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A Key Component in Texas  
Manufacturing: The Economic Impact of  
the Boeing Company

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# **A Key Component in Texas Manufacturing: The Economic Impact of the Boeing Company**

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## ***Fact Sheet***

### **A Key Component in Texas Manufacturing: The Economic Impact of the Boeing Company**

- Boeing's activities in Texas are critical to national defense and the nation's space programs.
- Current Texas operations of the Boeing Company are significant, including support of the NASA Johnson Space Center, the Army's Future Combat Systems, and a variety of support programs for specific military platforms such as the Apache Longbow helicopter and the Patriot missile.
- Boeing currently has 5,200 of its employees in Texas spanning across 13 counties and several military installations. Major employment centers in Texas are centered around Houston, Dallas/Irving/Fort Worth, and San Antonio.
- High technology manufacturers like Boeing are key to the long-term growth of the Texas economy.
- Boeing is critical as part of two of the targeted industry clusters identified in the Governor Perry's economic development strategy: Aerospace and Defense and Advanced Technologies and Manufacturing.
- Boeing manufacturing operations are also critical to the state as a result of the supply network it utilizes.
- Boeing purchases from suppliers in 2005 totaled \$1.489 billion.
- Boeing wages and salaries in Texas in 2005 averaged \$68,741 (not including benefits), 26 percent higher than the average wage in the manufacturing sector in the state.

- Boeing relies on suppliers in 63 counties in Texas, with the great majority of supplier purchases concentrated in East Texas near major Boeing facilities.
- In Texas, Boeing **direct** wages total \$381 million, supporting 5,200 employees and their families. Including benefits, this amount increases to \$521.7 million.
- Beyond employment, the direct impact of Boeing that includes its supplier purchases and other Boeing activities totals \$2.022 billion.
- Boeing's full economic impact including indirect and induced impacts (multiplier effects) total \$3.52 billion.
  - Boeing's impact on wages, salaries, benefits and the self employed is \$1.076 billion.
  - Boeing's tax impact is \$88.7 million.
  - Boeing and its supply network account for 20,670 jobs in Texas.
- Boeing's activities in the state will continue to expand, including high technology leadership with new programs such as Future Combat Systems at Ft. Bliss in west Texas and Strategic Border activities in the state's ports of entry.
- Texas is fortunate that Boeing's activities attract additional suppliers and their jobs. Support of Boeing's activities will remain important to achieving the strategic goals of economic development in Texas.

## A Key Component in Texas Manufacturing: The Economic Impact of the Boeing Company

This study was conducted by the Institute for Policy and Economic Development (IPED) at the University of Texas at El Paso (UTEP) at the request of Boeing Corporation in the state of Texas in order to measure the economic impact of Boeing activities on the state. These include direct expenditures on wages and salaries, as well as supplier expenditures, other direct costs expended such as tuition reimbursements, and philanthropic activities.

The findings of Boeing are presented in three sections. To begin we provide a description of Boeing activities in the state. Second, a brief methodological overview of how the findings were obtained, including a discussion of direct, indirect, and induced impacts of Boeing activities, is provided. The final section discusses Boeing's economic impact totals and related contributions in the State of Texas.

### Boeing in Texas

Boeing's presence in Texas dates to the 1960s, coinciding with the founding of the NASA Johnson Space Center in Houston and has developed to include operations in over a dozen Texas counties and military bases. Its presence is also extended by drawing inputs from manufacturing and support activities from over 60 Texas counties. In 2005, Boeing employed over 5,200 individuals in Texas, its fourth largest presence among the 50 states, who are engaged in activities ranging from NASA program management and manufacturing for defense and space products to aircraft training and logistics.

Overall, employment for these activities is concentrated in three urban areas, 1) Houston, 2) San Antonio, and 3) Dallas/Irving/Fort Worth. However, other Metropolitan Statistical Areas (MSAs) throughout the state are also key components in Boeing operations. In total, 13 different cities are identified by Boeing as employment sites, with another 63 counties serving as critical suppliers to Boeing manufacturing and services operations. Activities by area include:

**Austin:** a small contingent of employees work with state policymakers on behalf of Boeing.

**Corpus Christi:** Boeing personnel at the Corpus Christi Army Depot (CCAD) provide technical, engineering, and logistics support services for CH-47 Chinook components and AH-64 Apache components. Field service support includes flight line testing, prime shop liaison, Apache pilot program technical support, second source testing of components, and CCAD Forward support.

