State of Texas
Aerospace and Defense
Cluster Assessment

August 2005

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1.1 – Overview of Cluster Assessment Report

In Senate Bill 275, the 78th Texas Legislature initiated the development of a detailed assessment of the aerospace and defense industry in Texas, along with five other clusters: Advanced Technologies and Manufacturing, Energy, Information and Computer Technology, Biotechnology and Life Science and Petroleum Refining and Chemical Products. Currently, Texas is experiencing growth in aviation, space and defense activities that is creating companies, funding research initiatives and launching programs that create jobs, knowledge and technologically advanced products.

Not only does Texas have a strong foothold in aerospace and defense, but the state also is well positioned to profit from investment and market expansion in this cluster. Recent federal funding trends and commitment to projects at the federal level, indicate opportunities to secure funded programs that invest in research, product commercialization, workforce training in space, Unmanned Aerial Vehicle (UAV) technology, defense and biodefense, and composite aircraft to name a few. The Texas Industry Cluster Initiative aims to engage and represent statewide stakeholders and outline key recommendations for state leadership to best allocate state resources, foster growth in the clusters and develop a strategic economic development plan for the state.

Clusters rely on the continual advancement and investment of companies, infrastructure and technology to maintain a competitive advantage. The Aerospace and Defense Cluster is no exception. This assessment explored sources of economic activity, regional assets including support services and infrastructure, threats to economic growth and the future workforce pipeline required to meet the needs of industry as the cluster grows.

Leading industry representatives, entrepreneurs, workforce and economic development, business associations, support industry and academia created a detailed profile of the cluster. Through the examination of qualitative and quantitative data, the Aerospace and Defense Cluster team identified technology and market-driven opportunities to stimulate sustained economic growth. As the information was analyzed, the following themes emerged:

1) Workforce and Education
2) Capital and Commercialization
3) Collaboration and Strategic Partnerships
4) Business Climate

This team also identified several important activities and policy issues that resulted in recommendations.

> The aerospace industry, especially the manufacturing and design sectors, is labor intensive and depends upon a highly skilled and highly compensated workforce. From research and comments that have been collected, the state must recognize these factors if it wishes to attract, expand and retain these industries that form the cluster. Training skilled workers for the line must be complemented by development of specialized programs for the jobs of the future and enhanced by job training or retraining programs

underpinned by state support. Broadened availability of post-graduate engineering and design programs must be increased through cooperative efforts between this industry and higher education. In addition, as the state may begin to rely upon payroll or compensation factors as part of its state tax base, recognition that the aerospace is a high wage, labor-intensive, specialized industry must be continually evaluated. The design of such a tax system must consider the impact of national and global competition on this important sector of the Texas economy.

The state of Texas is in an excellent opportunity to leverage business opportunities in homeland and cyber security, Maintenance, Repair and Overhaul (MRO), Unmanned Aerial Vehicles (UAV), space program and industry commercialization, as well as composite aircraft. Adopting new technologies and improved processes for manufacturing will advance the aerospace and defense industries in Texas.

These issues and recommendations are included in this report for further consideration. A detailed appendix includes project proposals, the raw data collected during the assessment process and industry statistics for making decisions about the Aerospace and Defense Cluster in Texas.

1.2 – Recommendations

Throughout this assessment process, several common themes emerged and resulted in the following recommendations:

1. Workforce and Education

Staffing patterns in aerospace and defense experience peaks and valleys due to the fact that government contracts are a major source of revenue and often dictate workforce needs. Thus, industries in this cluster have a fluctuating career environment. Rapidly advancing technology and specialized skill requirements present additional challenges to filling immediate and future workforce requirements. The workforce must be continually prepared to meet industry demand for companies to remain competitive. Funding for the TWC Skills Development Grant program must be continued. The following recommendations focus on fulfilling the "just-in-time" workforce needs at the pace of technological growth:

- Support the development of training and certification curricula that focus on skills such as welding, machining, electronics and hands-on exposure to the production of goods.
- Create standardized industry certifications, recognized by employers that ensure candidates have attained industry standard skill levels while providing future employment security.
- Provide tax incentives for specialized training programs funded by the employer to support the adoption of new technology.
- Market and promote the benefits of building a career in aviation, space and defense.
- Assist in the funding and development of an employer-driven, standardized core curriculum for post-secondary students.
- Broaden the availability of post-graduate engineering and design programs that complement the skill requirements of this industry.

2. Technology Transfer and the Advancement of the Commercialization Process

The following recommendations support investment in innovation, research and product testing, each integral to supporting the development of new technologies required for growing the competitiveness of the Aerospace and Defense Cluster:

- Invest in centers of innovation to ensure an ongoing focus on advancing the commercialization of research into viable products that will advance the industry. The Texas Emerging Technology Fund (ETF) is one avenue to achieve this goal.
- Promote networks that ensure the collaboration between industries and research labs in incubator and academic environments for the benefit of the industry as a whole.

3. Business Climate*

The assessment of the Aerospace and Defense Cluster produced positive feedback regarding doing business in Texas. However, several factors were identified that concerned employers. The following recommendations seek to improve infrastructure and the overall business environment:

- Offer tax incentives for companies that invest in new equipment and expansion of facilities for economic growth.
- Ensure that Texas' policy focuses on creating a business friendly, cost effective environment for employers including addressing rising healthcare costs, aging facilities and corporate taxes.
- Develop a strong supply chain (logistics and distribution) model that fosters coordination among vendor and supplier channels to reduce the cost of delivering product to the marketplace.
- Invest in the regional airport system to support opportunities for commercial airline expansion, growing demand for air taxi service for commuters and increased use of airports as logistic hubs.
- Incorporate strategies for entrepreneurship, business incentives, access to capital, infrastructure build-out and promotion of defense and space programs into the state's strategic economic development plan.

* For the purpose of this assessment, business climate includes such issues as taxes, economic development, infrastructure needs and corporate overhead costs such as health and workers' compensation.

4. Collaboration

Participants in the assessment emphasized the importance of seeking input from government, industry and academia on an on-going basis. The following recommendations promote increased collaboration and the sharing of resources and expertise to foster growth in the industry cluster:

- Share public and private resources for grant writing and contract negotiations to secure government funds for procurement and program development.
- Enhance the logistic and supply chain channels to reduce material and distribution costs through co-op partnerships.
- Continue to foster regional collaboration for workforce development, infrastructure build-out and sharing of information databases identifying vendors, suppliers and distribution channels.

- Create centers of innovation where aviation, space and defense-related companies have the opportunity to test technology and network with other industries to determine and fulfill technology needs and drive integration. Government, industry and academia need to work together to develop new technologies for the cluster.

1.3 – Technology Targets of Opportunity for Texas

Texas' ability to innovate and create new technological advancements is one of its' greatest assets. The Aerospace and Defense Cluster team reviewed the data collected in this assessment and identified technologies that could create profitable business opportunities:

a) Nanotechnology, biotechnology
b) Precision composite and light weight materials
c) Homeland security – border control, cyber security, physical security
d) Advanced manufacturing – precision assembly and tools
e) Robotics – autonomous robotic vehicles
f) Alternative fuel sources
g) Wireless
h) UAV
i) Space-related innovations

Further investigation is needed into whether or not the technologies listed in this report, truly reflect what is best for the Aerospace and Defense Cluster in Texas and the advancement of the industry as a whole. This should include a review of converging technologies found in the other five clusters outlined in the cluster initiative.

