Business and Company Resource Center*. Online. Available at: <http://www.bidc.state.tx.us/proaerospace.htm>

The top five international export markets for Texas transportation equipment manufacturing industry in 2000 include:

Table 4-C. International Export Markets for Texas

Country	Value
Mexico	\$7,478,694,976
Canada	\$887,168,995
United Kingdom	\$293,183,958
Saudi Arabia	\$220,707,887
Sweden	\$208,279,991

Source: "2000 Survey of Manufacturers." US Census Bureau and "Texas Aerospace Manufacturing Industry." *U.S. Business and Industry Data Center and the Gale Group Business and Company Resource Center.*

Summary Highlights

The contracting nature of the commercial aerospace manufacturing industry for the first half of the decade does not signify a positive trend for new economic development and expansion. Considering that Texas contains the third largest aerospace manufacturing sector, it will no doubt feel the financial effects of September 11th. Therefore, the challenge may not be to expand Texas's percentage of aerospace manufacturing, but it may to assist in maintaining the market share of firms already located within its borders.

Space

Introduction

The Texas space industry is dominated, both symbolically and financially, by the National Aeronautics and Space Administration's Johnson Space Center. Located in Clear Lake, the JSC is NASA's center for human space flight operations. This section will outline the impacts of the Johnson Space Center on Texas as well as those of other space-related organizations. Spaceports and other commercial space endeavors have not been included as this information is evaluated annually at the state level by the Federal Aviation Administrator for Space Transportation (<http://ast.faa.gov/aboutCST/>).

NASA Johnson Space Center

Current Issues

NASA has enjoyed a long and successful history, but the agency now faces an uncertain future. The Bush administration and new agency leadership have yet to articulate a defined vision. After completing a ten-year tenure that ranks as the longest in NASA history, Daniel Goldin stepped down as chief administrator in January 2002.⁵⁵ Sean O'Keefe, a former top official with the President's Office of Management and Budget, succeeded him.⁵⁶

Already, O'Keefe has faced a lingering recession, a federal tax cut, and increased defense spending following the events of September 11th. All of these have made it increasingly difficult for NASA to secure funding. Additionally, cost overruns and accounting problems threaten to hurt NASA's image. A recently released audit report stated, "NASA lacks adequate controls to reasonably assure that property, plant, and equipment and materials are presented fairly in the financial statements."⁵⁷ Although much of the problem seems to be due to new government-wide accounting standards, NASA's bookkeeping was so confusing that auditors could not rule out the possibility of waste or fraud.⁵⁸

Current Expenditures

Procurements (contractual actions to obtain supplies, services, or construction) comprise roughly 90 percent of all NASA obligations, with employee salaries and benefits making up the remaining 10 percent.⁵⁹ In FY 2001, NASA awarded a total of \$10,639,182,000 to

⁵⁵ "The End of NASA's Goldin Age." *Boston Globe*. 27 November 2001.

⁵⁶ "New NASA chief prefers strategy to star-gazing; One giant leap to Mars isn't on his agenda." *The Times-Picayune*. 29 March 2002.

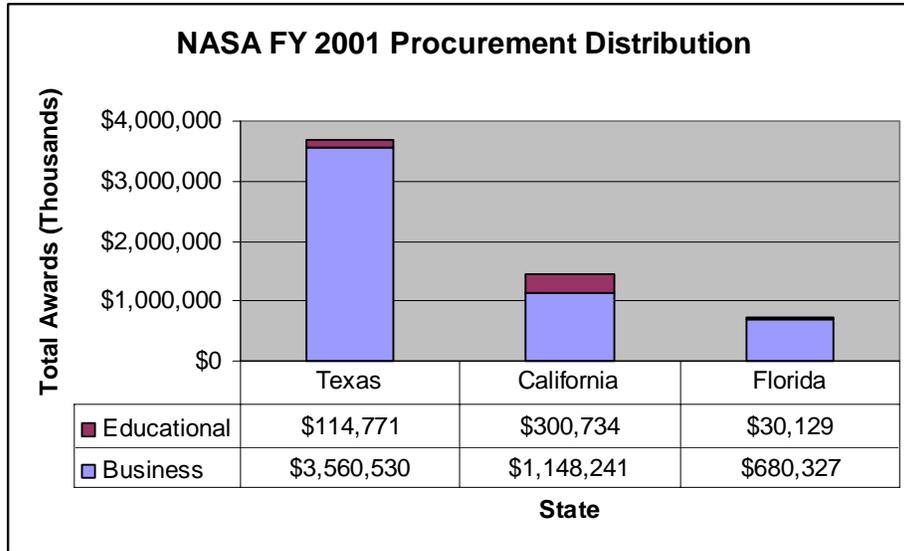
⁵⁷ "NASA bookkeeping in disarray; Space Agency unable to track how money was spent, audit says." *Houston Chronicle*. 1 March 2002.

⁵⁸ *Ibid.*

⁵⁹ NASA Annual Procurement Reports FY 1998-2001.

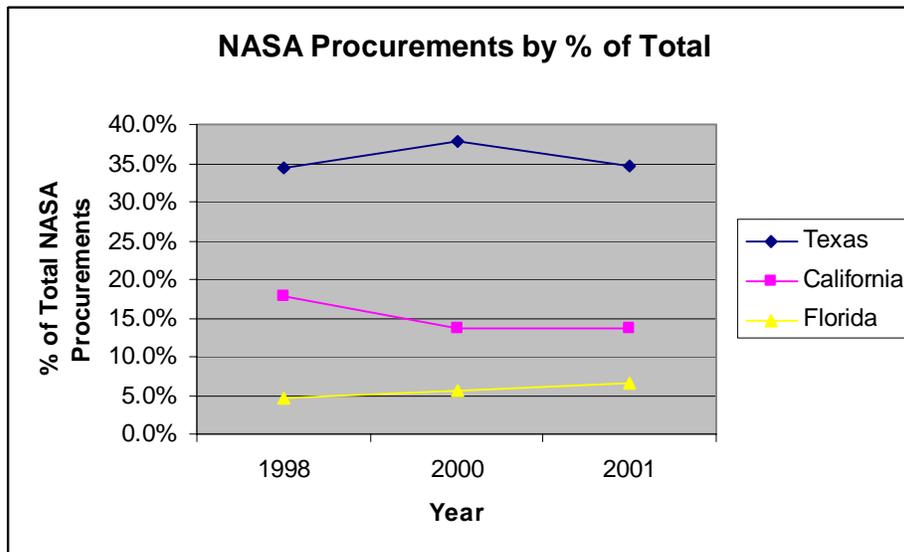
the fifty states, not including smaller awards less than \$25,000. Texas received, by far, more money than any other state. Figure 5-A below compares the three states that received the most procurement dollars in FY 2001. Figure 5-B shows the percent of total procurement dollars allocated to each state for FY 1998-2001 (FY 1999 data not available). The \$3,675,301,000 that NASA awarded to Texas businesses and educational institutions in FY 2001 accounted for nearly 35 percent of all awards. California and Florida are the next highest, awarded with 13.6 percent and 6.7 percent respectively.⁶⁰

Figure 5-A.



Source: NASA Annual Procurement Reports FY 1998-2001.

Figure 5-B.

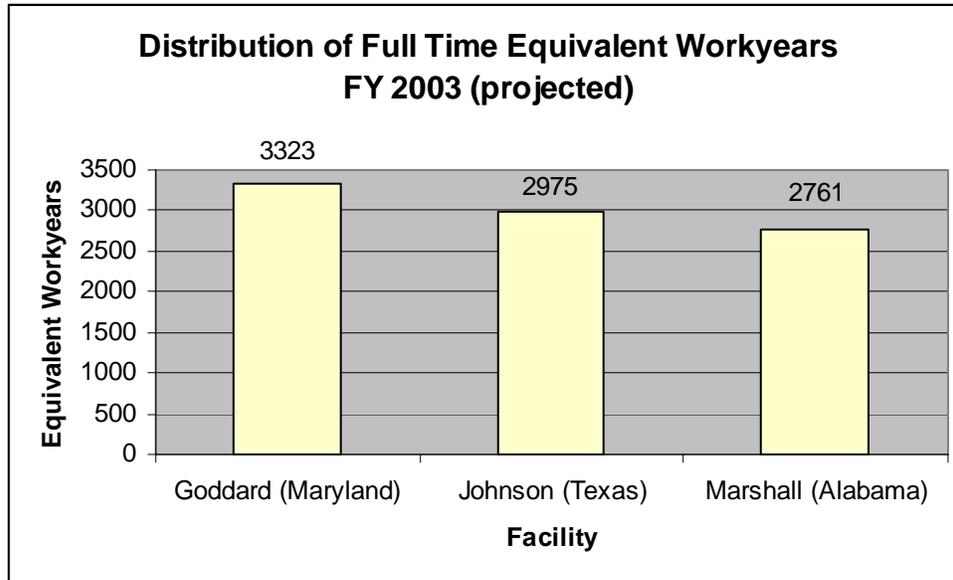


⁶⁰ NASA Annual Procurement Reports FY 1998-2001.

Source: NASA Annual Procurement Reports FY 1998-2001.

Figure 5-C below shows (in full-time equivalent workyears) the allocation of manpower to the top three NASA installations. The Johnson Space Center receives the second highest appropriation, with 2,975 FTE workyears projected in FY 2003. The Goddard Spaceflight Center in Maryland receives the highest number of work years (3,323).

Figure 5-C.



Source: NASA Annual Procurement Reports FY 1998-2001.

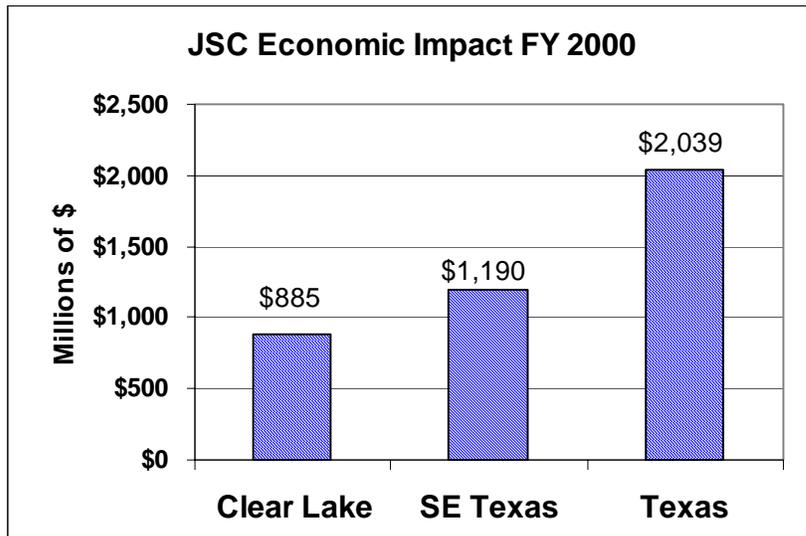
Economic Impact

Overall, the Johnson Space Center brought a total of \$3,782,348,000 to Texas in FY 2000. This includes procurements and the salaries of 27,635 JSC employees and contractors.⁶¹ The impact on the Texas economy is tremendous. Figures 5-D and 5-E below illustrate these impacts on the area, region, and state. The JSC expenditures translated into \$2,039,874,854 in business volume. The total number of jobs attributable to the JSC in FY 2000 was 49,998 resulting in \$3,741,391,696 in personal income.⁶²

⁶¹ NASA/JSC and UH-Clear Lake Center for Economic Development and Research.

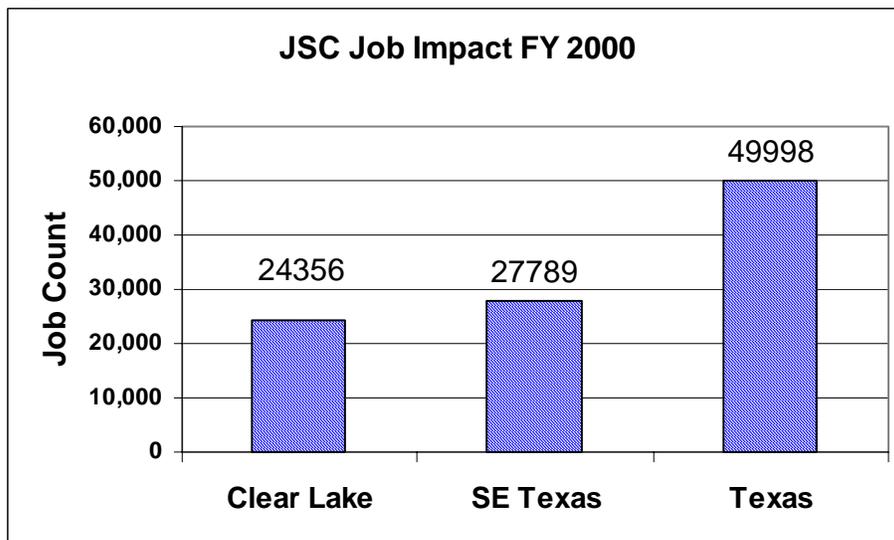
⁶² NASA/JSC and UH-Clear Lake Center for Economic Development and Research.

Figure 5-D.



Source: NASA/JSC and UH-Clear Lake Center for Economic Development and Research.

Figure 5-E.



Source: NASA/JSC and UH-Clear Lake Center for Economic Development and Research.

Future Budget Prospects for JSC

The Bush administration has begun to outline its priorities for NASA, and the result will likely have a negative effect on the Johnson Space Center and Texas. Starting with his FY 2003 budget, President Bush has proposed four consecutive annual reductions in spending for human spaceflight. The JSC is to receive \$6.13 billion in FY 2003 (a 10 percent reduction), falling incrementally to \$5.77 billion in 2006.⁶³

⁶³ "Bottom Line: Johnson Space Center likely to lose jobs." *Houston Chronicle*. 5 February 2002.

One key reason for the decline in spending is the cost overrun of the International Space Station. The International Space Station program began as an \$8 billion initiative in 1984, but has since ballooned to \$30 billion after repeated rescaling and redesign. This figure is \$5 billion over a Congressional spending cap and has prompted the Bush administration to halt current plans for expansion. Among the cuts are a 4-person dormitory module (the station currently houses three) and a lifeboat that would transport all seven back to Earth in an emergency.⁶⁴

Other Space Organizations

Other than the Johnson Space Center, two organizations that play a large role in the Texas space industry are the Texas Space Grant Consortium and the U.S. Department of Defense. In the context of the National Space Grant Program, the TSGC was formed in 1989 for the purpose of ensuring that the benefits of space research and technology are available to all Texans.⁶⁵ Among the Consortium's objectives are to:

- foster sharing of space related course materials among consortium academic institutions
- foster the development of multi-institutional space research efforts including industry-university teaming
- use interest in space to increase participation in science and mathematics in the public schools.⁶⁶

The Consortium currently involves 34 member institutions: 25 educational, four commercial, three state government, and two non-profit organizations.

Another major influence in the Texas space industry is the U.S. Department of Defense. Precise impact assessments are difficult, however, as the Department's activities are less visible and not delineated in the budget. Additionally, the DOD will at times release only partial information or will alter budget history without explanation. For FY 2000, the classified and unclassified budget totals for Defense space programs nationwide exceeded \$13 billion. The FY 2001 budget request was approximately \$14.5 billion.⁶⁷ Although these expenditures are not tracked to the state level, clearly their effect is substantial.

Texas Legislative Activity

A review of legislation at the state level shows that Texas is not heavily involved with the economic development of the space industry. Other than in regard to spaceports, the Texas legislature has not been active in space development. One action is Senate Resolution 798, adopted April 24, 2001, which expresses the Senate's unwavering support of the JSC and other aerospace technology companies in recognition of Space

⁶⁴ "NASA bookkeeping in disarray; Space Agency unable to track how money was spent, audit says." *Houston Chronicle*. 1 March 2002.

⁶⁵ *Texas Space Grant Consortium*. Online. Available at: www.tsgc.utexas.edu

⁶⁶ *Texas Space Grant Consortium*. Online. Available at: www.tsgc.utexas.edu/info/mission/html

⁶⁷ Smith, Marcia S. "U.S. Space Programs: Civilian, Military, and Commercial." *Congressional Research Service*. 1 March 2002.

Day 2001.⁶⁸ A second action that could be classified as a traditional incentive proposal is House Bill 1170, effective July 1, 2001. HB 1170 extends certain tax exemption already available to the JSC to the United Space Alliance, a leading space operations company. Specifically, the bill “exempts from limited sales, excise, and use taxes all goods and services that are indirect costs purchased for use in the performance of space flight contracts.”⁶⁹

Summary Highlights

1. Texas received 35% of all NASA procurement awards in FY 2001, far more than any other state.
2. Daniel Goldin has stepped down after ten years as NASA administrator. He was replaced by Sean O’Keefe, a former executive with the Office of Management and the Budget.
3. Manned space flight does not seem to be a priority for the Bush Administration. The current presidential budget proposes four annual cuts in spending for that objective.
4. This de-prioritization will negatively impact Texas due to the JSC’s reliance on manned space flight funding.

⁶⁸ “Senate Resolution 798.” *77th Texas Legislature*. Online. Available at: <http://www.capitol.state.tx.us/cgi-bin/db2www/tlo/billhist/billhist.d2w/report?LEG=77&SESS=R&CHAMBER=S&BILLTYPE=R&BILLSUFFIX=00798>

⁶⁹ “House Bill 1170.” *77th Texas Legislature*. Online. Available at: <http://www.capitol.state.tx.us/cgi-bin/db2www/tlo/billhist/billhist.d2w/report?LEG=77&SESS=R&CHAMBER=H&BILLTYPE=B&BILLSUFFIX=01170>

Military

Introduction

Military spending is the largest category of federal government spending and its presence in a state or region can make a substantial difference.⁷⁰ The two primary ways military spending is disseminated is through contracts and payroll. Military contracts “can play a crucial role in a region’s economic health.”⁷¹ Military spending and operations are related to the aerospace industry.⁷² For example, the military does not produce its own aircraft, even though aircraft are essential in completing its missions. Therefore, the military buys its aircraft from outside companies. Additionally, most commercial pilots received their training as pilots for the military.

The United States military has seen its budget, size, and importance fluctuate over the years. For example, the Cold War spurred the arms race, which in turn helped to increase military spending. During the peacetime of the post-Cold War era, the military saw a decrease in its budgets and size.⁷³ Since September 11th, 2001, the United States military has regained its relevance. The War on Terrorism and threats against national security have focused attention on military readiness and preparedness. The FY2003 Department of Defense budget request was for \$369 billion, an increase over the previous year’s budget.⁷⁴ The FY2003 Military Construction and Family Housing Budget request was for \$9 billion and includes over 300 construction projects.⁷⁵

Military in Texas

The military is important to the State of Texas. It has been estimated that \$41.3 billion is generated from the military in Texas.⁷⁶ There are seven Air Force bases and three Army forts in Texas that contribute to the state’s economy.⁷⁷ Of the eleven states evaluated in this report, Texas ranked third in military contracts and payroll.⁷⁸ (Military payroll refers

⁷⁰ Atkinson, Robert D. “Defense Spending Cuts and Regional Economic Impact: An Overview.” *Economic Geography*. Vol. 69, Issue 2. April 1993, p.107.

⁷¹ OhUallachain, Breandan. “Regional and Technological Implications of the Recent Buildup in American Defense Spending.” *Annals of the Association of American Geographers*. Vol. 77, Issue 2. June 1987, p.212.

⁷² OhUallachain, Breandan. “Regional and Technological Implications of the Recent Buildup in American Defense Spending.” *Annals of the Association of American Geographers*. Vol. 77, Issue 2. June 1987, p. 209.

⁷³ Atkinson, Robert D. “Defense Spending Cuts and Regional Economic Impact: An Overview.” *Economic Geography*. Vol. 69, Issue 2. April 1993, p.107.

⁷⁴ “Details of FY2003 Department of Defense Budget Request.” *Department of Defense News Release No.049-02*. 4 February 2002.

⁷⁵ “FY2003 Military Construction and Family Housing Budget Detailed.” *Department of Defense News Release No.045-02*. 4 February 2002.

⁷⁶ “Overview.” *Texas Office of Defense Affairs*. Online. Available at: <http://www.tded.state.tx.us/defense/>

⁷⁷ “Military Installations in Texas.” *Defense Affairs*. Online. Available at: <http://www.tded.state.tx.us/defense/def-map2.htm>

⁷⁸ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

to the amount of money spent on personnel in each state.) The following figures show the rankings of the eleven states we studied with respect to military contract dollars and payroll for FY2000.

Figure 6-A. Military Contracts

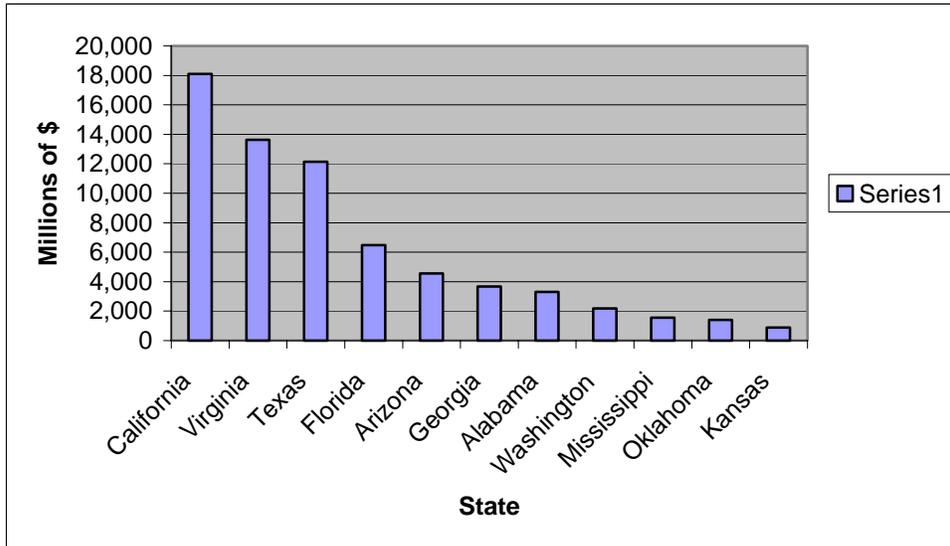
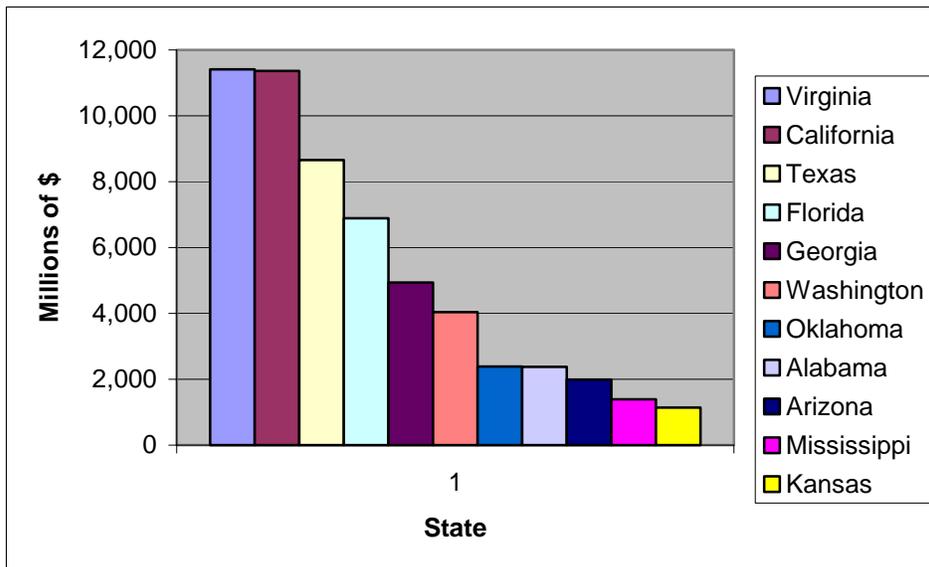


Figure 6-B. Military Payroll



California and Virginia were the only two states to out-perform Texas. Florida was slightly behind Texas in both categories.

Currently, the F-35 Joint Strike Fighter is one of the major aircraft projects being undertaken by the military. The JSF is scheduled to replace a variety of aging aircraft.⁷⁹ Lockheed Martin won the bid to produce the JSF for both the United States and British militaries.⁸⁰ Texas will directly benefit from this military contract since Lockheed Martin has operations here. The Fort Worth facility will work on the JSF project and gain over 2,000 jobs.⁸¹

Base Realignment and Closures Around the Nation

Military installations play a vital role in a community's economy. As evidenced by the above figures, the military has a great impact on the economies of California, Virginia and Texas. Therefore, it is understandable that communities are concerned about the closure of their installations. Since 1988, there have been approximately 95 military bases closed with those closures impacting over 320,000 jobs.⁸² The last round of base realignment and closures (BRACs) was in 1995.⁸³ In that round, California lost more military installations than any other state.⁸⁴ The next round is currently scheduled for 2005.⁸⁵

In order to protect their military bases, most communities and states have programs and organizations whose primary goal is to ensure the retention of those facilities. In Texas, the Office of Defense Affairs "assists the state's defense communities to prepare for future BRACs."⁸⁶ California has several measures in place to help manage and cope with BRAC. California is a member of the Southwest Defense Alliance. SDA is comprised of a group of states that joined together to "protect military bases from closure and to draw jobs to California and the Southwest."⁸⁷ Another support organization is the Travis Regional Armed Forces Committee.⁸⁸ This committee helps to maintain Travis AFB and jobs located therein. The Florida Defense Alliance, an organization within Enterprise Florida ("a public-private partnership"⁸⁹), "is designated as the organization to ensure that Florida's military installations are in competitive positions as the U.S. continues its defense realignment."⁹⁰

⁷⁹ "Made in Texas: Fort Worth Company gets Biggest Military Contract in History." *Fiscal Notes*. January 2002.

⁸⁰ Ibid.

⁸¹ "Made in Texas: Fort Worth Company gets Biggest Military Contract in History." *Fiscal Notes*. January 2002.

⁸² Frieden, Bernard J. and Christie I. Baxter. "From Barracks to Business: The M.I.T. Report on Base Redevelopment." *United States Department of Commerce*. Washington, DC: 2000. Page 11.

⁸³ Ibid.

⁸⁴ "Major Base Closure Summary." *DefenseLINK*. 27 May 1998. Online. Available at: <http://www.defenselink.mil/faq/pis/17.html>

⁸⁵ Albro, Derek. Legislative Assistant for Senator Don Nickles. Personal Interview. 1 March 2002.

⁸⁶ "Overview." *Texas Office of Defense Affairs*. Online. Available at: <http://www.tded.state.tx.us/defense/>

⁸⁷ "Texas May Enlist in Base-Retention Group." *Los Angeles Daily News*. 20 January 1999.

⁸⁸ "Travis Air Force Base." Online. Available at: <http://www.cedar.ca.gov/military/active/travis.htm>.

⁸⁹ "State Military Base Retention Programs." *California Research Bureau Note Vol.4, No. 1*. 7 May 1997. Online. Available at: <http://www.cedar.ca.gov/military/retentn.htm>

⁹⁰ "The 2000 Florida Statutes." *Online Sunshine*. Available at: <http://leg.state.fl.us/statutes/index>

Unfortunately, some communities will lose their military bases. The long-term success of a community can depend on how it responds to a base closure. Military base reuse or redevelopment is an extremely important issue, especially as the Department of Defense promises more base closures. Texas has two main programs to assist impacted communities. The Defense Economic Readjustment Zone Program which “provides assistance to Texas communities, businesses, and workers impacted” by base closures.⁹¹ “The incentives offered are similar to the Texas Enterprise Zone Program.”⁹² The Defense Economic Adjustment Assistance Grant Program provides state grants to local communities and/or counties for the “purchase of Department of Defense property, new construction, rehabilitation of facilities or infrastructure or purchase of capital equipment or insurance.”⁹³ California, who had a lot of experience with base closures in the last round of BRAC, has enacted laws to help communities and businesses. The Local Agency Military Base Recovery Act is one such law, which hopes to “stimulate business and industrial growth in areas that experience military base closures by relaxing regulatory controls.”⁹⁴

BRAC 2005

Every state with military installations is concerned about the next round of BRAC. To date, there is not a preliminary list of bases to either be closed or protected. However, the Air Force has released a list of structure changes for FY2003 and if the trends of these changes continue, it might be easier to predict which installations will be closed in 2005.

Air Force Structure Changes

Alabama

No structure changes.

Arizona

Davis-Monthan AFB will lose 497 military and 18 civilian authorizations.
Luke AFB will increase by 140 military authorizations.
Overall the state will lose 375 authorizations.

California

Beale AFB will increase by 76 military and 7 civilian authorizations.
Edwards AFB will lose 129 military and gain 59 civilian authorizations.
Travis AFB will gain 29 military authorizations.
Overall the state will gain 42 authorizations.

Florida

Eglin AFB will gain 33 military and 61 civilian authorizations.
MacDill AFB will lose 61 military and 1 civilian authorizations.
Tyndall AFB will gain 276 military authorizations.
Overall the state will gain 308 authorizations.

