OFFICE OF THE GOVERNOR

ECONOMIC DEVELOPMENT & TOURISM

TEXAS AEROSPACE AND AVIATION INDUSTRY REPORT

OCTOBER 2005

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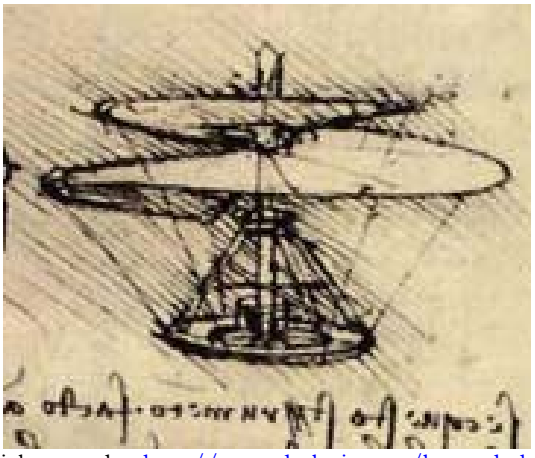
Contents

AEROSPACE & AVIATION INDUSTRY OVERVIEW

The aerospace and aviation industry is defined by two areas. "Aerospace" is the broader term that includes activities related to manmade flight in the earth's atmosphere and outer space. The U.S. Department of Defense (DoD) defines "aerospace" as "of or pertaining to Earth's envelope of atmosphere and the space above it; two separate entities considered as a single realm for activity in launching, guidance, and control of vehicles that will travel in both entities." "Aviation" is a subset of "aerospace," referring to activities related to manmade flight within earth's atmosphere. The American Heritage Dictionary defines "aviation" as "the design, development, production and operation of aircraft' and 'aircraft' as "machines or devices…capable of atmospheric flight." Wikipedia defines "aviation" as "activities surrounding mechanical flight and the aircraft industry, divided into three areas: commercial, general, and military aviation." Aerospace and aviation both have strong ties to the defense industry due to their military applications.

The history of aerospace and aviation goes back to approximately 1000 BC, when the Chinese manufactured kites large enough to carry military scouts aloft to check on troop movements. Leonardo da Vinci (1488-1514) famously designed a number of flying machines, including the "aerial screw" or helicopter pictured below, centuries before the means to commercially manufacture them existed.



Publicly posted at http://www.dyslexia.com/leonardo.htm

In 1783, the Montgolfier brothers successfully trialed manned and unmanned hot air balloons. The first Zeppelin airship flight took place in 1900. In 1903, Orville and Wilbur Wright took their first manned, powered, heavier-than-air, controlled flight at Kitty Hawk, North Carolina – and the age of modern aircraft began. The space age arrived in 1957 with the Soviet launches of Sputnik I and II. The first manned space vehicle was the USSR's Vostok I carrying Major Yuri Gagarin in 1961. Just eight years later, NASA's Apollo 11 completed the first – and last - manned lunar landing. Since then, there have been many other space milestones, such as NASA's 2004 landing of the Mars rover Spirit. Currently, the International Space Station continues to rotate multi-national crews, and China's space program is gearing up after its second manned mission in 2005.

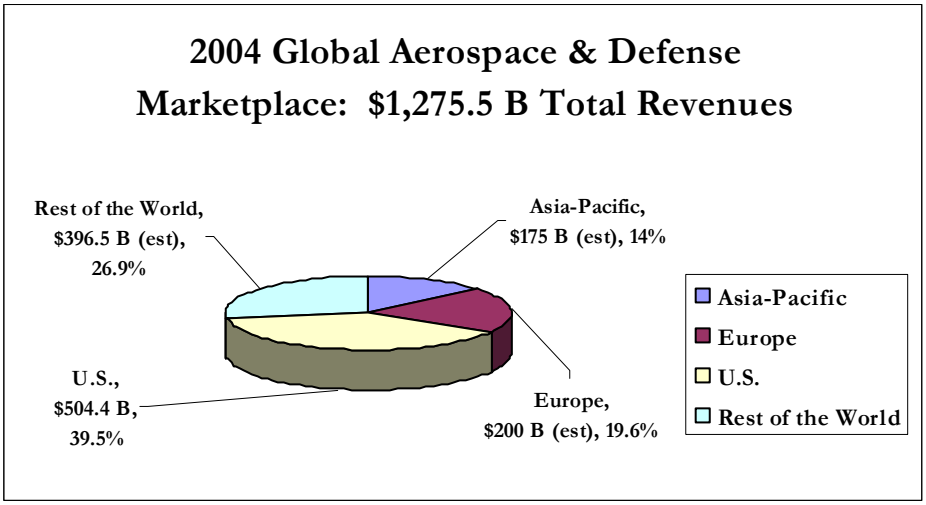
A list of the major aerospace and aviation industry codes from the North American Industry Classification System (NAICS) – which has replaced the Standard Industrial Classification (SIC) system – follows. Most of the industry codes fall into NAICS 33+, which are manufacturing breakouts. Aerospace and aviation industry manufacturing covers everything from aircraft engines to handgliders to guided missiles and space vehicles. NAICS 481: Air Transportation includes the air transport of passengers and cargo. NAICS 4881: Support Activities for Air Transportation includes airport operations, repairs and services, and air traffic control. NAICS 54133: Engineering Services is a broad, multi-industry area, and only the aerospace portion

is relevant. NAICS 927: Space Research and Technology is comprised of government or quasi-government research establishments. [i]

AEROSPACE & AVIATION INDUSTRY CODES	
NAICS 336411	Aircraft
NAICS 336412	Aircraft Engines & Engine Parts
NAICS 336413	Other Aircraft Parts & Equipment
NAICS 336414	Complete Guided Missiles & Space Vehicles
NAICS 336415	Space Vehicle Propulsion Units & Parts
NAICS 336419	Other Parts
NAICS 334511	Search, Detection & Navigation Instruments
NAICS 481	Air Transportation
NAICS 4881	Support Activities for Air Transportation
NAICS 54133	Engineering Services (Aerospace-related portion only)
NAICS 927	Space Research & Technology

GLOBAL AEROSPACE & AVIATION INDUSTRY MARKETPLACE

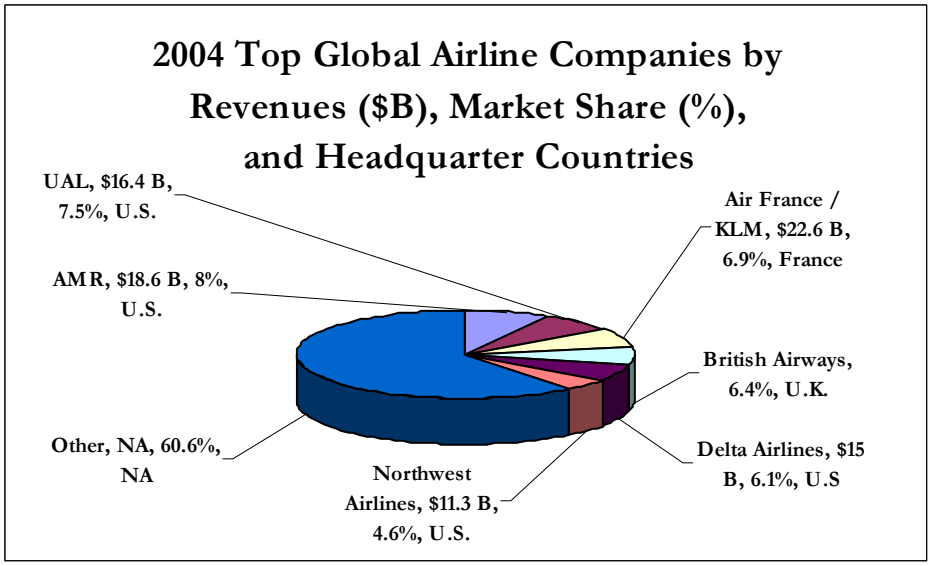
The global aerospace and aviation industry is comprised of a number of segments, as discussed in the previous section and defined by the industry codes above. In 2004, Datamonitor consulting firm's three combined industry breakouts - aerospace and defense, airlines, and air freight and logistics - were globally valued at $1,502.6 billion. The 2004 global aerospace and defense industry, Datamonitor's largest segment of the aerospace and aviation marketplace, grew 5.4 percent and was valued at $1,275.5 billion. The United States accounted for the largest portion of this global market with $504.4 billion or 39.5 percent. In Europe, the U.K led with $50.1 billion or 20.1 percent of the market. Japan led the Asia-Pacific region in 2004, accounting for $52.8 billion or almost 50 percent of the market. Major growth is predicted for the Asia-Pacific region, particularly China.