1.4 – Next Steps for the Aerospace and Defense Cluster Team

Implementation is a critical component of any strategic plan. The Aerospace and Defense Cluster team stands ready to act as liaisons between the regions and state leadership to identify priorities of action. Sub-groups from the team will promote economic development opportunities that create jobs, models that support the integration of technology and elevate Texas' academic requirements and institutions. In addition, the cluster team envisions a data resource bank of regional assets and infrastructure investment for the development of profitable partnerships statewide among the five other target clusters.

2 - Summary of Findings

One of Texas' primary strengths may be its regional diversity. Identifying the assets of a region in terms of technology, workforce, physical and virtual infrastructure, forms the basis for a more comprehensive economic development plan that will serve to network Texas' regions for more efficient statewide implementation and economic growth. Participants in the regional forums provided the majority of the information. The locations for these regional forums were selected based on the greatest concentration of employment within the aerospace and defense industry segment. The following summary highlights statewide assets and strengths that are imperative in developing strategies for growth in the Aerospace and Defense Cluster.

Texas – Statewide

- Technology and innovation for aviation, space and defense including UAV, biodefense and composites

- Presence of original equipment manufacturers (OEMs) and mid- to small-tier companies that form the core of Aerospace and Defense Cluster activities, including design, commercialization, manufacturing, testing, sales and maintenance.
- Strong presence of airport facilities, commercial and private logistic hubs, military bases, three spaceports, security and border control posts.
- Ability to attract federal contracts for the development and economic growth of the cluster. Awarded contracts through the Department of Defense (DoD). Grants and program funds through the National Science Foundation (NSF) and National Institute for Science and Technology (NIST). These contracts support job growth, manufacturing, research and development (R&D) and facilities.
- Academic institutions (post-secondary) with communication channels to industry for the development of curriculum and training programs to provide workforce skills.
- Strong airport system. Proves infrastructure and commercial travel options statewide.
- Strong foundation for growth in the following market segments – UAV, MRO, air taxi service, space programs and homeland security.

* This list includes a few highlighted assets from the assessment. A complete list is included in the Appendix.

The following chart outlines some of the regional cluster attributes that must be maintained to support development in the cluster. It highlights technology, expertise, industry presence and associations as well as components of physical infrastructure needed to move manpower and product. The four regional forums held across the state are represented in Table 1.1. Additional assets will be highlighted throughout the report and included in the appendices.

Table 2.1 - Regional Cluster Attributes and Representation[1]

Region	Industry Cluster Attributes	Infrastructure
San Antonio and Central Texas	Strong company presence – KellyUSA, Boeing, Lockheed Martin, Pratt & Whitney, GE, Chromalloy, Mooney Aircraft Company and Standard Aero. GPS/GIS and information technologies. Homeland security entities. Military presence and government agencies. College and university programs focus on Aerospace and Defense Cluster needs.	Airports, military bases, aircraft hangars and rail. Centralized location with market access. Alamo Community College District, University of Texas at San Antonio (UTSA) and South Texas Research Institute. San Antonio Economic Development's Aviation Council. National Security Agency. Maintenance, repair and overhaul (MRO) cluster.
Houston and Gulf Coast Region	Strong economic development strategic plan to develop space and aviation cluster representation. Nanotechnology, medical sciences, robotics and composite materials. R&D labs for space, air and defense technologies. Original equipment manufacturers (OEMs) and mid-tier companies. United Space Alliance, Boeing, Lockheed Martin, USA Space Operations and Barrios Technologies.	Investment in technology, IT and communication infrastructure. NASA/Johnson Space Center. R&D labs and expertise for space, air and defense. Strong academic focus to train workforce with transferable skills between aviation, space, defense and other market-related segments. Rice, UT Medical Branch (UTMB), University of Houston, San Jacinto Community College – Aerospace Academy. Ellington Field.
The Rio Grande Valley and South Texas	Maquiladora – access to affordable workforce. OEMs. MRO, R&D and manufacturing. Spaceport. Homeland security, border control, radar and defense. Rolls Royce, Lockheed Martin, GE and Raytheon.	Proximity to Mexico. Access to NAFTA, CAFTA corridors through, sea, air and land. University and college programs for workforce training – UT Pan American and Texas State Technical College (TSTC). Valley International and Harlingen Airports.
Dallas/Fort Worth and North Texas	Texas Logistic Capability Council. Texas Homeland Security Alliance. Strong presence of OEMs and technology associations. Nanotechnology, medical sciences, composites, wireless - GPS/GIS. Sensors, tracking devices and robotics. Geneva Aerospace, Raytheon, Vought Aircraft Industries, Lockheed Martin, Dallas Airmotive, L-3, BAE, General Dynamics, Bombardier and Bell Helicopter.	Strong IT and telecommunication infrastructure to conduct business. Airports, airstrips and logistic hubs. Airports include DFW International, Love Field, Alliance, Meachum and small regional airports. UT Dallas (UTD), UT Arlington (UTA), Texas Christian University (TCU), University of North Texas (UNT) and Southern Methodist University (SMU). Dallas and Tarrant County Community Colleges. Strong military presence.

Economic Threats

Given the strengths and assets identified in regions across the state, there remain economic threats that can negatively impact growth in the cluster. The following list identifies those areas of weakness, which pose the greatest threat to Texas' existing assets in this cluster:

- Maintenance, repair and overhaul (MRO) is a growing industry on which Texas should capitalize. However, equipment is expensive, and work depends on a healthy economy demanding and producing product. Workforce skills required for this market sub-segment are not readily available to support an increase in workload as experienced workers face retirement.
- NASA-related space programs rely on federal government funding. The industry is contract-based, creating a concern for its unpredictable future. If there is a lack of commitment to space exploration and programs by the U.S. government, there will be a loss of jobs, fewer entrepreneurial ventures and fewer dollars for research and development.
- Global competition is spurring economic trends such as the establishment of manufacturing plants offshore, low-wage competition wars and need for government to provide grant dollars to advance research and development efforts. In addition, aerospace companies have to make operations decisions based on variable business costs that continue to increase. These factors are threatening the retention of plants and jobs in Texas.
- Employers increasingly bear the burden of addressing multiple threats related to workforce including soft skills, traditional manufacturing skills and availability of skilled workers such as welders, machinists, technicians and skilled engineers.

A full review of the SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is included in this document for review (See section 7).