⁹¹ “Overview.” *Texas Office of Defense Affairs*. Online. Available at: <http://www.tded.state.tx.us/defense/>

⁹² Ibid.

⁹³ Ibid.

⁹⁴ *California Government Codes Section 7105-7118*. Available at: <http://www.leginfo.ca.gov/>.

Georgia

Robins AFB will gain 124 military and lose 7 civilian authorizations.
Overall the state will gain 117 authorizations.

Kansas

No structure changes.

Mississippi

No structure changes.

Oklahoma

No structure changes.

Texas

Dyess AFB will lose 40 military and 1 civilian authorizations.
Overall the state will lose 41 authorizations.

Virginia

Langley AFB will lose 78 military and gain 7 civilian authorizations.
Overall the state will lose 71 authorizations.

Washington

Fairchild AFB will lose 9 civilian authorizations.
McChord AFB will gain 86 military authorizations.
Overall the state will gain 77 authorizations.⁹⁵

Therefore, Arizona, Texas, and Virginia are the only states overall losing authorizations. Each of the other states studied in this report is either keeping the same structure or gaining authorizations. If this trend in structure changes continues, Arizona, Texas, and Virginia may face serious challenges in the 2005 BRAC round.

Summary Highlights

Overall the military is important to the aerospace industry and states because of the large spending contracts it distributes. The spending levels of the military have fluctuated over the years and currently have been increasing. The presence of either a military installation or a military contractor can provide financial benefit to an area. Therefore, many communities do not want the military to close its operations in their area and work to ensure that the military remains.

⁹⁵ "Air Force Announces 2003 Force Structure Changes." *Department of Defense News Release No. 143-02*. 22 March 2002.

State Briefings

Introduction

The second part of this study provides a baseline study of several of Texas' key competitor states in the aerospace industry. Through consultation with the TAC, TAC commissioners, and independent research by the Bush School team, ten states were identified as key competitor states:

- Alabama
- Arizona
- California
- Florida
- Georgia
- Kansas
- Mississippi
- Oklahoma
- Virginia
- Washington

Each state was selected not because it held a certain ranking in statistical categories when compared to Texas, but because of the specific attributes of the state that Texas may want to consider.

The following chapters of this report consist of ten individual briefings on the aerospace industry in the competitor states. Some data were collected consistently across all ten states, providing an opportunity for comparison. Other information was gathered on the unique attributes of the states that help each state promote, develop, or maintain its strength in the aerospace industry. States such as California and Florida have strengths in aerospace across the board, while other states like Kansas and Washington have singular strengths that help them succeed in aerospace-related ventures.

Each of the ten state briefings follows the same pattern, and will include the following information:

Strategy

*Organizations that Promote Aerospace
Economic Development*

Data Presentation

*Human Capital
Education
Labor
Aviation (Commercial and General)
Aviation Manufacturing*

*Space
Military*

Summary Highlights

Key state strengths

The information provided in these briefings will include a combination of data presentations and brief prose summaries of some of each state's strengths and weaknesses. The goal is for the reader to be able to use a state briefing to gain a better understanding of the aerospace industry in that particular state. No attempts are made to analyze the data beyond the obvious conclusions drawn from rankings. The data are merely offered as indicators of each state's strengths and weaknesses.

Alabama

Introduction

This section will focus on the state of Alabama, its economic development pursuits, human capital resources, space initiatives, and military presence. Among the eleven states studied in this report, Alabama ranks:

- Below national averages in education levels⁹⁶
- 10th (overall) in federal funding per pupil⁹⁷
- 10th in number of active aircraft⁹⁸
- 14th (overall) in number of aerospace manufacturing employees (5,735), which is 1.17% of the total number of aerospace workers in the U.S.⁹⁹
- 3rd in NASA procurement activity¹⁰⁰
- 7th in military contract dollars¹⁰¹
- 8th in military payroll expenditures¹⁰²

Alabama has a historical presence in the aerospace industry and still plays an important role today. The birthplace of the United States' space program was in Huntsville, Alabama.¹⁰³ This famous event was just the beginning of the state's aerospace tradition. Currently, Huntsville has the third highest concentration of aerospace companies in the United States.¹⁰⁴ Overall, Alabama is home to over 200 aerospace companies.¹⁰⁵

Strategy

Organizations which Promote Aerospace

Alabama has two formal organizations that promote the aerospace industry in the state. The Alabama Commission on Aerospace Science and Industry (ACASI) was created in 1992 and consists of "27 business leaders throughout the state tasked to work at stimulating the state's growing aerospace industry by recruiting new business and helping

⁹⁶ Niesse, Mark. "A State Divided-by Regions-Could Enhance Economic Growth." *The Associated Press*. 16 July 2001.

⁹⁷ Dugan, Kelli M. "Q&A with State's New Industry Hunting Chief." *The Associated Press*. 4 March 2002.

⁹⁸ "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

⁹⁹ "1999 Annual Survey of Manufacturers." *U.S. Census Bureau*.

¹⁰⁰ Annual Procurement Reports. *NASA*. FY1998-2001.

¹⁰¹ "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*

¹⁰² Ibid.

¹⁰³ "Business Climate, Aerospace in Alabama." *Economic Development Partnership of Alabama*. Online. Available at: <http://edpa.org/businessclimate.htm>

¹⁰⁴ Hardy, Alex. "A Walk in the Park." *Alabama Technology Today*. 1 March 2002. Online. Available at: <http://www.alatechoday.com/SepOct/park1.html>

¹⁰⁵ "Business Climate, Aerospace in Alabama." *Economic Development Partnership of Alabama*. Online. Available at: <http://edpa.org/businessclimate.htm>

companies to grow.”¹⁰⁶ The governor, lieutenant governor, and speaker of the house appoint the members of the commission.¹⁰⁷ The second organization that promotes aerospace in Alabama is the Aerospace Development Center (ADC). The ADC is currently working on an Alabama State Aerospace Strategic Plan, which would be implemented by the ACASI. In general, the ADC focuses on “economic development, academic development and outreach.”¹⁰⁸

Economic Development

Alabama Development Office

Alabama has two primary organizations that promote economic development in the state. The State of Alabama Development Office (ADO) is the governmental organization in charge of promoting economic development. The organization’s specific goals are “to raise the per capita income in Alabama, improve the quality of life for its citizens, reduce unemployment, and promote the advantages of increasing industrial growth in Alabama.”¹⁰⁹ In order to achieve its goals, the ADO offers technical support and marketing assistance to companies. Recruitment, both foreign and domestic, is also an important element in ADO’s strategy to improve the economic environment in Alabama.

Todd Strange, Director of the ADO, was interviewed in March 2002. In this interview, Director Strange commented on the role of the ADO in recruitment. He said, the “biggest challenge was to partner with and foster relationships with local and regional economic development officials and then coordinate all of the development activities that go on in the state of Alabama.” The Director added that creating those partnerships and overall coordination were his top priorities.¹¹⁰

Economic Development Partnership of Alabama

The Economic Development Partnership of Alabama is the other economic development organization. It is unique because it is a “totally private, non-profit organization dedicated to helping Alabama realize its full economic development potential. The Partnership is supported by 68 leading companies that are committed to the state’s long-term economic growth.”¹¹¹ The EDPA has provided assistance in bringing more aerospace industry companies to the state. For example, “in 1997, the Partnership was involved in the recruitment of The Boeing Co., which decided to build its \$400 million rocket plant in Decatur.”¹¹²

¹⁰⁶“Alabama Commission on Aerospace Science and Industry.” *Alabama Aerospace Advantages*. Online. Available at: <http://www.aerospace.state.al.us/acasi/about.htm>

¹⁰⁷ Ibid.

¹⁰⁸ “State Strategic Plan.” *Aerospace Development Center*. Online. Available at: <http://www.adcweb.org/>

¹⁰⁹ “About ADO.” *Alabama Development Office*. Online. Available at:

<http://www.ado.state.al.us/backb.htm>

¹¹⁰ Dugan, Kelli M. “Q&A with State’s New Industry Hunting Chief.” *Associated Press*. 4 March 2002.

¹¹¹ *Economic Development Partnership of Alabama*. Online. Available at: <http://www.edpa.org/frameset-aboutedpa.htm>

¹¹² Ibid.

Governor's Initiative

In July 2001, Governor Siegelman introduced a proposal to divide the state into eight economic development regions. According to the proposal, each region would identify its needs and “create a comprehensive plan for the future” to meet those needs. The governor’s initiative ran into some funding problems and is currently being analyzed by the state’s twelve regional planners and the Economic Development Association of Alabama.¹¹³

Incentive Programs

Alabama also promotes economic development through incentive programs. The state offers a capital investment tax credit to qualifying companies. To help recruit new businesses, Alabama has established twenty-seven Enterprise Zones. In these zones, companies can qualify for local tax and non-tax incentives.¹¹⁴

Data Presentation

Human Capital

Human capital consists of educational opportunities in the state and labor (workforce) statistics.

Education

Alabama provides individuals with opportunities to educate themselves, although the state is below national averages in education levels.¹¹⁵ In the fall of 1999, Alabama had 223,144 individuals enrolled in degree-granting institutions.¹¹⁶ The total number of bachelor’s and master’s degrees conferred by degree-granting institutions for 1999-2000 were 21,293 and 8,021 respectively.¹¹⁷ More specifically, Alabama provides students with the opportunity to study aviation. In Mobile, the Alabama Aviation and Technical College provides students with technical knowledge and skills to work in the aerospace industry.¹¹⁸

¹¹³ Niese, Mark. “A State Divided-by Regions-Could Enhance Economic Growth.” *The Associated Press*. 16 July 2001.

¹¹⁴ “Taxes.” *Alabama Development Office*. Online. Available at: <http://www.ado.state.al.us/taxes.htm>

¹¹⁵ Niese, Mark. “A State Divided-by Regions-Could Enhance Economic Growth.” *The Associated Press*. 16 July 2001.

¹¹⁶ “Table 191.” *National Center for Education Statistics*. Online. Available at: <http://www.nces.ed.gov/pubs2002/2002130c.pdf>

¹¹⁷ “Table 250.” *National Center for Education Statistics*. Online. Available at: <http://www.nces.ed.gov/pubs2002/2002130c.pdf>

¹¹⁸ “Stories & Photos of Mobile.” *Mobile Chamber of Commerce*. Online. Available at: <http://www.mobcham.org/travel/stories6.html>

In 1999, the Technology Park Jobs-Training Center was opened at Calhoun Community College. This center was constructed after Boeing decided to build a plant in Decatur. At Technology Park, aerospace workers are trained for local companies. The center also houses an information technology center and hopes to soon have a virtual reality center.¹¹⁹

Labor

Alabama is a Right-to-Work state. In the year 2000, Alabama had a population of 4.4 million¹²⁰ and a per capita income of \$23,460.¹²¹ The annual number of individuals employed in aerospace, total workforce and the percentage of the workforce employed in the aerospace industry for 1992 through 2000 are shown below:

Table 7-A. Alabama Aerospace Employment

	Annual Employment	Total Alabama* Workforce	% of Alabama Workforce
1992	16,646	1,674,358	0.99%
1993	15,228	1,716,642	0.89%
1994	14,137	1,757,633	0.80%
1995	14,325	1,803,233	0.79%
1996	16,513	1,820,908	0.91%
1997	16,410	1,866,408	0.88%
1998	16,964	1,897,817	0.89%
1999	18,718	1,919,217	0.98%
2000	19,781	1,931,050	1.02%

*non-farm, non-agriculture (Bureau of Labor Statistics)

Data available at Alabama Industrial Relations

As this table shows, the aerospace industry is a very small percentage of the overall employment in the state.

¹¹⁹ "Job-Training Center Moves Closer to Completion." *The Associated Press*. 24 August 2001.

¹²⁰ "Population for Alabama." *Labor Market Information Division*. Online. Available at: <http://www2.dir.state.al.us/aclmis/POPULAT.asp?geo=0101000000&currsession=POPULAT>

¹²¹ "Income for Alabama." *Labor Market Information Division*. Online. Available at: <http://www2.dir.state.al.us/aclmis/INCOME.asp?geo=0101000000&currsession=INCOME>

Aviation (Commercial and General)

There are many ways to measure the presence of commercial and general aviation in a state. Three ways are examined here: number of aviation museums, number of aircraft (both active and inactive), and the number of total hours flown. The State of Alabama is home to eight aviation museums, one of which is an air force base.¹²² The number of aircraft (both active and inactive) and estimated hours flown for Alabama has fluctuated over the years. The table below illustrates those variations between 1996-1999.

Table 7-B. Alabama General Aviation Measures

AL	Aircraft Population	# Active	Estimated total hours flown
1996	3,556	2,784	425,409
1997	3693	3058	504398
1998	4186	3712	565698
1999	3796	3227	540237

Source: "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*.

As the table shows, the number of aircraft and the number of hours flown increased steadily until 1998. However in 1999, both the number of aircraft and hours flown decreased.

The following companies have operations in Alabama:

- Boeing
- Raytheon
- Lockheed-Martin
- Honeywell
- SCI
- Pemco
- Northrop Grumman
- Pratt & Whitney

Aviation (Manufacturing)

According to the 2000 Census, aerospace manufacturing in Alabama is:

- 14th in number of aerospace manufacturing employees (5,735), which is 1.17% of the total number of aerospace workers in the U.S.
- 15th in payroll
- 11th in number of production workers
- 11th in number of hours of work generated by production workers
- 14th in wages of production workers
- 13th in value added

¹²² "Aviation Museums: Alabama USA." *Aviation Enthusiast Corner*. Online. Available at: <http://aeroweb.brooklyn.cuny.edu/museums.al.htm>

- 19th in costs of materials
- 17th in value of shipments
- 22nd in capital expenditures¹²³

Space

Huntsville, Alabama is home to NASA’s Marshall Space Flight Center. The Marshall Center ranks fourth out of eleven in overall NASA procurement (funding).¹²⁴ Activities at Marshall today consist of “projects related to the development of new spacecraft and satellite technology, including the International Space Station.”¹²⁵ The funding (procurement) and work years (full-time equivalent of one work year) levels for the facility are as follows:

Table 7-C. Alabama NASA Procurements

	Procurement (Millions \$) ^o	Work Years [^]
FY1998	\$2,075.40	unknown
FY1999	\$2,119.80	2690
FY2000	\$1,975.20	2651
FY2001	\$1,961.00	2758
FY2002	unknown	2761
FY2003*	unknown	2761

*projected

Source: ^oAnnual Procurement Reports. NASA [^]Budget Briefings. NASA

The table shows the increase in funding until FY2000 and the corresponding decrease of work years. It also shows how the work years have increased since FY2000, while the procurement funding has been decreasing. In November 2001, the “outgoing NASA administrator said that Marshall Space Flight Center should prepare for job losses as America shifts its priorities.”¹²⁶

Alabama is home of the National Space Science Technology Center, which is a “partnership between NASA’s Marshall Space Flight Center, Alabama universities, federal agencies and industry.”¹²⁷ According to the NSSTC, “The Center is a laboratory for cutting-edge research in selected scientific and engineering disciplines.”¹²⁸

¹²³ “1999 Annual Survey of Manufacturers.” *U.S. Census Bureau*. Online. Available at: <http://www.census.gov/>

¹²⁴ Annual Procurement Reports. NASA. FY1998-2001.

¹²⁵ “Business Climate, Aerospace in Alabama.” *Economic Development Partnership of Alabama*. Online. Available at: <http://edpa.org/businessclimate.htm>

¹²⁶ “Outgoing NASA Administrator says Marshall Jobs to Shrink.” *The Associated Press*. 12 November 2001.

¹²⁷ “About NSSTC.” *National Space Science Technology Center*. Online. Available at: <http://www.nsstc.org/about.html>

¹²⁸ Ibid.

Military

Military spending is the largest category of federal government spending and its presence in a state or region can make a substantial difference.¹²⁹ There are two main Army forts (McClellan and Rucker) and one Air Force base (Maxwell) in Alabama¹³⁰. Fort McClellan was closed as part of the 1995 base realignment and closure (BRAC) round.¹³¹ Therefore, Fort Rucker is the only active Army installation. In the recently published Air Force structure changes for Fiscal Year (FY) 2003, there were no personnel changes slated for Maxwell AFB.¹³²

The two primary ways military spending is disseminated are through contracts and payroll. Military contracts “can play a crucial role in a region’s economic health.”¹³³ Of the eleven states we studied, Alabama ranked seventh in military contract dollars awarded to the state for Fiscal Year 2000 (\$3.3 billion).¹³⁴ Military payroll refers to the amount of money spent on personnel in each state. In military payroll, Alabama ranked eighth for FY2000 (\$2.3 billion).¹³⁵ Despite its low ranking, Alabama recently received a portion of a \$15.7 million award given to states for science and engineering research.¹³⁶

With another round of base realignment and closure (BRAC) soon to begin, Alabama is positioning itself to retain its bases. The Alabama Department of Economic and Community Affairs has a Military Base Retention Initiative as part of a “joint effort with military base host communities to reduce the likelihood of Alabama base closings or realignments.”¹³⁷

¹²⁹ Atkinson, Robert D. “Defense Spending Cuts and Regional Economic Impact: An Overview.” *Economic Geography*. Vol. 69, Issue 2. April 1993, p.107.

¹³⁰ “U.S. Military Installations (Publicly Known) as of 26 August 1998.” *Department of Defense*. Online. Available at: http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_D_I.html

¹³¹ “Major Base Closure Summary.” *DefenseLink*. 27 May 1998. Online. Available at: <http://www.defenselink.mil/faq/pis/17.html>

¹³² “Air Force Announces 2003 Force Structure Changes.” *Department of Defense News Release No.143-02*. 22 March 2002.

¹³³ OhUallachain, Brendan. “Regional and Technological Implications of the Recent Buildup in American Defense Spending.” *Annals of the Association of American Geographers*. Vol. 77, Issue 2. June 1987, p.212.

¹³⁴ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*

¹³⁵ Ibid.

¹³⁶ “DoD to Award \$15.7 million for Science and Engineering Research.” *Department of Defense News Release No.136-02*. 22 March 2002.

¹³⁷ “Overview ADECA.” *Alabama Department of Economic and Community Affairs*. Online. Available at: http://isl-garnet.uah.edu/adeca/adeca_ov.html

Legislation/Regulation

In September 2001, the Governor of Alabama signed Senate Bill 86 into law. SB 86 is a state bond issue to raise money for various projects. One project will fund a “\$10 million project for aerospace hangars in Mobile and Selma.”¹³⁸

Summary Highlights

1. Alabama is able to recruit big corporations. Boeing, and more recently Hyundai, located a manufacturing plant in Alabama. The workings of the two major economic development organizations could have a direct impact on the recruitment of such big companies.
2. The governor and legislature are willing to work together to support the advancement of the aerospace industry. The passage of Senate Bill 86 will help to stimulate further employment in aerospace in Mobile and Selma.

¹³⁸ “Legislature Approves Bond Issue for UAB Research, Other Projects.” *The Associated Press*. 14 September 2001.

Arizona

Introduction

The key component of Arizona's role in the aerospace industry is its proportionately high concentration of manufacturing firms. As a response, the state's primary strategy for maintaining and expanding this presence is to encourage firms to create new jobs in a designated high-technology industrial cluster located in the Pima County-Tucson Metropolitan area.

The following is a brief summary of findings outlined below:

The state of Arizona:

- ranks 5th in aerospace manufacturing employees
- ranks 3rd in value added
- has witnessed the growth in number of Aerospace employees steadily increasing since the early 1990s
- possesses Phoenix Sky Harbor International which is regularly listed as one of the busiest airports in the world
- receives a significantly smaller share of NASA expenditures in comparison to the other major aerospace states studied in this report
- ranks 5th in military contract expenditures by the federal government
- has a robust economic development investment strategy based on the cluster principle and backed by tax incentives

Strategy

Organizations which Promote Aerospace

Arizona Space Commission

"The Commission is designated as Arizona's sole coordinator of all space-related commercial, and high technological partnerships." --The Arizona Administrative Register¹³⁹

The ASC is charged with providing expertise and advice to the state regarding all space-related and high technological business matters. It is also charged with the task of providing technical support to the Department of Commerce, local and regional industrial development organizations, local agencies, and other groups concerning infrastructure

¹³⁹ "Governor's Appointments of State Officials and Members of Boards and Commissions." *Arizona's Administrative Register*. 31 December 2000. Online. Available at: <http://www.sos.state.az.us/aar/2000/28-53a/boards.pdf>

improvements. The Commission's policy-making role is to prepare a plan that develops goals and objectives, establishes guidelines, and addresses the development of space-related industry for the Governor to be presented to the state legislature. The ASC should recommend legislation and provide general direction regarding the state's interests in space-related commerce.¹⁴⁰

Arizona Department of Transportation: Aeronautics Division

This division is charged by Arizona state law to:

- Encourage and advance the safe and orderly development of aviation in the state
- Assemble and distribute, to the public, information relating to aviation
- Represent the state on issues of routing and rate schedules concerning airline traffic
- Accept federal and other monies for airport development or air navigation facilities
- Ensure that the Grand Canyon National Park Airport is operated and maintained
- License aircraft dealers
- Register non-airline aircraft within the state
- Make recommendations on legislative and policy issues¹⁴¹

Governor's Arizona Science and Technology Council

The Council's primary purpose is to develop policies and programs that enhance science and technology for Arizona. It has the power to appoint committees drawn from the academic, scientific and industrial communities to assist in the formulation of recommendations in complex scientific matters. It is also charged with monitoring changes in national and international economic conditions that might justify a reorientation of the state's technology programs. It must identify future fields of science and technology that offer potential for application in Arizona and help to find funding sources. The Council's other role is to stimulate technology transfer between higher education institutions and industry including transfers of information available from various federal agencies.¹⁴²

Economic Development

ASPED & GSPED

The State of Arizona developed the *Arizona Strategic Plan for Economic Development (ASPED)* in 1992. The ASPED strategy was based on the clusters theory identified earlier

¹⁴⁰ Ibid.

¹⁴¹ "Aeronautics." *Arizona Department of Transportation*. Online. Available at: <http://www.sos.state.az.us/aar/2000/28-53a/boards.pdf>

¹⁴² Ibid, *Arizona's Administrative Register*.

in this report.¹⁴³ The Governor's Strategic Partnership for Economic Development (GSPED) is carrying out the implementation of the plan which is overseen by a 12-member executive board of business, education, and government leaders.¹⁴⁴ The approach of the Arizona state government to encourage science and technology is largely to bring together companies in geographical areas where Arizona has particular strengths.¹⁴⁵ GSPED has designated Pima County (encompassing the Tucson metropolitan area) as the state's primary High-Tech Industry Cluster (HTIC).

Data Presentation

Human Capital

Education

Organized within the HTIC is the Technology Transfer Committee, which is charged with facilitating arrangements between the state universities and industry that lead to technology development and commercialization. It has primarily built relationships with the Arizona Board of Regents, Arizona State University, the University of Arizona, and Northern Arizona University to establish new policies that facilitate the transfer of technology from the university environment to industry.¹⁴⁶

The educational resources system located in and adjacent to the Arizona High-Tech Industrial Cluster offers a wide variety of academic programs to meet the various needs of industry in the cluster. At the vocational training level the Southern Arizona Institute of Advanced Technology (SAIAT) provides targeted workforce training where students can focus on electronics and aerospace technology. The Pima County Community College offers two-year industry-targeted degree programs that allow the student to transfer credit to a four-year institution. The University of Arizona is a major research institution offering bachelor, graduate and doctoral degrees with departments of aerospace and mechanical engineering, chemical engineering, electrical and computer engineering, materials science and engineering, and systems and industrial engineering.¹⁴⁷

¹⁴³ Bauer, Brad and Steve Deller. "The Role of Diversification in Economic Growth and Stability." *Wisconsin Economic Development Association*. Online. Available at: <http://www.weda.org/notes/99fall-research.html>

¹⁴⁴ "Focused Future Project" *U.S. Department of Commerce. Economic Development Administration*. Online. Available at: http://www.doc.gov/eda/html/2c1_2_azstory.htm

¹⁴⁵ "SSTI's Profile of Arizona S&T Activities" *State Science & Technology Institute*. Online. Available at: <http://www.ssti.org/States/az.htm>

¹⁴⁶ "High Technology Industry Cluster -- Overview." *The Governor's Strategic Partnership for Economic Development, High Technology Industry Cluster*. Online. Available at: <http://azhitechcluster.org/overview/>

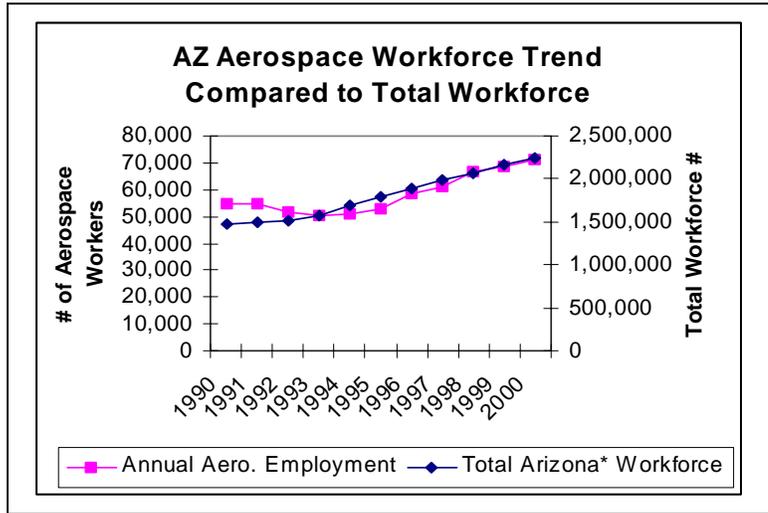
¹⁴⁷ Ibid.

Labor

As Figure 8-A illustrates, since 1993 in the state of Arizona, the growth in the number of aerospace employees has closely tracked the growth of the total workforce. Aerospace workers have (roughly) represented 3% of that total.

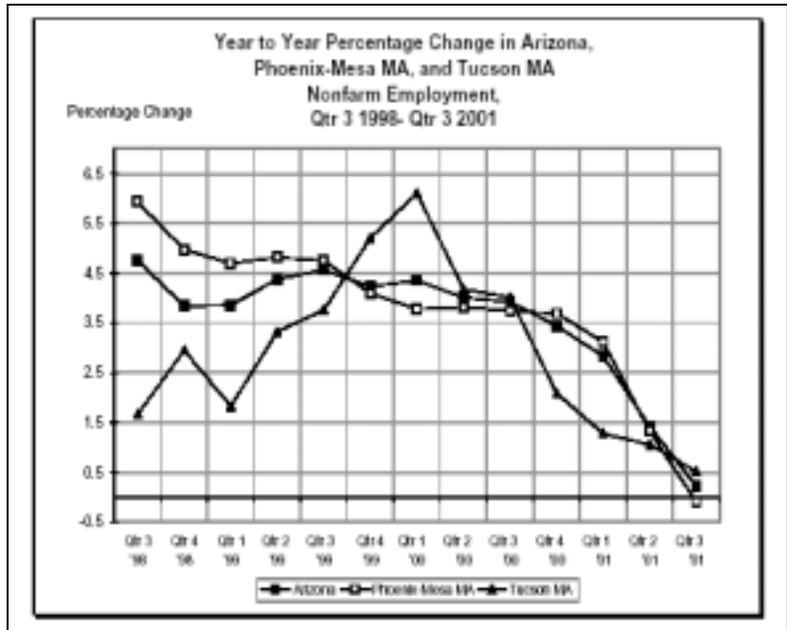
Despite the evident increase in the size of the workforce as shown above, if the farm workers are excluded and we analyze the percentage change in the unemployment rate, we see the non-farm labor market contracting. However, this may cast a positive light on the aerospace industry. Considering that this is pre-September 11th data, the aerospace manufacturing labor market maintained a consistent growth rate despite the contraction in the non-farm labor described above.

Figure 8-A.



Source: Data available at Arizona Department of

Figure 8-B.



Source: "Arizona Quarterly Review." Arizona Department of Economic Security, Division of Employee Services and Support, Research Administration. Fall 2001.

Aviation (Commercial and General)

In terms of commercial aviation, the state’s primary center of air traffic is the Phoenix Sky Harbor International Airport, which was listed as the 15th busiest airport in the world in passengers with 36,040,469 people using the facility in 2000.¹⁴⁸ For the same year, the Phoenix Airport was also ranked 5th busiest in the world for aircraft movement with 637,779 planes utilizing the airport.¹⁴⁹

Table 8-A (below) depicts the use and activity of the general aviation fleet in the state of Arizona for the period between 1996 and 1999.

Table 8-A. Arizona General Aviation Measures

Year	Aircraft Population	# Active	Est. % act	Est. total hours flown	Est. avg. hrs
1996	6202	4598	74.1	697064	151.6
1997	6940	5051	71.8	712438	141
1998	6406	5121	79.9	689231	134.6
1999	7285	5432	74.6	826596	152.2

Source: “General Aviation and Air Taxi Activity Survey 1996-1999.” *Federal Aviation Administration*.