Source: Datamonitor Est. = estimated value

The 2004 global airlines industry – commercial passenger air transportation - grew 1.9 percent and was valued at $217.9 billion by Datamonitor. The U.S. accounted for the largest portion of this global market with $78.9

billion or 37.7 percent, Europe accounted for 28 percent, Asia-Pacific accounted for 23.7 percent, and the rest of the world accounted for the remaining 10.5 percent. Four of the top six global airlines companies are headquartered in the U.S.



Source: Datamonitor NA = Not Available

The commercial segment of the global aerospace and aviation industry has suffered a significant decrease in air travel in the past few years due terrorism-related issues, economic instability in many world regions, international health scares such as the SARS virus, and increased fuel costs. Defense-related industry sectors have performed very well for largely similar reasons and account for $1,102.1 billion or 86.4 percent of the industry's market value. The aerospace and aviation industry is further shaped by its cyclical nature, strict regulations and certification requirements, lengthy and expensive research and development, and a limited major customer base of airlines and governments. In this global industry area, increased manufacturing costs have led to international consolidations, joint ventures, outsourcing, and the domination of nine companies led by the U.S.'s Boeing and Lockheed Martin and Europe's EADS and BAE Systems.

2004 TOP GLOBAL AEROSPACE AND DEFENSE COMPANIES (BY REVENUES WITH HEADQUARTER COUNTRIES)

Company	Revenues	Country
Boeing	$52.5 Billion	U.S.
EADS	$39.4 Billion	France
United Technologies Corp.	$37.4 Billion	U.S.
Lockheed Martin	$35.5 Billion	U.S.
Northrop Grumman	$29.8 Billion	U.S.
Honeywell International	$25.6 Billion	U.S.
Airbus *	$25.1 Billion	France
BAE Systems PLC	$24.7 Billion	U.K.
Raytheon	$20.2 B Billion	U.S.

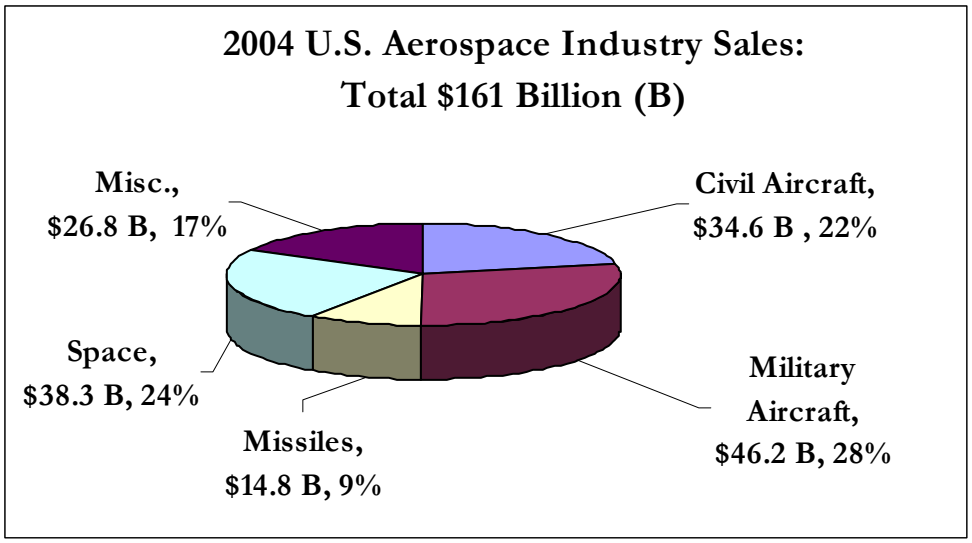
* EADS (80%) and BAE Systems (20%) jointly own and operate Airbus.
Source: Datamonitor

The 2004 global air freight and logistics industry – including air mail – grew 5.9 percent and was valued at $90.2 billion by Datamonitor. Air freight accounts for 95.7 percent of this sector's value. Asia-Pacific accounted for the largest portion of this global market with 34 percent, the U.S. accounted for 28.1 percent, Europe accounted for 25 percent, and the rest of the world for the remaining 12.9 percent. The leading global companies in this sector are DHL International, United Parcel Service (UPS), and FedEx and accounted for 20.1 percent of the 2004 sector marketplace. [ii]

U.S. AEROSPACE & AVIATION INDUSTRY MARKETPLACE

The United States has been the world leader in aerospace and aviation since the early twentieth century as both the largest producer and marketplace. The U.S. is the world's largest aerospace and defense market and has the world's largest military budget. In 2004, Datamonitor estimated the U.S. aerospace and defense industry market grew 10.9 percent to $504.4 billion. Defense spending accounted for 92.5 percent or $466.6 billion, with major U.S. defense aerospace customers including the U.S. Department of Defense and NASA. Six of the top nine global aerospace companies are based in the U.S. Boeing is the largest aircraft manufacturer in the U.S., the top global aerospace company by revenues, and was the global leader for commercial market share until recently when the European firm Airbus edged ahead.

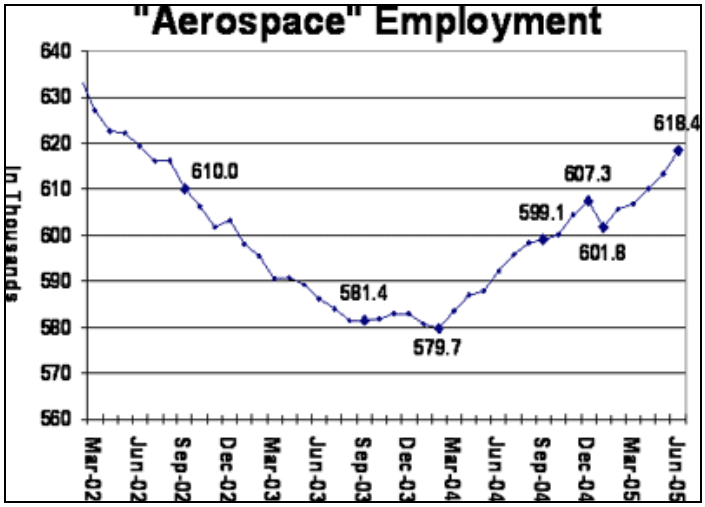
The Aerospace Industries Association (AIA) estimates that in 2004 the U.S. aerospace industry grew 8 percent and generated $161 billion in sales and $10 billion in profits. AIA indicates this figure represents approximately 15 percent of the nation's GDP and approximately 52 percent of the global aerospace market. AIA forecasts U.S. industry sales will grow to $173 billion in 2006. AIA also indicates that the U.S. aerospace and defense industry is the leading net exporter of manufactured goods with $31 billion in 2004 exports.



Source: AIA, *2004 Year-End Review and 2005 Forecast—An Analysis*, publicly posted data at http://www.aia-aerospace.org/stats/yr_ender/tables/2004/table1.cfm

National aerospace and aviation employment statistics showed steady growth in the late 1990s, followed by a downturn in 2000. National industry employment statistics are now showing growth. In December 2004, AIA estimated total U.S. aerospace employment at 607,300. AIA's most recent 2005Q2 employment statistics show 618,400 employed. This is in line with the industry employment growth trends, which have strongly

rebounded from a 50-year low of 579,700 employees in February 2004. The following AIA chart is based on U.S. Bureau of Labor Statistics data and provides U.S. aerospace industry employment details.