3 – Aerospace and Defense Cluster Definition and Representation

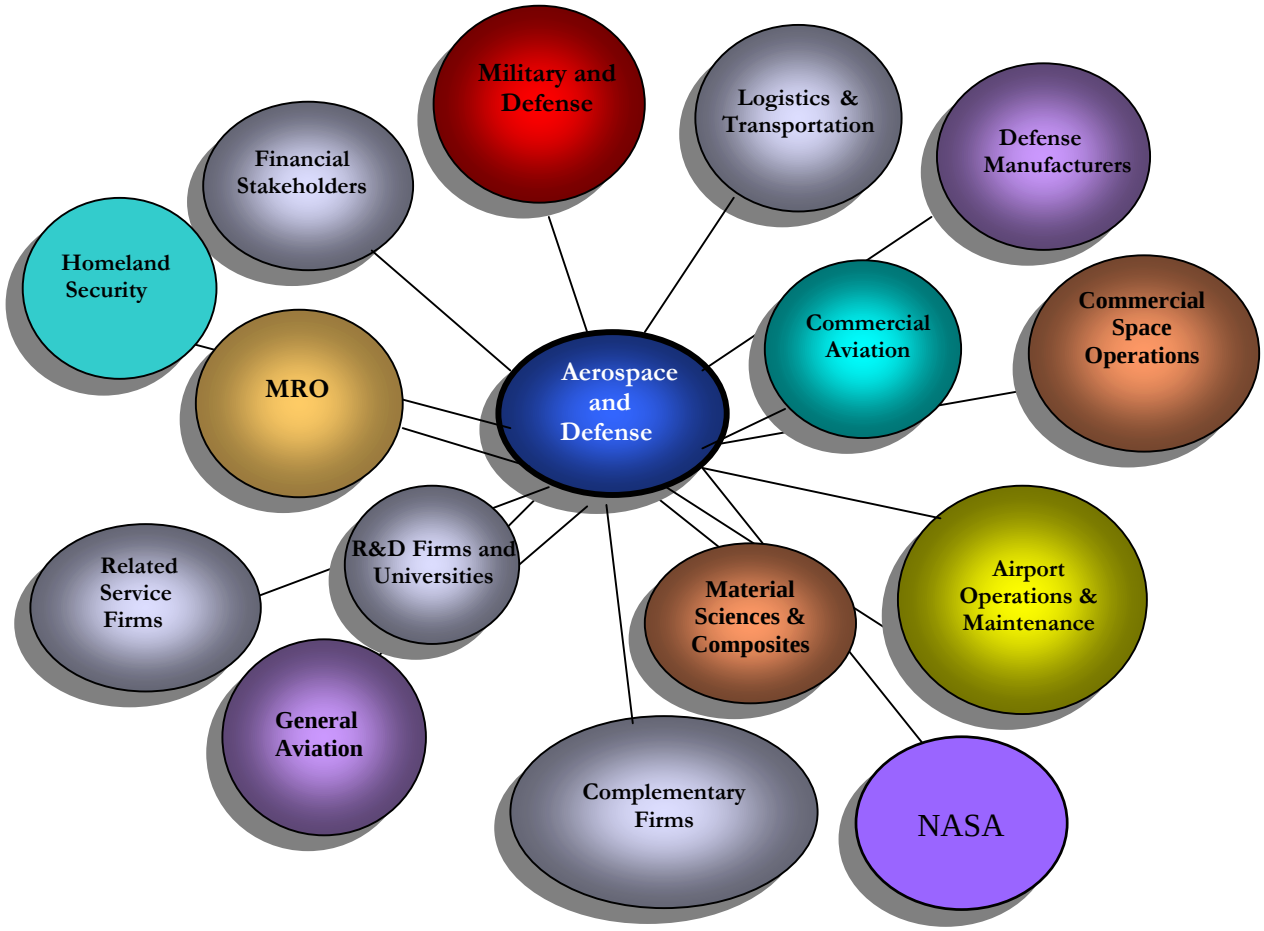
At the beginning of the cluster initiative process, a snapshot of industries and stakeholders in the cluster was proposed. The core industry representatives and stakeholders included:

- Commercial Aviation
- Financial and Service Stakeholders
- Military
- Defense Manufacturers
- Space
- Security
- Airport Operations & Maintenance
- Logistics and Transportation

Through the analysis of input from the regions, a more dimensional picture of the Aerospace and Defense Cluster emerged. Many more industries and stakeholders were added to complete this representative picture. This model looks at market segments that comprise the cluster, including defense, security, space, manufacturing, general aviation, military bases and activities and airport operations. Service companies that directly support the core industries are a significant component of this cluster and include maintenance of infrastructure and facilities, advancement

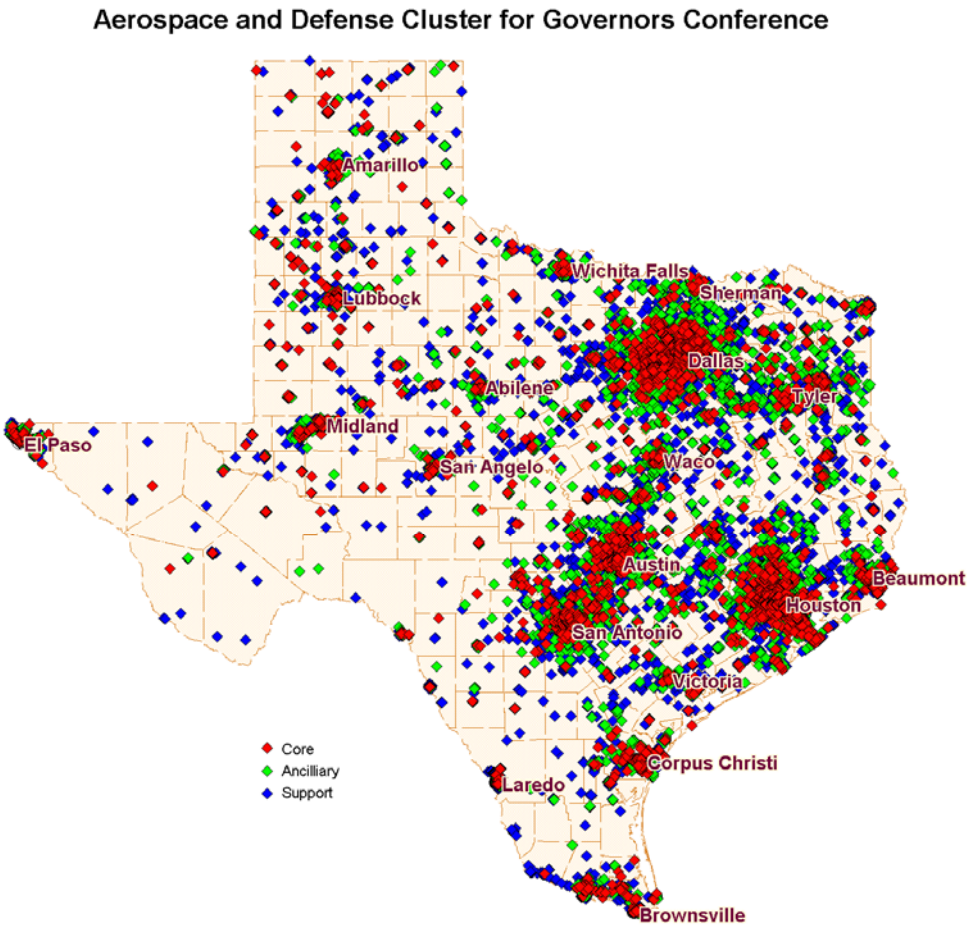
of technology, associations and institutions. Institutions represent research labs, academic institutions (colleges, universities, training centers), workforce providers and capital investors. To thrive, all parties must contribute and remain healthy to be competitive. The outcome of the assessment is depicted in Figure 2.1.