Aviation (Manufacturing)

Arizona's presence as a key aerospace manufacturing state is supported by the 1999 Survey of Manufacturers conducted by the U.S. Census Bureau, which indicated that Arizona is:

- 5th in number of aerospace manufacturing employees
- 5th in payroll
- 6th in number of production workers
- 6th in number of hours of work generated by production workers
- 6th in wages of production workers
- 3rd in value added
- 6th in costs of materials
- 4th in value of shipments
- 9th in capital expenditures¹⁵⁰

¹⁴⁸ "ACI Traffic Data: World airports ranking by total passengers." *The Airports Council International*. Online. Available at: <http://www.airports.org/traffic/passengers.html>

¹⁴⁹ "ACI Traffic Data: World airports ranking by total movements." *The Airports Council International*. Online. Available at: <http://www.airports.org/traffic/movements.html>

¹⁵⁰ “1999 Annual Survey of Manufacturers.” *U.S. Census Bureau*. Online. Available at: <http://www.census.gov/>

Key Arizona manufacturers include companies such as Raytheon Missile Systems which manufactures weapons for the U.S. government and other clients and is a key player in developing a national missile defense program. Other firms include:

- Bombardier Aerospace
- CO Guardian LLC
- Honeywell
- Sargent Controls & Aerospace
- Universal Avionics

Space

The National Aeronautics and Space Administration consistently spends less than 10% of its total budget on projects located within the state of Arizona. Table 8-B illustrates this finding.

Table 8-B. Arizona NASA Procurements

AZ	Business (Thousands)	Educational and Non- Profit (Thousands)	Total (Thousands)	Total (Percentage)
1999	\$35,273	\$22,397	\$57,670	0.5%
2000	\$53,072	\$26,519	\$79,591	0.8%
2001	\$77,975	\$22,277	\$100,252	0.9%

Source: NASA Annual Procurement Reports FY 1998-2001.

Military

The following is a summary of the Arizona military situation:

- 1 Army Fort (Huachuca)
- 2 Air Force Bases (Davis-Monthan, Luke)
- 1 Marine Corps Air Station¹⁵¹

Arizona ranked 5th among the states we studied in military contract dollars for FY2000 (\$4547 in millions of \$)¹⁵²

Arizona ranked 9th among the states we studied in military payroll for FY2000 (\$1995 in millions of \$)¹⁵³

¹⁵¹ "U.S. Military Installations (Publicly Known) as of 26 August 1998." *Department of Defense*. Online. Available at: http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_D_I.html

¹⁵² "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

The Air Force structure changes for FY2003 impacted Arizona in the following ways: Davis-Monthan AFB will lose 497 military personnel and 18 civilian authorizations. Luke AFB will increase by 140 military authorizations. Overall the state is losing jobs.¹⁵⁴

The state is taking steps to ensure that its military installations will stay active. The California Research Bureau noted, "During the last base realignment and closure round, the state of AZ appropriated \$1 million to assist local communities with military bases to hire consultants and lobbyists, with the goal of keeping their bases off the BRAC list."¹⁵⁵

If a base is closed, Arizona has policies in place to help those impacted. A military reuse zone is one such policy. This allows the Governor and the state Department of Commerce to reuse the former military installation to help impacted communities and businesses.¹⁵⁶ There are also tax credits and tax incentives for businesses in the military reuse zones.¹⁵⁷ The state also offers defense contractors assistance to "diversify into commercial markets and adopt new manufacturing processes and technologies."¹⁵⁸

Finally, Arizona is a member of the Southwest Defense Alliance.¹⁵⁹ This group attempts to protect military base retention in member states.

Legislation/Regulation

The following is a summary of the economic development strategies employed within the High-Technology Industry Cluster as outlined by the Greater Tucson Economic Council:¹⁶⁰

- Enterprise Zones:
Locating within one of the two manufacturing zones (pending qualifications) entitles a business to an 80 percent reduction in real and personal property tax for a five-year period.
- Foreign Trade Zones:

¹⁵³ "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

¹⁵⁴ "Air Force Announces 2003 Force Structure Changes." *Department of Defense News Release No.143-02*. 22 March 2002.

¹⁵⁵ "State Military Base Retention Programs." *California Research Bureau Note Vol.4, No. 1*. 7 May 1997. Online. Available at: <http://www.cedar.ca.gov/military/retentn.htm>

¹⁵⁶ "Designating Military Reuse Zones." Online. Available at: <http://www.azleg.state.az.us/ars/41/1531.htm>.

¹⁵⁷ "Credit for Increased Employment in Military Reuse Zones." Online. Available at: <http://www.azleg.state.az.us/ars/43/1167.htm>. And "Tax Incentives." Online. Available at: <http://www.azleg.state.az.us/ars/41/1532.htm>.

¹⁵⁸ *Arizona Revised Statutes Title 14, Chapter 10, Article 1, Section 41-1508*. 2000.

¹⁵⁹ "Texas May Enlist in Base-Retention Group." *Los Angeles Daily News*. 20 January 1999.

¹⁶⁰ "Tucson: A Sound Business Decision in 2002: Tax Reduction Programs." *The Greater Tucson Economic Council*. Online. Available at <http://www.futurewest.com/PDF/SoundBiz2002/TaxReduction.pdf>

The state of Arizona offers additional tax reductions for companies locating in a federally designated foreign trade zone.

- **Research & Development Expenses Credit:**
The state of Arizona offers a tax credit for qualified research that is conducted solely in its borders. This includes projects conducted at a university and paid for by the taxpayer.
- **Technology Tax Credit:**
The Arizona Department of Commerce administers a tax credit for employers who create information technology jobs.
- **Accelerated Depreciation:**
Specific classes of personal property are placed on an accelerated depreciation schedule in order to reduce property taxes on such items.
- **Pollution Control Equipment Credit:**
Ten percent of the purchase price of personal property that meets or exceeds pollution control standards is credited to the firm.
- **Central Business District Location (CBD):**
A firm that locates in a specific CBD may be entitled to a property tax abatement.
- **Airport Facility Location:**
Aerospace firms are specifically targeted to receive reduced property taxes should they locate at the Tucson International Airport within the high-tech industry cluster.
- **Defense Restructuring Assistance Program & Credits:**
Defense contractors are given corporate income tax reductions to maintain competitiveness of the firms or they supported in converting to non-defense production. This program has been in place since 1933.

Summary Highlights

Considering its relatively smaller size, Arizona has been able foster substantial economic growth in the manufacturing industry due to its long-term commitment to promoting a "business friendly" environment. This has been achieved through aggressively promoting their high-tech industry cluster through substantial financial incentive programs.

California

Introduction

The aerospace industry in California is in a gradual recovery from the post-Cold War decline. The general depression during this period also contributed to the decline in the aerospace industry due to a reduced demand for aircraft and space vehicles. Despite the post-Cold War contraction and restructuring, California still has the largest share of the national aerospace market.

California ranks:

- 1st in aerospace employment (1998-2000 avg: 364,900)
- 1st in military contract dollars (\$18.1 B)
- 1st in aircraft population (31219)
- 2nd in NASA FY 2001 procurement (\$1.45 B)

Strategy

Economic Development

Defense and Military

Two governmental organizations oversee California's central planning process to convert vacated military facilities and to transition the defense industry to meet private sector demands. The Governor's Office of Planning and Research lead policy and planning on military base reuse while the California Trade and Commerce Agency lead the effort to develop military properties and facilitate defense industry transition.¹⁶¹ Governor Pete Wilson and the State Legislature created the Defense Conversion Council to provide a policy-making forum for defense conversion issues that is statewide. This council consists of representatives from state agencies, the legislature, the private sector, and representatives of regional alliances. In their strategic plan, the Defense Conversion Council established four objectives to pursue:

1. Assist industrial transition to private sector markets
2. Strengthen community capacity to conduct economic development
3. Convert closed military bases to productive value
4. Provide a comprehensive system of workforce development¹⁶²

A statewide network of professional economic development organizations is vital in assisting the state in providing development services to communities and businesses. Over 400 local and regional organizations are located in defense-impacted cities and

¹⁶¹ Report of the Defense Conversion Council *Defense Conversion in California: Economies in Transition*, Executive Summary, 1996.

¹⁶² Ibid.

counties to conduct economic development programs. Among these organizations' functions are permit streamlining, business liaison, loan programs, diverse business incentives, business retention, expansion, attraction, and infrastructure development.¹⁶³

California is utilizing a combination of grants, lobbyists and consultants in its fight to prevent further base closings in the state. Some of these grants are given to local communities to determine the best means to promote the vitality and output of a base. Others are given to study ways to link military bases with state universities and high schools. These grants examine the potential for public-private partnerships, and avenues to further a sale of military land to private developers in exchange for the development or enhancement of existing facilities. In a recent 2001 grant for example, California awarded the city of Lancaster \$50,000 to study the cost and design of a calibration and instrumentation system for testing the Joint Strike Fighter at Edwards Air Force Base.¹⁶⁴

California has completed several negotiated sales and conveyances (or transfers of title) with military bases in the state. The California Trade and Commerce agency lists conveyances by type, differentiating between conveyances for economic development purposes and those for public benefit.

Listed below are examples of:

Economic Development Conveyances

- Fort Ord Army Base/CSU-Monterey Bay: Included 1,340 acres. No cost conveyance
- Fort Ord Army Base/UC Santa Cruz: included 962 acres. No cost conveyance
- Norton AFB/LRA: included 2,000 acres excluding the electric system. Price \$28 million
- Mather AFB/Sacramento County (golf course): Price: \$6 million
- Fort Ord Army Base/PG&E, gas and electric: No price in return for system upgrades

Public Benefit Conveyances

Sponsored by the U.S. Department of Health and Human Services

- Mather AFB/Sacramento County, 39 acres for a homeless shelter
- Sacramento Army Depot/Foodlink, 28 acres
- Mather AFB/2 chapels, 18 acres for church services
- Hamilton Navy Housing/City of Novato, family housing complexes, 554 acres: Price \$8.13 million¹⁶⁵

¹⁶³ "Governor Gray Davis Hosts Aerospace Summit." *In The News*. Online. Available at: www.state.ca.us/state/govsite/gov.html

¹⁶⁴ Cahlink, George. "Bracing for Closure." *Government Executive*. 1 August 2001.

¹⁶⁵ "Status Summary of 29 Major California Military Bases Announced for Closure of Realignment." *California Trade and Commerce Agency*. 1 February 1999.

Sponsored by the National Park Service:

- Mather AFB/Sacramento County, 1,432 acres for a park
- Norton AFB/Highlands, 15 acres for a park¹⁶⁶

Space Advocacy

In an independent report conducted in 2000, California was found to be comparatively moderate in its advocacy and political support of the space industry.¹⁶⁷ The advocacy group for California in this study is the California Space and Technology Alliance (CSTA). CSTA was created by statute in 1998 and is now known as the California Space Authority (CSA). The organization is a partnership of private and public entities brought together to promote and develop a space transportation system. Among its early accomplishments are the development of a strategic plan and an \$8.5 million California Space Infrastructure Program Study, which is underway with the ultimate goal of developing a Space Infrastructure Master Plan (SIMP).¹⁶⁸

The California Aviation System Plan projects strong future growth for the space industry in California. The launch business currently generates \$40 billion in revenues annually. The ten-year forecast is \$160 billion. There is an expectation that space will become more commercially viable. Currently, 90 percent of space revenue is government while 10 percent is commercial. In ten years, it is projected that 60 percent of revenue will be commercial. Overall, California projects 200,000 new jobs created in aerospace and defense industries in the next ten years.¹⁶⁹

Human Capital

Education

A report provided to the CSA found that California offers the greatest number of undergraduate, graduate, and postgraduate degrees in total and in aerospace education programs.¹⁷⁰ The University of California has nine campuses that create an extensive network of research, science, and engineering resources to the state's aerospace industry. In addition, California State University is the largest university system in the nation with 23 campuses granting 1,600 different bachelors' and masters' degrees. Cal State graduates more engineers than any other educational institution.¹⁷¹ In 1999, California

¹⁶⁶ Ibid.

¹⁶⁷ "Competitor Assessment." *Booz Allen Hamilton*. San Diego, California. 11 August 2000.

¹⁶⁸ "The California Aviation System Plan." *California Department of Transportation*. Appendix B, Policy 17:Space & Technology. Online. Available at:

<http://www.dot.ca.gov/hq/planning/aeronaut/documents/Aero%202001%20CIP.pdf>

¹⁶⁹ Ibid.

¹⁷⁰ "Competitor Assessment." *Booz Allen Hamilton*. San Diego, California. 11 August 2000.

¹⁷¹ "Top Ten Space Assets." *California Space Authority (CSA)*. Online. Available at: <http://csta.net/cainindex.html>

had twice as many aerospace industry related vocational institutions as Texas, the next leading state.¹⁷²

Although California does produce the most aerospace-related degrees, California's K-12 education system ranks poorly among other states involved in the aerospace industry. In a competitor metrics analysis prepared for the CSA, a K-12 ranking was developed with "4" representing the highest rating and "1" representing the lowest rating. While Texas and Virginia received scores of 4, California and Mississippi received scores of 1.¹⁷³

Aviation (Commercial and General)

California has 266 commercial and general aviation airports.¹⁷⁴ John D. Kasada, at the California Transportation Futures Conference held on June 21, 2001, suggested that California is in the fifth wave of transportation infrastructure in which airports are the primary drivers of urban growth and form. He claims that air commerce could be considered the backbone due to the critical nature of speed and agility in the new economy.¹⁷⁵

The California Aviation System Plan guides aviation planning in California. First created in 1981, the Plan contains a capital improvement plan that must be updated biennially while all other elements (air transportation issues, regional and state plans, regional and state comparisons, summary and conclusion) are revised every five years.¹⁷⁶ Increased use of the Internet in e-commerce has led to a dramatic increase in the use of air cargo. Overall, business-to-business (B2B) transactions are expected to increase from \$500 million to \$3 to \$6 trillion by 2005. In Southern California, three million tons of cargo passes through annually. By 2020, a projected nine million tons are annually expected the pass through. Los Angeles International Airport was responsible for over 400,000 jobs and generated \$61 billion in regional economic activity in 1999.¹⁷⁷

Aviation (Manufacturing)

California's aircraft manufacturing, while still a leader nationally, is substantially diminished following years of decline coinciding with the fallout from the end of the Cold War. The California Aviation System Plan recognizes the increasingly competitive environment that states, provinces, and nations encounter when pursuing outside business. What remains is 710 manufacturers of aircraft and parts.¹⁷⁸

¹⁷² Ibid.

¹⁷³ "Competitor Assessment." *Booz Allen Hamilton*. San Diego, California. 11 August 2000.

¹⁷⁴ "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

¹⁷⁵ "Governor Gray Davis Hosts Aerospace Summit." *In The News*. Online. Available at: www.state.ca.us/state/govsite/gov.html

¹⁷⁶ "The California Aviation System Plan." *California Department of Transportation*. Appendix B, Policy 17:Space & Technology. Online. Available at: <http://www.dot.ca.gov/hq/planning/aeronaut/documents/Aero%202001%20CIP.pdf>

¹⁷⁷ *Technology, Trade & Commerce Agency*. Online. Available at: <http://www.commerce.state.ca.gov>

¹⁷⁸ Ibid.

Boeing is California's largest producer of commercial and military aircraft, missiles, and information and communications systems. During the 1990s, Boeing acquired McDonnell Douglas and Rockwell International's aerospace and defense operations.¹⁷⁹

Space

The state of California received \$1.45 billion in procurement dollars from NASA in FY 2001. This amount was second only to Texas and represented 13.6% of all procurements for that year. \$300 million of the total went to educational and non-profit institutions, the most awarded to any state.¹⁸⁰

The CSA maintains a list of its top ten key space assets. Though many of the leading assets are military facilities, there are entities in the top ten dedicated almost exclusively to the advancement of space industry. Listed at the top of California's space assets is the state's manufacturing capability. According to CSA, California owns approximately 50 percent of the global satellite market and is home to several major producers of satellites. Among these are Boeing Satellite Systems in El Segundo; Lockheed Martin Commercial Space Systems in Sunnyvale; and Space System/Loral in Palo Alto. Each of the three listed companies brings 40 years of satellite development and spacecraft innovation to the space industry. In addition, numerous benefits are realized by other California major industries including entertainment, information technology, and agriculture.¹⁸¹

NASA also has a major presence in California with more NASA centers than any other state. Annually, California receives nearly 20 percent of NASA's total budget. Three major assets listed by CSA are:

NASA Ames Research Center- NASA's leader in astrobiology and NASA's center of excellence in information technology

The Jet Propulsion Laboratory (JPL)- the California Institute of Technology (Caltech) manages this facility. JPL is NASA's leading center for exploration of the solar system and robotics. In addition, JPL hosts NASA's Deep Space Network. This entity conducts spacecraft communications and scientific investigations.

NASA Dryden Flight Research Center- Located in the Antelope Valley, this facility conducts flight research for current and future aerospace vehicles. This is NASA's premier installation for aeronautical flight research and is involved in the development of reusable launch vehicles.

¹⁷⁹ "California's Economy: Industry Profiles Aerospace." *California Technology, Trade and Commerce Agency*. Online. Available at: http://commerce.ca.gov/state/ttca/ttca_homepage.jsp

¹⁸⁰ NASA FY01 Annual Procurement Report.

¹⁸¹ "Top Ten Space Assets." *California Space Authority (CSA)*. Online. Available at: <http://csta.net/cainindex.html>

California acquired the Space and Naval Warfare Systems Command (SPAWAR) in the late 1990's from Virginia. This facility serves as the national headquarters for one of the U.S. Navy's three hardware systems commands. This complex employs over 500 engineers, scientists, information specialists and technicians. It develops surveillance and reconnaissance systems needed to defend and deploy Naval forces.

Military

Military base closures were a threat to California's economic vitality throughout the 1990's. Twenty-nine California bases, or nearly 30 percent of the total domestic base closures during the first 4 BRAC rounds, closed during the decade.¹⁸² The Defense Conversion Council estimates a loss of 186,000 jobs and an annual negative economic impact of \$9.6 billion.¹⁸³

California has also sought strategic alliances in its fight to keep additional military bases from closing. California is a member of the Southwest Defense Alliance. SDA is comprised of a group of states that joined together to "protect military bases from closure and to draw jobs to California and the Southwest."¹⁸⁴ In addition, the Travis Regional Armed Forces Committee, a local AFB support organization, helps to maintain Travis AFB and the jobs located therein.¹⁸⁵ In addition, California has enacted laws to help communities and businesses. The Local Agency Military Base Recovery Act is one such law, which hopes to "stimulate business and industrial growth in areas that experience military base closures by relaxing regulatory controls."¹⁸⁶

New Contracts

Four significant defense contracts were awarded to California companies in January 2002.

1. Lockheed Martin Missile and Space in Sunnyvale received a \$248,522,592 contract to produce Trident II missiles.
2. Lockheed Martin Space Systems in Sunnyvale received a \$27,611,447 contract for Engineering Development Units, Support Equipment, design packages, and software upgrades.
3. Lockheed Martin Space Systems in Sunnyvale received a \$24,845,402 contract for Trident II missile production and deployed system support.
4. Science Applications International Corporation in San Diego was awarded a contract for \$100,000,000 for supplying the full inventory management of space parts in designated stock areas for the USAF.¹⁸⁷

¹⁸² Cahlink, George. "Bracing for Closure." *Government Executive*. 1 August 2001.

¹⁸³ Report of the Defense Conversion Council *Defense Conversion in California: Economies in Transition*, Military Bases, 1996.

¹⁸⁴ "Texas May Enlist in Base-Retention Group." *Los Angeles Daily News*. 20 January 1999.

¹⁸⁵ "Travis Air Force Base." Online. Available at: <http://www.cedar.ca.gov/military/active/travis.htm>.

¹⁸⁶ *California Government Codes Section 7105-7118*. Available at: <http://www.leginfo.ca.gov/>

¹⁸⁷ "Contracts." *Department of Defense News Release No.040-02*. 28 January 2002.

Legislation/Regulation

The California Department of Transportation is home to the Division of Aeronautics, the primary air transportation agency. The Division of Aeronautics has responsibilities that include:

- Providing State grants and loans to cities, counties, districts, and airport land use commissions for airport development and preparation of comprehensive land use plans.
- Inspecting airports and heliports for compliance with safety standards.
- Providing design, maintenance, and administration technical assistance.
- Developing and updating a plan that coordinates the State's aviation plan.
- Administering California Airport Noise Program regulations.
- Conducting preliminary California Environmental Quality Act (CEQA) documents for projects at or near airports.
- Providing environmental impact reduction technical assistance.¹⁸⁸

Business Incentives

California made changes to make the state friendlier to business in the years preceding the post Cold War economic crisis. These changes include tax credits for manufacturing equipment purchases, an expansion of a tax credit for research and development, a reduction of the capital gains tax for investment in small businesses, and a reinstatement of a partial operating loss carryover.¹⁸⁹

The California Trade and Commerce Agency sponsored the formation of a Business Investor panel through the Defense Conversion Council. This panel was charged with examining capital formation issues in California. The panel determined that beyond investment capital shortfalls, existing regulatory and tax policies served as obstacles to capital formation in California.¹⁹⁰ It is their belief that the small companies fared much worse under existing condition than larger entities. Two obstacles discussed in the panel's findings were:

Corporate Taxes. The Business Investment Panel noted a perception that California has an unfriendly tax climate for business. The Panel found this to be true citing data indicating that California had the highest corporate income taxes among all western states and that the California corporate rate was a full 50 percent above the national average.

Blue Sky Laws. Blue Sky laws are securities laws designed to standardize disclosure requirements. California engages in a Blue Sky law called "merit review." The state

¹⁸⁸ *California Division of Aeronautics.* Online. Available at:

<http://www.dot.ca.gov/hq/planning/aeronaut/htmlfile/mission/html>

¹⁸⁹ Report of the Defense Conversion Council *Defense Conversion in California: Economies in Transition, Regulatory and Tax Obstacles to Capital Formation*, 1996.

¹⁹⁰ *Ibid.*

Department of Corporations was given the power to approve or deny an offering based on disclosure “merit.” The Panel found this process to be a costly impediment to small businesses and start up companies. Despite a way around this exhaustive process, few in the early 1990’s were taking advantage, creating an additional cost to their businesses and the state of California.¹⁹¹

Data Presentation

Human Capital

Table 9-A. California Aerospace Employment

	Annual Employment	Total California* Workforce	% of California Workforce
1990	500,700	12,498,908	4.01%
1991	471,100	12,358,500	3.81%
1992	431,700	12,153,150	3.55%
1993	379,500	12,045,217	3.15%
1994	340,900	12,158,917	2.80%
1995	323,600	12,419,975	2.61%
1996	360,800	12,743,375	2.83%
1997	365,800	13,155,283	2.78%
1998	376,300	13,594,858	2.77%
1999	362,100	13,988,550	2.59%
2000	356,300	14,485,584	2.46%
2001	353,700	14,699,767	2.41%

* Non-farm, non-agricultural (Bureau of Labor Statistics)
Data available at California Economic Development Department

- California has 70,268 certified pilots (9.1 percent of national total)¹⁹²
- California ranks #1 in the U.S. with 12 public and private higher education institutions designated as doctoral extensive by the National Center of Education Statistics. Doctoral Extensive institutions are those that are committed to education through the doctorate and award 50 or more doctoral degrees per year across at least 15 disciplines¹⁹³

¹⁹¹ Report of the Defense Conversion Council *Defense Conversion in California: Economies in Transition, Regulatory and Tax Obstacles to Capital Formation*, 1996.

¹⁹² “Aviation In California: Fact Sheet.” *California Division of Aeronautics: California Technology, Trade and Commerce Agency*. 2000.

¹⁹³ “National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS).” *U.S. Department of Education*. August 2001.

- California ranks #1 with 188 public and private 2-year colleges¹⁹⁴
- California ranks #1 in the number of associates' degrees awarded during 1999-2000 with 65,938 degrees. Florida and Texas trail far behind with 35,348 and 25,665 associate degrees awarded respectively¹⁹⁵
- In FY 1999, California had twice as many aerospace industry related vocational institutions as Texas, the next leading state¹⁹⁶
- California State University is the largest university system in the nation with 23 campuses granting 1,600 different Bachelor's and Masters' degrees.¹⁹⁷

Aviation (Commercial and General)

- 15 Military/NASA airports¹⁹⁸
- \$129.7 billion of exports were carried through California ports of entry.¹⁹⁹
- California leads each of the states examined for this study in both aircraft population and active aircraft.
- The number of active aircraft in California declined from 1996 through 1998 before increasing to 24,760 in 1999 from the 1996 level of 23,090.
- California ranked first among states with an estimated 3,513,424 total hours flown in 1999.
- Estimated total hours flown increased in California each year from 1996 through 1999.²⁰⁰
- California has 14 percent of the U.S. total aircraft mechanics (43,000).²⁰¹

Based on airline activity data from the Air Transportation Association, the rankings of California in departures, cargo to emplane by ton, passengers to emplane, and 1997 total airline compensation are listed below:

- #2 in departures
- #1 in cargo to emplane
- #1 in passengers to emplane
- #1 in total airline compensation in 1997²⁰²

¹⁹⁴ Ibid.

¹⁹⁵ Ibid.

¹⁹⁶ "Top Ten Space Assets." *California Space Authority (CSA)*. Online. Available at: <http://csta.net/cainindex.html>

¹⁹⁷ "Competitor Assessment." *Booz Allen Hamilton*. San Diego, California. 11 August 2000.

¹⁹⁸ "Aviation In California: Fact Sheet." *California Division of Aeronautics: California Technology, Trade and Commerce Agency*. 2000.

¹⁹⁹ Ibid.

²⁰⁰ "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

²⁰¹ "Aviation In California: Fact Sheet." *California Division of Aeronautics: California Technology, Trade and Commerce Agency*. 2000.

²⁰² "State-by-State Impact of Airlines." *Aviation Economic Impact*. Online. Available at: <http://www.airlines.org/public/industry/display1.asp?nid=1175>

Aviation (Manufacturing)

- California has 710 manufacturers of aircraft and parts
- There is an aerospace supplier presence in every one of California's legislative and congressional districts.²⁰³

The 1999 Survey of Manufacturers conducted by the U.S. Census Bureau confirmed California's continued status as the leading state in aerospace manufacturing. California's rank among states involved in aerospace manufacturing is listed below:

- #1 in number of aerospace manufacturing employees
- #1 in payroll
- #1 in number of production workers
- #1 in number of hours of work generated by production workers
- #1 in wages of production workers
- #1 in value added
- #1 in cost of materials
- #1 in value of shipments
- #1 in capital expenditures²⁰⁴

Space

Figure 9-A demonstrates that, while Texas far surpassed California and Florida in total business procurement in FY2001, California more than doubled Texas and Florida in procurement dollars for educational programs. (see figure 9-A next page)

²⁰³ "Top Ten Space Assets." *California Space Authority (CSA)*. Online. Available at: <http://csta.net/cainindex.html>

²⁰⁴ "1999 Annual Survey of Manufacturers." *U.S. Census Bureau*. Online. Available at: <http://www.census.gov/>

Figure 9-A. NASA FY2001 Procurement Distribution

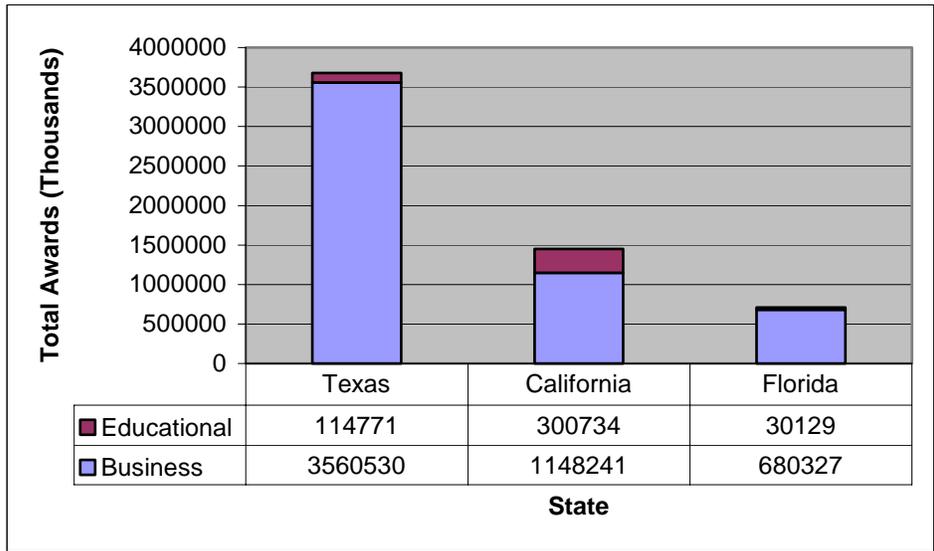
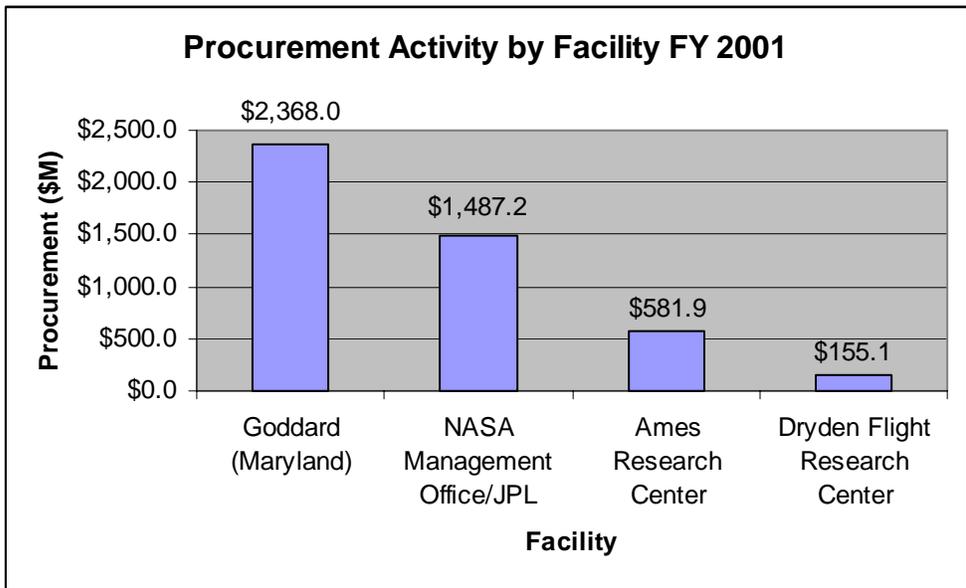


Figure 9-B. NASA FY2001 Procurement Activity by Facility



- 96 producers of spacecraft and parts operate in California
- According to The California Space Authority (CSA), California owns approximately 50 percent of the global satellite market and is home to several major producers of satellites including Boeing Satellite Systems in El Segundo;

Lockheed Martin Commercial Space Systems in Sunnyvale; and Space System/Loral in Palo Alto.²⁰⁵

Military

- California ranked 1st among the states included in this study in military contract dollars for FY 2000 with \$18,100,000,000²⁰⁶
- While California receives more DOD and NASA money than any other state, California's percentage is shrinking according to the California Manufacturers Association²⁰⁷
- Infrastructure:
 - 3 Army Forts (Hunter, Liggett, Ord, Irwin)
 - Oakland Army Base
 - 4 Naval Air Stations
 - 1 Naval Command Station
 - 1 Naval Submarine Base
 - 1 Naval Weapons Station
 - 7 Air Force Bases (Beale, Edwards, Los Angeles, March, McClellan, Travis, Vandenberg)
 - 2 Marine Corps Air Stations²⁰⁸
- 24 major California bases have been closed since 1988.²⁰⁹

Summary Highlights

- California ranks first among the eleven states studied in military procurement dollars, with \$18.1 billion allocated in FY2002. Compared to the other states, however, California's share of the total national military budget is declining.
- California is willing to use proactive measures like tax credits and a reduction of capital gains tax to encourage development and investment.
- California uses public-private partnerships to share authority and financial responsibility for dealing with military base closures.
- The human capital resources in California, including strong institutions of higher education and a technology-based workforce, position California to be a leader in the aerospace industry.