**Dallas/Irving/Ft. Worth:** In September 2006, Boeing acquired Aviall, a large independent provider of aviation parts and services in the aerospace industry. Aviall is now a wholly-owned subsidiary and reports to Boeing Commercial Aviation Services (CAS). With approximately 1,000 employees, Aviall is headquartered in Irving with customer service centers located in North America, Europe and Asia. CAS offers Integrated Materials Management (IMM) services to airline customers.

**Dyess Air Force Base:** The Boeing repair facility at Dyess AFB (near Abilene) provides component-level repair and on-aircraft modification support for the United States Air Force B-1B Bomber. Boeing employs 50 technicians and support staff on site.

**Houston:** Boeing's Houston operations include support to the United States space mission as well as satellite and defense operations. Boeing has provided technical and engineering support services to NASA's Johnson Space Center (JSC) since the 1960's and is currently responsible for providing the Space Shuttle engineering and operations support. Boeing is NASA's prime contractor for the International Space Station (ISS), as well as supporting NASA's the Constellation Program, which supports NASA's implementation of a sustained and affordable human and robotic exploration program.

Outside its support of the space program, Boeing Service Company (BSC) Satellite Operations & Ground Systems has provided operations and maintenance services to multiple satellite systems in both commercial and government sectors and has expanded its market focus to include support of the United States Army's Future Combat Systems (FCS) program.

**El Paso:** Originally opened in 1983 as a feeder plant in support of the U.S. Air Force's B-1B program, the Boeing El Paso plant is a key manufacturing site for defense

electronics and avionics. Current production programs include guidance replacement for the Minuteman III Missile, Patriot Missile guidance system, avionics for F-15 and F-18, power distribution systems for the International Space Station, along with a number of other smaller programs. Additionally, Boeing El Paso will host a Future Combat System (FCS) support facility which, beginning in 2008, will be staffed by several hundred engineers, technical, and support personnel who will work together with the Army on the testing, evaluating, and fielding of FCS technologies as they come online.

**Killeen:** Boeing employs 21 personnel at Fort Hood in Killeen to provide technical support for US Army AH-64D Apache Longbows and CH-47 Chinooks. Logistics and supply activities are under the contractor logistics support contract, and Boeing currently provides technical support for the suite of training devices that support the AH-64D Apache Longbow.

**Kingsville:** At the Naval Air Station (NAS) in Kingsville, the Boeing T-45C Goshawk jet carrier trainer is used by the US Navy to train their jet carrier aviators. New production T-454C aircraft are currently in production by Boeing IDS in Saint Louis and will be delivered to the Navy at NAS Kingsville through 2009.

**Laughlin Air Force Base:** At Laughlin AFB in Del Rio, Boeing employees provide maintenance and logistics support for T-37 and T-38 aircrew training devices and aircraft simulators.

**Randolph Air Force Base:** At Randolph Air Force Base at the Air Education and Training Command Headquarters near San Antonio, Boeing employees provide T-43 aircraft with parts and labor and provide maintenance and logistics support for T-37 and T-38 aircrew training devices and aircraft simulators, as well as the T-38C Consolidated Organizational Maintenance and Base Supply.

**Richardson:** The wholly-owned Boeing subsidiary located in Richardson was responsible for orchestrating the installation of Explosive Detection Systems at all 447 of the nation's commercial airports and serves as headquarters to over 1,500 employees dispersed at over 20 locations throughout the United States.

**San Antonio:** In April of 1998, The Boeing Company entered into a long term lease agreement for 1.3 million square feet of aircraft maintenance facilities and an associated flight ramp at the KellyUSA Industrial Park (formerly Kelly AFB) in San Antonio. Boeing's primary focus is an aircraft maintenance, modification, and upgrade center for large military aircraft.

The site located at KellyUSA is a paint and de-paint facility capable of handling all types of wide-bodied aircraft. Currently, Boeing provides a variety of services for the United States Air Force, including: block upgrades, aeronautical condition inspections, scheduled and unscheduled maintenance, upgrades, modifications and speed-line work for the C-17 Globemaster transport and KC-10 Extender aerial refueling aircraft. The site also hosts Boeing's KC-10 Program office that supports the USAF with worldwide logistics support.