Source: AIA, *Aerospace Employment Growth Continues*, publicly posted at http://www.aia-aerospace.org/aianews/press/2005/rel_08_12_05.cfm

While the overall U.S. aerospace industry grew, commercial aviation continues to suffer the effects of terrorism-related issues, economic downturns, increasing competition from discount airlines, high labor expenses, and increased fuel costs. Four major U.S. airlines have been in bankruptcy in the past few years. In 2002, the world's second largest airline, United Airlines, filed for bankruptcy and continues to operate under court protection. On September 14, 2005, the nation's third and fourth largest carriers – Delta and Northwest – filed for bankruptcy. The nation's seventh largest carrier, US Airways, has emerged from two bankruptcies in the past three years and in September 2005 completed a merger with discount carrier America West Airlines. The new US Airways is the first big airline merger since AMR's American Airlines purchased TWA in 2001. Other major network or "legacy" carriers, such as American Airlines and Continental, are struggling financially and have downsized significantly. On the other hand, the world's largest airline, American Airlines, recently reported 2005Q2 profits and record high traffic levels despite record high fuel costs. Discount "low cost" carriers like Southwest Airlines and JetBlue continue to perform well. Regional carriers like American Eagle and ExpressJet are faring the best, as the chart below indicates.

2005Q2 AIRLINE DOMESTIC UNIT REVENUES					
2005Q2 Rank	**Carrier Types**	**4th Quarter 2004 (cents per mile)**	**1st Quarter 2005 (cents per mile)**	**2nd Quarter 2005 (cents per mile)**	**2nd Quarter Operating Revenue $ (Millions)**
1	Regional	14.6	14.5	14.3	2,289.6
2	Network	11.8	12.0	13.3	15,844.5
3	Low Cost	7.9	8.4	8.7	3,868.9
	Top 21 Carriers Totals	**11.0**	**11.3**	**12.3**	**22,003.0**

Source: Bureau of Transportation Statistics (BTS), *Second Quarter 2005 Airline Financial Data*, Table 5: Airline Domestic Unit Revenue, published September 19, 2005, publicly posted at http://www.bts.gov/press_releases/2005/bts041_05/html/bts041_05.html

The national aerospace and aviation industry's booming growth is largely due to the Department of Defense (DoD) spending in military aircraft, missiles, and space. Industry consolidations have led to the dominance of three major U.S. aerospace manufacturers: Boeing, Lockheed Martin, and Raytheon. The U.S. National Aeronautics and Space Administration (NASA) is another major industry player, with an annual research

budget of approximately $1 billion for its aeronautics division alone. NASA has assisted the general aviation industry and contributed substantially to spacecraft and aircraft technology advances over the years.

In 2004, the U.S. aerospace industry's exports increased by $3.8 billion to $56.8 billion. Commercial exports accounted for approximately 82 percent of these sales, with an estimated value of $46.5 billion. 2004 military exports were estimated at $9.8 billion, a 16 percent increase over 2003 sales. Imports declined for the third year in a row to approximately $24.6 billion. 2004 total orders increased to $158 billion after a two year slump, while backlog orders increased to $208 billion. [iii]

TEXAS AEROSPACE & AVIATION INDUSTRY MARKETPLACE OVERVIEW

Texas is a national leader in the aerospace and aviation industry. The combination of government and private business support, a highly trained workforce, excellent educational and research institutions, a reliable power grid, and a favorable business climate have contributed to maintaining the state's leadership in the aerospace and aviation industry.

The following are a selection of recent state government efforts to support the Texas aerospace and aviation industry:

- In June 2005, Texas Governor Perry signed a bill creating the $200 million Emerging Technology Fund (ETF). The ETF will improve Texas university research, increase collaboration between the public and private sectors, help start-up technology firms, assist in speeding technology commercialization, and attract more top-notch companies and researchers to Texas.

- In October 2004, Texas Governor Perry announced a state industry cluster initiative to stimulate long-term growth and economic development in six key areas. The *Aerospace and Defense*, *Advanced Technologies and Manufacturing* and *Information and Computer Technology* industry clusters all contain aerospace and aviation elements.

- In 2002, the Texas Technology Initiative (TTI) was formed to promote state technological innovations and development through an alliance of elected officials, business leaders, educators, and entrepreneurs. The TTI long-term economic development strategy targets many advanced technologies, including aerospace and aviation.

- In 2001, the 77th Texas Legislature appropriated $800 million for science, engineering, research, and commercialization activities, including $385 million for research infrastructure.

Texas is home to three major airlines, two of the world's busiest airports, a leading space operations company, and NASA's Johnson Space Center. Most of the top global aerospace and defense companies have business operations or dealings in Texas.

- American, Continental, and Southwest Airlines are all Texas-based Fortune 500 companies. American Airlines, which is based in Dallas, is the world's largest airline. Continental Airlines, based in Houston, is ranked as the number five U.S. carrier. Southwest Airlines, which is based in Dallas, is the nation's most profitable low-cost carrier.

- The Dallas/Fort Worth (DFW) International Airport ranked 6th and George Bush Intercontinental Airport in Houston ranked 18th of the world's top 30 busiest airports in 2004. The DFW

International Airport ranked 3rd and the George Bush Intercontinental Airport in Houston ranked 10th of the top 50 busiest U.S. airports in 2004.

- NASA's Lyndon B. Johnson Space Center (JSC), established in Houston in 1961, is the home and Mission Control Center for the U.S. human space flight program. JSC headed the Gemini, Apollo, and Skylab projects and currently serves as the lead NASA center for the Space Shuttle program and the International Space Station missions. In 1958, then Texas Senator – and later Vice President and President – Lyndon B. Johnson co-wrote the legislation creating NASA. JSC was named for Johnson in 1973. Approximately 15,000 civil servants and contractors work at JSC, making it one of the state's largest aerospace and aviation industry employers.

A Space Shuttle atop a specially modified Boeing 747 flying over JSC.
Source: NASA. Publicly posted at
http://en.wikipedia.org/wiki/Lyndon_B._Johnson_Space_Center

- United Space Alliance (USA), one of the world's leading space operations companies, is headquartered in Houston. USA was established in 1996 as the prime contractor for NASA's Space Shuttle Program and is co-owned by Boeing and Lockheed Martin.

- Six of the nine top global aerospace and defense companies – Boeing, Lockheed Martin, Honeywell, Raytheon, BAE Systems, and Northrop Grumman – have business operations or dealings in Texas. [iv]

TEXAS AEROSPACE & AVIATION INDUSTRY MARKETPLACE STATISTICS AND EMPLOYMENT

Texas aerospace and aviation industry statistics and employment figures indicate a strong national and global presence, a solid support base, and tempered growth. According to the Texas Workforce Commission (TWC), from 2004Q1 to 2005Q1 the Texas industry's weekly and annual wages slightly increased and the number of establishments and overall employment slightly decreased. According to the U.S. Census Bureau's 2003 Annual Survey of Manufacturers, Texas ranked in the top ten nationally in NAICS 3364 for capital investments, employees, value added per employee, and value of shipments. The Dallas-Fort Worth, Houston, Austin, and San Antonio metropolitan areas account for most of the state's industry employment.

The following charts provide a snapshot of the 2005Q1 aerospace and aviation industry using the major industry codes (NAICS) using the latest available data from the Texas Workforce Commission and Bureau of Labor Statistics.

2005Q1 TEXAS AEROSPACE INDUSTRY INFORMATION					
NAICS	***Description***	***Employees***	***Establishments***	***Ave. Weekly Wage***	***Ave. Annual Pay***
NAICS 336411	**Aircraft**	31,357	90	$1,377	$71,604
NAICS 336412	**Aircraft Engines & Engine Parts**	5,031	45	$941	$48,932
NAICS 336413	**Other Aircraft Parts & Equipment**	8,527	96	$1,399	$72,748
NAICS 334511	**Search, Detection & Navigation Instruments**	6,087	50	$1,619	$84,188
NAICS 481	**Air Transportation**	68,616	471	$1,026	$53,352
NAICS 4881	**Support Activities for Air Transportation**	17,980	555	$804	$41,808
TOTALS/ AVERAGES*	**---**	**137,598**	**1,307**	**$1,194.33***	**$62,105.33***

Source: Texas Workforce Commission (TWC) Quarterly Employment & Wages Private establishments only
Note that TWC doesn't report on NAICS 336414, 336415, 336419, or 927.