²⁰⁵ "Top Ten Space Assets." *California Space Authority (CSA)*. Online. Available at: <http://csta.net/cainindex.html>

²⁰⁶ "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

²⁰⁷ "State Looking to Save, Expand Aerospace Industry" *Aerospace News and Review. Journal of Aerospace and Defense Industry News*. 19 November 1999.

²⁰⁸ "U.S. Military Installations (Publicly Known) as of 26 August 1998." *Department of Defense*. Online. Available at: http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_D_I.html

²⁰⁹ "Major Base Closure Summary," available at: <http://www.defenselink.mil/faq/pis17.html>, viewed on April 29, 2002.

Florida

Introduction

In order to better understand the aerospace industry in Texas, it is important to know the status of the aerospace industry in other states. This section will focus on the state of Florida, its economic development pursuits, human capital resources, space initiatives, and military presence. Among the eleven states studied in this report, Florida ranks:

- 3rd in active aircraft²¹⁰
- 8th in number of aerospace manufacturing employees (13,805), which is 9.88% of the total aerospace-manufacturing employees in the U.S.²¹¹
- 4th in NASA procurement activity²¹²
- 4th in military contract dollars²¹³
- 4th in military payroll expenditures²¹⁴

Florida is well known both nationally and internationally as a hub of major aerospace activity. From the Kennedy Space Center at Cape Canaveral that has sent Americans into space and to the moon to the Miami and Orlando airports that send people to all corners of the world and welcome them back to the United States, Florida's strength in aerospace activities ranks among the top states in the nation.

Following the decision of then President Harry S. Truman to locate the new Joint Long Range Proving Grounds at Cape Canaveral in October 1949²¹⁵, the aerospace industry in Florida accelerated. The development of the space program during the "space race" of the 1950's and 1960's fueled development in Florida of aerospace assets. Large numbers of federal employees and their families were located near federal installations.

The warm climate of Florida also contributed to the development of the Miami and Orlando airports as major international airports. With normally mild weather, Florida often serves as the point of arrival and departure for many international flights.

²¹⁰ "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

²¹¹ "1999 Annual Survey of Manufacturers." *U.S. Census Bureau*. Online. Available at: <http://www.census.gov>

²¹² Annual Procurement Reports. *NASA*. FY 1998-2001.

²¹³ "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

²¹⁴ *Ibid.*

²¹⁵ "Chapter One: Origins." *The Kennedy Space Center Story*. Online. Available at: <http://www-pao.ksc.nasa.gov/kscpao/kscstory/ch1/ch1.htm>

Strategy

Organizations which Promote Aerospace

Public

Two independent agencies in Florida approach aerospace issues from distinct but interrelated perspectives. The Florida Department of Transportation (FDOT) fulfills the traditional role of administering aviation issues. The Florida Space Authority (FSA) promotes the commercial space industry in Florida.

The Florida Department of Transportation

FDOT coordinates aviation activities for the state of Florida. The traditional role of administering pilot licensing, airport authorization, and other governmental functions is fulfilled by the FDOT. Enplanements, airport traffic reports, and other statistical measures are maintained by FDOT. In addition to record keeping, FDOT also engages in economic development activities including attempting to attract new aviation-related businesses to Florida. FDOT has also worked with private aerospace promotion groups like the Florida Aviation Aerospace Alliance (FAAA) in cooperative efforts to expand the aerospace industry in Florida.²¹⁶

The Florida Space Authority

The governor and state legislature created FSA as a government space agency in 1989. According to the FSA, “The Authority’s mission is to expand, retain, and diversify the state’s space-related industry...With regard to spaceport development and operations, FSA is broadly empowered to own, operate, construct, finance acquire, extend, equip and improve spaceport infrastructure.”²¹⁷ Additionally, “Florida Space Authority is dedicated to providing economic development for the state through space-related business and educational activities.”²¹⁸ Long-term, FSA hopes to gain federal support for the utilization of federal launch sites for commercial applications.

The Florida Space Grant Consortium

The FSGC was founded in 1989 as part of NASA’s Space Grant and College Fellowship Program. The purpose of the FSGC is to provide students and scholars with grants, scholarships, and fellowships that will aid in their study of space-related fields. According to the organization, “The Florida Space Grant Consortium sees ourselves developing stronger contacts with government, industry, and educational partners, and using these contacts and partnerships to further meet the needs of Florida’s educational

²¹⁶ “Florida Aviation Aerospace Alliance- The Organization.” *Florida Aviation Aerospace Alliance*. Online. Available at <http://www.faaa.org/organization.html>

²¹⁷ “Quick Facts about Florida Spaceport Authority.” Online. Available at <http://www.spaceportflorida.com/>

²¹⁸ Ibid.

system. In addition, FSGC will work closely with Kennedy Space Center (KSC), as KSC moves its focus to becoming a Spaceport Technology Center. This close interaction will afford greater opportunities for our award recipients to perform research and investigations on projects that will be utilized by real-world space-related projects and missions.”²¹⁹ In this way, FSGC combines both education and economic development to promote the aerospace industry in Florida.

Private

The Florida Aviation Aerospace Alliance

According to the FAAA website, “The FAAA began with 37 companies as an Aviation Aerospace Task Force in May 1997. In February 1998 the Florida Aviation Aerospace Alliance was established as a private, dues paying, non-profit, corporation. Today this growing organization, *in partnership with the State of Florida*, has succeeded in bringing the Aviation, Space, and Aerospace Defense Sub-Sectors from across Florida together with a commitment to enhance the growth of their businesses and the growth of the aviation and aerospace industry in our State.”²²⁰ Listed among the organization’s accomplishments are the elimination of the sales and use taxes on the parts and repair of aircraft, establishment of a capital investment tax credit, and the elimination of the sales and use tax on the purchase and lease of commercial aircraft.²²¹

Economic Development

The Florida Office of Trade, Tourism, and Economic Development

OTTED has supervisory authority over state planning for economic development. According to the Office of the Governor, “The Office of Tourism, Trade and Economic Development’s Mission is to assist the governor and lieutenant governor in working with the legislature, state agencies, business leaders, and economic development professionals to formulate policies and strategies designed to provide economic opportunities for all Floridians. In order to achieve its mission, OTTED works closely with Enterprise Florida Inc., VISIT FLORIDA, Florida Sports Foundation, Spaceport Florida Authority, Florida Film Commission, Black Business Investment Board, and Front Porch Florida.”²²²

Florida takes a centralized approach to economic development. The Florida Statewide Strategic Plan for Economic Development, initiated by the Governor, is revised each year

²¹⁹ “Mission.” *Florida Space Grant Consortium*. Online. Available at <http://fsgc.engr.ucf.edu/aboutfsgc/aboutfsgc.htm>

²²⁰ “Florida Aviation Aerospace Alliance- The Organization.” *Florida Aviation Aerospace Alliance*. Online. Available at <http://www.faaa.org/organization.html>

²²¹ Ibid.

²²² “Partnering to Shape Florida’s Economic Future” *Florida Strategic Plan for Economic Development 2001-2006*. Online. Available at <http://www.efflorida.com/strategicplan/2001sp/SPED%2001-06%20final%20approved.pdf>

to coordinate the efforts of various local, regional, and state agencies and organizations to improve the business climate of Florida. The 2001 plan is focused on six imperatives:

1. Make Florida a priority location for national and international business and trade expansion.
2. Develop a world-class workforce.
3. Enhance the competitiveness of Florida's business climate.
4. Create a worldwide pro-business image.
5. Establish the infrastructure for a globally competitive economy
6. Promote growth opportunities for Floridians, including urban core and rural communities.²²³

The Strategic Plan is not focused around any one particular industry, but instead speaks to generalizations about the type of economic activity that the state seeks to encourage. High priorities include knowledge-based industry and high-tech manufacturing, both critical elements of the aerospace industry. The coordinated approach to economic development allows the state to have a system of communication between different levels of government. Such an approach allows Florida to move quickly to attract new businesses to the state, even when the legislature may not be in session to approve tax breaks or other pro-business legislation.

Enterprise Florida

Enterprise Florida is a partnership between Florida state government and the state's private businesses. It carries the primary responsibility for promoting economic development in the business community. According to the agency, "Enterprise Florida's mission is to increase economic opportunities for all Floridians, by supporting the creation of quality jobs, a well-trained workforce, and globally competitive businesses. It pursues this mission in cooperation with its statewide network of economic development partners."²²⁴

Data Presentation

Human Capital

Education

One of the keys to maintaining strong aerospace employment is an educated workforce. Florida offers ample opportunities for higher education. With 176 total sites for state university system activities, not including other degree-granting institutions, there are

²²³ "Partnering to Shape Florida's Economic Future" *Florida Strategic Plan for Economic Development 2001-2006*. Online. Available at <http://www.eflorida.com/strategicplan/2001sp/SPED%2001-06%20final%20approved.pdf>

²²⁴ "About Us." *Enterprise Florida*. Online. Available at http://www.eflorida.com/all_about.html

locations all over the state for Floridians to participate in higher education.²²⁵ The state university system offers 195 Bachelor’s fields of study, 201 Master’s fields of study, and 134 doctoral fields of study.²²⁶ The state grants approximately 50,000 degrees annually.²²⁷ In 2000, the state university system had 291,811 students enrolled in its various institutions.

Labor

Florida does have a large and highly skilled workforce. From 1990-2001, the overall workforce in Florida grew from 5,387,292 to 7,199,908 workers.²²⁸ During that same time frame, the total number of workers employed in the aerospace industry fell from 194,138 to 135,611 workers.²²⁹ This decrease follows the national trends. The 30 percent decrease was above the national average.²³⁰ The annual employment, annual average wage, total Florida workforce, and percentage of total Florida workforce are noted in the chart below.

Table 10-A. Florida Aerospace Employment

	Annual Employment	Annual Avg. Wage	Total Florida* Workforce	% of Florida Workforce
1990	125,100	\$30,696	5,387,292	2.32%
1991	116,271	\$32,703	5,294,308	2.20%
1992	111,697	\$34,739	5,358,708	2.08%
1993	112,860	\$35,210	5,571,650	2.03%
1994	111,077	\$36,176	5,799,158	1.92%
1995	112,672	\$37,131	5,488,733	2.05%
1996	132,059	\$37,874	6,182,708	2.14%
1997	135,091	\$39,745	6,413,717	2.11%
1998	139,602	\$41,934	6,634,283	2.10%
1999	136,264	\$43,161	6,826,617	2.00%
2000	137,084	\$46,225	7,082,242	1.94%
2001^	135,608	\$11,966	7,199,908	1.88%

^annual employment and wage is the average of the first two quarters

* Non-farm, non-agricultural (Bureau of Labor Statistics)
Data available at Florida Labor Market Statistics.

²²⁵ “SUS Physical Characteristics.” *A Profile In Brief*. Online. Available at <http://www.fldcu.org/borpubs/profilebrief.pdf>

²²⁶ “SUS Academic Characteristics.” *A Profile In Brief*. Online. Available at <http://www.fldcu.org/borpubs/profilebrief.pdf>

²²⁷ Ibid.

²²⁸ “SIC Code Data.” *Florida Labor Market Statistics*.

²²⁹ Ibid.

²³⁰ Ibid.

Aviation (Commercial and General)

Florida consistently ranks among the top states in all aviation categories. The warm climate and ready availability of both aircraft and airports contribute to a vibrant aviation industry. Both commercial and general aviation are strong in Florida. As will be demonstrated below, Florida joins California and Texas as leaders in general aviation in terms of aircraft and aircraft activity, and joins California, Texas, Illinois, and New York in commercial aviation activity. In addition to traditional measures of aviation strength, this study looked at other aviation assets as well. Florida is home to 20 aviation museums, including the world-renowned National Museum of Naval Aviation at the Pensacola Naval Air Station.²³¹

Florida ranks third behind California and Texas in the number of total aircraft, number of active aircraft, and total number of hours flown for all aircraft.²³² The following chart details the steady increase in both number of aircraft and activity of those aircraft in Florida.

Table 10-B. Florida General Aviation Measures

Year	Aircraft Population	# Active	Estimated total hours flown
1996	15,467	11,398	1,589,666
1997	16,547	12,030	1,877,892
1998	15,714	12,785	1,962,460
1999	18,889	15,301	2,530,511

Source: "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*.

Florida has some of the nation's most heavily used commercial airports. Miami International Airport serves as American Airlines' main southeast hub, in addition to being the main point of departure and arrival for many international flights.²³³ Florida is home to 7 of the nation's 61 most heavily used airports, including Miami (7), Orlando (16), Tampa (30), Fort Lauderdale/Hollywood (32), West Palm Beach (54), Fort Meyers (60), and Jacksonville (61). In 1998, these seven airports had a combined total passenger traffic total of 103,201,503 people.²³⁴

²³¹ "Aviation Museums: Florida USA." *Aviation Enthusiast Corner*. Online. Available at: <http://www.aero-web.org/museums/fl.htm>

²³² "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

²³³ "How Airlines Work." *Roberts, Roach, and Associates*.

²³⁴ "Use of Major U.S. Airports- 1991(a)." *The Economic Impacts of Civil Aviation (Source: Airport Operators Council International)*

Aviation (Manufacturing)

Florida ranks high in several major manufacturing categories. According to the 2000 U.S. Census, among the 50 states, aerospace manufacturing in Florida is:

- 8th in total number of all aerospace manufacturing employees
- 8th in payroll
- 8th in number of production workers
- 8th in total hours of work generated by production workers
- 8th in wages of production workers
- 8th in value added by manufacturer
- 8th in costs of materials
- 8th in value of shipments
- 7th in total capital expenditures²³⁵

Space

The most significant space asset in Florida is the Kennedy Space Center at Cape Canaveral, Florida. The origin of all manned space flight missions in the U.S., the Kennedy Space Center is also a premier location for commercial, scientific, and military satellite launches.

Table 10-C. NASA Procurement

Kennedy Space Center

Fiscal Year	Procurement (Millions\$)^o	Work Years[^]
1998	\$454.70	Unknown
1999	\$1,120.30	1,784
2000	\$852.80	1,806
2001	\$888.40	1,825
2002	Unknown	*1,852
2003	Unknown	*1,870

*projected

Source: ^oAnnual Procurement Reports. NASA [^]Budget Briefings. NASA

The table demonstrates the fluctuation of the funding of the Kennedy Space Center each fiscal year. The actual dollars procured is a reflection of Congressional budget priorities at the federal level, and the desire of Congress to fund manned space flight. The more funding provided for the international space station, Hubble Telescope and other assets that require manned space flight missions would be directly reflected in the Kennedy Space Center's annual budget allocation. Work years have increased steadily, while funding has fluctuated.

²³⁵ "1999 Annual Survey of Manufacturers." U.S. Census Bureau. Online. Available at: <http://www.census.gov>

As mentioned before, Florida also participates in the national Space Grant Consortium program, which promotes education and economic development in fields that contribute to the expansion of space-based industries. According to the Florida Space Grant Consortium, “FSGC is administered through the University of Central Florida and the Florida Space Institute, and its main offices are located at the Astronaut Memorial Foundation's Center for Space Education, found on the grounds of the Kennedy Space Center Visitor's Complex. The Consortium is a voluntary association of seventeen public and private Florida Universities and colleges. The Consortium also includes all of Florida's community colleges, as well as the Spaceport Florida Authority, the Higher Education Consortium for Science and Mathematics, and the Kennedy Space Center Astronaut Memorial Foundation.”²³⁶

Military

Military spending in Florida contributes significantly to the state's economy. With several key military installations in the state, including six Naval Air Stations and four Air Force Bases, federal military spending will continue to play a key role in the state's economic future.²³⁷

Compared to the other ten states studied, Florida ranked 4th in military contract dollars awarded to the state for FY 2000 (\$6.47 billion).²³⁸ In military payroll, Florida ranked 4th in FY 2000 (\$6.887 billion).²³⁹

Headed into the next round of military base closings, Florida is attempting to position itself as a strategic necessity for U.S. security. The renewed national focus on homeland security in the post-September 11 environment will be of special importance in Florida, given the state's geographic location.

Legislation/Regulation

Three major issues were pushed in the state legislature this year that failed to pass, but will be renewed during the 2002 session:

1. Tax exemption for research and development and manufacturing equipment for defense and space industry.
2. Proration of the aviation fuel tax.
3. Sales tax exemption for aircrew training simulators²⁴⁰

²³⁶ “Mission.” *Florida Space Grant Consortium*. Online. Available at <http://fsgc.engr.ucf.edu/aboutfsgc/aboutfsgc.htm>

²³⁷ “U.S. Military Installations (Publicly Known) as of 26 August 1998.” Department of Defense. Online. Available at : http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_D_I.html

²³⁸ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

²³⁹ Ibid.

²⁴⁰ “New Legislative Agenda For 2001.” *Florida Aviation Aerospace Alliance*. Online. Available at: <http://www.faaa.org/1999.asp>

These issues will be at the forefront of the aerospace industry's lobbying efforts in the state legislature during the 2002 session.

Summary Highlights

1. Florida has the Kennedy Space Center, a unique installation that will almost certainly be perpetually maintained due to its location and facilities. This single fact will drive space-based aerospace industry in Florida for decades to come.
2. Florida's centralized approach to economic development, coupled with the Florida Space Authority and the Department of Transportation's efforts to bring new business to Florida, will continue to pay dividends.

Georgia

Introduction

In order to better understand the aerospace industry in Texas, it is important to know the status of the aerospace industry in other states. This section will focus on the state of Georgia, its economic development pursuits, human capital resources, space initiatives, and military presence. Among the eleven states studied in this report, Georgia ranks:

- 6th in active aircraft²⁴¹
- 6th in number of aerospace manufacturing employees (18,874), which is 16.78% of the total aerospace-manufacturing employees in the U.S.²⁴²
- 6th in military contract dollars²⁴³
- 5th in military payroll expenditures²⁴⁴

Strategy

Organizations which Promote Aerospace

Governmental Groups

Georgia does not have a state agency or commission that is solely dedicated to promoting and supporting the aerospace industry. However, in 1994 the Governor's Science and Technology Advisory Council produced a report examining how the aerospace industry could benefit Georgia.²⁴⁵ To continue this study the *Senate Study Commission on Promoting Aerospace Development, Commercial Space Activities, and Telecommunications Technology* was commissioned in 1998. The purpose of the study was to "investigate the feasibility of the emerging aerospace and telecommunications market niches."²⁴⁶ Within the report they concentrated on three key focus areas—Economic Development, Private-to-Public Technology Transfer, and Launch Infrastructure.

The Commission provided recommendations to provide funding for the expansion of educational programs and tax incentives for companies in the aerospace industry to attract high-tech companies. They also recommended that a resolution be introduced to

²⁴¹ "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

²⁴² "1999 Annual Survey of Manufacturers." *U.S. Census Bureau*. Online. Available at: <http://www.census.gov>

²⁴³ "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

²⁴⁴ Ibid.

²⁴⁵ Report of the Senate Commission on Promoting Aerospace Development, Commercial Space Activities, and Telecommunications Technology.

²⁴⁶ Ibid.

allow them to continue their study. Finally, they recommended that additional grants be awarded to students in aerospace fields.²⁴⁷

Georgia Space Grant Consortium

Although there is not a lead agency to promote aerospace, Georgia is part of the National Space Grant Consortium. It was one of the first states to receive this honor in 1989.²⁴⁸ The consortium is comprised of nine colleges and universities including Clark Atlanta University, Columbus State University, Georgia Tech, Kennesaw State University, Mercer University, Morehouse College, Spelman College, State University of Western Georgia, University of Georgia and one non-profit, Orbit Education, Inc.²⁴⁹ “The consortium targets pre-college, undergraduate, graduate, professionals, and the general public [while providing] a complementary blend of educational, technical, research, and social elements.”²⁵⁰

Economic Development

Georgia’s approach to economic development is decentralized. There are two state departments that are responsible for economic development efforts—*Department of Community Affairs* and *Department of Industry, Trade, and Tourism*. Within economic development, as a whole, there are four major efforts consisting of marketing and business recruitment, financial incentives, technical assistance, and employee training services.²⁵¹ These efforts go beyond the two state departments, which are aided by the Department of Labor, the University System of Georgia, and the Department of Technical and Adult Education.²⁵² The University System of Georgia and the Department of Technical and Adult Education provide employee-training services. Currently there is a coalition building in support of centralizing these efforts under one legislatively responsible organization.²⁵³

Georgia Department of Community Affairs

The Department of Community Affairs (DCA) is charged with identifying “industries for which the rural areas of the state have a comparative advantage and exploring resources for venture capital of the rural areas.”²⁵⁴ However, a comprehensive plan hasn’t been made available since 1990.²⁵⁵ DCA is responsible for the administration of financial

²⁴⁷ Ibid.

²⁴⁸ *Georgia Space Grant Consortium*. Online. Available at: <http://www.ae.gatech.edu/research/gsgc/>

²⁴⁹ “Georgia Space Grant History.” *Georgia Space Grant Consortium*. Online. Available at: <http://www.ae.gatech.edu/research/gsgc/page3.html>

²⁵⁰ Ibid.

²⁵¹ “Compilation of Statewide Recommendations.” Online. Available at: <http://www.dca.state.ga.us/ruralcouncil/state/SRGCompilation.PDF>

²⁵² “State Economic Development Efforts: An Overview.” (1999) *Department of Audits Office of Planning and Budget*. Online. Available at: <http://www2.state.ga.us/Departments/AUDIT/pao/econdev.pdf>

²⁵³ Ibid.

²⁵⁴ Ibid, p.17.

²⁵⁵ Ibid.

incentive programs, as well as technical assistance to local governments, development authorities, and private for-profit entities.²⁵⁶ The Department of Industry Trade, and Tourism and the University System of Georgia aid DCA in administering technical assistance. Some of the programs DCA oversees are outlined in Table 11-A.

Table 11-A. Georgia State-Administered Financial Incentive Programs

Program	Type Assistance	Eligible Recipients	Program Description
Employment Incentive Program (EIP)	Grants	Local Governments	1. Infrastructure improvements to facilitate business location/ expansion 2. Low- interest loans to eligible businesses 3. Funds for local training centers
Regional Economic Business Assistance (REBA)	Grants	Local Governments	1. Infrastructure improvements, site acquisition, equipment and machinery, railway access, and other projects designed to facilitate a company locating in the local community
Regional Assistance Program (RAP)	Grants	Local Governments State Agencies State Authorities	1. Regional industrial parks, regional marketing and recruitment programs, and other regional activities designed to support the development of multi-county/ regional economic development
Business Development Revolving Loan Fund	Loans	Companies	1. Low- cost loans to qualified businesses located in the 35 counties of the Appalachian Region of Georgia to encourage economic development, downtown development, job creation/ retention, and preservation / enhancement of historic and other business districts
ARC Infrastructure Program	Grants	Local Governments	1. Infrastructure projects such as water and sewer projects and adult literacy and dropout prevention projects
Loans for Rural Industry (LFRI)	Loans	Companies	1. Low- cost loans for companies engaged in manufacturing, warehousing, distribution, and other “value- added” activities
Incentive Loans for Industry (ILFI)	Loans	Companies	1. Low- cost loans for companies engaged in manufacturing, warehousing, distribution, and other “value- added” activities
Business Expansion and Support Act	Tax Credits	Companies	1. Job tax credits and different forms of investment tax credits depending on such factors as location, number of jobs created, and dollar amount and type of investment

Source: State Economic Development Efforts: An Overview, pg. 4

²⁵⁶ “Economic Development.” Georgia Department of Community Affairs. Online. Available at: <http://www.dca.state.ga.us/economic/index.html>

Additional financial incentives for businesses provided by the State of Georgia are included in Table 11-B.

Table 11-B. Financial Incentives Provided For Business By Georgia 1996

State-sponsored industrial development authority
Privately sponsored development credit corporation
State authority or agency revenue bond financing
City and/or county revenue bond financing
City and/or county general obligation bond financing
State loans for building construction*
State loans for equipment or machinery*
City and/or county loans for building construction
City and/or county loans for equipment or machinery
State financing aid for existing plant expansion*
City/county incentives for industrial plants in high unemployment areas
State incentives for industrial plants in high unemployment areas

*Through FY 1998, loans for building construction, equipment, and machinery were available through DCA's ILFI and LFRI Programs. Currently, local governments may obtain an EIP grant from DCA for a loan to an eligible business
Source: State Economic Development Efforts: An Overview, pg. 7

Department of Industry, Trade, and Tourism

The Department of Industry, Trade, and Tourism (GDITT) is required to make and prepare plans and establish long-term policies for the development and expansion of commerce and industry in the state.²⁵⁷ Along with providing technical assistance, GDITT focuses on marketing and business recruitment. While working in conjunction with the Georgia Department of Labor, GDITT provides interested companies with information on economic and social conditions such as wage data, labor availability, suitable site locations, housing, local educational systems, and taxes.²⁵⁸

²⁵⁷ "State Economic Development Efforts: An Overview." (1999) Department of Audits Office of Planning and Budget. Pg. 17 Online. Available at: <http://www2.state.ga.us/Departments/AUDIT/pao/econdev.pdf>

²⁵⁸ Ibid, p.2.

Data Presentation

Human Capital

Education

Education is a key factor in any economic development endeavor, especially the development of the aerospace industry. Like many other states Georgia has three main educational levels—Primary & Secondary, Post-secondary, and Technical.

Primary & Secondary

In 1999, Georgia received a grade of 89 (B+) from Education Week's *Quality Counts* report.²⁵⁹ In addition to the education students receive in the classroom, Georgia has several extracurricular groups or learning centers that augment the education of Georgia students. Programs focusing on aerospace in particular include:

- SciTrek
An outreach program that offers hands-on learning pertaining to robotic technology, principles of aviation, environmental science, flight camp, career programs, and additional national science programs to 100,000 school children per year²⁶⁰
- Coca Cola Space Science Center
A living memorial to the space shuttle Challenger 51-L Crew, which is affiliated with NASA and provides a full day of flight simulations to students in 6th grade and above²⁶¹
- Thirteen Scribes Inc.
A computer software company that provides low-cost financing for low-cost computers, as well as installation and training for families²⁶²
- Georgia Youth Science and Technology Center
One of fifteen networks of science and technology support centers within Georgia that offers professional development programs, as well as student programs.²⁶³
- Georgia Space Grant Consortium
Provides a link between secondary students and post-secondary students²⁶⁴

²⁵⁹ "Academic Standards, Assessments, and Accountability." *Education Week*. Online. Available at: <http://www.edweek.org/sreports/qc99/states/indicators/in-t2.htm>

²⁶⁰ Senate Commission report pg. 4

²⁶¹ Ibid, p.4-5.