Figure 3.1
Stakeholders and Industry Representatives for the Aerospace & Defense Cluster Team[2]



To demonstrate areas of concentration among these stakeholders and industry representatives by location, regional cluster representation was mapped using the North American Industry Classification Systems (NAICs) and data provided by Labor Market and Career Information (LMCI).

Figure 3.2 - Aerospace and Defense Cluster Regional Concentration[3]



4 – The Competitive Landscape

The economic impact of approximately 186,000 jobs makes the aerospace and defense industry one of the largest overall employment generators in the state. The aerospace cluster includes both military and civilian sectors, general defense and homeland security, commercial aviation, manufacturing and space activities. The value chains and fulfillment roles of supplier-vendors create opportunities for companies to co-locate, generating stronger regional clusters. For instance, the Joint Strike Fighter (JSF) aircraft project in Fort Worth and the V-22 Osprey project in Fort Worth and Amarillo require suppliers of parts and materials to expand adjacent to development and manufacturing activities. Other opportunities discovered through the cluster assessment process include sub-orbital vehicle and launch activities in West Texas, UAV

technology for border security, engine manufacturing in South Texas and new materials and avionics research in Central Texas.

The impact of NASA and the Johnson Space Center continues to foster new products and innovations in areas as diverse as health care, pharmaceuticals, nanotechnology and advanced materials, data and information management. Awarded funds for space and aviation projects will continue to drive the growth of entrepreneurial ventures and feed the mid-tier companies. Finally, Texas has several reasons for focusing increased attention on homeland security. With several international ports, a wide geographic border with Mexico, major petrochemical and refining facilities and the presence of government agencies, Texas through securing assets will indirectly drive new business opportunities.

Competitive Collaborations

The aerospace and defense industries have an opportunity to foster cluster growth through embedding cross-cluster technology into new products and processes. For example:

- Technology that can launch human beings into space and onto other planets for longer periods of time. Robotics and space vehicles that can capture and digitize data for analysis and education.
- Information technologies to improve navigation systems, tracking, GPS and radar. Systems integration into aircraft, sensor and tracking systems, as well as physical and virtual defense products.
- Fuel cells and advancements in energy storage.
- New manufacturing tools and processes in the MRO market that integrate lean manufacturing principles and cost-effective supply chain processes.

Technology is just one variable that will promote growth for the aerospace & defense cluster. Industry trends such as globalization of manufacturing and expansion of customer markets, outsourcing specific business operations, streamlining the fulfillment process and cross-training of the workforce, should be recognized as opportunities to learn and adopt best practice scenarios. The following trends present both challenges and opportunities the cluster:

- Streamlining operations through outsourcing business operations or services to other firms reduces operating costs. Examples include outsourcing manufacturing and offshore customer service and outsourcing intellectual property (IP) to contractors. Some of these trends increase productivity while others threaten a company's competitiveness.
- The emergence of new global markets increases the flow and distribution of goods creating a need for new technology and investment into the fulfillment process to remain competitive.
- Texas' workforce must be skilled in languages, math, science and technology. Employees must be cross-trained to remain employable during industry productivity shifts.

Industry trends that impact the Aerospace and Defense Cluster are visible across other clusters in Texas. The cluster will do well to review best practices for high productivity and reduce operation costs. Creating highly competitive clusters across Texas should be the core of the economic development strategy.

5 – Assessment Methodology

In order to engage a broad set of stakeholders and to capture their ideas regarding building an Aerospace and Defense Cluster strategy, statewide activities were launched to include:

- An electronic survey to capture state and regional opinions around technology, entrepreneurship and cluster strategies
- Interviews with 60 key stakeholders (government, academia, industry)
- Four regional forums (San Antonio, Weslaco – The Rio Grande Valley, Houston and Dallas/Fort Worth)
- Ongoing legislative and policy discussions with the cluster team

The intent of this qualitative approach was to gain valuable insight, commentary and guidance from over 190 industry leaders, vendors and suppliers supporting the growth of the cluster.

Complementing the qualitative and anecdotal information was an extensive process of quantitative data collection from several third-party and original sources. The RAND Corporation's RaDiUS (Research and Development in the U.S.) database on federal funding, Schoenfield & Associates database on private sector R&D, the CHI Research patent database, Texas Workforce Commission (TWC) employment data and input from the Aerospace and Defense Cluster team, provided the information on assets and activities building the knowledge base for aerospace and defense.

6 – Qualitative and Quantitative Data

Interviews, regional forums and cluster team discussion provided significant insight. Data and information captured outlined the assets and strengths of the cluster and what actions should be taken to maintain the cluster's competitiveness, regionally and globally. After review of the responses and data, the state of Texas may wish to create a forum for cluster planning and implementation that will provide additional insights into the growth of this cluster.

6.1 – Qualitative Data - Survey of the State and Cluster Expertise

The survey focused on employment and education, entrepreneurship and the business environment. 63% of the respondents had served or participated in a workforce advisory committee and 31% had served on a human resource committee or program. 70% were in a product design or research role within their company.

The following summarizes the response percentages for the main themes captured by the survey:

Employment

- Of the surveyed companies, 65% of the employees recruited came directly from community colleges or technical schools, and 61% were graduate students with a four-year degree. 42% were recruited from other institutions or organizations.
- 83% of respondents believed it was easy to retain top talent once hired as an employee of the company; however, between 33% of the respondents felt it was difficult to attract scientists, technicians and engineers.

- Respondents emphasized that Texas needs to address building a talented workforce pipeline. The awareness that Texas' education system is responsible for developing the future workforce must start at the K-5 level. Applied learning skills must be incorporated into the curriculum.

Entrepreneurship

- 67% of respondents felt it was important to attract entrepreneurship to Texas. 78% felt that it was important to very important to have access to seed and VC funding.
- 89% or respondents felt it was important to very important that the state and regional leaders foster entrepreneurship to aid start-up companies.
- The state must develop and support programs that provide matching funds and assistance to start-up firms.

Business Environment

- The survey questions focused on business regulations, quality of life, cost of doing business and education. 38% felt that Texas was losing ground in terms of quality of K-12 education, 38% felt that the tax burden on businesses is increasing, and 63% felt that Texas could improve the business regulation environment.
- The respondents were asked what technologies they felt will be the largest contributors of growth for the Aerospace and Defense Cluster. The responses included UAVs, composite technologies, commercialization of space, genetic research, alternative fuels, autonomous intelligent vehicles and nanotechnology.

Overall respondents were aware of the cluster initiative and aspects surrounding Texas' strategy on economic development. Respondents represented workforce, R&D and business operations. The survey also captured the insights of small to large companies of 1000 plus employees, giving the survey depth in terms of reaching all aspects of the industry. The survey questions and detailed responses are included in appendices.

6.2 – Qualitative Data - Stakeholder Interview and Regional Forum Perspective

One-on-one interviews were conducted with a select number of industry professionals from various segments of the Aerospace and Defense Cluster. Participants were asked their opinion around workforce, education, entrepreneurship, regional and state resources and global trends. The responses are summarized below.