SUPPLEMENTARY 2004 TEXAS AEROSPACE INDUSTRY INFORMATION					
NAICS	***Description***	***Employees***	***Establishments***	***Ave. Weekly Wage***	***Ave. Annual Pay***
NAICS 927 TOTALS	**Space Research & Technology**	3,032	3	$1,457	$75,764

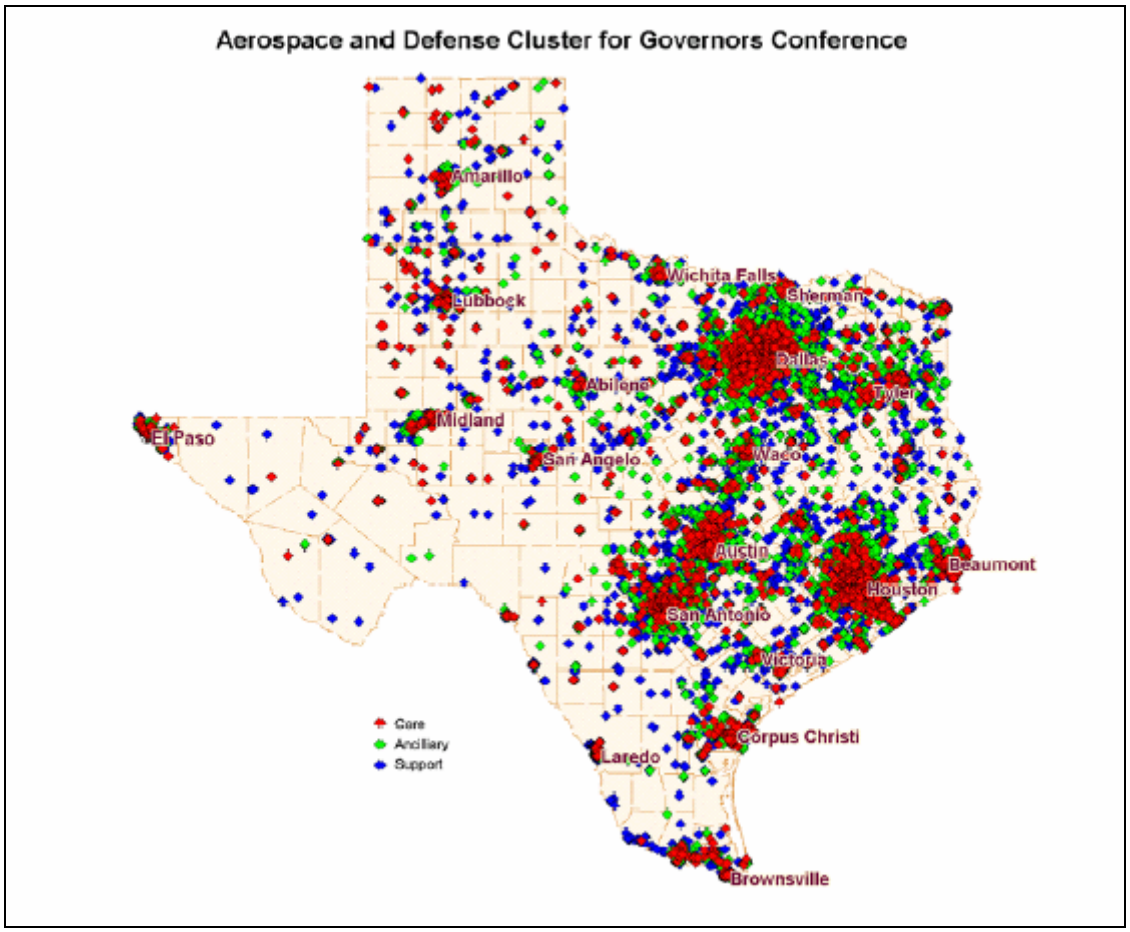
Preliminary data only Federal government establishments only
Source: Bureau of Labor Statistics (BLS) Quarterly Census of Wages & Employment
Note that BLS doesn't report on NAICS 336419 and has no data for NAICS 336414 or 336415.

The following chart provides information from the 2003 and most recent U.S. Census Bureau's Annual Survey of Manufactures (ASM) on the Texas aerospace and aviation industry using the major industry codes (NAICS). Note the ASM only provides data to the four-digit level.

2003 TEXAS & U.S. AEROSPACE AND AVIATION MANUFACTURING INFORMATION					
Region	***NAICS/Description***	***Employees***	***Value Added***	***Value of Shipments***	***Total Capital Investments***
TEXAS	**3364/Aerospace Product and Parts Manufacturing**	**33,558**	**$3.84 Billion**	**$8.54 Billion**	**$198.1 Million**
U.S.	**3364/Aerospace Product and Parts Manufacturing**	374,265	$65.34 Billion	$123.95 Billion	$2.3 Billion
TEXAS NATIONAL RANKING	**---**	**2**	**6**	**4**	**5**

Source: Census Bureau, *Annual Survey of Manufactures, 2003*

The Texas Workforce Commission (TWC) has created a mapping tool to track the Texas industry clusters announced by Governor Perry in October 2004. The following *Aerospace and Defense* industry cluster map illustrates that most of the state's aerospace and aviation industry employment is concentrated in major Texas metropolitan areas.



Source: *State of Texas Aerospace and Defense Cluster Report*, August 2005, posted at http://www.texasindustryprofiles.com/PDF/twcClusterReports/TexasAerospaceandDefenseCluster.pdf

The following charts list some of the leading companies operating in the Texas aerospace and aviation industry by two major industry code breakouts.

TOP AEROSPACE AND AVIATION COMPANIES IN TEXAS
NAICS 3364 – AEROSPACE PRODUCT AND PARTS MANUFACTURING
(ARRANGED BY EMPLOYMENT)

Company	City	Business Description
Lockheed Martin	Fort Worth, San Antonio	Military aircraft (15,500)
Boeing	Houston, San Antonio, El Paso, Abilene, Del Rio, Richardson, Kingsville	Commercial and military aircraft (5,300)
Vought Aircraft Industries	Dallas	Corporate headquarters and aircraft parts (5,000)
Raytheon	Garland, McKinney	Electronic aircraft components (2,000)
Bell Helicopter Textron	Hurst	Helicopters and components (1000+)
L-3 Communications	Waco, Greenville, Austin	Military and commercial aircraft systems integration (1,500)
BAE Systems	Irving, Austin	Electronic aircraft components (1,600)
Weber Aircraft	Gainesville	Aircraft interiors (900)

Sources: 2005 Directory of Texas Manufacturers, published by Manufacturers News Inc.; InfoUSA's ReferenceUSA dataset of Texas companies; Company websites; Factiva, a Dow Jones & Reuters database; UTSA 2005 report on Boeing

TOP AEROSPACE AND AVIATION COMPANIES IN TEXAS
NAICS 481 – AIR TRANSPORTATION
(ARRANGED BY EMPLOYMENT)

Company	City	Business Description
American Airlines (AA)	Dallas	Airline company and corporate HQ (1000+)
AMR Corporation	Fort Worth	Airline holding company and corporate HQ; parent company of AA (1000+)
Continental Airlines	Houston	Airline company and corporate HQ (1000+)
Southwest Airlines	Dallas	Airline company and corporate HQ (1000+)
ExpressJet Holdings Inc.	Houston	Airline and airfreight company and corporate HQ (1000+)
Kitty Hawk Inc.	Dallas	Airfreight company and corporate HQ (600+)
EGL Inc.	Houston	Airfreight company and corporate HQ (500+)

Sources: InfoUSA's ReferenceUSA dataset of Texas companies; Company websites; Factiva, a Dow Jones & Reuters database

A selection of Texas industry statistics highlights follow:

- There are over 300 airports in the Texas Airport System, which ranks as the second largest state airport system in the nation.
- Texas has 27 commercially served airports in 24 major cities.
- Texas has eight airports providing international service located in Austin, Dallas/Fort Worth, Houston, San Antonio, El Paso, Del Ro, Laredo, and McAllen.

- Fort Worth Alliance Airport is the first airport built strictly to serve the inter-modal distribution business needs.

- Texas has 48,281 licensed pilots (private/commercial/helicopter) and 26,839 state-owned and registered aircraft, of which 7,460 are corporate aircraft.

- In 2004, Texas exports for transportation equipment (NAICS 336), which includes automotive, aircraft, railroad, ship, and missile, were valued at $12.6 billion – up from $9.9 billion in 2003. This is the state's fourth largest exporting category. NAFTA partners Mexico and Canada accounted for most of this trade.

- From 2000 to 2005 to date, the U.S. Depart of Defense (DoD) granted Texas over $10 million in unclassified aerospace and aviation-related SBIR awards. DoD classified awards aren't disclosed.