In addition, Boeing has two contracts to support the KC-135 Stratotanker aircraft. The primary KC-135 contract is to perform Programmed Depot Maintenance (PDM) wherein the aircraft go through a through inspection and repair process every five years. Boeing also performs avionics installation of the new Global Air Traffic Management system into the aircraft. Finally, Boeing has recently undertaken the C-130 Avionics Modernization Program at KellyUSA and is designing and installing new "glass cockpits" into these aircraft.

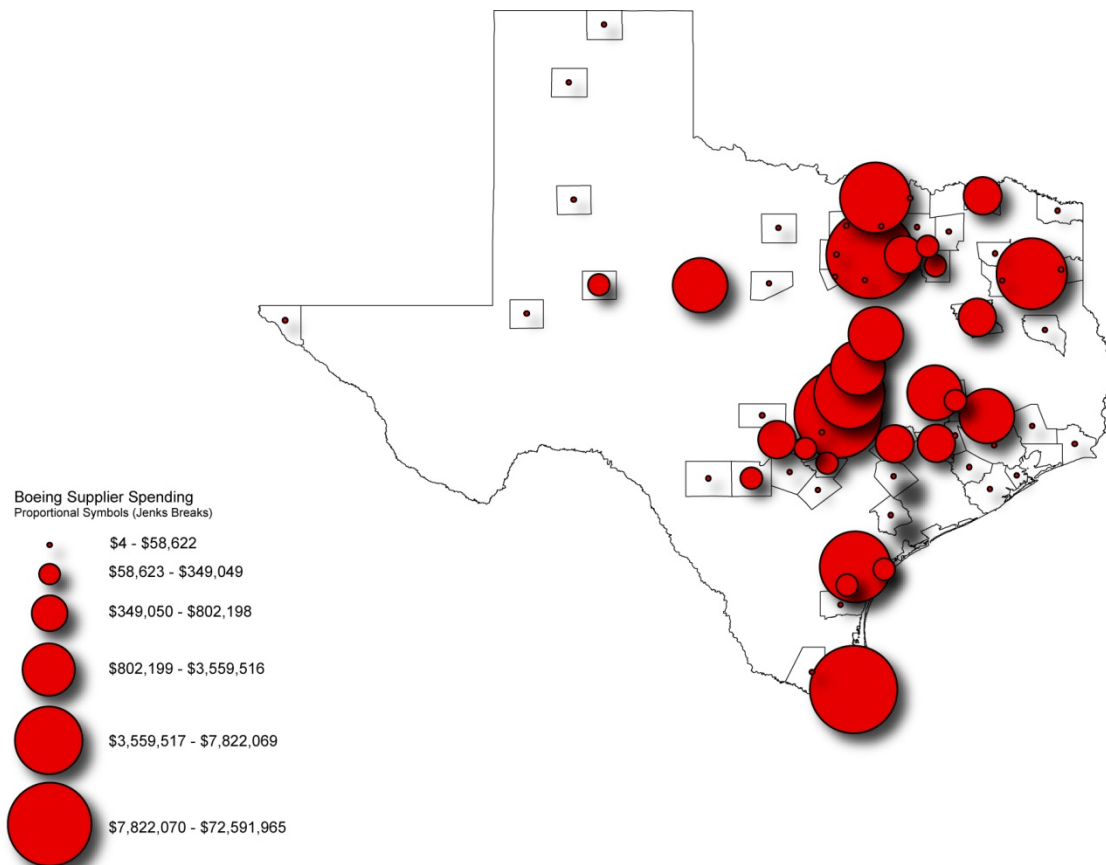
The San Antonio site employs over 1,600 personnel and is a certified FAA Repair Station.

**Universal City:** At the Universal City Training Support Center (TSC) near San Antonio, Boeing employees develop computer and web-based training products, conduct a variety of training analyses, and provide graphics design in support of the T-38C AUP (Avionics Upgrade Program), C-130 AMP (Avionics Modernization Program), KC-767 Tanker Transport and Boeing's GMD (Ground-Based Midcourse Defense) system.

## Boeing's Texas Suppliers

Boeing's 5,200 employees draw on suppliers from 63 counties across the state. Not surprisingly the bulk of suppliers are often located in the same counties as major Boeing operations. In Dallas and Tarrant counties, home to Dallas, Irving, and Fort Worth, Boeing operations, accounted for over \$890 million in purchases from suppliers, while Harris County (Houston) accounted for another \$130 million. The Dallas/Irving/Fort Worth operation employs approximately 1,000 individuals while Houston is home to the Johnson Space Center and a wide variety of Boeing activities. Figure 1 below shows the degree to which these purchases are concentrated across the state. While the majority are concentrated in East Texas, Cameron County (Brownsville), located at the southern tip of the state, accounted for \$42.1 million in supplier purchases; an indicator of the dispersion Boeing has in Texas.