²⁶² Ibid, p.5.

²⁶³ Ibid, p.5-6.

²⁶⁴ *Georgia Space Grant Consortium*. Online. Available at: <http://www.ae.gatech.edu/research/gsgc/index.html>

Post-secondary

Georgia has the fourth largest public university system, which includes 34 institutions. In academic year 1999-2000, a total of 29,219 bachelor's and 10,410 master's degrees were conferred. From 1996 to 1999, the state increased its total fall enrollment as illustrated by Table 11-C.

Table 11-C. Total Georgia Fall Enrollment in Degree Granting Institutions

1996	1997	1998	1999
300,795	306,238	303,685	311,812

Source: National Center for Education Statistics, Digest of Education Statistics, 2001

Included within the Georgia post-secondary system is Georgia Tech, which is the nation's largest source of electrical engineering graduates, it also known for the Daniel Guggenheim School of Aerospace Laboratory. Georgia Tech is affiliated with NASA and is rated first in the nation among all public universities for engineering research and development expenditures.²⁶⁵

Georgia Department of Technical and Adult Education

The Georgia Department of Technical and Adult Education (DTAE) oversees the state's system of technical colleges, the adult literacy program, and a host of economic and workforce development programs.²⁶⁶ DTAE is a network of 33 technical colleges that provide traditional training and graduates 15,000 people annually.²⁶⁷ It oversees such economic development programs as

- Georgia Quick Start
- Information Technology Plus
- Certified Specialist programs
- Workforce Development Initiatives
- Apprenticeship in Mold-Making
- Maintenance Assessment
- Restraining Tax Credit
- Georgia Business Expansion Support Act²⁶⁸

²⁶⁵ Georgia Department of Industry, Trade, and Tourism, April 2001.

²⁶⁶ Georgia Department of Technical and Adult Education. Online. Available at: <http://www.dtae.tec.ga.us/>

²⁶⁷ Ibid.

²⁶⁸ "Economic Development Programs." Georgia Department of Technical and Adult Education. Online. Available at: <http://www.dtae.tec.ga.us/>

Labor

From 1996 to 2001, Georgia has had a 16 percent increase in annual employment for the aerospace industry, while the overall workforce has had a 12 percent increase.²⁶⁹ In comparison, the annual employment for the U.S. has remained relatively stable (less than one percent decrease from 1996 to 2000).²⁷⁰

Table 11-D. Georgia Employment and Wage Statistics

	Annual Employment	Annual Avg. Wage	Total Georgia Workforce*	% of Georgia Workforce
1996	75,384	\$40,748	3,528,300	2.14%
1997	79,549	\$44,258	3,615,342	2.20%
1998	83,749	\$48,111	3,739,833	2.24%
1999	85,751	\$55,339	3,883,192	2.21%
2000	85,665	\$53,326	3,949,633	2.17%
2001^	87,530	\$14,197	3,957,658	2.21%

^annual employment and wage is the average of the first two quarters

* Non-farm, non-agricultural (Bureau of Labor Statistics)

Source: Georgia Department of Labor, Workforce Information and Analysis

Aviation (Commercial and General)

Georgia has four major airports—Atlanta Hartsfield International, Augusta Bushfield, Savannah International, and Valdosta Regional. In 1998, Atlanta alone had 73,474,298 passengers.²⁷¹ Among the eleven states studied Georgia ranks 6th in aircraft population (Table 11-E), which had a dramatic decrease from 1998 to 1999 (see Table 4).

²⁶⁹ "SIC Code Data." *Georgia Department of Labor, Workforce Information and Analysis.*

²⁷⁰ *Ibid.*, compilation.

²⁷¹ *Economic Impacts of Civil Aviation.* Pg. 8

Table 11-E. Aircraft Population by State Rankings

	Aircraft Population
California	29,650
Texas	19,744
Florida	16,654
Washington	8,559
Arizona	6,708
Georgia	5,252
Oklahoma	5,045
Kansas	4,468
Virginia	4,117
Alabama	3,808
Mississippi	2,317

Source: Federal Aviation Administration

Table 11-F. Georgia General Aviation Measures

Year	Aircraft Population	Number Active	Estd. Hours Flown
1996	5,824	4,666	623,527
1997	5,737	4,501	569,984
1998	5,895	4,826	608,527
1999	6,550	4,756	621,727

Source: Federal Aviation Administration

Aviation (Manufacturing)

Georgia has a major stake in manufacturing. Some of the top aerospace manufacturers located in Georgia are:

- Lockheed Martin
- Boeing
- Lucas Aerospace
- Gulfstream
- Northrop Grumman
- Ayres Corp.
- Textron's Cessna Aircraft
- Eaton Aerospace
- Pratt & Whitney
- Precision Components
- McCann Aerospace
- PCC Airfoils

According to the Census 2000, Georgia ranks

- 10th in total capital expenditures
- 7th in costs of materials
- 7th in value of shipments
- 6th in number of aerospace manufacturing employees
- 6th in payroll of aerospace manufacturing employees
- 5th in number of production workers
- 5th in number of hours of work generated by production workers
- 5th in wages of production workers
- 5th in value added by manufacturer²⁷²

Space

Although there are no space facilities in Georgia, Georgia does have affiliations with NASA through the Space Grant Consortium.

Military

As with manufacturing, the military is an important aspect of Georgia's economy. The major military bases include three Army forts (Benning, Gordon, Stewart), three Air Force bases (Dobbins, Moody, Robins) and one Naval submarine base.²⁷³ In total there are thirteen military bases that contribute \$15 billion a year to the state's economy.²⁷⁴

Georgia ranks 6th among the states included in this study in military contract dollars in state for FY2000 (\$3665 in millions)²⁷⁵ and ranks 5th in payroll for FY2000 (\$4934 in millions of \$).²⁷⁶

During the last two rounds of base closure and realignment, Georgia did not have any bases closed and actually gained jobs through the process.²⁷⁷ In FY03 Robins Air Force Base will gain 124 military personnel and lose 7 civilian authorizations.²⁷⁸ Overall, they are gaining personnel authorizations, which could translate into a more secure future in which the base will not be altered in the next round of base closure and realignment.

²⁷² "1999 Annual Survey of Manufacturers." *U.S. Census Bureau*. Online. Available at: <http://www.census.gov>

²⁷³ "U.S. Military Installations (Publicly Known) as of 26 August 1998." *Department of Defense*. Online. Available at: http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_D_I.html.

²⁷⁴ "Military Bases Aim to Dodge Cuts." *Atlanta Business Chronicle*. 2 March 2001.

²⁷⁵ "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

²⁷⁶ *Ibid.*

²⁷⁷ "Military Bases Aim to Dodge Cuts." *Atlanta Business Chronicle*. 2 March 2001.

²⁷⁸ "Air Force Announces 2003 Force Structure Changes." *Department of Defense News Release No.143-02*. 22 March 2002.

The prevented loss of personnel could be attributed to the Georgia Military Affairs Coordinating Committee. The MACC “strives to enhance the state’s military bases and is a liaison among military bases, the private sector and state and local governments. The committee works closely with the Governor.”²⁷⁹

In the event that Georgia does experience a base closure, the state has a manufacturer’s investment tax credit program in place to assist companies who primarily produce defense related products. This will provide support to companies in switching equipment, etc from defense industry to another industry.²⁸⁰

Legislation/Regulation

Preliminary research has not provided any evidence of aerospace specific legislation. The most notable push is for the centralization of the economic development effort in Georgia.

Summary Highlights

Georgia does not have a state agency or commission that is solely dedicated to promoting and supporting the aerospace industry. However, the Georgia Department of Community Affairs and Department of Industry, Trade, and Tourism facilitate economic development. They provide marketing and business recruitment, financial incentives, technical assistance, and employee training. Additionally, Georgia has many educational programs that focus on aerospace at the primary, secondary, and collegiate level.

²⁷⁹ Ibid.

²⁸⁰ “Rules and Regulations of the State of Georgia.” Online. Available at: <http://www.ganet.org/rules/index.cgi?base=560/7/8/37>.

Kansas

Introduction

In order to better understand the aerospace industry in Texas, it is important to know the status of the aerospace industry in other states. This section will focus on the state of Kansas, its economic development pursuits, human capital resources, space initiatives, and military presence. Among the eleven states studied in this report, Kansas ranks:

- 9th in the number of active aircraft²⁸¹
- 2nd (overall) in the number of aerospace manufacturing employees²⁸²
- 11th in military contract dollars²⁸³
- 11th in military payroll dollars²⁸⁴

The aerospace industry is a vital part of the Kansas economy; however Kansas is just as important to the success of the United States aerospace industry. “The aircraft and aerospace industry is the largest key sector of the Kansas economy, employing over 42,000 people.”²⁸⁵ Kansas is important to the aviation industry specifically since “over 70 percent of the general aviation aircraft produced in the United States originates in Kansas.”²⁸⁶ In addition, Wichita, Kansas has been referred to as the “Business Jet Air Capital of the World.”²⁸⁷

Strategy

Organizations which Promote Aerospace

There is no specific organization or agency charged with promoting aerospace in the state of Kansas. However, there are several organizations that promote aerospace through economic development.

Economic Development

Kansas Department of Commerce and Housing

Kansas has two formal organizations that coordinate and promote economic development. The Kansas Department of Commerce and Housing (KDCH) “is the lead

²⁸¹ “General Aviation and Air Taxi Activity Survey 1996-1999.” *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

²⁸² “1999 Annual Survey of Manufacturers.” *U.S. Census Bureau*. Online. Available at: <http://www.census.gov>

²⁸³ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

²⁸⁴ Ibid.

²⁸⁵ “Kansas Information.” *Home Again*. Online. Available at: <http://www.homeagain.org/kansasecon.html>

²⁸⁶ “UK Aerospace Companies Build Relationships with Kansas.” *Prowse & Company News Release*. 16 October 2000. Online. Available at: <http://www.prowse.co.uk/Kansas/K161000.htm>

²⁸⁷ Ibid.

agency for economic development in Kansas,” and is responsible for “fostering economic development through the promotion of business, commerce, and industry. This is accomplished through the Department’s seven divisions, along with a network of business assistance providers throughout the state.”²⁸⁸ KDCH also assists companies in participating in foreign trade shows. For example, Kansas sent a delegation to participate in the Asian Aerospace Exhibit in Singapore in late February.²⁸⁹ The delegation was sponsored by the KDCH and funds from the Kansas Trade Show Assistance Program were utilized.²⁹⁰

Kansas Technology Enterprise Corporation

Another entity that promotes economic development is the Kansas Technology Enterprise Corporation (KTEC). KTEC “is a quasi-public corporation established by the state of Kansas to promote advanced technology economic development. KTEC strives to meet the needs of Kansas entrepreneurs and technology companies by supporting development and commercialization of new technologies.”²⁹¹

Governor’s Commitment to Economic Development

Governor Bill Graves personally supports economic development. He has been “out of the country on three economic development trips in the past three years.”²⁹² In October 1999, Governor Graves traveled to Canada and met with business officials to promote investments in Kansas.²⁹³ Kansas has already had success in recruiting foreign companies to invest in its state. Bombardier Aerospace Learjet’s parent company is a Canadian business and is the “largest foreign employer in Kansas.”²⁹⁴ The governor has also traveled to Paris and attended the Paris Air Show.²⁹⁵ While in Paris, he “signed a memorandum of understanding with the Paris Chamber of Commerce & Industry to promote business relations between Kansas and French companies.”²⁹⁶

Incentive Programs

Additionally, Kansas offers traditional incentives to attract economic development. Kansas has the following incentive programs:

²⁸⁸ “About the Kansas Department of Commerce and Housing.” Kansas Department of Commerce and Housing website. Online. Available at: http://kdoch.state.ks.us/ProgramApp/about_kdoch.jsp.

²⁸⁹ “Kansas to Exhibit at Asian Aerospace 2002.” *Wings Over Kansas*. 5 January 2002. Online. Available at: <http://www.wingsoverkansas.com/extras/newsreleases.html>.

²⁹⁰ Ibid.

²⁹¹ “About KTEC.” Kansas Technology Enterprise Corporation website. Online. Available at: <http://www.ktec.com/aboutktec.htm>.

²⁹² Myers, Roger. “Roger Myers Capital-Journal.” *The Topeka Capital-Journal*. 15 June 2001.

²⁹³ “Governor Plans Trade Mission to Visit Canadian Companies.” *The Associated Press*. 1 October 1999.

²⁹⁴ Ibid.

²⁹⁵ Myers, Roger. “Roger Myers Capital-Journal.” *The Topeka Capital-Journal*. 15 June 2001.

²⁹⁶ Ibid.

- Economic Development Initiatives Fund (money generated from Kansas Lottery tickets which funds projects of the KDCH and the KTEC);²⁹⁷
- High Performance Incentive Program (sales tax exemption, training tax credit, and investment tax credit);
- Kansas Economic Opportunity Initiatives Fund (0% forgivable loan for project-related costs); and
- Kansas Enterprise Zone Program (100% state and local sales tax exemption on purchase of labor and materials for construction, \$1,500 credit per new job, and investment credit).²⁹⁸
- Kansas also offers research and development tax credits to companies.²⁹⁹

Data Presentation

Human Capital

Human capital consists of educational opportunities in the state and labor (workforce) statistics.

Education

Kansas provides many opportunities for individuals to receive a quality education. In the fall of 1999, Kansas had 176,737 individuals enrolled in degree-granting institutions.³⁰⁰ In 1999-2000, the total number of bachelor's and master's degrees conferred by degree-granting institutions in Kansas were 14,234 and 4,908 respectively.³⁰¹

With respect to aerospace education, the Kansas Commission on Aerospace Education attempts to promote aerospace and aviation through public education programs.³⁰² The commission started a publication "Wings Over Kansas," which at one time was distributed around the United States.³⁰³ Today it is available electronically and discusses the aerospace industry in Kansas. Kansas also provides individuals with the opportunity to learn aerospace industry specific skills. Kansas has three aviation maintenance schools.³⁰⁴ In addition, Wichita State University is home to the National Institute for

²⁹⁷ Milburn, John. "Officials Chart Course for State's Economic Recovery." *The Associated Press*. 9 February 2002.

²⁹⁸ "Commercial/General Aviation Comparison." *Supplemental TDAAA Matrix*. 30 January 2001.

²⁹⁹ Ibid.

³⁰⁰ "Table 191." *National Center for Education Statistics*. Online. Available at: <http://www.nces.ed.gov/pubs2002/2002130c.pdf>

³⁰¹ "Table 250." *National Center for Education Statistics*. Online. Available at: <http://www.nces.ed.gov/pubs2002/2002130c.pdf>

³⁰² *Kansas Commission on Aerospace Education*. Online. Available at: <http://www.kcae.org/acrobat/mission.pdf>

³⁰³ Ibid.

³⁰⁴ "Director of Aviation Maintenance Training Schools." *Aviation Today*. Online. Available at: <http://www.aviationtoday.com/reports/avmaintenance/director/kansas.htm>

Aviation Research (NIAR), which “supports the aviation industry through research and development, testing, certification, and technology transfer.”³⁰⁵

In June 2001, a partnership between four aerospace companies and the Wichita Area Technical College was established to provide training for potential aerospace workers. Upon successfully completing the program, participants would be guaranteed jobs in the aerospace industry. The four companies hope to replicate this program in other areas.³⁰⁶

In order to help those workers impacted from the aftermath of September 11, 2001, Raytheon officials and the City of Wichita announced a program to assist unemployed aerospace workers in December 2001.³⁰⁷ The program would help those individuals to become schoolteachers. Their spouses are also eligible for the program. Participants of the program will begin by substitute teaching in the spring of 2002, and then “attend classes at Wichita State University during the summer to earn a provisional certification.”³⁰⁸

Labor

Kansas is a right-to-work state.

Profile of Kansas:

- 15th largest state
- Population of 2.6 million
- Located in geographical center of United States
- 3rd fastest growing economy
- In 2000, nearly 22% of the workforce employed in the aerospace industry³⁰⁹

Aviation (Commercial and General)

There are many ways to measure the presence of commercial and general aviation in a state. Three ways are examined here: number of aviation museums, number of aircraft (both active and inactive), and the number of total hours flown. Kansas has six aviation museums, one of which is an air force base.³¹⁰ The number of aircraft and number of hours flown have increased annually. The table below illustrates this fact:

³⁰⁵ *National Institute for Aviation Research*. Online. Available at:

<http://kronos.niar.twsu.edu/home.asp?targ=overview>

³⁰⁶ “Aircraft Industry working with Wichita Schools for Training.” *The Associated Press*. 5 June 2001.

³⁰⁷ “Program Targets Laid Off Aircraft Employees to Become Teachers.” *The Associated Press*. 23 December 2001.

³⁰⁸ *Ibid.*

³⁰⁹ “UK Aerospace Companies Build Relationships with Kansas.” *Prowse & Company News Release*. 16 October 2000. Online. Available at: <http://www.prowse.co.uk/Kansas/K161000.htm>

³¹⁰ “Aviation Museums: Kansas USA.” *Aviation Enthusiast Corner*. Online. Available at: <http://aeroweb.brooklyn.cuny.edu/museums.ks.htm>

Table 12-A. Kansas General Aviation Measures

KS	Aircraft Population	# active	Estimated total hours flown
1996	3940	2989	358894
1997	4149	3217	428471
1998	4827	3778	561200
1999	4957	3821	632530

Source: "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*.

The following companies have operations in Kansas:

- Airbus Industrie
- Boeing-Wichita
- Bombardier Aerospace/Learjet
- Cessna Aircraft
- Raytheon Aircraft

Aviation (Manufacturing)

According to the 2000 Census, Kansas is very important to the aerospace manufacturing industry. The following illustrates this:

- 2nd in number of aerospace manufacturing employees
- 4th in payroll
- 2nd in number of production workers
- 2nd in number of hours of work generated by production workers
- 2nd in wages of production workers
- 2nd in value added
- 2nd in costs of materials
- 2nd in value of shipments
- 5th in capital expenditures³¹¹

Space

Kansas does not have any NASA facilities. Kansas has participated in NASA's Space Grant Consortium since 1991.³¹² By participating in this program, the state promotes "math, sciences, and technologies education for Kansans of all ages."³¹³

³¹¹ "1999 Annual Survey of Manufacturers." *U.S. Census Bureau*. Online. Available at: <http://www.census.gov>

³¹² "NASA KANSAS." *Kansas Space Grant Consortium*. Online. Available at: <http://www.ksgc.org/overview.htm>

³¹³ Ibid.

Military

Military spending is the largest category of federal government spending and its presence in a state or region can make a substantial difference.³¹⁴ Kansas is home to two Army forts (Leavenworth and Riley) and one Air Force base (McConnell).³¹⁵ No major military installation in Kansas has been closed during a base realignment and closure (BRAC) round.³¹⁶ According to the Air Force structure changes for FY2003, Kansas will experience no change in personnel at McConnell.³¹⁷ Overall Kansas does not have a heavy military presence especially in comparison to the other states in this study. Additionally, Kansas seems to be able to retain their military installations.

The two primary ways military spending is disseminated are through contracts and payroll. Military contracts “can play a crucial role in a region’s economic health.”³¹⁸ Kansas ranked last out of the eleven states studied in military contract dollars for FY2000 (\$891 million).³¹⁹ Military payroll refers to the amount of money spent on personnel in each state. The state also ranked last in military payroll dollars for FY2000 (\$1.1 billion).³²⁰ Although Kansas’ economy does not rely heavily on the military, every dollar spent in the state is still important. Recently the state did receive military funding for research. Kansas was one of the states to receive part of a \$154 million award to perform science and engineering research.³²¹

Currently, the Joint Strike Fighter is one of the major aircraft projects being undertaken by the military. The JSF is scheduled to replace a variety of aging aircraft.³²² Lockheed Martin won the bid to produce the JSF for both the United States and British militaries.³²³ Kansas will directly benefit from this military contract since Lockheed Martin has operations there. Lockheed Martin held a job fair in Wichita in March 2002 in order to fill positions for the JSF project.³²⁴

³¹⁴ Atkinson, Robert D. “Defense Spending Cuts and Regional Economic Impact: An Overview.” *Economic Geography*. Vol. 69, Issue 2. April 1993, p.107.

³¹⁵ “U.S. Military Installations (Publicly Known) as of 26 August 1998.” *Department of Defense*. Online. Available at: http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_D_I.html

³¹⁶ “Major Base Closure Summary.” *DefenseLink*. 27 May 1998. Online. Available at: <http://www.defenselink.mil/faq/pis/17.html>

³¹⁷ “Air Force Announces 2003 Force Structure Changes.” *Department of Defense News Release No.143-02*. 22 March 2002.

³¹⁸ OhUallachain, Breandan. “Regional and Technological Implications of the Recent Buildup in American Defense Spending.” *Annals of the Association of American Geographers*. Vol. 77, Issue 2. June 1987, p.212.

³¹⁹ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

³²⁰ *Ibid.*

³²¹ “DoD to Award \$15.7 million for Science and Engineering Research.” *Department of Defense News Release No.136-02*. 22 March 2002.

³²² “Made in Texas: Fort Worth Company gets Biggest Military Contract in History.” *Fiscal Notes*. January 2002.

³²³ *Ibid.*

³²⁴ “Wichita Aviation Workers Turn Out in Force for Aviation Job Fair.” *The Association Press*. 21 March 2002.

Legislation/Regulation

Aviation Research

House Bill 2690, which would finance aviation research at Wichita State University (WSU), passed both the House and Senate and as of 04/11/02 is awaiting action by a conference committee.³²⁵ This legislation is a bond issue that would provide \$13 million for improvements at WSU. These improvements were “sought by private industry for expanded research facilities.” “Industry officials say the upgrades will be key to keeping aircraft production work in Wichita.”³²⁶

Economic Development Funding

There is a piece of legislation in the Kansas House of Representatives that would “dedicate all lottery proceeds to economic development beginning in 2004.”³²⁷ Economic development in the state is currently partially funded by the lottery. This legislation would “end the practice of using lottery money to fund other state operations” and therefore increase the amount of money available for economic development activities.³²⁸

Summary Highlights

1. Kansas companies attend foreign trade shows and network with overseas companies. The Kansas companies are assisted in their efforts by the formal economic development organizations in the state. The aerospace industry is not specific to the United States and the overall economic environment has been moving towards globalization. Therefore, a company and/or state with more global connections should do better in the new global environment.
2. The Kansas Legislature listens to aerospace industry officials. The consideration of House Bill 2690 illustrates this fact. By listening to industry officials and proactively responding, the state will most likely retain jobs in the industry.

³²⁵ *Kansas Legislature*. Online. Available at: <http://www.kslegislature.org/cgi-bin/billtrack/index.cgi>

³²⁶ “Senate Panel Endorses Expanding Regents Bonding Plan.” *The Associated Press*. 22 March 2002.

³²⁷ Milburn, John. “Officials Chart Course for State’s Economic Recovery.” *The Associated Press*. 9 February 2002.

³²⁸ *Ibid.*

Mississippi

Introduction

The state of Mississippi may be a key competitor of Texas in certain aerospace-related endeavors in the coming years. This section examines Mississippi's economic development activity, human capital resources, space initiatives and military. Among the eleven states studies in this report Mississippi ranks:

- 11th in percentage of high school graduates³²⁹
- 11th in percentage of college graduates³³⁰
- 9th in military contract dollars: \$1.56 billion³³¹
- 10th in military payroll: \$1.39 billion.³³²
- 11th in the number of active aircraft³³³
- 5th in NASA contract awards³³⁴

Key Points

- Mississippi is beginning to build an aerospace park around the Stennis Space Center that will be anchored by Lockheed Martin. One of the main reasons was Mississippi Senator (and former Majority Leader) Trent Lott's lobbying effort to secure a \$140 million contract for the facility.
- Mississippi is attempting to use a cluster-based economic development strategy by attempting to grow an information technology cluster in the state. This strategy may be mirrored as the new aerospace park begins to flourish.

Strategy

Organizations which Promote Aerospace

The state does not have an organization on the state level that exclusively promotes the aerospace industry in the state. However, a volunteer organization called Partners for Stennis serves to promote the Stennis Space Center.³³⁵

³²⁹ "Education Attainment by State." *U.S. Census Bureau, Statistical Abstract of the United States*, 2000.

³³⁰ Ibid.

³³¹ "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

³³² Ibid.

³³³ "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

³³⁴ Annual Procurement Report, FY 2001, NASA.

³³⁵ *Partners for Stennis*. Online. Available at: <http://www.partnersforstennis.org>. Viewed on 20 April 2002.

Economic Development

Statewide Strategic Planning

The state of Mississippi began a concerted effort to initiate a statewide economic development strategy with the passage of the Statewide Economic Development Planning Act of 1987.³³⁶ This Act mandated the creation of Bureau for Long Range Economic Development Planning. This organization is tasked with “completing a strategic, comprehensive economic development plan for Mississippi.”³³⁷ The organization has been effective in pursuing goals in the past, including convincing the Mississippi state legislature to adopt a “regional approach to economic development planning.”³³⁸ More importantly, the creation of a statewide organization dedicated to mapping future economic development throughout the entire state provides policymakers with thoughtful and consistent recommendations in the policy area.

Mississippi Development Authority Incentives

The Mississippi Development Authority is the statewide agency responsible for implementing statewide economic development strategies and their initiatives. The agency is especially focused on recruiting new businesses to Mississippi and retaining the businesses already located in Mississippi. The state has numerous economic development incentives, one of the most notable being Major Economic Impact Authority, which allows the state to issue bonds to assist local communities “meet development requirements of large capital projects.”³³⁹ This program is reserved for projects that exceed \$300 million.³⁴⁰

In addition to this program the state offers numerous aggressive tax-related incentives, including no sales taxes on purchases of raw materials, processing chemicals or packaging materials, limited or abolished sales taxes on other materials if they are used for specific purposes, income tax credits based upon the number of new jobs created and tax credits for certain employer expenses.³⁴¹ Also, the state is willing to assist companies in both finding and training employees through the State Department of Education.³⁴² In some cases the state will even pay the cost of training the workers for the company.³⁴³

³³⁶ “Planning: Seizing the Future.” University Research Center. Online. Available at: <http://net1.ihl.state.ms.us/planning/plandept.htm>. Viewed on 11 April 2002.

³³⁷ Ibid.

³³⁸ “Seizing the Future: On the Right Track.” 1999 Report, University Research Center. Online. Available at: <http://net1.ihl.state.ms.us/planning/plandept.htm>. Viewed on 11 April 2002.

³³⁹ “Incentives.” Mississippi Development Authority. Online. Available at: www.mississippi.org/why_ms/incentives.htm. Viewed on 11 April 2002.

³⁴⁰ Ibid.

³⁴¹ Ibid.

³⁴² Ibid.

³⁴³ “Workforce.” Mississippi Development Authority. Online. Available at: http://www.mississippi.org/why_ms/workforce.htm. Viewed on 12 April 2002.

Major Project

The state of Mississippi has shown a willingness to provide large incentive packages to single companies. In 2000, the state provided a minimum of \$300 million in economic incentives to Nissan Corporation to locate a plant in Canton, Mississippi.³⁴⁴ However, if Nissan meets certain targets, the total incentive package may reach \$695 million.³⁴⁵ The development has led to additional benefits, since nine firms will be building plants in the region to supply the Nissan plant. The aggregate size of these facilities will be 650,000 square feet.³⁴⁶

Cluster-Based Development

The state is also undertaking a concerted effort to develop a communications and information technology-based industry cluster. The theory behind such an endeavor is that by locating related industries in a certain geographic area, stakeholders can focus their efforts on developing certain competencies related to the cluster.³⁴⁷ Also, announced investments in the state during the first nine months of 2001 totaled \$3.9 billion, compared to \$1.6 billion during the same period in 2000.³⁴⁸ Approximately \$1.8 billion of these investments were in power generation, transmission and distribution.³⁴⁹

Data Presentation

Human Capital

Education

Degrees Granted

The total enrollment in degree-granting institutions in the Fall of 1999 was 133,170.³⁵⁰ During the 1999-2000 school year, institutions of higher education awarded 10,988 bachelor's degrees and 3,263 Masters degrees.³⁵¹

³⁴⁴ "Mississippi Churning." *Wall Street Journal*. 4 January 2002.

³⁴⁵ Bernard, Bush. "Mississippi's \$695 million Lands Nissan." *Nashville Business Journal*. 16 November 2000.

³⁴⁶ Lyne, Jack. "Eight Supplier Facilities Will Cluster Near Nissan's Mississippi Plant." *Site Selection*. 13 August 2001.

³⁴⁷ "Skills and Workforce Development for Mississippi's CIT Cluster." *Regional Technology Strategies Inc.* Online. Available at: <http://www.rtsinc.org>. P1-3. Viewed 11 April 2002.

³⁴⁸ Ibid.