- From 2000 to 2005 to date, the National Science Foundation (NSF) granted Texas over $12 million in aerospace and aviation-related SBIR awards.

- In 2003, TxDOT's (Texas Department of Transportation) Aviation Division commissioned a study which estimated the economic impacts of the state's general aviation sector at $5.9 billion and the commercial service sector at $34.9 billion, for a total of $40.8 billion. [v]

TEXAS AEROSPACE & AVIATION INDUSTRY PATENTS AND EDUCATION STATISTICS

Texas public universities and other educational institutions are significantly invested into aerospace and aviation-related industry-related research and development (R&D), leading to continual discoveries. A selection of state statistics follows:

- In 2004, the state's total 2004 R&D expenditures in higher educational institutions were $2.25 billion, according to the Texas Higher Education Coordinating Board. Aerospace technologies' total R&D expenditures in Texas public universities were $168.5 million and manufacturing technologies' were $11.81 million. Engineering's total R&D expenditures in Texas public higher education institutions were $319.1 million and computer sciences' were $49.5 million.

- In 2003, Texas ranked second nationally in total R&D expenditures at universities and colleges, with $2.76 billion according to the National Science Foundation.

- From 1993 to 2003, unclassified federal R&D funding in the aerospace sector totaled $27.5 billion.

- In 2002, Texas ranked fourth nationally in total R&D expenditures, estimated at $14.2 billion according to the AeA's publication *Cyberstates 2005*.

- In 2001, Texas received almost $3 billion in federal funding for total R&D. $1.1 billion of this funding came from the Department of Defense, which primarily supported industrial firms at an estimated $.8 billion. [vi]

The following chart provides Texas aerospace and aviation-related patent data from the U.S. Patent and Trademark Office (USPTO). Class 244: Aeronautics includes aircraft, spacecraft, missiles, and related

equipment, components, and electronics. From 2000 through 2004, Texas ranks third overall in the nation for Class 244 patents.

2000-2004 TEXAS AEROSPACE AND AVIATION-RELATED UTILITY PATENTS CLASS 244: AERONAUTICS

Region	*2000*	*2001*	*2002*	*2003*	*2004*	*Total*
TEXAS TOTALS	13	23	30	25	17	**108**
U.S. TOTALS	298	306	291	295	287	**1477**

Source: United States Patent and Trademark Office at http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecstc/classes.htm

The following chart lists fiscal year 2004 aerospace and aviation-related R&D expenditures at selected Texas public universities. The chart includes the top five institutions in each subject area. Note that of the $70.6 million spent on aerospace technology R&D, $27.6 million were from federal sources; $23.1 million were from state sources including appropriations, contracts, and grants; $11.7 were from institutions; and $8.2 million were from private sources.

FISCAL YEAR 2004 HIGHEST AEROSPACE-RELATED R&D EXPENDITURES AT SELECTED TEXAS PUBLIC UNIVERSITIES

Selected Texas Institutions	*Aerospace Technology*	*Manufacturing Technology*	*Computer Science*	*Engineering*
Texas A&M University and Services	*$52,681,091*	*$6,456,816*	*$8,938,716*	*$121,707,373*
Texas Tech University	*$2,469,674*	*$2,478,651*	$863,059	*$12,256,615*
University of Texas at Arlington	$242,315	*$2,428,487*	*$2,870,931*	*$9,113,443*
University of Texas at Austin	*$9,914,453*	*$1,083,627*	*$22,191,391*	*$128,816,119*
University of Texas at Brownsville	*$1,495,635*	$0	$0	$0
University of Texas at Dallas	$1,220,436	$318,697	*$3,813,979*	$6,657,797
University of Texas – Pan American	$0	*$527,693*	$467,712	$878,169
University of Houston	*$2,152,969*	$309,536	*$5,405,868*	*$13,605,268*
SELECTED TEXAS UNIVERSITIES' TOTALS	***$70,176,573***	***$13,603,507***	***$44,551,656***	***$293,034,784***
ALL TEXAS PUBLIC UNIVERSITIES' TOTALS	**$70,664,575**	**$14,128,747**	**$49,518,031**	**$311,993,095**

Italicized numbers indicate the five highest in each category.

Source: Texas Higher Education Coordinating Board at http://www.thecb.state.tx.us/reports/pdf/0836.pdf

TEXAS AEROSPACE-RELATED DEFENSE INDUSTRY AREA

Texas is a national leader in the aerospace-related defense industry area, from aerospace research and flight training to cutting-edge military aircraft development and space exploration. The state has led in this area since 1910, when the first U.S. military flight took place on March 2 at Fort Sam Houston in San Antonio. On that date, 1st Lt. Benjamin D. Foulois, Signal Corps, U.S. Army, became the first military-trained pilot to fly a government-owned plane. Since then, Texas has been deeply involved in the aerospace-related defense industry.

A selection of Texas aerospace-related defense industry statistics highlights follow:

- Texas has six Air Force Bases (AFBs), two Naval Air Stations (NASs), and over 530 military aircraft based in state.

- For FY2005, NASA's budget for the Johnson Space Center was $185 million or approximately 11 percent of NASA's $16.2 billion budget. For FY2006, NASA's requested budget for the Johnson Space Center is $207 million or approximately 13 percent of the total FY2006 NASA budget request of $16.4 billion.

Source: NASA's Johnson Space Center website, publicly posted at http://www.nasa.gov/centers/johnson/home/index.html

- The San Antonio area has a number of aerospace-related defense industry activities, including:

    - Port of San Antonio – formerly KellyUSA Business Park and before that Kelly Air Force Base – is now a defense industry business park with tenants including Boeing Logistics Support Systems (BLSS), Pratt & Whitney, and General Electric. BLSS is the anchor tenant with 1,590 employees and a 20-year lease.

    - Kelly Aviation Center (KAC), L.P. is a joint venture of Lockheed Martin Aircraft & Logistics Centers, General Electric Aircraft Engines, and Rolls Royce located at the Port of San Antonio. The KAC facility was established as a Center of Excellence for Military Engine MRO (maintenance, repair and overhaul). The public-private teaming of KAC and the U.S. Air Force's Oklahoma City Air Logistics Center is considered the epitome of a successful public-private venture.

- In 2004, Texas was ranked third in the nation for all Department of Defense (DoD) prime contract awards by state at $21.04 billion and third for all Air Force prime contract awards by state at $8.15 billion. 2004 DoD prime contracts for the U.S. totaled $203.38 billion.

- In 2004, Texas ranked first nationally for total Air Force employment and third for total DoD employment. Of the 149,145 DoD military and civilian personnel in Texas, 54,841 were Air Force employees: 40,410 military and 14,431 civilian. Nationally, there were almost 1.7 million DoD military and civilian personnel and 466,653 U.S. Air Force employees.

- In 2004, Texas had 12,535 Air Force-related Reserve and National Guard or approximately 16 percent of the state's 76,101 Reserve and National Guard employees. Nationally, there were just over 1 million total U.S. Reserve and National Guard, of which 206,536 were Air Force-related.

- In 2004, Texas was ranked third nationally for Air Force prime contract awards at $8.15 billion.