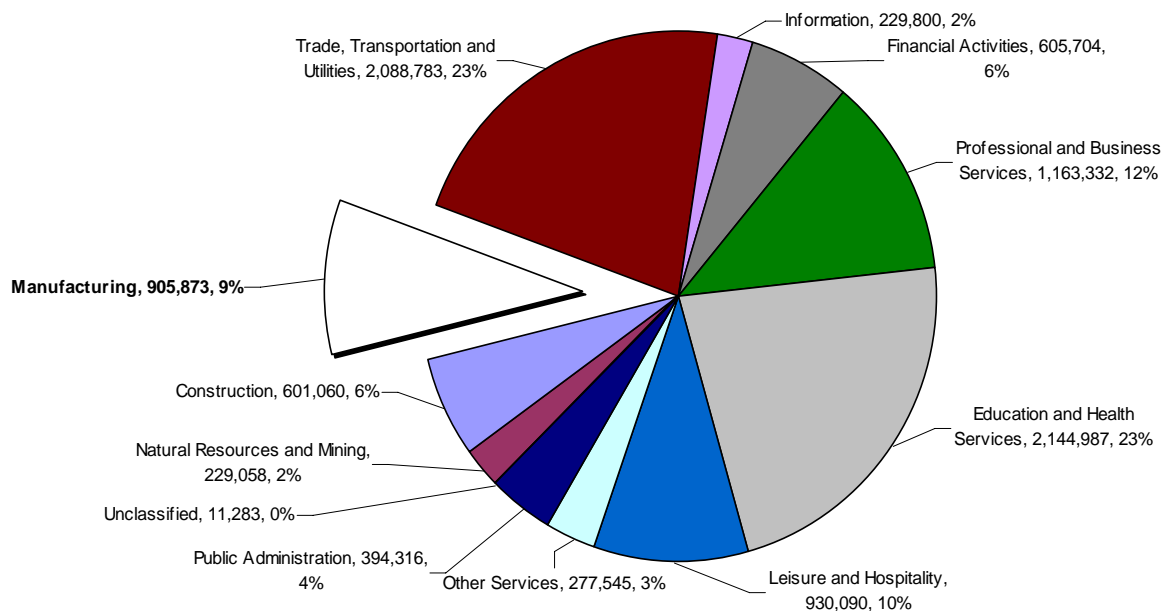
**Figure 1**  
**Boeing Purchases from Suppliers in Texas, Proportional Dot Concentration**



## Boeing and Texas Manufacturing

In 2005, slightly over 9.58 million individuals were employed in the State of Texas, the largest sector being Education and Health Services (2,144,987 or 22.4 percent of total). Trade, Transportation, and Utilities ranked second with over 2 million employees (2,088,783, or 21.8 percent of total) as a result of Texas' industry concentration in oil and gas combined with its location as a major entry and exit port for trade with Mexico. Overall, manufacturing is one of the state's smaller employment sectors. However, this is not seen as unusual since most state economies have undergone a transition and are typically dominated by services, which, in the case of Texas, accounts for 12 percent of the economy. Manufacturing in Texas accounts for only 9.5 percent of the workforce (905,873), fifth among all industry sectors, as shown in Figure 2.

Figure 2: Total Employment in Texas



Despite being smaller in size based on percentage of total employment, manufacturing is without question a key component of the Texas economy. Low-wage, low skill jobs have migrated out of the state, as, for example, they did in El Paso with the mass exodus of the apparel industry. As a result, the focus has become high skill manufacturing where United States operations provide a higher return to manufacturers. In Texas, this position is also being promoted by state policymakers who include "Advanced Technologies and Manufacturing" as

one of the six industry clusters critical to economic development in the state. More specific focus with regard to Boeing activities in the state is defined within "Aerospace and Defense" cluster.