Table 6.1 Interview and Forum Input Summary[4]

Workforce	Education
• Large companies hire the best talent making it difficult for small companies to compete for talent • There is a need to map workforce skills in order to provide industry with a workforce pipeline (that includes industry needed skills) • Students must be encouraged to pursue careers in the aerospace industry • Changing state demographics shows an increase in limited and non English speaking population • Industry needs a strategy to transfer knowledge from the experienced to next generation of workers • Rapidly changing technology trends cause industry and academic institutions to struggle to remain current • Increasing need for industry standard certifications (e.g. airframe, power plant)	• Increase collaboration between industry and universities for improved processes, commercialization and research • Industry will need to play a greater role in defining what is needed for the development of the workforce pipeline (e.g. skills, number of graduates) • Create better communication channels between students in the early grade levels about specific careers and promote the benefit of pursuing those careers • Increase number of trade schools, internships and apprenticeship programs
Entrepreneurship and Commercialization	**Regional and State Resources**
• Encourage new companies to break into aerospace market through strong incentives and a strategic economic plan • Promote the coordination of vendor/supplier channels that create competitiveness across the cluster • Create new commercialization mechanisms • Support the Texas Emerging Technology Fund (TETF) • State support for the establishment of incubators and a statewide entrepreneurial system • Provide the infrastructure to create new company spin-offs from the NASA and other federally funded programs • Academic institutions must interact with industry to redesign commercialization process	• Create a statewide marketing plan that promotes technology and regional cluster strengths • Create a resource bank allowing companies to access information regarding capital, grants and incentive programs that benefit start-ups and companies commercializing product • Invest in regional airport system • Texas needs to ensure that space and aviation programs are a priority • Create a statewide economic development plan that highlights recruitment and retention of cluster representatives

The interview and regional forums also highlighted some of the global and national trends that will aid or threaten the growth of the aerospace and defense industry.

Global and National Trends – Common Themes

- Impact of energy costs on aerospace drives need to seek alternative energy sources
- Aerospace is a global business and is becoming more technology driven
- Industry is moving towards composite material manufacturing for aircraft
- Industry is moving towards developing light jet aircraft for corporate and commercial fleets
- Components and parts made outside the U.S., shipped to and assembled in U.S.
- Without state and industry support for growth in the MRO market in Texas, MRO activity may move overseas in the next 5-10 years.
- Lack of awareness of a region's or industry's capabilities is a huge threat in a global economy

6.3 – Quantitative Data - Federal DoD Funding in Texas*

Over a ten-year period between 1993 – 2003, Texas received a total of $20.32 billion in federal DoD funding. In the regional forum sessions, Texas industry representatives outlined the positive and negative impacts of large sums of DoD funds flowing into Texas. The positives included the job creation, commitment to innovation, ability to upgrade research facilities, increase in manufacturing production and the expansion of federal programs at NASA and other federal entities. However, loss of contracts or decreased federal funding can threaten the survival of small to mid-sized companies that rely on the trickle down of federal contract dollars. Also, shifts in workforce demand can create a negative image of the aerospace and defense industry among those considering careers in this market segment.

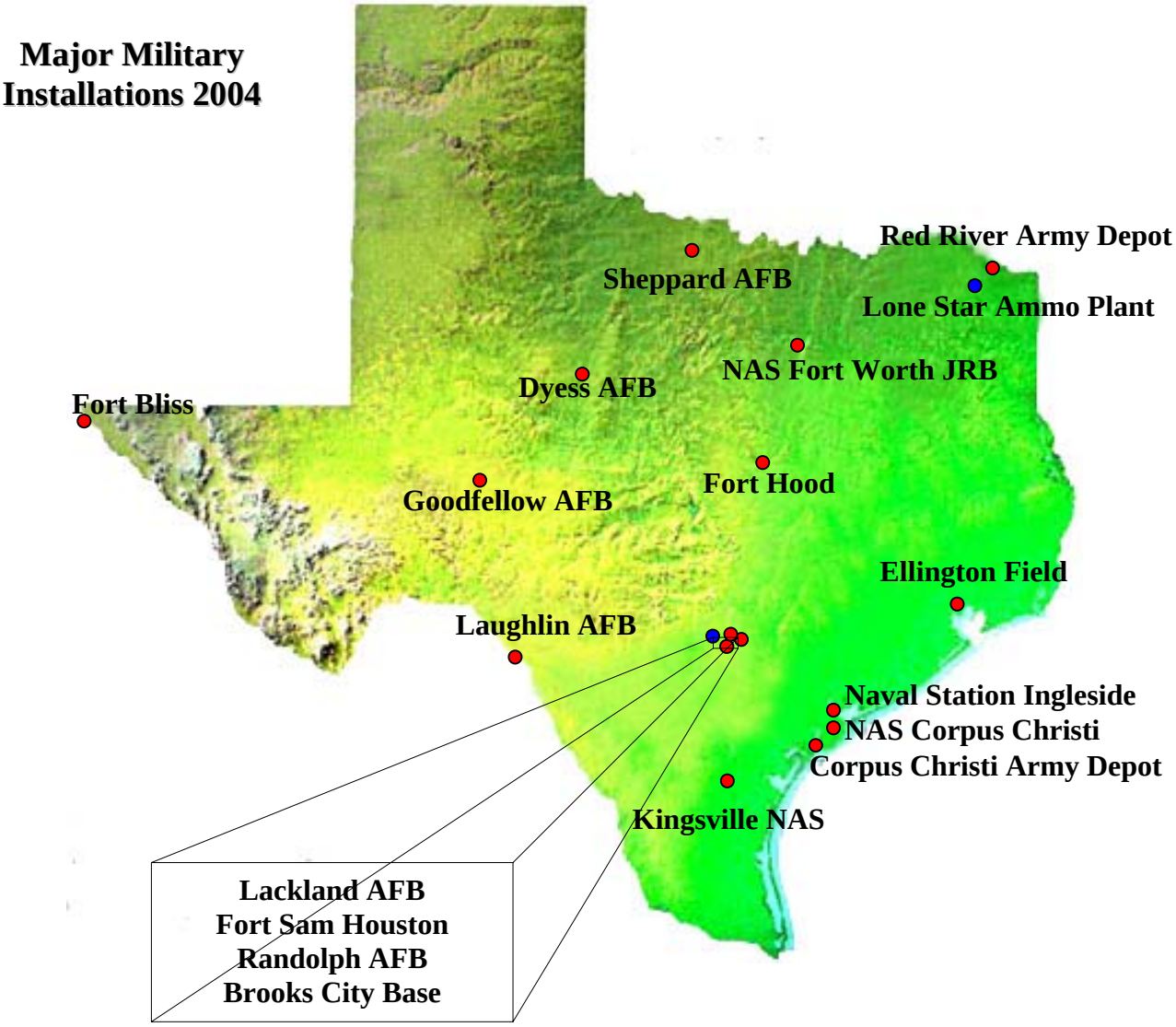
* *For the complete RAND RADiUS Federal R&D Funding data for Texas, see Appendix A*

6.4 – Base Realignment and Closure (BRAC)

The current BRAC and quadrennial examination of the overall DoD operations and budget provides Texas with a unique opportunity to examine the totality of R&D investment, academic and industry partnerships, infrastructure and mission-focus for the next ten years. Locations of vital defense investments are primarily in a handful of regions in Texas with some (not all) overlap to the current military base and infrastructure sites. During the upcoming 2005-2006 BRAC process whereby the federal government examines overlap and inefficiencies, Texas can assume that certain locations will be scrutinized for staffing, research, management and operations support.