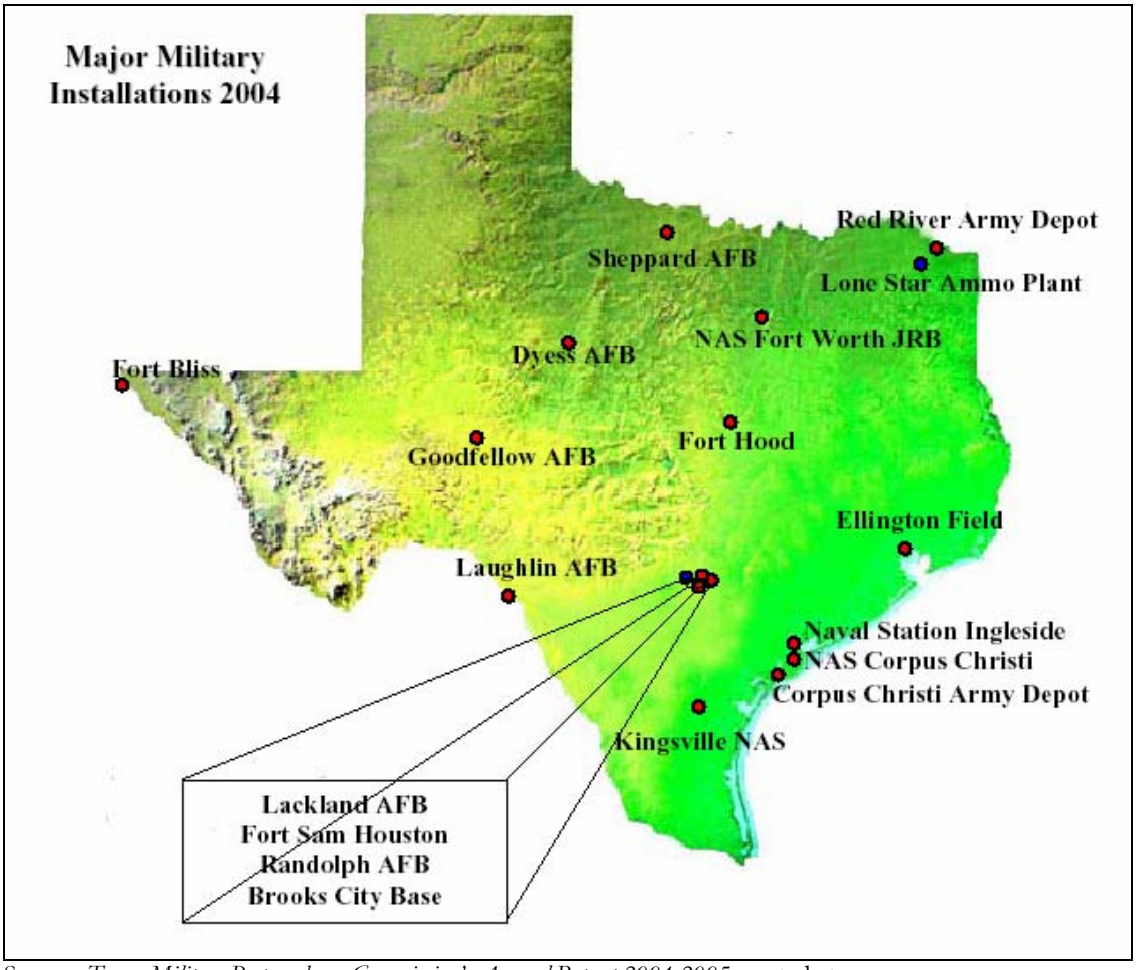
- In 2004, eight of the top ten DoD prime contractors in Texas were aerospace or aviation related, and their contracts totaled approximately $14.6 billion. The following chart provides details.

FISCAL YEAR 2004 TOP DOD AEROSPACE-RELATED AWARDED CONTRACTORS IN TEXAS

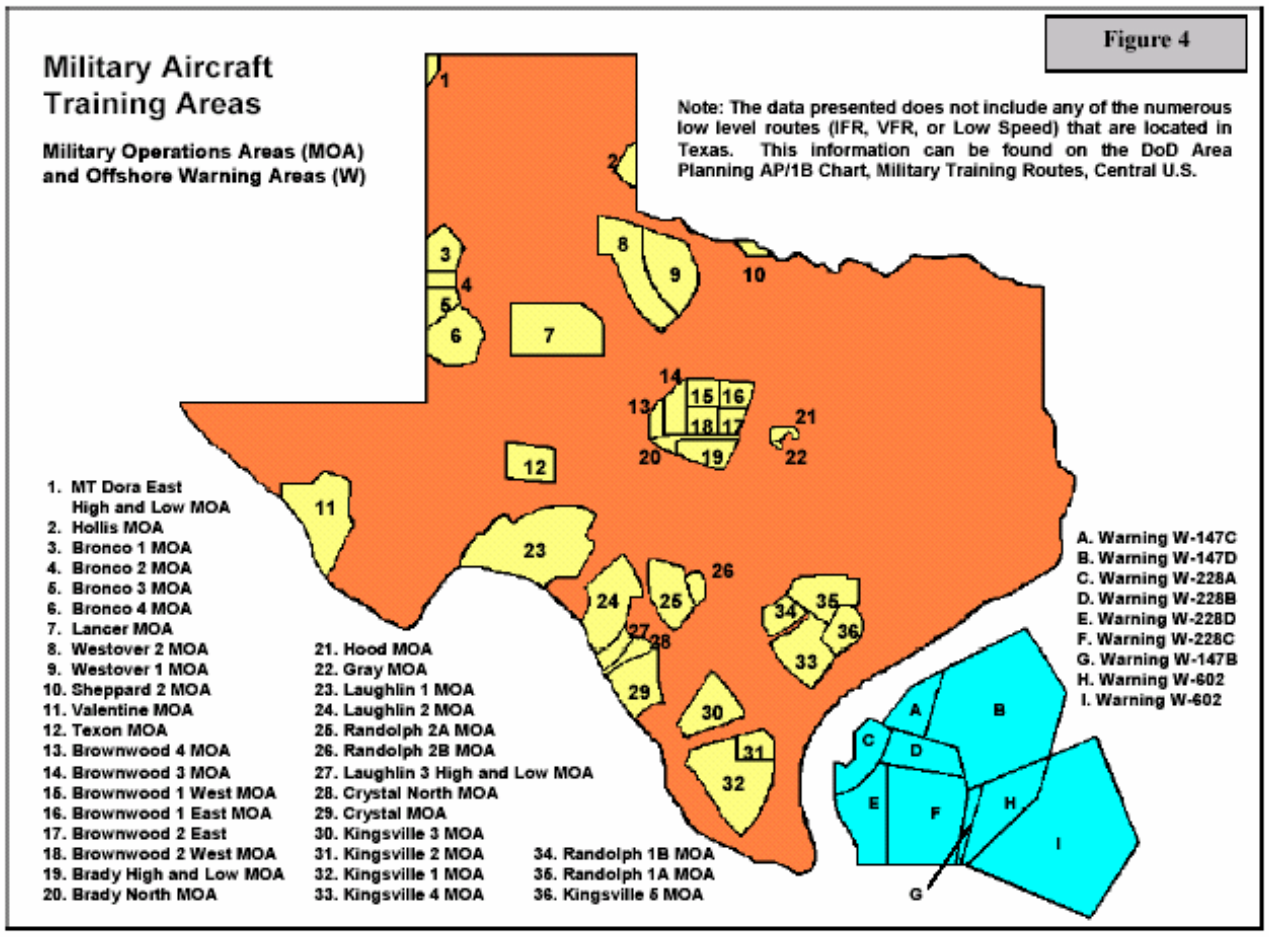
Company	Total Amount Awarded (in thousands)
Lockheed Martin	$9,581,402
Bell Boeing Joint Project Office	$1,255,200
Raytheon	$917,726
N.V. Koninklijke Nederlandsche	$757,540
L-3 Communications Holding, Inc.	$691,984
Textron Inc.	$623,242
The Boeing Company	$498,965
Computer Science Corporation	$281,444
TOTALS:	**$14,607,503**

Source: U.S. Department of Defense at http://siadapp.dior.whs.mil/procurement/historical_reports/geographic/P06-P09/FY2004/P06-P09-State-/Rank-2004.pdf

The following Texas maps show aerospace-related defense facilities including Air Force Bases (AFBs), Naval Air Stations (NASs), and state military aircraft training areas. [vii]



Source: *Texas Military Preparedness Commission's Annual Report 2004-2005*, posted at http://www.governor.state.tx.us/divisions/tmpc/files/masterplan2004.pdf



Source: *Texas Military Preparedness Commission's Annual Report 2004-2005*, posted at http://www.governor.state.tx.us/divisions/tmpc/files/masterplan2004.pdf

SELECTED RECENT TEXAS AEROSPACE & AVIATION INDUSTRY ACTIVITIES

A selection of recent, major Texas industry activities follows.

- In September 2005, the DoD approved Full Rate Production (FRP) of the Bell Boeing V-22 Osprey tiltrotor aircraft by Textron's Bell Helicopter unit. The hybrid helicopter-airplane is considered vital to the future of the Marine Corps air fleet. A joint venture of Boeing Co. and Textron's Bell Helicopter unit builds the aircraft in Fort Worth, Texas and Pennsylvania, and then assembles them in Amarillo, Texas. Current plans include the delivery of 360 aircraft to the U.S. Marine Corps

(USMC), 50 for the U.S. Air Force, and 48 for the U.S. Navy. The total program is valued at over $19 billion to Bell and Textron through 2018.