## **Manufacturing Employment in Texas**

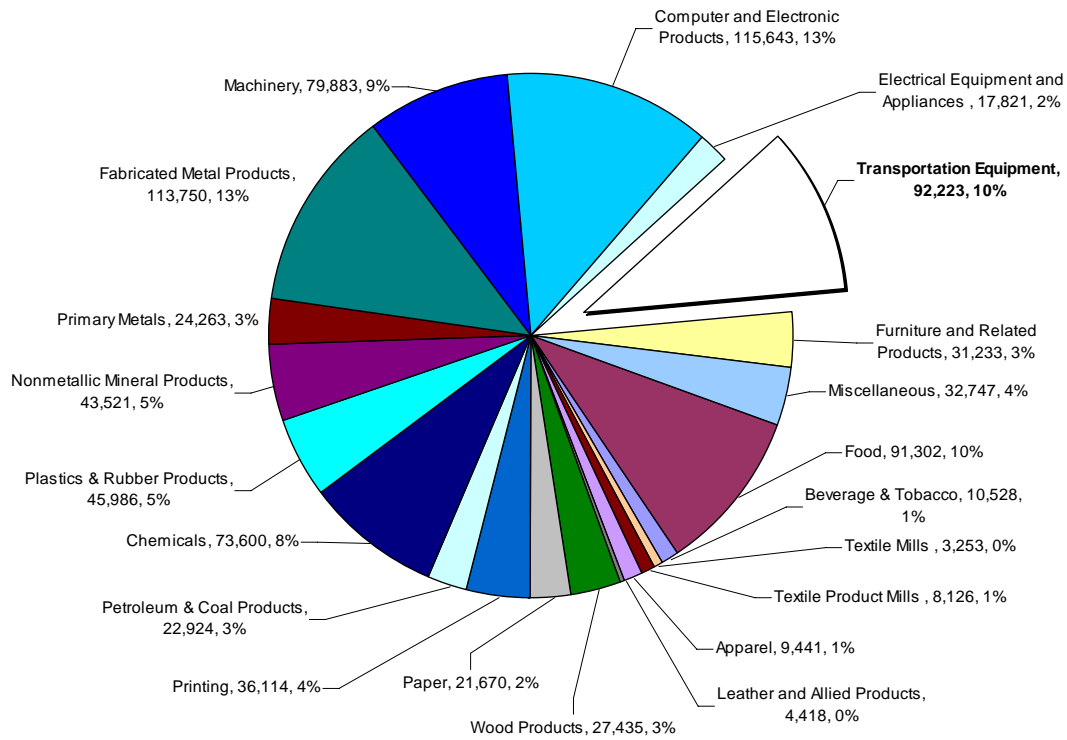
A total of 905,877 people worked in manufacturing in Texas in 2005, a sector where employment is dominated by higher wage, high technology industries. The top three employers include Computer and Electronic products (115,643, 12.8 percent), Fabricated Metal Products (113,750, 12.6 percent), and Transportation Equipment (92,233, 10.2 percent), the latter capturing the bulk of Boeing activities. Other industries, such as Food (10.1 percent), Machinery (8.8 percent), and Chemicals (8.1 percent) round out the top six industries in the state, accounting for two thirds of all manufacturing employment in the state. Transportation equipment, which includes Boeing, is placed within manufacturing for Texas in Figure 3.

The real strength in manufacturing is not only its direct employment impacts, but the varied inputs which are the products and services necessary to produce a good. Typically, manufacturing industries often have a broad range of support industries, many which fall outside of manufacturing. Manufacturing support services, for example, range from legal and accounting to architectural and engineering services. In this environment, manufacturing jobs have the capacity to compound their benefit to a regional economy due to the need for external inputs to the sector.