³⁴⁹ Ibid.

³⁵⁰ "Digest of Education Statistics." National Center for Education Statistics, , 2001, Table 191. Online. Available at: <http://www.nces.ed.gov/pubs2002/2002130c.pdf>. Viewed 13 April 2002.

³⁵¹ Ibid, Table 250.

Aerospace Research Facilities

In addition, the state of Mississippi has some specific aerospace education assets. Mississippi State University has a specialized Department of Aerospace Engineering that includes numerous research laboratories and one research center.³⁵² The most relevant research affiliate is the Raspet Flight Research Laboratory, including both a flight test facility and an aircraft development facility.³⁵³

Workforce

Mississippi's aerospace workforce, compared to other states, is very minor. Both in numbers and as a percentage of the state's total workforce, aerospace employees are somewhat insignificant. Table 13-A looks at aerospace employment in Mississippi since 1990.

Table 13-A. Mississippi Aerospace Employment

	Annual Employment	Annual Avg. Wage	Total Mississippi* Workforce	% of Mississippi Workforce
1990	5,028	\$27,215	936,533	0.54%
1991	2,855	\$24,228	937,475	0.30%
1992	2,417	\$27,130	960,275	0.25%
1993	2,513	\$27,847	1,002,275	0.25%
1994	5,028	\$27,215	1,055,142	0.48%
1995	5,028	\$27,215	1,824,525	0.28%
1996	6,023	\$30,585	1,089,417	0.55%
1997	7,231	\$30,382	1,107,117	0.65%
1998	7,249	\$31,029	1,133,658	0.64%
1999	7,004	\$31,267	1,153,492	0.61%
2000	7,079	\$38,491	1,153,825	0.61%
2001			1,133,867	

* Non-farm, non-agricultural (Bureau of Labor Statistics)
Data available at Mississippi Employment Security Commission

Workforce Investment Act of 1998 and the Wagner-Peyser Act

The state of Mississippi adopted a five-year plan in 1998 that would be in effect from July of 2000 to June of 2005. The plan builds on Mississippi's previous commitment to use community colleges as engines for job training and placement. In essence, the state

³⁵² Department of Aerospace Engineering, Mississippi State University. Online. Available at: <http://www.ae.msstate.edu/research/index.html>. Viewed on 12 April 2002.

³⁵³ Ibid, Online. Available at: http://www.ae.msstate.edu/research/rfrl/page_2.html. Viewed on 12 April 2002.

has attempted to create a “one-stop” shop for those seeking employment by streamlining state workforce programs. The state is attempting to implement this plan on a regional basis.³⁵⁴

Aviation (Commercial and General)

Mississippi ranks last in all of the commercial aviation rankings that we studied for this report, including the number of aircraft in the state and the aggregate number of hours flown.³⁵⁵

Aviation (Manufacturing)

The manufacturing data supplied by the state and the Census Bureau did not report manufacturing data specific to the aerospace industry in Mississippi. However, the state does have aerospace manufacturing assets. These include a Boeing facility located at the Stennis Space Center, Raytheon facilities in Forest and Madison and Lockheed Martin facilities in Columbus, Pascagoula and Stennis.³⁵⁶

Space

Stennis Space Center

The state of Mississippi has a considerable presence in space technology due to the presence of the Stennis Space Center. Stennis received approximately 1.5% of NASA’s overall budget in FY2001, approximately \$155,100,000, and produced 301 work years.^{357, 358} The Center houses NASA and “more than 30 resident agencies.”³⁵⁹ Also, the Center is moving aggressively to expand aerospace-related facilities within the center. For example, the deactivated Mississippi Army Ammunition Plant Industrial Complex houses a new Boeing rocket engine assembly facility.³⁶⁰ In addition, Mississippi is constructing a new high-tech aerospace park at Stennis.³⁶¹ The first tenant of the facility

³⁵⁴ “Strategic Five-Year workforce Investment Plan.” State of Mississippi, for the period July 1, 2000 through June 30, 2005.

³⁵⁵ “General Aviation and Air Taxi Activity Survey 1996-1999.” *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

³⁵⁶ “Locations of Boeing, Lockheed Martin, Raytheon and TRW.” *Project Abolition*. Online. Available at: <http://www.projectabolition.org/locations.html>. Viewed 13 April 2002.

³⁵⁷ NASA Annual Procurement Reports, FY 1998-2001.

³⁵⁸ NASA Budget Briefings, FY2000-2003.

³⁵⁹ “John C. Stennis Space Center Fact Sheet.” Online. Available at: <http://www.ssc.nasa.gov/~pais/factsheets/html/fs-ssc-stennis.html>. Viewed 12 April 2002.

³⁶⁰ Ibid.

³⁶¹ “Stennis Space Center.” *NASA Spinoff*, Office of Aerospace Technology Commercial Technology Division. Online. Available at: <http://www.nasatech.com/Spinoff/spinoff2001/stennis.html>. Viewed on 12 April 2002.

will be Lockheed Martin, which “teamed with the state of Mississippi, Hancock County, and NASA to develop the Lockheed Martin Propulsion, Thermal, and Metrology Center.”³⁶² The 220,000 square-foot facility will produce components for Lockheed’s space products.³⁶³ In addition to the Lockheed facility, Pentagon’s Ballistic Missile Defense Organization has scheduled construction of a testing facility for its Space-Based Laser program. The facility’s cost is approximately \$140 million and construction will begin in 2002.³⁶⁴ During the process of deciding where the facility was to be located then-Senate Majority Leader Trent Lott acknowledged that he urged the Department of Defense to decide to locate the facility at Stennis.³⁶⁵

According to a study by Dr. Charles A. Campbell, Associate Professor of Economics, Mississippi State University, if the Stennis Space Center had not been in operation during 2000, personal income would have been reduced by \$807 million, retail sales by \$323 million and local tax revenue by \$87 million.³⁶⁶

Military

The state has four major military facilities: two Naval Air Stations (Meridian and Pascagoula) and two Air Force Bases (Columbus and Keesler).³⁶⁷ Of the eleven states studied in this report, Mississippi ranks ninth in military contract dollars for FY2000: \$1.56 billion³⁶⁸ and tenth in payroll: \$1.39 billion.³⁶⁹ In addition Mississippi is one of four (of the eleven we are studying) that is receiving money from the Department of Defense for science and engineering research. The overall grant was for \$15.7 million and the average each state will receive is \$291,000.³⁷⁰

Mississippi receives less military resources than nine of the other states to which it is compared in this report. In addition, the Air Force Structure changes for FY 2003 do not impact either of the bases in Mississippi, meaning that no increases or decreases in personnel are planned.³⁷¹

³⁶² Ibid.

³⁶³ Ibid.

³⁶⁴ “Stennis Space Center.” *NASA Spinoff*, Office of Aerospace Technology Commercial Technology Division. Online. Available at: <http://www.nasatech.com/Spinoff/spinoff2001/stennis.html>. Viewed on 12 April 2002

³⁶⁵ Ballingrud, David and David Dahl. “Florida Woos Space Laser, but Another Suitor has Clout.” *St. Petersburg Times*. 3 April 1998.

³⁶⁶ Campbell, Charles A. Associate Professor of Economics, Mississippi State University, January 2001. Online. Available at: <http://www.ssc.nasa.gov/about/economic/>. Viewed on 12 April 2002.

³⁶⁷ “U.S. Military Installations (Publicly Known) as of 26 August 1998.” *Department of Defense*. Online. Available at: http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_K_M.html

³⁶⁸ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

³⁶⁹ Ibid.

³⁷⁰ “DoD to Award \$15.7 million for Science and Engineering Research.” *Department of Defense News Release No.136-02*. 22 March 2002.

³⁷¹ “Air Force Announces 2003 Force Structure Changes.” *Department of Defense News Release No.143-02*. 22 March 2002.

Summary Highlights

- Mississippi deserves attention because of the development of the Stennis Space Center. This development could evolve into a cluster, given the current plans to create an industrial park at Stennis.
- Mississippi has attempted to adopt a cluster-based economic development plan.
- Texas policymakers must be cognizant of a state within the region that is willing to allocate approximately \$695 million in incentives to lure a large company.

Oklahoma

Introduction

In order to better understand the aerospace industry in Texas, it is important to know the status of the aerospace industry in other states. This section will focus on the State of Oklahoma, its economic development pursuits, human capital resources, space initiatives, and military presence. Among the eleven states studied in this report, Oklahoma ranks:

- 7th in the number of active aircraft³⁷²
- 15th (overall) in the number of aerospace manufacturing employees³⁷³
- 10th in military contract dollars³⁷⁴
- 7th in military payroll dollars³⁷⁵

The state of Oklahoma has a higher concentration of pilots and general aviation aircraft per capita than in the United States as a whole.³⁷⁶ Another fact about Oklahoma few people are aware of is that “over 300 companies in the aerospace industry do business in the state.”³⁷⁷

Strategy

Organizations which Promote Aerospace

Oklahoma Aeronautics and Space Commission

The Oklahoma Aeronautics and Space Commission is part of the Oklahoma Department of Transportation and was formed in 1963, making it one of the oldest state-level space agencies in the country. The commission’s main goal is to promote aerospace, airport development and aerospace education. Currently, the commission is focusing its efforts on gaining a larger share of the fuel taxes, making the state more secure and prepared in the case of an emergency.³⁷⁸

³⁷² “General Aviation and Air Taxi Activity Survey 1996-1999.” *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

³⁷³ “1999 Annual Survey of Manufacturers.” *U.S. Census Bureau*. Online. Available at: <http://www.census.gov>

³⁷⁴ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

³⁷⁵ Ibid.

³⁷⁶ Penn, David A. and Michael F. Price. “Economic Impact of Aviation and the Aerospace Industry in Oklahoma.” *Oklahoma Aeronautics and Space Commission, Oklahoma Department of Transportation*. September 1999.

³⁷⁷ “Some Facts About the Aerospace Industry and the State of Oklahoma.” *Oklahoma State University*. Online. Available at: <http://www.mae.okstate.edu/aero/overview/okaerofacts.htm>

³⁷⁸ Garza, Shawn. *Oklahoma Aeronautics and Space Commission*. Personal Interview. 8 February 2002.

Economic Development

Oklahoma Department of Commerce

The Oklahoma Department of Commerce is the “lead agency for economic development in the state.”³⁷⁹ In the past, ODC has assisted companies in participating in foreign trade shows. For example, Oklahoma companies took part in the Farnborough International 1996 (“one of the world’s foremost aeronautical trade fairs”) in England and more recently in the Paris Air and Space Show.³⁸⁰

Economic Development Institute

The Economic Development Institute at the University of Oklahoma is another resource available to the state. The EDI “is the world’s economic development ‘teacher’ since it provides professional economic developers with the up-to-date knowledge and tools necessary to succeed in today’s competitive marketplace.”³⁸¹

Incentive Programs

The state of Oklahoma has the following incentive programs:

- Oklahoma Quality Jobs Program-provides payments to companies for creating new jobs;
- Sales tax exemptions for companies;
- Investment/New Jobs Income Tax Credit-credit is calculated yearly and based upon the amount of investment or number of new jobs created; and
- Commercial Space Industry Credit-companies may have a credit of five percent for creation of new jobs or investment in the space industry.³⁸²

Data Presentation

Human Capital

Human capital consists of educational opportunities in the state and labor (workforce) statistics.

Education

The state of Oklahoma offers many educational opportunities to its residents. In the fall of 1999, Oklahoma had 179,055 individuals enrolled in degree-granting institutions.³⁸³

³⁷⁹ *Oklahoma Department of Commerce*. Online. Available at: <http://www.odoc.state.ok.us/index.html>

³⁸⁰ “Oklahoma Companies Represented at International Trade Fair.” *Oklahoma Department of Commerce News Release*. 19 August 1996.

³⁸¹ *Economic Development Institute*. Online. Available at: <http://tel.occe.ou.edu/edi/who.html>

³⁸² “2001 Business Incentives and Tax Information Guide.” Online. Available at: <http://domino1.odoc.state.ok.us/BUSDev/bitit.nsf/pages/Introduction>

The total number of bachelor's and master's degrees conferred by degree-granting institutions in 1999-2000 were 15,578 and 5,359 respectively.³⁸⁴ Oklahoma also offers education in aerospace. There are seven aviation maintenance training schools in Oklahoma.³⁸⁵

The federal government has helped provide aerospace education in Oklahoma. For example, Oklahoma State University received grants from NASA and the Department of Defense for programming. NASA will have OSU operate the NASA Aerospace Education Service Program for them.³⁸⁶ "The primary purpose of the program is to improve science and math education across the nation. The program provides professional development opportunities to grammar and secondary schools, museums, planetaria and libraries."³⁸⁷

Labor

Oklahoma is a Right-to-Work state.
Profile of Oklahoma (1999 figures):

- \$11.7 billion in aerospace industry output
- \$4.7 billion in payrolls
- 143,700 jobs
- \$77 million in state income tax revenue generated from the aerospace industry
- \$60.6 million in state sales tax revenue generated from the industry.³⁸⁸

Aviation (Commercial and General)

There are many ways to measure the presence of commercial and general aviation in a state. Three ways are examined here: number of aviation museums, number of aircraft (both active and inactive), and the number of total hours flown. There are ten aviation museums in Oklahoma, one of which is an air force base.³⁸⁹ The table below shows the number of aircraft and hours flown in Oklahoma from 1996-1999.

³⁸³ "Table 191." *National Center for Education Statistics*. Online. Available at: <http://www.nces.ed.gov/pubs2002/2002130c.pdf>

³⁸⁴ "Table 250." *National Center for Education Statistics*. Online. Available at: <http://www.nces.ed.gov/pubs2002/2002130c.pdf>

³⁸⁵ "Oklahoma." *Directory of Aviation Maintenance Training Schools, Aviation Today*. Online. Available at: <http://www.aviationtoday.com/reports/avmaintenance/directory/oklahoma.htm>

³⁸⁶ Gillham, Omer. "OSU Secures Massive Government Contracts." *Tulsa World*. 28 July 2001.

³⁸⁷ Ibid.

³⁸⁸ Penn, David A. and Michael F. Price. "Economic Impact of Aviation and the Aerospace Industry in Oklahoma." *Oklahoma Aeronautics and Space Commission, Oklahoma Department of Transportation*. September 1999.

³⁸⁹ "Aviation Museums: Alabama USA." *Aviation Enthusiast Corner*. Online. Available at: <http://aeroweb.brooklyn.cuny.edu/museums.al.htm>

Table 14-A. Oklahoma General Aviation Measures

OK	Aircraft Population	# Active	Estimated total hours flown
1996	4706	3411	558553
1997	4800	3385	432222
1998	4825	3795	429309
1999	5850	4479	590557

Source: "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*.

Between 1996 and 1998, Oklahoma saw a decline in the number of hours flown; however, both the number of aircraft and hours flown dramatically increased in 1999.

Oklahoma has a wide range of aviation companies. For example, a company (Oklahoma Wreckchasing) in the state specializes in aviation archaeological investigation.³⁹⁰ Pro Fab, Inc. and Precision Machine Manufacturing (PMM) are two other aerospace companies in the state.

Federal Aviation Administration Operations

The Federal Aviation Administration's Civil Aerospace Medical Institute (CAMI) is located in Oklahoma City, Oklahoma. "CAMI is the medical certification, research, and education wing of the United States Department of Transportation Federal Aviation Administration's Office of Aerospace Medicine."³⁹¹ More specifically, employees at CAMI "study the factors that influence human performance in the aviation environment, find ways to understand them, and then communicate that understanding to the aviation community."³⁹²

Aviation (Manufacturing)

According to the 2000 Census, aerospace manufacturing in Oklahoma is:

- 15th in number of aerospace manufacturing employees
- 16th in payroll
- 14th in production workers
- 14th in number of hours of work generated by production workers
- 15th in wages of production workers

³⁹⁰ Oklahoma Wreckchasing. Online. Available at: <http://okwreckchasing.com/>

³⁹¹ Civil Aerospace Medical Institute. *Federal Aviation Administration*. Online. Available at: <http://www.cami.jccbi.gov/aboutcami.html>

³⁹² Ibid.

- 15th in value added
- 15th in costs of materials
- 16th in value of shipments
- 18th in capital expenditures³⁹³

Space

Oklahoma does not have any NASA facilities. The state has pursued spaceport activities, though. The Oklahoma Space Development Authority (OSDA) is the primary supporter of those efforts. OSDA hopes to “create a commercial spaceport in southwest Oklahoma, promote and stimulate the creation of space related education, and enhance economic development.”³⁹⁴ The state has been able to secure \$240,000 of federal funds for space education programs.³⁹⁵

Military

Military spending is the largest category of federal government spending and its presence in a state or region can make a substantial difference.³⁹⁶ Oklahoma has one Army fort (Sill) and three Air Force bases (Altus, Tinker, Vance).³⁹⁷ Oklahoma’s Tinker AFB has seen an increase in personnel in recent years. For example, when Kelly AFB in Texas was closed some of the functions and personnel from that base were moved to Tinker AFB.³⁹⁸ In the Air Force structure changes for FY2003, Oklahoma’s bases did not have a change in personnel.³⁹⁹

The two primary ways military spending is disseminated are through contracts and payroll. Military contracts “can play a crucial role in a region’s economic health.”⁴⁰⁰ Oklahoma ranked tenth, or next to last, among the states studied in this report in military contract dollars for FY2000 (\$1.4 billion).⁴⁰¹ Military payroll refers to the amount of money spent on personnel in each state. Oklahoma ranked seventh in military payroll for

³⁹³ “1999 Annual Survey of Manufacturers.” *U.S. Census Bureau*. Online. Available at:

<http://www.census.gov>

³⁹⁴ “Goals.” *Oklahoma Space Development Authority*. Online. Available at:

<http://www.state.ok.us/~okspaceport/agency.htm>

³⁹⁵ Ibid.

³⁹⁶ Atkinson, Robert D. “Defense Spending Cuts and Regional Economic Impact: An Overview.” *Economic Geography*. Vol. 69, Issue 2. April 1993, p.107.

³⁹⁷ “U.S. Military Installations (Publicly Known) as of 26 August 1998.” *Department of Defense*. Online. Available at: http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_D_I.html

³⁹⁸ Gonzalez, John W. “Kelly AFB Sees its Last Landing.” *Houston Chronicle*. 13 July 2001.

³⁹⁹ “Air Force Announces 2003 Force Structure Changes.” *Department of Defense News Release No.143-02*. 22 March 2002.

⁴⁰⁰ OhUallachain, Brendan. “Regional and Technological Implications of the Recent Buildup in American Defense Spending.” *Annals of the Association of American Geographers*. Vol. 77, Issue 2. June 1987, p.212.

⁴⁰¹ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

FY2000 (\$2.4 billion).⁴⁰² Oklahoma was one of the states that received part of the \$15.7 million research award for science and engineering.⁴⁰³

Legislation/Regulation

Space Industry Tax Incentive Act

In 1999, the Oklahoma State Legislature passed “the Space Industry Tax Incentive Act which encourages commercial aerospace development in the state through tax credits.”⁴⁰⁴ In 2001, Senate Bill 14 was introduced in the Oklahoma Senate and if passed, it would have exempted repair parts from the state sales tax. It was hoped that SB 14 would entice aerospace jobs to the state. SB 14 did not pass and therefore did not become law.

Great Plains Airlines Tax Cut Proposal

State Representative Russ Roach presented tax cut legislation to assist “Great Plains Airlines in obtaining more aircraft.” Great Plains is based out of Tulsa, Oklahoma and “offers flights to Tulsa, Oklahoma City, Nashville, Albuquerque, and Colorado Springs.” “The tax credits would help the airline lease four more 32-seat Fairchild Dornier 328 jets, which would allow Great Plains to make more frequent runs on its existing routes and expand to other destinations.”⁴⁰⁵

Summary Highlight

The Oklahoma Legislature realizes the importance of the aerospace industry and has been proactive in providing a favorable environment for companies. The tax incentive act and the tax credits for Great Plains are both examples of this favorable environment.

⁴⁰² Ibid.

⁴⁰³ “DoD to Award \$15.7 million for Science and Engineering Research.” *Department of Defense News Release No.136-02*. 22 March 2002.

⁴⁰⁴ David, Leonard. “Oklahoma Steps Up to Space.” *Space.Com*. 10 December 2001. Online. Available at: http://www.space.com/missionlaunches/ok_spaceport_011210.html

⁴⁰⁵ Ford, Brian. “Tax Credit Bill Would Let Airline Lease Jets.” *Tulsa World*. 30 January 2002.

Virginia

Introduction

The Commonwealth of Virginia was a leading participant in the evolution of the aerospace industry in America. The first U.S. civil aeronautical laboratory, NASA Langley Research center, was established in Hampton, Virginia in 1917.⁴⁰⁶ Utilizing an optimal geographic location, Virginia has developed into an aerospace leader largely through its military-industrial complex, dedication to space research, and a business friendly commonwealth government.

Strategy

Economic Development

Virginia Economic Development Partnership

The Virginia Economic Development Partnership was created by the state as a marketing organization in 1995 with a purpose to encourage, stimulate, and support the development and expansion of the economy in the commonwealth. The Commonwealth recently moved from eighth place to fourth place in the 2002 Governor's Cup competition. The competition assesses states' success in fostering business expansion activity.⁴⁰⁷

Virginia promotes the aerospace industry migration into Virginia by boasting a streamlined environmental permitting process that does not include requirements more stringent than the federal minimum. In addition, Virginia has maintained a corporate tax rate of 6 percent for the past thirty years. Sales and tax exemptions are available for companies involved in the sale, lease, use, storage, consumption, or distribution of space related materials when applied for through the Virginia Commercial Space Flight Authority.⁴⁰⁸

Research and Development

The Aerospace Research Laboratory (ARL) was established in 1986. Housed at the University of Virginia, this center conducts applied and basic research in advanced aerospace technologies. Current research areas include aeronautics, structure and materials, aeroacoustics, high speed mixing and combustion, and computational modeling.⁴⁰⁹

⁴⁰⁶ Virginia Economic Development Partnership. Online. Available at: <http://www.yesvirginia.org>

⁴⁰⁷ Ibid.

⁴⁰⁸ Ibid.

⁴⁰⁹ Aerospace Research Laboratory. School of Engineering and Applied Science, University of Virginia. Online. Available at: <http://www.seas.virginia.edu/centers/ARL.html>

At George Mason University, the Center for Earth Observing and Space Research (CEOSR) focuses on research done from satellite platforms. The center also serves as a working group for space science and remote sensing projects. The Center is interdisciplinary in focus and provides infrastructure needed to conduct research projects within its area of focus.⁴¹⁰

Twenty-six federal research and development facilities that focus on defense or are defense related are located in Virginia.⁴¹¹

Data Presentation

Human Capital

The labor force in Virginia is developed through a comparatively excellent system of primary and secondary schools, a college and university system that has in part produced the largest number of doctoral scientists and engineers in the southeast, and a superabundance of skilled former military personnel. The workforce in Virginia is growing at twice the national rate. Virginia has demonstrated the capacity to provide skilled workers. Nine universities offer 22 different engineering degrees. Among these, three universities offer graduate aerospace engineering degrees.⁴¹²

A few things to keep in mind about Virginia's human capital:

- In FY 2000, 33,079 or 0.94 percent of Virginia's total 3,516,083 workers work in aerospace.
- Total full-time equivalent work years at the NASA Langley Research Center is projected to remain stable at 2365 between FY 2002 and FY 2003. This follows a decrease in total work years between FY 2001 and FY 2002. In addition, work years declined at Langley from FY 1999 and FY 2000.⁴¹³

Aviation (Commercial and General)

Virginia has 14 commercial and 57 general aviation airports.

- Virginia has an aircraft population of 3,648 planes. 2748 of the 3,648 planes are active.
- Virginia ranked #8 among the states in this study in total active aircraft in 1999.
- Between 1997 and 1999, Virginia moved ahead of Kansas in the total number of active aircraft.

⁴¹⁰ Center for Earth Observing and Space Research, George Mason University. Online. Available at: www.ceosr.gmu.edu

⁴¹¹ The Aerospace Industry in Virginia. Online. Available at: [www.innovationavenue.com](http://www.innovationavenue.com/www.innovationavenue.com/industries/aerospace.asp), www.innovationavenue.com/industries/aerospace.asp

⁴¹² The College Board College Handbook 2001. <http://collegeboard.com>

⁴¹³ NASA Budget Briefings FY 2000-2003

- In 1999, Virginia ranked #10 among the states in this study in the estimated total hours flown. Only Mississippi had a lower 1999 total in estimated total hours flown.
- Total estimated hours flown in Virginia increased each year since 1996. The Commonwealth increased its total hours flown from 358,959 to 530,317 between 1996 and 1999.

Based on airline activity data from the Air Transportation Association, the rankings of Virginia in departures, cargo to emplane by ton, passengers to emplane, and 1997 total airline compensation are listed below:

- #6 in departures
- #6 in cargo to emplane
- #6 in passengers to emplane
- #6 in total airline compensation in 1997⁴¹⁴

Aviation (Manufacturing)

According to the Virginia Economic Development Partnership, thirty companies directly related to aircraft manufacturing and more than sixty companies manufacturing or providing service for space related products, such as rockets, operate in Virginia.⁴¹⁵

Data from the 1999 Survey of Manufacturers conducted by the U.S. Census Bureau indicates that Virginia ranked comparatively low among states involved in aerospace manufacturing.

- #25 in number of aerospace manufacturing employees
- #25 in payroll
- #25 in number of production workers
- #25 in number of hours of work generated by production workers
- #25 in wages of production workers
- #25 in value added
- #25 in cost of materials
- #25 in value of shipments
- #28 in total capital expenditures⁴¹⁶

⁴¹⁴ "State-by-Sate Impact of Airlines." *Aviation Economic Impact*. Online. Available at: <http://www.airlines.org/public/industry/display1.asp?nid=175>

⁴¹⁵ Virginia Economic Development Partnership. Online. Available at: <http://www.yesvirginia.org>

⁴¹⁶ "1999 Annual Survey of Manufacturers." *U.S. Census Bureau*. Available at: <http://www.census.gov/>

Space

Virginia's Langley Research Center is the Commonwealth's major space resource. The NASA facility generated \$445,100,000 in procurement activity in FY 2001. Among NASA installations, Langley ranked #7 in FY 2001 total dollars of procurement activity. The Virginia Space Flight Center was created on July 1, 1995 with an initial \$350,000 committed for infrastructure development. On September 18, 1995, the Virginia Space Flight Center concept was approved. The mission of the center is to develop and operate a multi-user spaceport at the NASA Wallops flight facility which provides low cost, safe, reliable, "schedule friendly" space access to commercial, government, and academic users.⁴¹⁷

NASA selected Virginia as one of the teams to support the agency's Small Aircraft Transportation System (SATS). "SATSLab" teams are funded by NASA in a cost sharing partnership created to develop technologies and demonstrate SATS capabilities between 2001 and 2005. Creators of SATS have a vision for the future in which there are small high-tech airplanes, air space, and airports nationwide. The system is designed to make regional flying safe and cost effective.⁴¹⁸

During the next 12 months, beginning July 9, the Virginia Team will receive \$2.5 million from NASA and will, itself, contribute \$1.6 million of in-kind resources to the Virginia effort. Overall, SATS is a five year \$69 million project of concept research led by NASA Langley Research Center in Hampton, Virginia.⁴¹⁹

Some additional things to remember about Virginia's space industry:

- NASA selected Virginia as one of the teams to support the agency's Small Aircraft Transportation System (SATS). "SATSLab" teams are funded by NASA in a cost sharing partnership created to develop technologies and demonstrate SATS capabilities between 2001 and 2005.
- Virginia ranked #7 in total procurement activity dollars in FY 2001.
- The Langley Research Center received an increase in procurement activity from FY 199 to FY 2001. However, the procurement level has not returned to the FY 1998 level of \$501,400,000.⁴²⁰

Military

6 Army Forts (Myer, Belvoir, Lee, Monroe, AP Hill, Story)
Langley Air Force Base
Byrd Field
Norfolk and all the Naval Operations there

⁴¹⁷ Virginia Space Flight Center. Online. Available at: www.va-spaceflightcenter.org/main.html

⁴¹⁸ The SATS Vision: Small Aircraft Transportation System (SATS). Online. Available at: <http://sats.larc.nasa.gov/main.html>

⁴¹⁹ Ibid

⁴²⁰ NASA Annual Procurement Reports FY 1998-2001

The Pentagon (DoD headquarters)⁴²¹

- Virginia ranked 2nd among the states we studied in military contract \$ for FY2000 (\$13637 in millions of \$)⁴²²
- Ranked 1st among the states we studied in military payroll for FY2000 (\$11407 in millions of \$)⁴²³

The Air Force structure changes for FY2003 will impact Virginia in the following ways: Langley AFB will lose 78 military and gain 7 civilian authorizations.⁴²⁴

Legislation/Regulation

Two main agencies entrusted with the administration, planning and governance of aviation are the Department of Aviation and the Virginia Aviation Board. The Department of Aviation is an executive branch agency in Virginia that reports directly to the secretary of Transportation. The Virginia Aviation Board, though not part of the Department of Aviation, establishes and monitors funding program policy and is designed to provide citizen access to the Department of Aviation to promote a safe aviation environment.