The V-22 Osprey
Source: publicly posted at http://www.bellhelicopter.textron.com/en/aircraft/military/bellV-22.cfm

- In April 2005, the Lockheed Martin F/A-22 Raptor fighter aircraft was given the green light by the DoD to enter full-scale production and should be in operation in December 2005. The Raptor was developed to replace the aging fleet of F-15 Eagles used by the U.S. Air Force. The aircraft fuselage is being built by Lockheed Martin in partnership with Boeing and Pratt & Whitney. F/A-22 production is taking place at various Lockheed Martin Aeronautics facilities, including the Tactical Aircraft Systems division in Fort Worth.

The Raptor F/A-22
Source: publicly posted at http://www.f22-raptor.com/media/index.html#

- In March 2005, Amazon.com founder Jeff Bezos announced plans to build a spaceport on 165,000 acres he owns near Van Horn in West Texas, 140 miles southeast of El Paso. The private venture, known as Blue Origin, is owned by Bezos and headquartered in Seattle, Washington. Blue Origin been conducting initial R&D since 2003.

- In August 2004, Governor Perry announced that L-3 Communications Integrated Systems (L-3/IS), headquartered in Greenville, Texas, will expand its operations in both Greenville and Waco and create 140 new jobs. Texas committed nearly $400,000 in job training funds to secure this $47 million investment.

- In July 2004, Lockheed Martin announced the startup of the F-35 Joint Strike Fighter (JSF) aircraft's assembly operation at its Fort Worth plant**.** Lockheed Martin secured $4.6 billion for the JSF in the Defense Authorization Act of 2005, which would bring the program's three-year total to more than $12 billion. The JSF is expected to create almost 32,000 jobs and $2.5 billion in revenue for Texas. It will also bring $400 million in capital for the plant, the largest increase in its 62 years of operation. Production of the JSF is a combined effort between the U.S. Air Force, Navy and Marine Corps and both the British Royal Navy and Air Force and involves Northrop Grumman, BAE Systems, Pratt and Whitney, and Rolls-Royce. The JSF program is the largest in Pentagon history, at an estimated cost of $240 billion.

- In February 2004, Governor Perry announced a $35 million Texas Enterprise Fund grant to Vought Aircraft Industries, headquartered in Dallas and the nation's largest privately owned aerospace manufacturing company, to assist its Dallas expansion. Vought will create 3,000 new jobs by the end of 2009. Vought's expansion was the nation's largest job creation announcement in 2004 according to Business Facilities magazine and represents a $598 million investment. [viii]

INDUSTRY RESOURCES

Aerospace and Defense Industry Cluster Report at
http://www.texasindustryprofiles.com/PDF/twcClusterReports/TexasAerospaceandDefenseCluster.pdf
This 2005 report is one of six Texas industry cluster reports posted on the Texas Workforce Commission's website at http://www.texasindustryprofiles.com/ under the Industry Clusters menu tab. The report examines the Texas industry area and provides analysis and recommendations.

Aerospace Industries Association at http://www.aia-aerospace.org
An industry association website with free U.S. aerospace statistics, economic indicators, news releases, reports, and more. Some website materials are for members only.

Airports Council International at http://www.airports.org/
An industry association website with free international and U.S. statistics, news, links, and more. North American statistics and data are posted at http://www.aci-na.org/asp/stats.asp?page=278.

Air Transport Association (ATA) at http://www.airlines.org/home/
An association website with free U.S. airline news, reports, and statistics. ATA annual reports from 1937 onward are posted at http://www.airlines.org/econ/d.aspx?nid=8156.

Aviation Week at http://www.aviationnow.com/avnow/
This industry publication's website provides articles and industry news on aerospace and aviation. Some data are for subscribers only. Free data from the 2005 Aerospace Source Book are posted at
http://www.aviationnow.com/content/reference/sourcebook/sourcebook.htm

Bureau of Labor Aviation Statistics at
http://transtats.bts.gov/Databases.asp?Mode_ID=1&Mode_Desc=Aviation&Subject_ID2=0
A government website with aviation-related statistics on U.S. and international air carriers, airlines, travel, airports, shipments, employment, safety, accidents, etc.

Bureau of Transportation Statistics (BTS) at http://www.bts.gov/
A government website with a wealth of U.S. and international aerospace and aviation statistics and reports. The annual report compilation titled National Transportation Statistics is posted at
http://www.bts.gov/publications/national_transportation_statistics/ and Airline information is posted at
http://www.bts.gov/programs/airline_information/.

Federal Aviation Administration at http://www.faa.gov/
A government website with U.S. aviation-related statistics and information.

International Air Transport Association (IATA) at http://www.iata.org/
An industry association website with free news, statistics, annual reports, and more.

ITA's Aerospace Industries at http://www.ita.doc.gov/td/aerospace/
This Department of Commerce – International Trade Administration (ITA) website includes aerospace and defense industry reports, publications, and statistics.

NASA Johnson Space Center (JSC) at http://www.nasa.gov/centers/johnson/home/index.html
This government website has JSC information, news, reports, photographs, and more.

National Transportation Safety Board (NTSB) at http://www.ntsb.gov/
A government website with aviation industry data posted at http://www.ntsb.gov/aviation/aviation.htm.

TxDOT Aviation Information at http://www.dot.state.tx.us/avn/avninfo.htm
A government website from TxDOT (Texas Department of Transportation) with Texas aviation-related reports, statistics, a newsletter, and more.

ENDNOTES

[i] *DOD Dictionary of Military Terms*, U.S. Department of Defense, http://www.dtic.mil/doctrine/jel/doddict/data/a/00093.html, accessed October 2005; *The American Heritage Dictionary of the English Language*, Fourth Edition, Houghton Mifflin Company, 2000, http://dictionary.reference.com/; *Aviation*, Wikipedia, the Free Encyclopedia, http://en.wikipedia.org/wiki/Aviation, accessed October 2005; History of Flight Timeline, American Institute of Aeronautics and Astronautics, http://www.aiaa.org/content.cfm?pageid=260, accessed October 2005; Leonardo's Machines: Aerial Screw, National Museum of Science and Technology in Milano, Italy, http://www.museoscienza.org/english/leonardo/vite.html, accessed October 2005; *North American Industry Classification System: United States, 2002*, U.S. Office of Management and Budget, 2002.

[ii] *Global Aerospace & Defense*, Datamonitor Industry Market Research, August 2005; *United Kingdom Aerospace & Defense*, Datamonitor Industry Market Research, August 2005; *Japan Aerospace & Defense*, Datamonitor Industry Market Research, August 2005; *Aircraft,* Encyclopedia of Global Industries, Online Edition, Thomson Gale, 2005; *Global Airlines*, Datamonitor Industry Market Research, May 2005; *Global Air Freight & Logistics*, Datamonitor Industry Market Research, May 2005.

[iii] *2004 Year-End Review and 2005 Forecast – An Analysis*, Aerospace Industries Association, http://www.aia-aerospace.org/stats/yr_ender/yrendr2004_text.pdf; *Aircraft,* Encyclopedia of Global Industries, Online Edition, Thomson Gale, 2005; *Aircraft,* Encyclopedia of American Industries, Online Edition, Gale, 2004; *Second Quarter 2005 Airline Financial Data: Regional Passenger Airlines and Low-Cost Airlines Report Domestic Profit; Network Carriers Report Loss*, Bureau of Transportation Statistics (BTS), September 19, 2005, http://www.bts.gov/press_releases/2005/bts041_05/html/bts041_05.html; *Legislative Briefing: A Snapshot of the Aerospace Industry*, Aerospace Industries Association, August 2004; *Aerospace & Defense in the United States*, Datamonitor Industry Market Research, August 2005; *Global Aerospace & Defense*, Datamonitor Industry Market Research, August 2005; *Global Airlines*, Datamonitor Industry Market Research, May 2005; *Aerospace Employment Growth Continues*, AIA, August 12, 2005, http://www.aia-aerospace.org/aianews/press/2005/rel_08_12_05.cfm; *US Airways Completes Merger with America West*, Reuters, September 27, 2005; *Delta Air, Northwest File for Bankruptcy Protection*, Bloomberg, September 14, 2005; *AMR Corporation Reports a Second Quarter Profit of $58 Million Despite High Fuel Costs, Historically Low Ticket Prices*, July 20, 2005, http://www.shareholder.com/aa/releaseDetail.cfm?ReleaseID=169292; *U.S. Aerospace and Aviation Industry: A State-by-State Analysis*, Commission on the Future of the United States Aerospace Industry, October 2002, http://66.77.20.156/assets/aerospace/02-218/docs/StateByStateReportR.pdf.