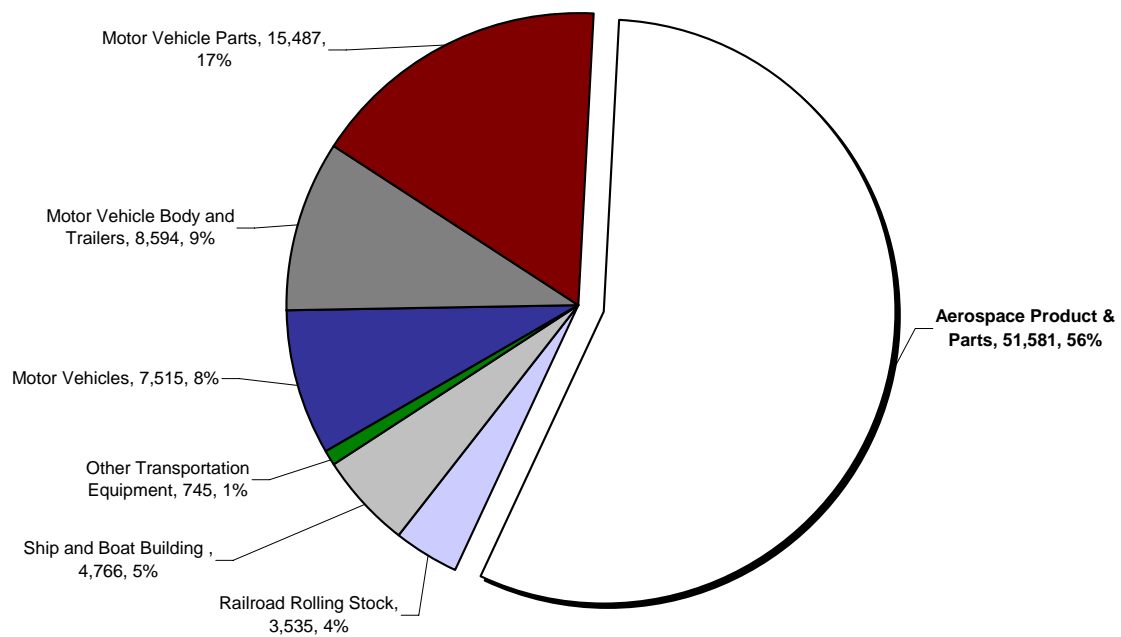
## **The Transportation Equipment Manufacturing Sub-sector**

The transportation equipment sub-sector in Texas employed 92,223 people in 2005 and was overwhelmingly dominated by Aerospace Products and Parts (56 percent or 51,581). The next closest employment sub-sector, motor vehicle parts (16.8 percent or 15,487), stood at less than one-third of that size. The remaining 27 percent of employment in the sub-sectors (25,155) was distributed among five additional areas as illustrated in Figure 4 below.

**Figure 3: Manufacturing Employment in Texas**



**Figure 4: Transportation Equipment Employment in Texas**



From the 51,581 employees in Aerospace Products and Parts, Boeing employed roughly 5,200 (or 10 percent). This employment pattern reflects Boeing's diversity, spanning a wide range of activities from support of the Goshawk T45C jet carriers to support services for the Johnson Space Center. As such, Boeing is engaged in the 5 North American Industrial Classification (NAICS)<sup>1</sup> sub-sectors described in Table 1. For 2005, the Bureau of Labor Statistics (BLS) reported 238 establishments in Texas (individual businesses) falling into one of the five sub-sectors. It should also be noted that Boeing's competitors make up some of these firms, including General Electric, Raytheon, Lockheed, and dozens of other smaller enterprises.

**Table 1**  
**Boeing Manufacturing Sub-sectors**

| NAICS Code | Industry Name  |
|------------|--|
| 336412     | Aircraft Engine and Engine Parts Manufacturing   |
| 336413     | Other Aircraft Parts and Auxiliary Equipment Manufacturing                               |
| 336414     | Guided Missile and Space Vehicle Manufacturing   |
| 336415     | Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing |
| 336419     | Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing       |

### The Economic Impact of Boeing in Texas

Boeing's impact in Texas reaches beyond its direct employment and supplier purchases. Its activities not only require inputs from other similar businesses, but also include a wide variety of services coming from the areas of Scientific and Research Development (NAICS541700) and Custom Computer Programming Services (NAICS 541511). While the actual products purchased from suppliers (inputs) will vary by establishment, the idea that individual businesses rely upon others when they must increase output is commonly accepted in the field of economics. The impact of the single establishment is typically termed a direct impact, while the reliance it places upon others that supply its services and materials are termed indirect. While this process is covered in more detail below, the *direct impacts* of Boeing can be described as:<sup>2</sup>

1. Operations -- expenditure data for suppliers for 2005, data obtained from Boeing representatives and mapped based on typical input patterns for the manufacturing sub-sectors in which Boeing operates in the State of Texas.

2. Personnel (Wages and Benefits) -- this category includes all wages paid and benefits provided to Boeing employees in 2005.
3. Charitable Contributions -- Boeing reported its employees donated \$1.464 million to charity in 2005, an increase from 1.1 million in 2004.
4. Tuition Reimbursement -- Boeing provides tuition reimbursement to its employees for qualifying educational expenditures, such as those deemed skill upgrades or necessary for career advancement. Tuition reimbursement in 2005 totaled \$3.99 million.
5. Travel – This includes expenditures for Boeing employees from outside of Texas visiting the state for work related purposes.

The total for all five classes of direct expenditures in Texas by Boeing sums to \$2.021 billion, and are shown in Table 2.