Figure 6.2 maps the realignment of Texas' military installations for 2004.

Figure 6.2 Texas Military Installations 2004[5]



Source: Texas Military Preparedness Commission Annual Report 2004/2005

The following are some of the responses captured during the cluster assessment based on the 2005 BRAC announcements. Opinions expressed in the cluster process interviews, forums and small group discussions suggest that Texas requires a more purposeful strategy for addressing sustainable growth in aerospace, military and homeland security related activities. Texas should anticipate that other realignments – such as corporate or federally funded projects – could also affect certain regions, requiring a response strategy similar to the BRAC response outlined by the Governor.

6.5 – Small Business Innovation Research (SBIR) Data

SBIR grants have provided a source of funding for Texas businesses and research initiatives. One of the strong recommendations that emerged throughout the cluster process was the need for Texas to find funds to match and or support SBIR grants. In a ten year span, Texas received a total of $209 plus million in granted funds. As a state, Texas ranks between eight and ninth in terms of total national SBIR funding. A review of data showed that there is an increase in

awarded SBIR funds to Texas businesses each year, but state support could increase this even more through programs that provide matching funds. The steady increase in awarded funds to Texas companies provides optimism in terms of the creation of new companies, investment in research and the possible partnerships that could advance the Aerospace and Defense Cluster.

** There is no available number for classified DoD grants.*

6.6 – Quantitative Data – Patents

In aerospace and defense a total of 673 patents were filed over a thirteen-year period, 1990 – 2003. Upward shifts in government spending, positive economic trends and technology drivers are evident in the higher number of patents filed in defense-related products, weapons and firearms (259) and navigational systems (164). This can be related to the technology developments in other industries such as telecommunications, information technologies and material sciences.

Texas ranks third in terms of the number of patents issued in high tech arenas in the U.S. behind California and New York. The technology focus varies across the state of Texas, depending on cluster strength and regions with high research activity. Table 6.3 shows that a total of 673 patents were issued in industry segments that are related to aviation, space and defense. The cluster participants noted that as patent filings are linked to investment and economic trends, there may be a healthy number of patents filed in Texas due to the growth in homeland security activities, defense product innovation and collaboration with other industries to advance product applications and capabilities.

Table 6.3 Patents in Texas for the Aerospace and Defense Cluster[6]

Aerospace/Defense Patents Issued for Texas by Subcategory, 1990 – 2003[1]		
Subcategory	**Number of Patents**	**Subcategory as % of Texas aerospace/defense Patent Total**
Aircraft	110	16.3%
Aircraft Engines	54	8.0%
Helicopters	22	3.3%
Navigation/GPS	164	24.4%
Other aerospace	64	9.5%
Weapons/Firearms	259	38.5%
Total	**673**	**100.0%**

6.7 – Quantitative Data – Venture Capital Investment in Texas

Between 1995 and 2004, $18 billion in venture capital was invested in Texas companies. Texas consistently ranks 5th or 6th in venture investing, behind Silicon Valley, Boston, Southern California, the Southeast and the Mid-Atlantic. The aerospace and defense industries that comprise the cluster tend not to attract venture capital dollars, but attract other sources of funds through grants, federal agencies and contract projects. Smaller to mid-sized companies are able to contract with the larger OEMs that secure federal contract dollars.

7 – SWOT (Strengths-Weaknesses-Opportunities-Threats) Analysis

With significant assets in airports, aircraft fleets, manufacturing plants, military and defense activities, space programs and innovation labs, Texas has the core foundation for a highly competitive Aerospace and Defense Cluster. As part of the cluster assessment process, participants were asked to participate in a SWOT analysis. The table below is an outcome of the quantitative and qualitative analysis. It lists the major strengths and weaknesses of the Texas aerospace and defense industry, as well as some of the more significant opportunities and threats that it faces.

Table 7.1 SWOT Statewide Summary[7]

Strengths	Weaknesses
• Presence of original equipment manufacturers (OEMs) in cluster is dispersed across Texas. • Growing maintenance repair and overhaul (MRO) presence increases stability. • Suppliers in Texas are mostly start-up and mid-tier level companies. Job growth in the industry primarily results from expansion in these companies. • History of aviation and space industry in Texas, long-term contracts and NASA provide stability. • Growth in defense and security markets provides contracts and job growth in homeland security, border control and immigration. • Innovation in UAV, composite aircraft and materials demonstrate success. • Available space and real estate offer companies options on where to locate. Movement towards "shovel-ready sites" (sites ready for new occupants immediately) increases responsiveness to development opportunities. • Strong history of innovation can be leveraged for homeland security and defense markets. • Collaboration between state and industry aids in policy development and industry advancement in Texas. • Infrastructure in NASA, spaceports and airport system. • Office of the Governor's division of Economic Development and Tourism, Office of Aerospace and Aviation's Strategic Goals 2005-2009 for Aerospace and Aviation.	• Generally manufacturing plants and labs require new equipment to speed innovation and to decrease time to market. Companies may decide not to upgrade due to cost. • Shortage of skilled workforce to make companies competitive including welders, machinists and avionics and electrical technicians. • Industry imbalance – Smaller companies rely on OEMs to secure contracts, so business opportunities flow downward. Example: DoD contracts and NASA • Market is cyclical – Workforce needs based on contracts and market trends are not friendly for recruiting and maintaining skilled employees. Also creates periods of low production and layoffs. • Over 70% of suppliers are out of state. Could pose a threat to retention of companies in Texas. • Require more collaboration among government, industry and academia to produce future workforce pipeline. • NASA contracts create peaks and valleys in dollar flow to contract companies. Smaller companies rely on these contracts. If Texas does not support NASA programs, fear is companies and jobs will be lost. • Recruitment of out of state suppliers hampered by lack of supplier lists from tier one companies. • BRAC requires proper response by the state. • Business climate threats – rising health costs, property taxes and taxes on inventory and equipment.

Opportunities	Threats
• Cooperative collaboration to maximize distribution channels – ports, roads, air and rail reduce time to market • Leverage government relationships at state and federal level – Affect policy through industry lobby groups to attract, secure and leverage government contracts • Leverage interfaces with other market segments – Advanced materials, nanotechnologies and biotechnologies for technology advancement. • Create Texas Space Authority • Create entrepreneurial program for the creation of new companies out of the work being done at NASA. • Expand top tier industry with emphasis on manufacturing, research and part suppliers • Support advances in material sciences and light aircraft • Invest in airport system for the profitability of reaching global markets, "air taxi service" market segment, expansion of private and commercial travel. • Develop a statewide standardized certification program for the aviation, space and defense market segments. • Foster entrepreneurship for smaller companies to spur innovation • Reduce fixed-costs through tax policies, supply chain and incentives for expansion • Homeland security – Product development, federal resources and contracts	• Loss of intellectual property rights to global competitors should be addressed. • Brain Drain – graduates and experts are leaving region and state for more money and opportunity • Loss of large facilities, production sites and jobs due to business climate issues and outsourcing trends. Can companies afford to retain and grow manufacturing, R&D, MRO in Texas when compared with other states? • BRAC • Lack of workforce pipeline. Industry concerned that workforce will not be available due to social, technology and economic trends. Particular emphasis is on preparedness upon graduation from the K-12 education system. • Protect sales tax exemptions regarding sale of aircraft to foreign government and non-Texas residents. • Demographics – currently Texas has an aging workforce, growing immigrant population, high dropout rates in grades 9-12. • Reduced defense spending. • Lack of a statewide marketing strategy to entice students to embark on careers in aviation, space and defense.