[iv] *Perry Signs Bill Creating Emerging Technology Fund*, June 13, 2005, http://www.governor.state.tx.us/divisions/press/pressreleases/PressRelease.2005-06-13.4031/view; *Gov. Rick Perry Announces Strategic Plan to Create Jobs*, October 20, 2004, http://www.governor.state.tx.us/divisions/press/pressreleases/PressRelease.2004-10-20.2446/view; *The Texas Technology Initiative*, http://www.texasnano.org/pdfs/TTI_description_letter_2-15-05.pdf, accessed October 2005; *Delta Air, Northwest File for Bankruptcy Protection*, Bloomberg, September 14, 2005; *Second Quarter 2005 Airline Financial Data: Regional Passenger Airlines and Low-Cost Airlines Report Domestic Profit; Network Carriers Report Loss*, Bureau of Transportation Statistics (BTS), September 19, 2005, http://www.bts.gov/press_releases/2005/bts041_05/html/bts041_05.html; *Airport Capacity Benchmark Report 2004*, Federal Aviation Administration, September 2004, http://www.faa.gov/events/benchmarks/DOWNLOAD/pdf/2004_Benchmark_Report.pdf; *World's 30 Busiest Airports by Passengers and Cargo, 2004*, Airports Council International, http://www.infoplease.com/ipa/A0004547.html; *NASA Johnson Space Center Website*, http://www.nasa.gov/centers/johnson/home/index.html, accessed October 2005; *Lyndon B. Johnson Center*, Wikipedia, the Free Encyclopedia, http://en.wikipedia.org/wiki/Lyndon_B._Johnson_Space_Center; accessed October 2005; *United Space Alliance Website*, http://www.unitedspacealliance.com/about/, accessed October 2005.

[v] *U.S. Aerospace and Aviation Industry: A State-by-State Analysis*, Commission on the Future of the United States Aerospace Industry, October 2002, http://66.77.20.156/assets/aerospace/02-218/docs/StateByStateReportR.pdf; *Annual Survey of Manufacturers: Geographic Area Statistics: 2003*, U.S. Bureau

of Census, May 2005, http://www.census.gov/prod/2005pubs/am0331as1.pdf; *TWC Clusters Geographic Information System (GIS)*, http://www.texasindustryprofiles.com/apps/gis/clustersgis/, accessed October 2005; *Texas Exports Data*, WISERTrade, 2004; *Texas Aerospace & Aviation Brochure*, Texas Office of Aerospace & Aviation, June 2005; *DoD SBIR/SSTR Awards Basic Search Website*, Department of Defense (DoD), http://www.dodsbir.net/Awards/Default.asp, accessed October 2005; *Award Search Website*, National Science Foundation, http://www.nsf.gov/awardsearch/, accessed September 2005; *National Transportation Statistics 2005*, Bureau of Transportation Statistics, Table 1-41:Passengers Boarded at the Top 50 U.S. Airports, http://www.bts.gov/publications/national_transportation_statistics/2005/html/table_01_41.html; *Senator Hutchison Celebrates First Step for Joint Strike Fighter*, Senate Press Release, July 12, 2004, http://hutchison.senate.gov/prl525.htm; *Economic Impact of General Aviation in Texas*, Texas Department of Transportation, 2003, http://www.dot.state.tx.us/avn/econimp/TxAptEcn.pdf; *Boeing Logistics Support Systems: Role in the San Antonio and Texas Economics*, University of Texas at San Antonio (UTSA), Institute for Economic Development, September 2005, http://ied.utsa.edu/BLSS%20full%20report.pdf.

[vi] *Cyberstates 2005*, AeA, April 2005, http://www.aeanet.org/PressRoom/prjj_cs2005_texas.asp; *Research Expenditures, September 1, 2003 – August 31, 2004,* Texas Higher Education Coordinating Board, April 2005, Tables 5, 9 and 10 and figures 5 and 8, http://www.thecb.state.tx.us/reports/pdf/0836.pdf, accessed October 2005; *Patenting in Technology Classes, Breakout by Geographic Origin (State and Country)*, 2000-2004, U.S. Patent and Trade Office, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecstc/classes.htm, accessed October 2005; *Academic Research and Development Expenditures: Fiscal Year 2003*, National Science Foundation, August 2003, Table 16, http://www.nsf.gov/statistics/nsf05320/; *Research in Texas Overview*, The Texas Higher Education Coordinating Board, http://www.researchintexas.com/, accessed October 2005; *State of Texas Advanced Technologies and Manufacturing Cluster Assessment Report*, August 2005, http://www.texasindustryprofiles.com/PDF/twcClusterReports/TexasAdvancedTechnologiesandManufacturingCluster.pdf.

[vii] *DoD Prime Contract Awards by State Rank FY 2004*, U.S. Department of Defense (DoD), http://siadapp.dior.whs.mil/procurement/historical_reports/geographic/P06-P09/FY2004/P06-P09-State-Rank-2004.pdf; *Percent Distribution of DoD Military and Civilian Personnel by State – September 30, 2004*, U.S. Department of Defense, http://www.dior.whs.mil/mmid/M02/fy04/M02_2004_Census.pdf; *Defense Industry Overview for the U.S. and States FY2004*, U.S. Department of Defense, http://web1.whs.osd.mil/mmid/L03/fy04/ATLAS_2004.pdf; *First Military Flight in US in Texas*, http://ameddregiment.amedd.army.mil/fshmuse/tour11.htm, accessed October 2005; *Texas Military Preparedness Commission's Annual Report 2004-2005*, http://www.governor.state.tx.us/divisions/tmpc/files/masterplan2004.pdf; *Summary of FY 2005 Budget Request*, National Aeronautics and Space Administration, http://www.nasa.gov/pdf/55524main_FY05%20Agency%20Summary-2.31.pdf; *FY 2006 Budget Request*, National Aeronautics and Space Administration, http://www.nasa.gov/pdf/107486main_FY06_high.pdf; *A Quick Look at Aeronautical Activities in Texas*, Texas Department of Transportation, Aviation Division, March 2005; *Boeing Logistics Support Systems: Role in the San Antonio and Texas Economics*, University of Texas at San Antonio (UTSA), Institute for Economic Development, September 2005, http://ied.utsa.edu/BLSS%20full%20report.pdf; *KellyUSA Redevelopment Program*, City of San Antonio Economic Development, http://www.sanantonio.gov/edd/redev/military/kellyusa.asp?res=1024&ver=true, accessed October 2005; *Kelly Aviation Center*, http://www.kellyaviationcenter.com/, accessed October 2005; Kelly Aviation Center Adds Rolls-Royce to Joint Venture, September 8, 2005, http://www.lockheedmartin.com/wms/findPage.do?dsp=fec&ci=17071&rsbci=2&fti=129&ti=0&sc=400.

[viii] *Perry Announces $35 Million Grant for Vought Aircraft*, February 26, 2004, http://www.governor.state.tx.us/divisions/press/pressreleases/PressRelease.2004-02-26.2358/view; *Big Deals in the Lone Star State*, Business Facilities Magazine, July 2004; *Military Jet Faces a Fight to Fit In*, Washington Post, April 19, 2005; *JSF (F35) Joint Strike Fighter, International*, http://www.airforce-technology.com/projects/jsf/, accessed October 2005; *Pentagon Gives Go-Ahead for Full-Scale Production of Hybrid Chopper-Airplane for Marines*, Associated Press Newswire, September 28, 2005; *Space Dreams Boost Tiny*

Texas Town, Associated Press Newswire, March 13, 2005; *Perry Announced L-3 Communications to Expand in Greenville*, August 2, 2004, http://www.governor.state.tx.us/divisions/press/pressreleases/PressRelease.2004-08-02.4122/view.

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