**Table 2**  
**Boeing Texas Direct Economic Impacts, 2005**

| Expenditure Category           | Amount                 |
|--------------------------------|------------------------|
| Operations                     | \$1,489,515,060        |
| Personnel (wages and benefits) | \$521,678,675          |
| Tuition Reimbursement          | \$3,995,179            |
| Charitable Contributions       | \$1,464,301            |
| Travel                         | \$5,073,680            |
| <b>Total</b>                   | <b>\$2,021,726,895</b> |

### **Economic Impacts Beyond Direct Effects: Input-Output Analysis**

Input-output (I-O) analysis, in its simplest form, is made possible by two models—one descriptive and one predictive. Input-output tables may be thought of as tabular representations of the inner workings of a given economy. Once created, the tables provide a means of tracking what one industry buys from another to produce its goods. These transactions are based on the idea of economic interdependence; or put another way, industries rely upon one another through purchases from and sales to other industries.<sup>3</sup> An airplane manufacturer, for example, must purchase  $x$  units of aluminum to produce  $y$  plane bodies; and, the aluminum producer must in turn buy  $w$  units of fuel to heat the ovens that help produce  $x$  units of aluminum.

The extent to which industries rely upon one another is captured by the descriptive model. The tables within the descriptive model provide detailed information by industry and commodity on everything from employment and earnings (value added<sup>4</sup>) to business volume (output<sup>5</sup>). The predictive model comes into play when some change (typically in final demand or consumption) or shock (i.e. hurricane, terrorist attack) is applied to an economy. The “ripple effects” of one industry purchasing from another to meet the new demand are captured as “rounds” until the amounts purchased become so small that they are considered insignificant. The sum of the rounds is then added to the original change for a total economic impact.

The multipliers<sup>6</sup> are also provided by the predictive model. Depending on the application, several types of regional multipliers are available. Although they differ in how data are regionalized, most impact studies dealing with a project such as this choose one of three commercially available impact programs. These include; REMI, an acronym for Regional Economic Models, Inc; RIMS II, the Bureau of Economic Analysis’ (BEA) Regional Industrial Modeling System, version two; and, IMPLAN, produced by the Minnesota IMPLAN Group (MIG). While any of the three could have been used for this study, IMPLAN was selected because its multipliers more accurately depict local economies than RIMS II (and are generally more conservative)<sup>7</sup> due to a more efficient regionalization<sup>7</sup> process. For point in time analysis, REMI and IMPLAN provide similar results.

## How to Interpret an Impact Study

The impact of any change in final demand to an economy of interest is divided into three components by IMPLAN. These are termed direct, indirect, and induced effects.

- *Direct effects* refer to the initial and more observable change in final demand; a one million dollar construction project entered into the appropriate I-O industry would show a direct impact of one million dollars.
- The *indirect effects* can be best thought of as the ripple effects of increased production among the businesses that supply goods to the construction project.
- *Induced effects* are household effects, which generally mean that due to the initial shock households will have more (or less) income to spend on things like eating out or medical care.

In addition to changes in output/final demand, impacts are also provided for employment, employee compensation, and taxes. Detailed tables in the appendix also include

Value Added and Tax Impacts.<sup>8</sup> Employee compensation is simply the salary and wages paid to workers in Texas as a result of Boeing activities.

All impact estimates are in 2003 dollars and are deflated from the expected impact year if different from the model year, a requirement resulting from the fact that model data are typically published two to three years from the current calendar year.<sup>9</sup>

## Findings

- As the focus in Texas continues to be high wage and high skill manufacturing as outlined in the Governor's economic development strategy, Boeing is critical to this strategy and the state's long-term economic success.
- In this regard, the Boeing Company in Texas paid salaries and wages well above the state average in the manufacturing sector in 2005, \$68,741 (not including benefits) versus \$54,288, respectively, 26 percent higher overall than their peers.
- Boeing's wage differential makes its Texas operations attractive for economic development in the state, not only because it supports high wage levels, but also because it draws upon other high wage industries as part of its production process.
- These relationships make Boeing's direct employment in 2005 of 5,200 individuals only a fraction of its total economic impact.
- Boeing's direct business volume (output) totaled \$2.021 (2003 \$) billion in 2005.
- Accounting for supplier inputs and increased household spending, Boeing's activities were responsible for \$3.52 billion of Texas' total business volume in 2005.
- Wage and sole proprietor (individuals who own their own businesses) impacts of Boeing were equally impressive. Direct expenditures in this category totaled \$540 million, but generated a \$1.076 billion impact after including indirect and induced effects.
- Employment impacts show that Boeing direct employees when combined with supplier purchases and other expenditures totaled 8,598.
- Boeing's supplier base is also of great importance to the state. After accounting for estimated direct employment by Boeing (5,200), and the added direct employment of suppliers (3,398), the total impact to the state is 20,670 jobs, creating nearly 4 jobs for every individual or direct Boeing employee.