Department of Aviation

A written grant agreement with the Department of Aviation through the director is required before the disbursement of any state funds that are appropriated by the General Assembly of Virginia for the promotion of aviation and the planning, or construction or improvement of aviation facilities at licenses public use airports or heliports.⁴²⁵

The Department of Aviation is empowered by statute to create and administer the Financial Assistance Program to Airports Program, to:

1. Plan for the development of a state aviation system
2. Promote aviation in the Commonwealth
3. Provide assistance to cities, towns, counties, and other governmental subdivisions for the planning, development, construction, and operation of airports, landing fields, and other aviation facilities⁴²⁶

⁴²¹ "United States Military Installations in 2002, Virginia." Online. Available at:

<http://www.safmi.hq.af.mil/saf-mii/installations/virginia.htm>

⁴²² "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001.*

⁴²³ Ibid.

⁴²⁴ "Air Force Announces 2003 Force Structure Changes." *Department of Defense News Release No.143-02.* 22 March 2002.

⁴²⁵ "Financial Aid to Airports, Section III" Virginia Aviation Board . Online. Available at:

<http://www.yesvirginia.org>

⁴²⁶ Financial Aid to Airports, Section I, Code of Virginia

Virginia Aviation Board

In addition to the Department of Aviation, The Virginia Aviation Board is authorized to accept, receive, receipt for, disburse and expend federal, state, and other monies, public and private, made available by grant or loan or both, to plan, develop, promote and maintain airports in the state. The Virginia Aviation Board is entrusted to administer two dedicated revenue funds for support of an air transportation system.

The Aviation Special Funds are generated through the taxation on aviation fuel purchased in the state. Also, the sale and use of aircraft and aviation parts, as well as miscellaneous licensing fees for leasing of aircraft and airports are taxed to generate revenue for the Aviation Special Fund.⁴²⁷ The use of these funds is limited to:

1. The Administration of the Department of Aviation
2. The construction, maintenance, and improvement of public use airports and landing areas
3. Promotion of aviation in the interest of the public

The Commonwealth Airport Funds are generated through taxation of general retail sales; automotive and aviation fuel; and motor vehicles. The funds can only be used to support planning and capital development needs at Virginia's licensed, public-use airports.⁴²⁸

Summary Highlights

1. Virginia has benefited from the leadership of its governor and formed partnerships that integrated the needs of government, nonprofit organizations, and private industry. The Virginia Economic Development Partnership is a marketing organization that utilized a cooperative effort in increasing the awareness of Virginia as a center for advanced technology. In an environment of increased competition among states, the creation of the Virginia Economic Development Partnership indicated that Virginia is making a proactive effort to make the world aware of Virginia's aerospace assets and friendly business climate.
2. Virginia has maintained a friendly business climate by maintaining a low 6 percent corporate tax structure over a period of 30 years. Virginia has improved their favorable business atmosphere by creating sales and tax exemptions. These exemptions are available for companies involved in the sale, lease, use, storage, consumption, or distribution of space related materials. These measures signify a dedicated effort to attract business to and retain the space industry in the Commonwealth of Virginia.

⁴²⁷ Ibid

⁴²⁸ Ibid

Washington

Introduction

- Washington ranks 1st out of 11 (tied with Texas) in percentage of state revenues from corporate income (0%)
- Ranks 11th out of 11 in percentage of state revenues from property tax (13.5%)
- Ranks 4th out of 11 in active aircraft population (6834)
- Ranks 8th out of 11 in NASA procurement dollars received (\$48.8 million)
- Ranks 8th out of 11 in military contract dollars for FY2000 (\$2.2 billion)

Strategy

Washington is a leader in the aerospace industry, primarily due to the presence of the Boeing Corporation. Boeing is the state's largest private employer and accounted for over 90 percent of total employment within the state aerospace industry.⁴²⁹ In March of 2001, Boeing shocked state and local officials with the announcement that they would be moving their corporate headquarters to either Denver, Dallas or Chicago.⁴³⁰ Chicago eventually won the relocation battle with a closely guarded incentive package purported to be worth \$61 million, although the state legislature has recently moved to scale back the final amount.^{431 432} One facet of the plan, dubbed the Corporate Headquarters Relocation Act, would exempt Boeing from paying property tax for 20 years.⁴³³ Company executives stated that the move was a part of a larger strategic decision to increase access to global markets, but some critics allege that the move is a reaction to Washington's unhealthy business climate.⁴³⁴ Although the relocation involved fewer than 500 of Boeing's 198,000 employees worldwide, the symbolic loss is significant and may affect future aerospace development in Washington.⁴³⁵

⁴²⁹ Washington State Labor Market Information. Online. Available at: www.wa.gov/esd/lmea

⁴³⁰ "Boeing won't budge on move, State can't entice it to stay, governor says." *Seattle Times*. 27 March 2001.

⁴³¹ "Boeing moves headquarters to Chicago, Aerospace giant says relocation will save money, focus operations." *USA Today*. 11 May 2001.

⁴³² "Dems cut Ryan's Boeing package." *Chicago Sun-Times*. 24 May 2001.

⁴³³ "State cuts taxes to lure Boeing; Sales pitch includes \$50 million in incentives." *Chicago Sun-Times*. 20 April 2001.

⁴³⁴ "Anger boils over, but not at Boeing; Company mends fences as lawmakers beat up on each other." *Seattle Times*. 23 March 2001.

⁴³⁵ "Boeing moves headquarters to Chicago, Aerospace giant says relocation will save money, focus operations." *USA Today*. 11 May 2001.

Organizations which Promote Aerospace

The State of Washington does not have a state level agency solely devoted to the development of the aerospace industry. Largely due to the dominant presence of Boeing, the state chooses to focus on general economic development and fostering a healthy overall business climate. The three most visible organizations are the Washington Office of Trade and Economic Development, the Washington Alliance for a Competitive Economy, and the Washington Competitiveness Council.

Economic Development

Washington Office of Trade and Economic Development (OTED)

The Washington OTED works to enhance and promote sustainable economic vitality throughout the state. The office contains four divisions, one of which is dedicated to business development. The agency has a \$54 million two-year operating budget and a \$17 million capital budget.⁴³⁶

One main activity of the business development division is the Business Retention & Expansion program. The program works primarily with manufacturing and processing firms. The OTED staff will assist threatened or expanding businesses and, together with local economic development councils, will provide problem solving and technical assistance. The program also coordinates services and resources, and assesses industry issues.⁴³⁷ A second activity of the business development office is to facilitate a wide range of tax incentives to qualified companies. Some examples of the incentives offered are:

- Sales and use tax exemptions on machinery used in operations
- Sales and use tax exemptions for locating a business in specified geographic areas
- Business and Occupation tax credits for employee training
- Sales and use tax exemptions for high technology⁴³⁸

Washington Alliance for a Competitive Economy (WashACE)

WashACE is composed of four member organizations: the Association of Washington Business, the Washington Research Council, the Washington Roundtable, and the Washington Association of Realtors. The organization works to draw attention to general business climate issues such as transportation and infrastructure, education and workforce preparation, taxation, regulation, housing, and quality of life.⁴³⁹ Recently, six months of interviews with industry leaders culminated in the release of the 2002 Competitiveness

⁴³⁶ Washington Office of Trade and Economic Development website. Online. Available at: www.oted.wa.gov

⁴³⁷ Why Washington, Business Development. Online. Available at: www.busdev.wa.gov

⁴³⁸ Ibid.

⁴³⁹ Davis, Richard. President of the Washington Research Council. Personal correspondence.

Report. The report sought to gauge business climate health, identify real and perceived problem areas, and offer recommendations for policymakers.⁴⁴⁰

Washington Competitiveness Council (WCC)

The most significant and potentially transformational action taken by Washington State has been to create the Washington Competitiveness Council. Governor Gary Locke convened the Council in the fall of 2001 to examine Washington's ability to compete in the global economy of the 21st century.⁴⁴¹ The Council divided its work into five areas: Taxes and Fees, Regulatory and Permitting Issues, Physical Infrastructure, Human Capital and Innovation, and Benchmarks and Performance Measures. The Council's report, delivered in December 2001, offered defined recommendations in each area from tax and regulatory reform to long-range planning.⁴⁴² The Governor has vowed to act on the Council's directives and is currently pushing several pieces of legislation.⁴⁴³

Legislation/Regulation

In the area of aerospace, the Washington State Legislature has been relatively slow to get involved in economic development. However, they are beginning to take steps toward a more proactive orientation. The legislature has this year resolved under Senate Resolution 8433 to establish a joint select committee to study the retention and expansion of the aerospace industry. The committee will be tasked with examining regulation, taxation policy, work force training, international trade, transportation, education, and other issues that may affect aerospace industry development.⁴⁴⁴

Under general economic development, the legislature has followed through with the recommendations provided by the Washington Competitiveness Council. Already, multiple bills have been signed into law in four out of the five focus areas identified by the Council.⁴⁴⁵ By acting with such speed and direction, the Washington Legislature has begun to show that it is serious about developing the aerospace industry in their state.

⁴⁴⁰ 2002 Competitiveness Report. *Washington Alliance for a Competitive Economy*.

⁴⁴¹ Washington Competitiveness Council. Online. Available at: <http://www.governor.wa.gov/wcc/wcc.htm>

⁴⁴² Ibid.

⁴⁴³ "Locke reviews progress, urges support for competitiveness proposals." *Office of the Governor Press Release*. 28 February 2002.

⁴⁴⁴ "Concurrent Resolution 8433." *Washington State Senate*. Read first time 18 February 2002.

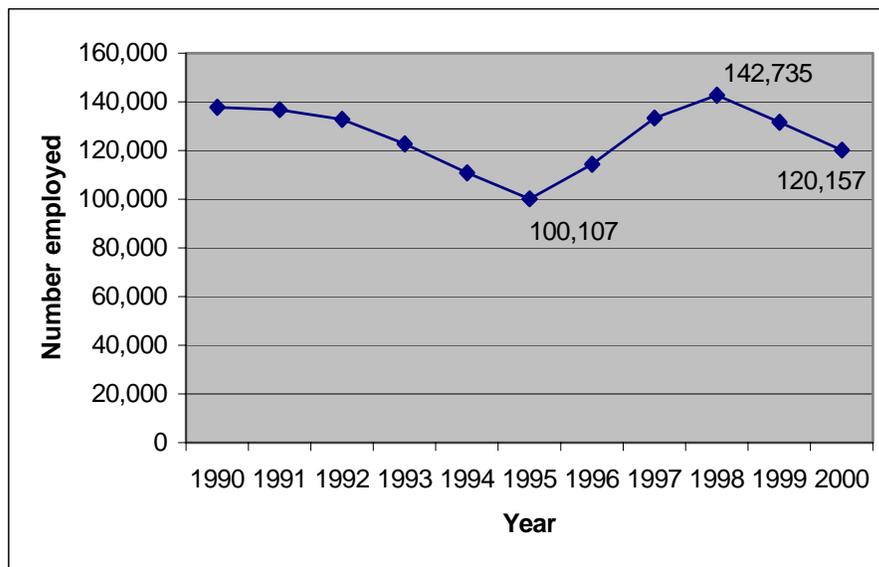
⁴⁴⁵ 2002 Session Highlights, Washington Competitiveness Council. Online. Available at: <http://www.governor.wa.gov/wcc/wcc.htm>

Data Presentation

Human Capital

As of April 2002, Boeing employed 68,200 in Washington State out of a worldwide total of 178,500.⁴⁴⁶ Figure 16-A shows the total aerospace employment across the state for 1990-2000. Figure 16-B shows the size of the aerospace industry in Washington, as measured by percentage of workforce employed.

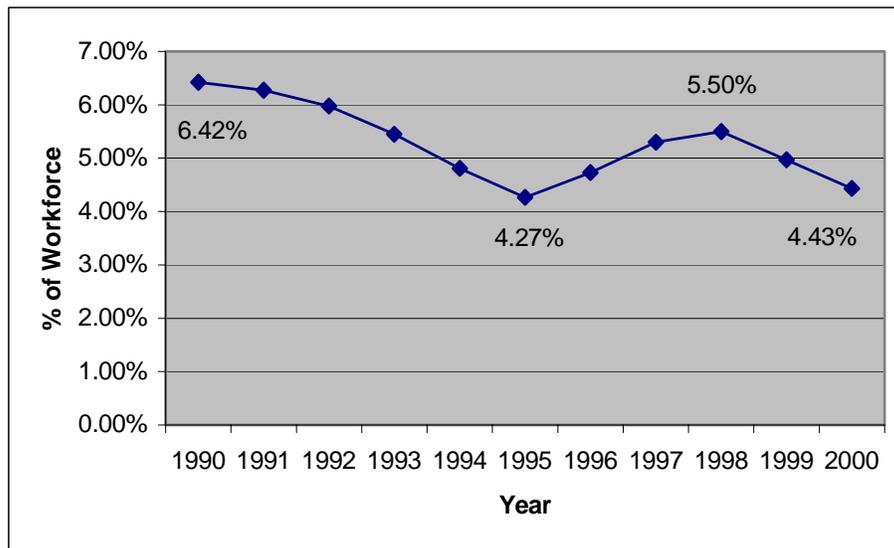
Figure 16-A. Washington State Annual Aerospace Employment



Data available at Washington State Employment Security Department

⁴⁴⁶ Boeing Employment Numbers. Online. Available at:
http://www.boeing.com/employment/employment_table.html

Figure 16-B. Aerospace Employment as a Percentage of Total State Employment



Data available at Washington State Employment Security Department

Aviation (Commercial and General)

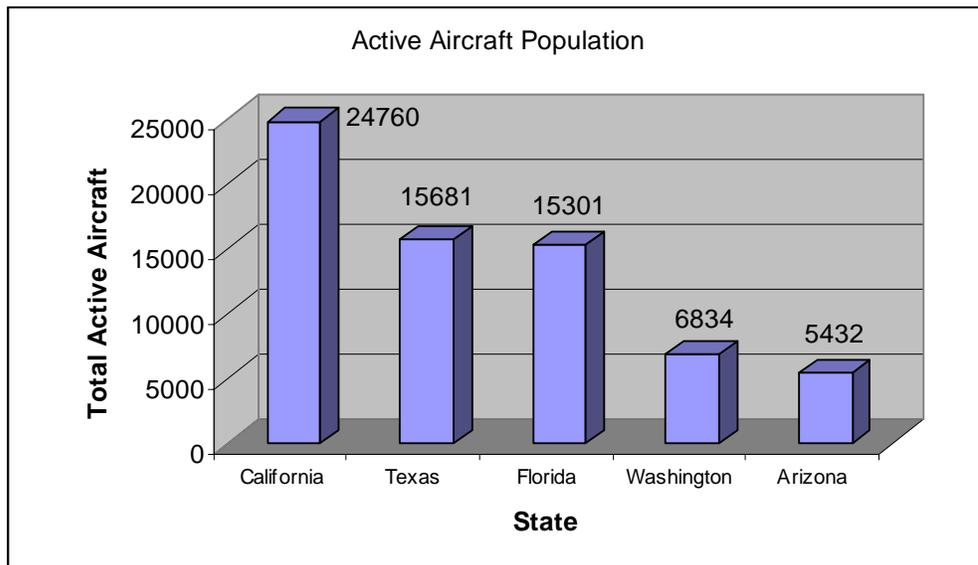
The primary advocate for general aviation in Washington is the State's Department of Transportation Aviation Division. They strive to proactively advance aviation in the state by:

- Maintaining and improving safety, education, and training programs
- Identifying and prioritizing airport needs and securing long-term funding to meet those needs
- Streamlining pilot and aircraft registration
- Capturing aviation generated funds presently diverted to non-aviation uses⁴⁴⁷

Illustrated in Figure 16-C, Washington currently has an active aircraft population of 6,834, which ranked 4th on our list of 11 states.

⁴⁴⁷ Washington State Aviation. Online. Available at: www.wsdot.wa.gov/Aviation

Figure 16-C.



Source: "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*.

Aviation (Manufacturing)

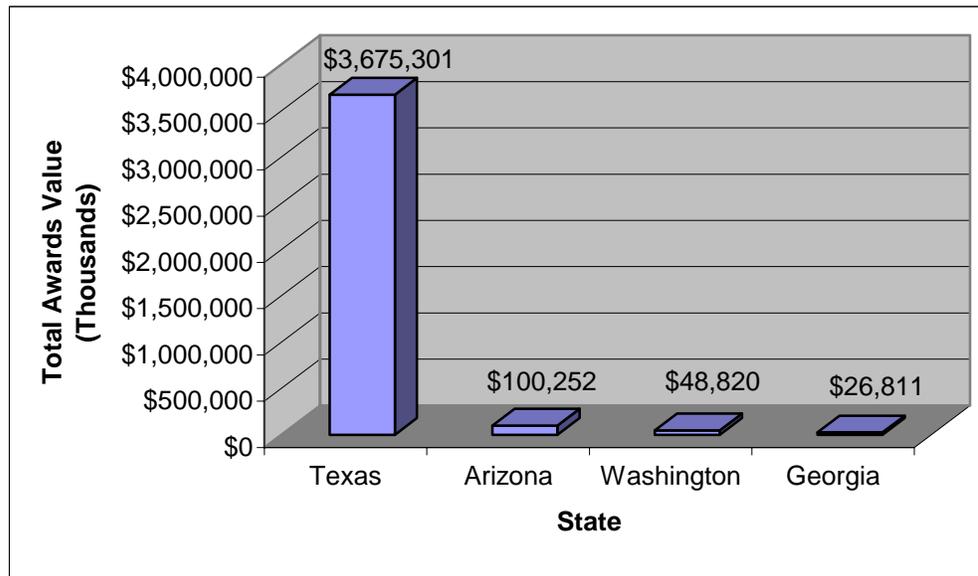
Due to a lack of reporting by Washington, a comparison is unavailable.

Space

The state of Washington does not have a significant NASA facility and therefore received relatively little in NASA procurement awards. As shown in Figure 16-D Washington ranked 8th of 11 states with only \$48 million awarded.⁴⁴⁸

⁴⁴⁸ NASA Annual Procurement Reports FY 1998-2001.

Figure 16-D. Total NASA FY2001 Procurement



Source: NASA Annual Procurement Reports FY 1998-2001.

NASA has a presence, however, through the Washington Space Grant Consortium. Established in 1989 under the National Space Grant Program, the consortium seeks to further science, mathematics, and technology education for diverse learners of all ages. Like other state Space Grant Consortia, their purpose is to:

- Establish a national network of universities with interests in aeronautics, space, and related fields
- Encourage cooperation among aerospace industry, government, and universities
- Promote a strong educational base in science, math, engineering, and technology from the elementary to university levels⁴⁴⁹

Military

The State of Washington has the following military infrastructure:

- 3 Naval air stations
- 1 Naval submarine base
- 2 Air Force bases (McChord, Fairchild)
- 1 Army base (Lewis)⁴⁵⁰

Washington ranked 8th among the states we studied in military contract \$ for FY2000 (\$2.2 billion)⁴⁵¹

⁴⁴⁹ Washington Space Grant Consortium. Online. Available at: www.waspacegrant.org

⁴⁵⁰ "U.S. Military Installations (Publicly Known) as of 26 August 1998." *Department of Defense*. Online. Available at: http://www.millennium-ark.net/News_Files/INFO_Files/Military_Install_D_I.html.

⁴⁵¹ "National Defense and Veterans Affairs." *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

Smiths Aerospace Actuation Systems, in Yakima was awarded a \$5,740,490 requirements contract for 473 holdback bars and 131 adapter/fitting assemblies used on F/A-18 aircraft and 150 holdback bars used on F-14 aircraft in January 2002. Work on this contract is expected to finish in October 2007.⁴⁵² In addition, Boeing-SAIC will receive a \$154 million contract award from the Army to integrate the Future Combat Systems. The Boeing facilities in Washington will be receiving part of this money.⁴⁵³

Washington ranked 6th among states we studied in military payroll for FY2000 (\$4.04 billion).⁴⁵⁴ The Air Force structural changes for FY2003 impacted the state in the following ways:

- Fairchild AFB will lose 9 civilian authorizations
- McChord AFB will gain 86 military authorizations
- Overall state will gain personnel authorizations⁴⁵⁵

Washington does have a strategy for avoiding having any military installations in the state closed. Washington “established economic development councils with mixed public/private funding.”⁴⁵⁶ These councils were “active in responding to threatened base closures.”⁴⁵⁷

This strategy seems successful since Washington did not have any bases closed in the previous (most recent) base realignment and closure round.⁴⁵⁸

Summary Highlights

1. Boeing is the major aerospace presence in Washington, accounting for 90% of the total aerospace industry employment within the state.
2. Washington does not have a state level agency solely devoted to the development of the whole aerospace industry, but does have a few significant economic development organizations.
3. Governor Gary Locke is committed to improving the business climate in the state and has convened the Washington Competitiveness Council to address the issue.
4. The Governor has followed up on WCC recommendations, leading to the passage of several bills by the state legislature.

⁴⁵² “Contracts.” *Department of Defense News Release No.040-02*. 28 January 2002.

⁴⁵³ “DARPA, Army Announce Future Combat Systems Lead System Integrator.” *Department of Defense No.109-02*. 7 March 2002.

⁴⁵⁴ “National Defense and Veterans Affairs.” *U.S. Census Bureau, Statistical Abstract of the United States: 2001*.

⁴⁵⁵ “Air Force Announces 2003 Force Structure Changes.” *Department of Defense News Release No.143-02*. 22 March 2002.

⁴⁵⁶ “State Military Base Retention Programs.” *California Research Bureau Note Vol.4, No. 1*. 7 May 1997. Online. Available at: <http://www.cedar.ca.gov/military/retentn.htm>.

⁴⁵⁷ Ibid.

⁴⁵⁸ Ibid.

Summary

Texas

Economic Development

Economic development in Texas is far more decentralized than in other states. Acknowledging the Texas Department of Economic Development's perspective that the best form of government is local government, Texas has taken important first steps in developing state economic development resources that will allow for greater cooperation and partnerships between industries and government at the state, regional, and local levels.

In 1998, strategies toward state economic development centered on statewide education and workforce development, and bolstering industry clusters. During this time, Texas also spent billions of dollars on various incentive programs. Though the use of incentives to create certain economic outcomes is important in competing with other states for business resources, it is important that a state has clear objectives and determines the criteria for a successful investment.

The First Statewide Economic Development Plan will be adopted on or before September 1, 2002. In addition, Governor Rick Perry recent formed the Governor's Task Force for Economic Growth to advise him on long-term economic growth. The creation of the Texas Aerospace Commission signifies a recognition in Texas that the environment for attracting and retaining industry has become much more competitive due to recruitment by states with comprehensive economic development plans. TAC can gain a niche and achieve a greater impact if it seeks a role in the development of both the Governor's Task Force and the Texas Economic Development Plan.

Human Capital

Human capital refers to people and their value to the marketplace in terms of skill sets acquired on the job or through training that allows a person to produce for an employer. An analysis of human capital at the state level involves an examination of the overall workforce and the education, training, and skills necessary to perform specialized tasks. This report presents data on aerospace industry employment and educational resources measured across states. The ability to produce or attract an educated worked that includes technicians, physicist, aerospace engineers, electrical engineers, and computer scientists, among other specialties is crucial to a states' emergence as an aerospace leader.

Education

The data for Texas shows areas of strength and areas with room for improvement. For example, while Texas ranks 2nd among the states in this study in its ability to graduate

bachelor and master degree students in computer science and engineering, Texas ranks 8th in this study in the percentage of total population enrolled in degree granting institutions. While Texas is able to produce graduates with high-tech skills for the aerospace industry, a potential concern could be a potential expansion of an underclass if greater numbers of Texans are not brought into the process of higher education.

Workforce

Texas ranks a distant second to California in aerospace industry workforce. However, Texas ranked 5th in the percentage of the non-farm, non-agricultural workforce in the aerospace industry. Total aerospace employment in 2000 dropped for the first time in the five-year period dating back to 1996. However, the effect of September 11th, particularly on aviation, is unclear at this time.

Aviation

Commercial Aviation

Texas is home to five of the top 55 largest airports in the nation. Among these are Dallas/Fort Worth Airport (4), George Bush Intercontinental Airport in Houston (12), Houston Hobby (41), Dallas Love Field (49), and Austin/Bergstrom (53). All of the major airports in Texas serve as either national or regional hubs for the nation's largest airlines.⁴⁵⁹

General Aviation

Texas ranks second to California in general aviation areas including aircraft population, number of aircraft active, and total number of hours flown. A strong pro-aviation environment exists in Texas, California, and Florida. Existing infrastructure including the high number of general aviation airports increases opportunities for expansion.⁴⁶⁰

Aviation Manufacturing

Texas consistently ranks in the top five in aerospace manufacturing. Prior to September 11th, The Bureau of Labor Statistics predicted overall growth in employment in the aerospace industry to exceed growth for all industries. Industry wide, aerospace sales increased every year in constant dollars since 1990. In addition, another group predicted increases in commercial aircraft deliveries during the decade of 2000-2010.⁴⁶¹

⁴⁵⁹ "How Airline Hubs Work." *Roberts Roach & Associates*.

⁴⁶⁰ "General Aviation and Air Taxi Activity Survey 1996-1999." *Federal Aviation Administration*. Online. Available at: <http://www.api.faa.gov/pubs.asp>

⁴⁶¹ "Aerospace Manufacturing." *Bureau of Labor Statistics*. Online. Available at: <http://www.bls.gov/oco/cg/cgs006.htm>

The estimated effect of the attacks on the aerospace industry are staggering. The American Industries Association predicted a manufacturing loss of \$2 billion in 2001, \$6 billion in 2002, and a loss \$7 billion in 2003 before predicted recovery in 2004.⁴⁶²

Texas may have to redefine its goals following September 11th. The challenge may be in maintaining the market share of firms already in the state rather than expanding Texas' percentage of aerospace manufacturing

Space

Texas, through NASA's Johnson Space Center (JSC), is consistently the nation's leading state in total NASA procurement dollars. The economic impact of JSC is significant to the State of Texas, Southeast Texas, and Clear Lake. The overall economic and job impact of JSC for Texas in FY is \$2,039,000,000 and a total of 49,998 jobs.⁴⁶³ The existence of JSC alone makes Texas a leader in the U.S. space industry. However, NASA continues to face an uncertain future. Expected declines in revenue from federal tax cuts, economic recession, and September 11th financial losses creates a difficult budgetary environment for NASA to compete in. Additionally, budget increases for the U.S. military increase and spending on the International Space Station make it unlikely that NASA installation will successfully sustain or increase their budget in upcoming years.

Room for growth in the space industry is possible for Texas during this decade. Commercial space is expected to grow as in industry largely due to increasing use and need for satellite technology. This projected industry growth will likely occur in research and development, high technology manufacturing, and space vehicle production. Increased involvement from the Texas Legislature in the economic development of the space industry has the potential to attract new business and increase the proportion of space industry production in Texas from outside the federal government.

Military

While all states face a renewed threat of another round of military base closings, the United States military budget is expected to expand during much of the next decade. The War on Terror and unprecedented threats to U.S. civilians and cities has restored the importance of military strength and preparedness. While Texas has measures in place to assist communities when bases cease military operations, more needs to be done to ensure Texas does not experience the rate and amount of closures California experienced during the 1990's. In general, California suffered the most military base closures during the 1990's. The Southeast, despite a large number of personnel, fared much better than the West and the Northeast in keeping their military bases.

⁴⁶² Douglass, John. W. "Statement before the Armed Services Subcommittee on Military Procurement, March 19, 2002." *Aerospace Industries Association*. Online. Available at: http://www.aia-aerospace.org/aianews/speeches/2002/tst_jwd_03_19_02.pdf

⁴⁶³ NASA/JSC and UH-Clearlake Center for Economic Development and Research.

San Antonio resident and small business owner Roberto Sanchez experienced the loss of the Brooks Air Force installation and has since gained perspective on the need to address needs rather than simply participate in local fights to save individual bases. Sanchez suggests that, “ The best way to help military bases [remain open] is for communities to help them solve their problems.”⁴⁶⁴ California and Florida, among several other states, have utilized private-public partnerships at the state and local level to create linkages that join military and state assets.⁴⁶⁵ These partnerships have the ability to infuse new infrastructure and improve existing assets that will, in effect, increase the financial standing of those military bases involved in partnerships.

Competitor States

Alabama

1. Alabama is able to recruit big corporations. Boeing, and more recently Hyundai, located a manufacturing plant in Alabama. The workings of the two major economic development organizations could have a direct impact on the recruitment of such big companies.
2. The Governor and legislature are willing to work together to support the advancement of the aerospace industry. The passage of Senate Bill 86 will help to stimulate further employment in aerospace in Mobile and Selma.