Table 7.1 (continued) SWOT Statewide Summary

To summarize, the overarching themes that surfaced in the SWOT analysis were collaboration and understanding industry trends that shape investment, workforce, education, economic development and supply chain. Participants focused on strengths in existing infrastructure, presence of industry leading companies through entrepreneurial companies and market opportunities such as homeland security, UAVs and composite aircraft. Weaknesses centered on business climate issues, including the lack of a workforce pipeline and increasing costs.

Participants also identified the market trends, the cyclical peaks and valleys in awarded work contracts, the availability of a skilled workforce and outsourcing as areas of weakness for this cluster. Numerous opportunities for the aviation, space and defense market segments surfaced during this analysis. With collaboration, state-funded investment programs, effective policy and innovation, the cluster will benefit economically from market expansion. Recommendations included the establishment of a statewide aerospace curriculum and a Texas Space Authority. The SWOT results additionally encouraged the continual dialogue between cluster entities across multiple market segments in Texas.

Finally, participants outlined threats to the growth of the Aerospace and Defense Cluster, identifying areas in which the state should act to protect the health of this cluster. Preeminent were the loss of intellectual property to global competitors and aging facilities. By identifying those critical elements to the healthy growth of this cluster, the state and its partners have an added opportunity to strategically create solutions to minimize threats and focus on growth.

8 – Recommendations for Implementation

8.1 – Strategic Recommendations for Elevating Texas' Competitiveness

Participants isolated core issues to address in developing an integrated approach to recommendations for the implementation phase of the cluster initiative:

- Education and Workforce – Develop and leverage programs that will enhance the communication between industry, education and government on short- and long-term workforce needs. Lessen the gap between the critical skills required by industry and the capabilities of graduates from the educational system and recipients of workforce training, e.g. TWC Skills Development Grant Program.
- Funding – State should support industry and education in the development of new funding models to grow existing business and support entrepreneurial efforts e.g., Texas Enterprise Fund (TEF) and Emerging Technology Fund (ETF).
- State and Regional Economic Development Strategy – Develop a strategy to recruit suppliers to Texas through partnerships with existing companies in Texas. Incorporate a marketing plan that focuses on companies in Texas buying from other Texas companies.
- Communications – Launch ongoing, proactive regional and statewide effort to regularly inform stakeholders and others about progress in strengthening the cluster and to inventory activities, practices, resources, assets and people.

8.2 – Implementation Strategy – Recommended Next Steps

The cluster participants identified immediate and long-term priorities for the Aerospace and Defense Cluster. It is recommended that the Aerospace and Defense Cluster team partner with regional and state leaders to lead the implementation of these particular initiatives.

Immediate Implementation

Collaboration

- Adopt a co-op supply chain model for reduced material and distribution costs. This model should include access to resources and best-practice models.
- Collaborate with the state economic development representatives and all interested stakeholders statewide to focus on building upon the strengths and targets of opportunity for this cluster.

Workforce

- Create a shared data, information resource bank of regional assets and workforce profiles for identifying skills and workforce talent.
- Establish standard industry certifications with emphasis on technical training and skill enhancement.
- Maintain and expand government workforce development programs (i.e. Skills Development Fund grant program).

Business Climate

- Investigate innovative ways to reduce the cost of doing business such as finding new ways to address increasing costs in healthcare and disability.
- Offer tax incentives for companies purchasing R&D equipment or expanding operations.

Long-term Implementation

Collaboration

- Promote innovation for defense projects
- Develop curriculum for industry certifications and to build the next generation of skilled workers

Workforce

- Create regional aerospace advisory groups to promote industry and involve government resources during down-turns

Business Climate

- Review periodic recommendations from the governor's industry cluster group
- Collaborate with industry representatives to recommend policy

8.3 – Assessment Summary and Targets of Opportunity

As we have seen, technology and innovation spur healthy clusters. This process explored some of the emerging technologies that could advance the aerospace and defense industries. This will require collaboration between private and public entities, investment and the exposure to converging technology applications to foster growth in the cluster. Technology and programs that present business and industry advancement opportunities are listed below.

- Precision composite materials
- Aerospace design systems
- Intermodal transportation
- Advanced manufacturing processes and precision assembly
- Maintenance Repair and Overhaul (MRO)
- Composite aircraft
- Advanced airport hubs – commercial and private
- Alternative energy
- Cross cluster technologies – e.g., biotech, nanotech, aerospace
- Commercial space applications – realities of consumer interest, cargo, research
- Autonomous robotic vehicles
- Homeland and cyber security
- Sensors and other monitoring technologies

It is important to remember that the collaboration with other clusters will enhance shared resources, funding and program validity. Working with other cluster entities provides information sharing and the introduction to experts in technology and product commercialization.

8.4 – Market Segment Opportunities

The regional forums, survey and interviews focused on extracting opinions and information regarding the activities that make up the Aerospace and Defense Cluster. As each region has its area of specialization and emerging market opportunities, the cluster team isolated five areas of the market that focus on technology and program expertise driving new business opportunities. These projects were compiled by leading experts in the Aerospace and Defense Cluster.[8]

I. Small Aircraft Transportation System – The Next Generation of Air Travel

II. Maintenance, Repair and Overhaul (MRO)

III. Unmanned Aerial Vehicles (UAVs)

IV. Space Industry – Our Role in a New Era of Space Exploration

V. Homeland Security Assessment and Business Opportunities

I. Small Aircraft Transportation System – The Next Generation of Air Travel

As companies work to design and produce the next generation of very light jets (VLJs) or microjets that exhibit the newest advancements in navigation, IT and composite technologies, the market for air taxis and charters has been identified as one of the most significant business opportunities in air travel. Within civil aviation, a growing trend in Small Aircraft Transportation Systems (SATS) is creating an option for travelers wishing to travel between small airports, into rural areas and according to a flexible schedule. SATS will provide flexible, safe, advanced travel for clients commuting between small regional airports with no large carrier or scheduled flight service. One or two engine jet aircraft that can be flown by one pilot, with automated pilot back-ups, will become a viable option at a cost of approximately $1-$2 per square mile per passenger. As public perception changes about the safety and restrictions around flight, SATS will become a popular option for those wishing to fly outside the large carrier flight paths. Also not to be overlooked, in addition new aviation technologies in the future will include the production and commercial utilization of tiltrotor aircraft for short haul transportation needs

This market is expected to be one of the fastest-growing segments in aviation. The Federal Aviation Association (FAA) expects growth of close to 20,000 more general carrier aircraft added to U.S. fleets over the next 12 years – 4,500 of them VLJs. Historically, private jets have been an option only for corporate executives who can afford to have their own fleets as opposed to traveling through airport hubs. Corporations and individual businessmen see the following benefits in owning their own plane or fleets:

- Time-saving, through fewer unscheduled delays
- Increased productivity, as employees can work in complete privacy
- Control of all aspects of the travel plan
- Accessibility to more remote destinations than airlines
- Full control of fleets and maintenance
- Enhanced company image

These benefits are also the cause of growing popularity in VLJs. The market is exhibiting an increase in VLJ sales partly due to the use of jet charters by business passengers avoiding the hassles of airline flight as well as the affordability of these jets. "Aviation as we've seen it traditionally is going away," FAA spokesman Greg Martin told USA Today. “Travelers see time as valuable and expect the market to provide flexibility in terms of cost, service and flight

schedules." While concerns center on the overcrowding of the airspace system, the fact is that thousands of airports across the country are currently underutilized. VLJs are a viable option for the development of rural airports and the creation of economic opportunities for those regions.