- In addition, Boeing and its employees donate thousands of hours of time in civic organizations and Boeing itself plays a major role in all the communities where it operates serving as a corporate entity that community's are willing to call their own.

**Table 3****IMPLAN Estimates of Boeing Economic Impacts in Texas in 2005<sup>10</sup>**

| <b>Economic Impacts</b>  | <b>Direct</b>  | <b>Indirect</b> | <b>Induced</b> | <b>Total</b>   |
|--|----------------|-----------------|----------------|----------------|
| <b>Output (\$Mil)</b>  | <b>\$1,920</b> | <b>\$904</b>    | <b>\$696</b>   | <b>\$3,520</b> |
| Proprietor Income and Employee Compensation Component (\$ Mil) | \$541          | \$309           | \$226          | \$1,076        |
| Business Taxes Component (\$ Mil)                              | \$13.7         | \$28            | \$47           | \$88.7         |
| <b>Employment</b>  | <b>8,598</b>   | <b>5,414</b>    | <b>6,658</b>   | <b>20,670</b>  |

**Conclusions**

- Boeing's role in the nation's space mission is not only vital to the national economy but provides a cornerstone for significant employment in technology based manufacturing.
- It is undeniable that Texas's overall growth will benefit from Boeing's continued presence.
- Boeing must be valued from a competitiveness standpoint, providing Texas a resource to attract other industries and as a key component of the Governor's economic development strategy.
- Boeing can be used to attract similar industries, having created a supply chain within the state to produce similar products.
- Expansion of activities such as Future Combat Systems and development of the Secure Border Initiative must be capitalized upon not only for the specific mission of the program but to continue to expand Texas' high skill and high tech industries base.
- Boeing's philanthropic activities provide yet an even higher value added to communities where Boeing has locations.

## End Notes

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<sup>1</sup> The North America Industrial Classification System (NAICS) provides a method for identifying similar activities in the United States, Canada and Mexico in order to provide documenting trade, inputs and outputs by industry and replaced the SAICS or Standard Industrial Classification system.

<sup>2</sup> Capital expenditures data should be included in any industries direct impacts; however, Boeing was unable to provide data for the state of Texas. As such, the economic impacts discussed herein should be considered conservative.

<sup>3</sup> Leontief, Wassily. (1936). "Quantitative Input-Output Relations in the Economic System of the United States." *The Review of Economics and Statistics*. 21, 105-125; Miller, Ronald E. and Peter Blair. (1985). *Input-Output Analysis: Foundations and Extensions*. New Jersey: Prentice Hall; Miernyk, William. (1965). *The Elements of Input-Output Analysis*. New York: Random House.

<sup>4</sup> Value added is the sum of wages paid to employees, revenue earned by sole proprietorships, and indirect business taxes.

<sup>5</sup> Output is the sum of intermediate inputs (goods and services used to produce a product) and value added (payments to workers, taxes, profits).

<sup>6</sup> Multipliers are generated from the purchases by one sector of goods and services from other sectors. The sum of these rounds of purchases is the process used to calculate multipliers.

<sup>7</sup> Rickman, Dan S. and Keith Schwer. (1995). "A comparison of the multipliers of IMPLAN, REMI, and RIMS II: Benchmarking ready-made models for comparison." *The Annals of Regional Science*. 29, 363-374; Lindall, Scot and Doug Olson. (2000). *IMPLAN Pro Version 2.0 Analysis Guide*. Stillwater MN, MIG. pp. 169-172.

<sup>8</sup> Value added is the sum of wages paid to employees, revenue earned by sole proprietorships, and indirect business taxes.

Tax Impacts are changes in income received by Federal and State/Local governments.

<sup>9</sup> Detailed industry tables for each of the impacts, including labor income impacts were calculated in support of this analysis and can be obtained from Boeing.

<sup>10</sup> All dollar amounts are in 2003 dollars and have been deflated from those provided in Table 2.