Arizona

1. The State's primary strategy for maintaining and expanding its high aerospace manufacturing presence is to encourage firms to create new jobs in a designated high-technology industrial cluster located in Pima County-Tucson Metropolitan area.
2. In terms of commercial aviation, the state's primary center of air traffic is the Phoenix Sky Harbor International Airport which was listed as the 15th busiest airport in the world in passengers with 36,040,469 people using the facility in 2000.⁴⁶⁶ For the same year, the Phoenix Airport was also ranked 5th busiest in the world for aircraft movement with 637,779 planes utilizing the airport.⁴⁶⁷
3. Economic development strategies employed within the High-Technology Industry Cluster as outlined by the Greater Tucson Economic Council include Enterprise Zones, Foreign Trade Zones, Research & Development Expenses Credit,

⁴⁶⁴ “Bracing for Closure.” *Government Executive Magazine*. 1 August 2001.

⁴⁶⁵ Ibid.

⁴⁶⁶ "ACI Traffic Data: World airports ranking by total passengers." *The Airports Council International*. Online. Available at: <http://www.airports.org/traffic/passengers.html>

⁴⁶⁷ "ACI Traffic Data: World airports ranking by total movements." *The Airports Council International*. Online. Available at: <http://www.airports.org/traffic/movements.html>

Technology Tax Credit, Accelerated Depreciation, Defense Restructuring Assistance Program & Credits, and Pollution Control Equipment Credit.⁴⁶⁸

California

1. California ranks first among the eleven states studied in military procurement dollars, with \$18.1 billion allocated in FY2002. Compared to the other states, however, California's share of the total national military budget is declining.
2. California is willing to use proactive measures like tax credits and a reduction of capital gains taxes to encourage development and investment.
3. California uses public-private partnerships to share authority and financial responsibility for dealing with military base closures.
4. The human capital resources in California, including strong institutions of higher education and a technology-based workforce, position California to be a leader in the aerospace industry.

Florida

1. Florida has the Kennedy Space Center, a unique installation that will almost certainly be perpetually maintained due to its location and facilities. This single fact will drive space-based aerospace industry in Florida for decades to come.
2. Florida's centralized approach to economic development, coupled with the Florida Space Authority and the Department of Transportation's efforts to bring new business to Florida, will continue to pay dividends.

Georgia

1. Georgia's approach to economic development is decentralized. The Department of Community Affairs (DCA) is charged with identifying "industries for which the rural areas of the state have a comparative advantage and exploring resources for venture capital of the rural areas."⁴⁶⁹ However, a comprehensive plan hasn't been made available since 1990.⁴⁷⁰
2. In addition to the education students receive in the classroom; Georgia has several extracurricular groups or learning centers that augment the education of Georgia

⁴⁶⁸ "Tucson: A Sound Business Decision in 2002: Tax Reduction Programs." *The Greater Tucson Economic Council*. Online. Available at: <http://www.futurewest.com/PDF/SoundBiz2002/TaxReduction.pdf>

⁴⁶⁹ Ibid, p.17.

⁴⁷⁰ Ibid.

students. Programs focusing on aerospace in particular include: SciTrek, Coca Cola Space Science Center, Thirteen Scribes Inc., Georgia Youth Science and Technology Center, Georgia Space Grant Consortium.⁴⁷¹

Kansas

1. Kansas companies attend foreign trade shows and networks with overseas companies. The Kansas companies are assisted in their efforts by the formal economic development organizations in the state. The aerospace industry is not specific to the United States and the overall economic environment has been moving towards globalization. Therefore, a company and/or state with more global connections should do better in the new global environment.
2. The Kansas Legislature listens to aerospace industry officials. The consideration of House Bill 2690 illustrates this fact. By listening to industry officials and proactively responding, the state will most likely retain jobs in the industry.

Mississippi

1. The state of Mississippi ranks near the bottom of most of the categories in which we ranked the eleven competitor states. However, the state does deserve attention because of the development of the Stennis Space Center. This development could evolve into a cluster, given the current plans to create an industrial park at Stennis. In addition, Texas policymakers must be cognizant of a state within the region that is willing to allocate approximately \$695 million in incentives to lure a large company.

Oklahoma

1. The Oklahoma Legislature realizes the importance of the aerospace industry and has been proactive in providing a favorable environment for companies. The tax incentive act and the tax credits for Great Plains are both examples of this favorable environment.

Virginia

1. Virginia promotes the aerospace industry migration into Virginia by boasting a streamlined environmental permitting process that does not include requirements more stringent than the federal minimum. In addition, Virginia has maintained a corporate tax rate of 6 percent for the past thirty years. Sales and tax exemptions are available for companies involved in the sale, lease, use, storage, consumption,

⁴⁷¹ *Georgia Space Grant Consortium*. Online. Available at:
<http://www.ae.gatech.edu/research/gsgc/index.html>

or distribution of space related materials when applied for through the Virginia Commercial Space Flight Authority.⁴⁷²

2. 20,000 skilled workers enter the workforce from the military every year.⁴⁷³ Many of these new workers enter the workforce with aerospace related experience.
3. Virginia has maintained a friendly business climate by maintaining a low 6 percent corporate tax structure over a period of 30 years.

Washington

1. Washington is a leader in national aerospace, primarily due to the presence of the Boeing Corporation. Boeing is the state's largest private employer and accounted for over 90 percent of total employment within the state aerospace industry.⁴⁷⁴
2. The State of Washington does not have a state level agency solely devoted to the development of the aerospace industry. Largely due to the dominant presence of Boeing, the state chooses to focus on general economic development and fostering a healthy overall business climate.
3. In March of 2001, Boeing shocked state and local officials with the announcement that they would be moving their corporate headquarters to either Denver, Dallas or Chicago.⁴⁷⁵ Chicago eventually won the relocation battle with a closely guarded incentive package purported to be worth \$61 million, although the state legislature has recently moved to scale back the final amount.^{476 477}

⁴⁷² Virginia Economic Development Partnership. Online. Available at: <http://www.yesvirginia.org>

⁴⁷³ Ibid.

⁴⁷⁴ Washington State Labor Market Information. Online. Available at: www.wa.gov/esd/lmea.

⁴⁷⁵ "Boeing won't budge on move, State can't entice it to stay, governor says." *Seattle Times*. 27 March 2001.

⁴⁷⁶ "Boeing moves headquarters to Chicago, Aerospace giant says relocation will save money, focus operations." *USA Today*. 11 May 2001.

⁴⁷⁷ "Dems cut Ryan's Boeing package." *Chicago Sun-Times*. 24 May 2001.

Appendix A

SIC Classifications

Aerospace industry is defined as including the following Standard Industrial Classification codes:

General Headings

- **36** Electronic & other electric equipment
- **37** Transportation equipment
- **38** Instruments & related products
- **45** Transportation by air

Aerospace Specific codes as defined by Aerospace Industries Association (AIA)*

- **3663** Radio & TV communications equipment
- **3669** Communications equipment, NEC
- **3721** Aircraft
- **3724** Aircraft engines & parts
- **3728** Aircraft parts & equipments
- **3761** Guided missiles & space vehicles
- **3764** Space propulsion units & parts
- **3769** Space vehicle equipment, NEC
- **3812** Search & navigation equipment
- **3829** Measuring & controlling devices, NEC
- **4512** Air transportation, scheduled
- **4513** Air courier services
- **4522** Air transportation, nonscheduled
- **4581** Airports, flying fields & services

*4512, 4513, 4522, and 4581 were not outlined by AIA
Source: Aerospace Industries Association. Online available at http://www.aia-aerospace.org/stats/facts_figures/ff_00_01/Ff00p012.pdf

State Sources:

Alabama Industrial Relations
Arizona Department of Economic Security
California Economic Development Department
Florida Labor Market Statistics
Georgia Department of Labor, Workforce Information and Analysis
Kansas Department of Human Resources
Mississippi Employment Security Commission
Oklahoma Employment Security Commission
Texas Workforce Commission, Labor Market Information Department
Virginia Employment Commission
Washington State Employment Security Department

Alabama

Employment

	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>
3663	*	*	164	221	248	263	283	305	326
3669	*	5	*	*	*	*	*	*	*
3721	4,296	4,274	3,995	3,920	3,444	3,515	3,814	4,186	4,314
3724	656	*	*	*	*	*	*	*	*
3728	1,647	1,528	1,295	1,182	1,176	1,244	1,375	1,433	1,701
3761	5,261	4,706	4,215	3,886	3,351	3,137	3,019	2,989	2,952
3764	1,110	997	867	809	622	396	340	741	838
3769	368	298	235	267	302	360	322	544	782
3812	635	641	648	739	823	849	831	755	775
3829	*	*	*	14	16	*	*	*	*
4512	618	604	585	519	462	479	575	879	1,000
4513	601	671	726	831	4,373	4,525	4,507	4,661	4,724
4522	172	178	179	147	145	148	188	190	189
4581	1,282	1,326	1,228	1,790	1,551	1,494	1,710	2,035	2,180
Total	16,646	15,228	14,137	14,325	16,513	16,410	16,964	18,718	19,781

Source: Alabama Industrial Relations

Arizona

Employment

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
3663	557	601	622	602	646	901	762	779	728	1,182	1,099	1,047
3669	256	241	124	149	151	137	153	162	229	92	87	198
3721	5,594	4,901	4,097	3,856	3,736	3,784	4,315	4,690	5,446	6,132	6,371	6,566
3724 + 3728	14,478	14,996	14,924	13,897	13,015	13,321	14,153	14,908	16,586	15,439	15,127	15,041
3761 + 3812	14,553	13,875	12,573	11,755	12,823	13,001	12,325	12,570	13,350	14,601	15,723	16,356
3764 + 3769	276	245	203	207	245	186	166	168	292	425	294	292
3829	1,798	1,630	1,080	1,062	949	887	851	779	1,592	909	955	951
4512	12,070	12,908	12,792	13,120	13,714	14,047	14,378	15,566	16,018	17,100	18,020	18,854
4513	989	944	1,268	1,425	1,560	1,789	6,340	6,248	6,378	6,642	7,099	6,839
4522	380	460	455	547	742	815	1,162	1,204	1,436	1,134	1,207	1,138
4581	3,987	3,774	3,695	3,604	3,724	3,966	3,896	4,154	4,766	5,258	5,182	5,489
TOTAL	54,938	54,575	51,833	50,224	51,305	52,834	58,501	61,228	66,821	68,914	71,164	72,771

Source: Arizona Department of Economic Security

California

Employment

	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>
372	162,300	145,800	132,200	108,100	92,700	84,400	83,000	84,800	89,400	83,500	75,000	71,400
376	75,700	68,100	57,900	46,600	36,200	28,900	25,900	24,700	24,900	22,400	21,800	20,400
381	99,300	94,100	84,000	70,700	61,400	55,400	56,300	58,500	57,200	53,400	48,600	48,200
382	69,500	67,500	62,900	60,700	59,500	61,200	64,200	67,300	68,500	63,100	68,500	70,400
45	93,900	95,600	94,700	93,400	91,100	93,700	131,400	130,500	136,300	139,700	142,400	143,300
Total	500,700	471,100	431,700	379,500	340,900	323,600	360,800	365,800	376,300	362,100	356,300	353,700

Source: California Economic Development Department

Florida

Employment

	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>
366	17,899	17,248	18,725	19,842	20,974	21,215	21,338	21,207	20,978	19,487	20,293	20,201
372	18,488	17,192	16,782	15,039	13,369	14,330	15,735	16,429	17,342	17,010	16,234	14,777
376	18,912	17,996	16,990	15,314	13,050	11,984	11,091	10,439	10,055	8,729	8,326	8,223
381	13,739	12,775	11,594	10,393	9,193	8,667	8,764	9,891	9,543	9,444	8,464	8,558
382	4,996	4,615	4,903	5,268	5,253	5,070	6,207	6,188	6,484	5,844	5,964	6,306
451	37,201	32,686	28,516	31,372	32,183	32,897	50,173	52,111	56,285	57,251	59,438	59,206
452	2,071	2,406	2,821	3,749	4,111	4,793	5,250	4,827	4,043	3,878	3,503	3,776
458	11,794	11,353	11,366	11,883	12,944	13,716	13,501	13,999	14,872	14,621	14,862	14,564
Total	125,100	116,271	111,697	112,860	111,077	112,672	132,059	135,091	139,602	136,264	137,084	135,608

^annual employment is the average of the first two quarters

Source: Florida Labor Market Statistics

Georgia

Employment

	1996	1997	1997	1998	1999	2000	2001
3663	4,667	4,425	4,425	4,229	3,154	3,124	3,227
3669	570	631	631	611	558		2,348
3721	13,245	14,498	14,498	15,191	16,259	14,443	13,329
3724	1,916	2,539	2,539	2,750	2,678	2,504	2,724
3728	2,409	3,211	3,211	3,339	2,754	2,064	1,931
3761	1,290	1,392	1,392				
3764							
3769							
3812	707	615	615	708	434	408	402
3829	46	56	56	68	74	88	107
4512	31,132	33,475	33,475	36,950	39,029	40,621	41,652
4513	15,572	15,161	15,161	16,106	16,634	18,204	16,935
4522	584	464	464	502	510	521	587
4581	3,246	3,082	3,082	3,295	3,667	3,688	4,288
Total	75,384	79,549	79,549	83,749	85,751	85,665	87,530

^annual employment is the average of the first two quarters

Source: Georgia Department of Labor, Workforce Information and Analysis

Kansas

Employment

	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>
36	8,393	8,626	9,326	9,309	9,655	9,046	8,570	8,606	8,374	8,814	9,175
37	49,707	49,470	48,675	44,212	42,899	44,187	49,101	55,227	59,588	59,893	57,109
38	3,903	3,812	3,548	3,789	3,866	4,260	4,133	4,032	4,511	4,541	4,426
45	1,471	1,349	1,397	1,474	1,714	1,670	6,554	6,540	7,034	7,288	7,998
Total	63,474	63,257	62,946	58,784	58,134	59,163	68,358	74,405	79,507	80,536	78,708

Source: Kansas Department of Human Resources

Mississippi

Employment

	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>
366	N/A	1,090	1,050	1,176	1,223						
372	N/A	315	332	171	226						
376	N/A	470									
381	N/A	N/A	N/A	N/A	N/A	N/A	347	353	357	N/A	N/A
382	N/A	533	N/A	N/A	N/A	N/A	289	382	411	418	N/A
45	5,028	2,322	2,417	2,513	5,028	5,028	5,387	5,091	5,099	5,239	5,160
Total	5,028	2,855	2,417	2,513	5,028	5,028	6,023	7,231	7,249	7,004	7,079

Source: Mississippi Employment Security Commission

Oklahoma

Employment

	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>
3663	203	200	225	254
3669	69	79	76	124
3721	861	728	540	557
3724	908	1,096	1,144	1,208
3728	4,060	4,779	4,857	4,807
3761	*	*	*	*
3764	*	NON DISCL	NON DISCL	NON DISCL
3769	NON DISCL	80	73	94
3812	1,379	1,376	708	568
3829	86	85	63	36
4512	NON DISCL	NON DISCL	NON DISCL	NON DISCL
4513	3,212	3,477	3,488	3,492
4522	239	349	354	503
4581	3,655	3,978	3,963	4,118
Total	14,672	16,226	15,489	15,760

Source: Oklahoma Employment Security Commission

Texas

Employment

	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>
Total (all codes)	179,837	178,231	171,733	179,837	154,283	143,636	178,581	179,837	191,834	195,511	179,837	70,056

Source: Texas Workforce Commission, Labor Market Information Department

Virginia

Employment

	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>
4510									25,197	27,125	28,887
4520	507	446	423	418	421	450	523	545	1,051	1,207	1,204
4580	2,973	2,724	2,529	2,551	2,708	2,659	2,830	2,990	2,921	2,919	2,988
Total	3,480	3,170	2,952	2,969	3,129	3,109	3,353	3,535	29,169	31,251	33,079

Source: Virginia Employment Commission

Washington

Employment

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3663	346	342	345.00	352.00	371.00	891.00	1,132.00	1,056.00	1,063.00	1,232.00	1,738.00
3669	119	121	131.00	145.00	166.00	186.00	210.00	208.00	216.00	244.00	262.00
3721	105,609	105,448	102,650.00	95,310.00	84,992.00	73,005.00	78,100.00	94,112.00	100,097.00	88,011.00	76,621.00
3724	393	700	583.00	509.00	378.00	358.00	404.00	492.00	540.00	486.00	493.00
3728	10,276	9,147	8,445.00	6,773.00	6,345.00	6,720.00	7,514.00	10,045.00	11,478.00	10,405.00	9,040.00
3761	*	*	*	*	*	*	*	*	*	*	*
3764	*	*	*	*	*	*	*	*	*	*	*
3769	*	*	*	*	*	*	*	*	*	*	*
3812	3,803	3,633	3,240.00	2,821.00	1,789.00	1,644.00	1,702.00	1,570.00	2,132.00	2,835.00	2,607.00
3829	533	712	869.00	868.00	842.00	871.00	1,335.00	1,388.00	1,279.00	962.00	971.00
4512	13,222	13,057	12,914.00	12,047.00	11,852.00	12,097.00	12,439.00	12,877.00	13,491.00	14,498.00	14,676.00
4513	867	834	877.00	1,124.00	1,264.00	1,394.00	8,520.00	8,104.00	8,831.00	9,409.00	9,734.00
4522	203	236	304.00	419.00	413.00	369.00	388.00	404.00	429.00	507.00	504.00
4581	2,306	2,465	2,460.00	2,375.00	2,414.00	2,572.00	2,611.00	3,097.00	3,179.00	3,066.00	3,511.00
Total	137,677	136,695	132,818	122,743	110,826	100,107	114,355	133,353	142,735	131,655	120,157

^ 3761, 3764, and 3769 were suppressed

Source: Washington State Employment Security Department

Boeing Educational Requirements

Degrees from Houston Division

A+ Certification	Criminology	Management Science
Accounting	Dance	Management Systems
Administer MS Windows NT 4.0	Data Processing	Management Technology
Administration	Design	Manufacturing
Administrative Secretary	Design Engineer	Manufacturing Engineering
Advertising	Digital Electronics	Marine Engineering
Aeronautical Engineer	Drafting Technology	Marketing
Aeronautical Studies	Economics	Material Engineer
Aeronautics	Economics Business Admin	Material Management
Aeronautics Astronautics	Education	Material Science
Aerospace	Education Administration	Materials Engineering
Aerospace & Astro Engineering	Educational Technology	Math Computer Science
Aerospace Engineering	Electric Electronic Technology	Math Education
Aerospace Ocean Engineering	Electrical Engine Control Sys	Math Sciences
Aerospace Science	Electrical Engineering	Mathematics
Aerospace Systems	Electrical Engineering Tech	Mechanical & Aero Engineer
Aerospace Technology	Electrical Technology	Mechanical Design
Agricultural Engineering	Electronic & Computer Engineer	Mechanical Drafting Des Tech
Agriculture	Electronic Electrical Engineer	Mechanical Eng Aero Ops
Air Transportation Engineering	Electronic Engineering	Mechanical Engineer Tech
Aircraft Assec Systems Tech	Electronic Engineering Tech	Mechanical Engineering
Aircraft Design	Electronic Mechanical Tech	Mechanical Engineering Tech
Aircraft Engineering	Electronic Optical Technology	Mechanical Engrg Science
Aircraft Maintenance	Electronic Technology	Media Studies
Aircraft Maintenance Engineer	Electronics	Medical Technician
Aircraft Maintenance Engrg	Elementary Education	Metallurgy
Aircraft Maintenance Mgmt	Emergency Medicine	Microbiology
Aircraft Maintenance Tech	Engineer	Microsoft Certified System Engr
Aircraft Mechanics	Engineer Civil Engineering	Music
Airframe Power Plant	Engineering	National Resource Strategy
Airway Science	Engineering Administration	Naval Science
Anthropology	Engineering Drafting	Nuclear Engineering
Applied Math	Engineering Management	Nuclear Physics
Applied Mechanics	Engineering Math & Computer Sc	Nuclear Technology
Applied Science	Engineering Mechanics	Occupational Education
Architectural Drafting	Engineering Physics	Occupational Health Safety
Architectural Engineering	Engineering Science	Occupational Studies
Architecture	Engineering Technology	Ocean Engineering
Art	English	Open Systems Technology
Art Education	English Literature	Operations Management
Arts	Environmental Engineering	Organizational Management
Arts & Sciences	Environmental Management	Packaging Engineer
Astronautical Engineering	Environmental Science	Personnel Management

Astronautics	Environmental Science Eng	Petroleum Engineering
Astronomy Space Science	Environmental Studies	Philosophy
Atmosphere Science	Finance	Photographic Science
Automated Manufacturing Tech	Financial Management	Photography
Automotive & Diesel Mechanics	Fine Arts	Physical Science
Automotive Body	Fluid Mechanics	Physics
Automotive Technology	Foreign Affairs	Physics & Math
Aviation	Foreign Languages	Physiology
Aviation Business Admin	Forestry	Political Science
Aviation Maintenance Tech	French	Pre Engineering
Aviation Maintenance Mgmt	General Business	Pre Law
Aviation Management	General Education	Pre Med Technology
Aviation Mechanic	General Engineering	Production Management
Aviation Safety	General Science	Professional Aeronautics
Behavioral Science	General Studies	Professional Studies
Biblical Studies	Geology	Project Management
Biochemistry	German	Propulsion
Biological Science	Government	Psychology
Biology	Government Administration	Public Administration
Biomedical Engineering	Graphic Arts	Public Policy
Business	Graphic Communications	Quality Control
Business & Management	Health Services Management	Quantative Analysis
Business Administration	History	Radio, Television, and Film
Business Administration Mgmt	Human Factors	Real Estate
Business Computer Methods	Human Resources	Respiratory Therapy
Business Data Processing	Human Resources Management	Robotics
Business Finance	Human Services	Russian
Business Information Systems	Humanities	Safety
Business Management	Industrial Arts	Science
Business Marketing	Industrial Education	Science Education
Business Technology	Industrial Engineering	Secretarial Science
Chemical Engineering	Industrial Engineering Tech	Senior Professional Human Res
Chemistry	Industrial Management	Social Science
Child Develop & Family Rel	Industrial Production	Sociology
Christian Education	Industrial System Engineering	Software Engineering
Civil Engineering	Industrial Technology	Space Engineering
Civil Technology	Information Systems	Space Science
Commercial Art	Information Systems Mgmt	Space Systems
Commercial Engineering	Information Technology	Space Systems Management
Commercial Programming	Instructional Technology	Space Technology
Commercial Science	Instrumentation Pro Control	Spanish
Communications	Interior Design	Speech Communications
Computer	Internal Relations	Statistics
Computer & Information Science	International Business	Strength Engineering
Computer Aided Design	International Management	Structural Design
Computer Electronics	International Studies	Structural Engineering

Computer Engineering	Journalism	Studies of the Future
Computer I S Technology	Kinesiology	Systems Engineer
Computer Information	Languages	Systems Management
Computer Information Science	Law	Systems Science
Computer Information Systems	Law Enforcement	Teaching
Computer Science	Legal	Technical Aeronautics
Computer Science Theory	Legal Assistant	Technical Systems Mgmt
Computer Systems	Legal Secretary	Technology
Computer Systems Engineer	Liberal Arts	Technology Management
Computer Technology	Library Science	Television
Construction Management	Literature	Textile Engineering
Contract Management	Logistics	Theology
Control Engineering	Logistics Management	Total Quality Management
Counseling	Lpn	Vocational Education
Creative Writing	Management	Welding
Criminal Justice	Management Engineering	Welding Technology
Criminal Justice Law Enforce	Management Information Systems	Zoology

Certifications Required for Operators and Engineers in El Paso

Course Number	Course Title	Hours
9TEARBSWG	Arbor Press Swaging	1.0
9TEBCI	BATCH CLEANER IONOGRAPH	8.0
9TELTACC	Automated Conformal Coat Cert.	32.0
9TELTACI	AMEC Qualification	24.0
9TELTASU	ASU Qualification	4.0
9TELTAWQ	AWAC Qualification	4.0
9TELTBTU	BTU Paragon 150 Convection Re -flow Oven	3.0
9TELTCAD	Camalot 5000 Automatic Adhesive Dispenser	4.0
9TELTCEM	C-17, F-15, F-18, AV8B Qualification of Personnel	24.0
9TELTCON	Conformal Coat Application and Touch-up Qualific'n	40.0
9TELTCSG	Contact System CS400D Qualification	32.0
9TELTCSQ	1t03l leaded Component Sequence Preparation Qualif	10.0
9TELTCTC	Cleanliness Testing Cert.	16.0
9TELTDSC	Detrex Semi-aqueous In-Line Cleaning System	40.0
9TELTDSS	DSC Qualification of Personnel	2.0
9TELTDTC	Delta II and Delta III Qualification	2.0
9TELTEAA	EPO Eubanks Autotab Machine	32.0
9TELTEEX	Eye Examination	0.3
9TELTELC	Electrovert In-Line Cleaning System	40.0
9TELTESE	Engineering Restricted Solder Certification	40.0
9TELTFFI	Qual of Prsnl F-22, B-1B, CWIU, Apache, Sea Launch	16.0
9TELTFLO	Mobile Equipment Cert.	4.0
9TELTFOT	Fibre Optics Termination Cert.	24.0
9TELTGPS	GPS (Global Positioning System IIF) Qualification	8.0
9TELTGRQ	GRP Requirements	4.0
9TELTHPQ	Harpoon Qualification of Personnel	24.0
9TELTIIIP	Instructor IPC Certification	40.0
9TELTIIJS	Instructor J-Std-001 Certification	40.0
9TELTIMT	ISO 9000 Awareness - Management/Team Leaders	2.0
9TELTINC	Instructor NHB 5300.4(3J) Conformal Coat & Staking	80.0
9TELTINH	Instructor NASA STD 8739.4 Crimp, Cable, Harness	80.0
9TELTINS	Instructor NHB 5300.4(3J) Solder Certification .	80.0
9TELTIOV	ISO 9000 Awareness -Overview	1.0
9TELTIPB	IPC-610(B)	40.0
9TELTJSB	J-STD-001(B)	12.0
9TELTMAI	Mechanical Assembly Inspection Certification	40.0

9TELTMSA	Solder Certification per MIL-STD-2000A	8.0
9TELTMVD	Modified Vapor Degreaser Acrylic Stipping Process	4.0
9TELTMYD	MYDATA TP18-UFM SMD Automatic Placement Machine	4.0
9TELTNCC	NASA Conformal Coat/Staking Cert per NHB 5300.4 3j	8.0
9TELTNHA	NASA Crimping, Harnessing, and Cabling Cert	32.0
9TELTNHB	NASA Crimping, Harnessing, and Cabling Inspection	32.0
9TELTNJA	NASA Conformal Coat/Staking per NHB 5300.4 3J SPRY	40.0
9TELTNJB	NASA Conformal Coat/Staking per NHB 5300.4 3J INSP	40.0
9TELTNSA	Solder Certification per NHB 5300.4(3A-1)	120.0
9TELTNSB	Inspector Solder Certification per NHB 5300.4 3A-1	120.0
9TELTNSC	NASA Conformal Coat/Staking per NHB 5300.43J TCHUP	16.0
9TELTPCS	Polyurethane Conformal Coat Chemical Stripping	8.0
9TELTPHI	Dip & Spray Insp of Polyurethane Hysol PC 18M/29M	4.0
9TELTPHP	Dip & Manual Spray of Polyurethane Hysol PC 18M/29M	32.0
9TELTPHT	Polyurethane HYSOL PC29M Touch Up Qualification	16.0
9TELTQES	Quality Engineering Soldering Certification	40.0
9TELTRIV	Chassis Riveting Certification	4.0
9TELTROY	Royonic 512 Qualification	32.0
9TELTRSC	RS Cable Connector Encapsulation Procedure	40.0
9TELTRWK	EPO Rework Certification	40.0
9TELTSAQ	Dip and Manual Spray of Silicone DC 2620/2577	32.0
9TELTSCS	Stencil Cleaner Process	10.0
9TELTSCQ	Silicone Conformal Coat Touch-up Qualification	8.0
9TELTSDC	Polyurethane PC29 Conformal Coat Touch-up	8.0
9TELTSTP	Surface Mount Fine Pitch Component Hndlng & Pckng	2.5
9TELTSTO	Shanklin Shrink Tunnel Oven Process	1.0
9TELTSWG	Module Swaging and Riveting Certification	8.0
9TELTUMD	Unimod Dip Inserter Qualification	32.0
9TELTUSP	MPM Automatic Solder Printing	4.0
9TELTVCD	Universal Variable Center Distance Operations Qual	32.0
9TELTWAC	Westek In-Line Aqueous Cleaner	40.0
9TELTWVE	EPO Wave Solder Certification	32.0
9TEPRTC	Process Restricted Certification	8.0
9TEUYRFF	Inspection of Electronic Assemblies Certification	40.0
9TEUYRFJ	Radiographic Inspection Level I	40.0
9TEUYRFK	Radiographic Inspection Level II	40.0
9TEUYRFL	Radiographic Inspection Level III	40.0
9TEUYRFM	EPO Crimping Certification	8.0
9TEUYRFP	Electronic Functional Test Certification	40.0
9TEUYRRC	General Inspection Certification	40.0
9TEVYRAC	Wire Preparation Qualification	8.0

9TEVYRAJ	Torquing and Staking Qualification	40.0
9TEVYRAN	Adhesive Bonding Operations Qualification	8.0