The following statistics support the need to invest in air transportation advancements as well as the infrastructure to support it.

- Civil aviation contributed more than $900 billion and 11.3 million jobs to the U.S economy in the year 2000, at least 9 percent of the total U.S. GDP of $9.9 trillion; of this, one dollar in nine is contributed by general aviation.
- Aggressive investment in air transportation infrastructure would reduce projected 2012 passenger delays by 64 million hours or 25 percent. Critically, every dollar of investment would generate as much as $5 in economic benefits to the U.S. economy. This investment would also need to incorporate less utilized airports that border metro areas.
- As a result, business operations would become more efficient, costs would be reduced and U.S. international competitiveness would increase, particularly in aviation (including air cargo) and in tourism, thereby increasing economic development.

The aviation industry generates jobs, economic opportunity and has become critical to Texas' economy. The following recommendations by the Aerospace and Defense Cluster will promote investment in light jets and the expansion of air transportation infrastructure:

1) Allocate state funding to invest in airports that have runways to accommodate jet landings. Airports need to also serve as logistic hubs for revenue generation and include services for commercial travel.
2) Include in Texas' Economic Development strategy the need to recruit companies that are investing in microjet technology, manufacturing and sales of final product. Texas has the infrastructure to support these companies.
3) Focus on building a workforce pipeline that will support the microjet marketplace. Skills include mechanical engineering, aviation technician, maintenance, repair and overhaul (MRO). Robotics, information technologies and telecommunications systems such as navigation, satellites and global positioning systems (GPS).
4) Encourage partnerships with nanotechnology and composite technology companies to aid in the advancement of the microjet market.

The Texas Aerospace and Defense Cluster team will support the initiatives of building infrastructure to support business expansion, technology development and the marketing of VLJs as a cost effective solution to air travel.

Sources:

www.faa.org
Matthew Wald. Envisioning the Day When the Skies Will Teem with Air Taxis. June 19th, 2005. New York Times.

II. Maintenance, Repair & Overhaul (MRO)

A. MRO Industry Trends, Growth Projections and Market Opportunities

1) Commercial MRO trends toward outsourcing will continue in the coming years (2005-08) with the exception of line maintenance
   Outsourcing trend by major category
   - Airframe 61-70%
   - Engine 82-89%
   - Components 66-70%
   - Line 31-30%
   - Modifications 48-53%

2) Top 3 reasons for this trend in commercial:
   - Airlines are focusing on core competencies & getting away from non-strategic capabilities (primary reason)
   - Cost reduction & savings are required by all major carriers and providing their own MRO capability is not cost effective
   - Service and quality become even more difficult as fleets age.

3) Top commercial improvement initiatives
   - Strategic sourcing, supplier partnering
   - Lean process redesign
   - Enhanced employee education & training

   Implications/results of these trends
   - Globalization of the commercial MRO market is enabling domestic airlines to move work to cheaper offshore locations.
   - Commercial US airlines, forced to reduce costs, outsource first to domestic MROs and then to low-cost offshore providers
   - High labor content to Latin America
   - High technology (wide-body) to Asia

4) Both carriers and commercial MROs continue to place emphasis on cost cutting due to ongoing financial crisis in the airline industry
   - Basic capabilities are more important to carriers than enhanced service offerings
   - Increased price competition has caused significant deterioration in margins for both carriers and 3rd party domestic providers
   - As commercial MROs see their business moved offshore, they are likely to seek new opportunities in the military market and other non-traditional areas

5) Military MRO spending is greater but slower growing than commercial
   - 2005-2009 spending will grow from $53B to $57B
   - 50/50 rule (Title 10) will limit continued expansion of outsourcing in some platforms/services
   - Growth and profitability of MRO segments varies significantly with US Military MRO being among the slower growing but most profitable segments.
   - Engine MROs have been successful sustaining high margins

- Profits in commercial airframe MRO are much lower than in military
- OEM touch labor rates approximate $85/hr, commercial MRO range from $54-$40

Size of MRO market for different platform types

Fighter/attack $11.7B	Rotary wing $6.5B
Transport $3.5B	Special mission $2.7B
Trainers $1.2B	Tankers $1B
USAF $14B	Army $4.3B
Navy $5.8B	USMC $2.7B

- From a high-level overview, the four most attractive markets are heavy transport, fighter/attack, tanker and rotary wing.
- With quality and reliability remaining pre-requisites, future contracts will likely be competed based on cycle time and price.

B. Defined Technologies – Foundation and Supporting

To perform MRO work, both foundation technologies (avionics, powerplant, etc.) and supporting technologies (supplier management, strategic sourcing) are required. All impact the business segment. The opportunity exists to create as many jobs in supporting technologies as in the core MRO business. This broadens the potential for academic and governmental support as well as the opportunity for local/regional consortia to make an impact. The technologies and skillsets are listed below.

Avionics & Electronics	Aircraft Mechanic (A&P)
QE inspectors	3-D modeling & imaging
Workscoping & assessment	Tooling, equipment & resources
Performance measurement	Technical support
Dangerous goods/hazardous materials	Supply Chain
EDI	Warranty
Lease and contract reporting	MPD Tasks
Aircraft work packaging & planning	Application software and hardware
Defect reporting	Component and part scheduling

Aero, structural, production, manufacturing, electronic engineering

Materials, production, warehouse, supplier and logistics management

C. Market Opportunities

Possible projects and technology applications or opportunities related to the market segment include the following:

1. Supplier parks contiguous with major MRO / production facilities
2. Technology demonstrators, applying leading edge technology in 3-D modeling to expedite MRO and create efficiencies
3. Collaborative endeavor to adopt lean supply chain and manufacturing processes to assure improvement across the entire value chain (requires deployment of lean manufacturing concepts / practices into tier 1, 2 and 3 suppliers across the industry)
4. Resource/competency clearinghouse to enable exchange of talent during re-structure/downsizing; intent to promote employment stability/continuity in the industry

5. Start-up assistance for new or emerging 3rd party MROs
6. Governmental assistance to existing domestic carriers / 3rd party MROs to keep work on-shore
7. State/regional financial support of existing MRO operations (Kelly USA) to prevent work being pulled back into military depot's
8. Support existing military depots in Texas

D. Recommendations for Resource Allocation and Economic Development Strategy

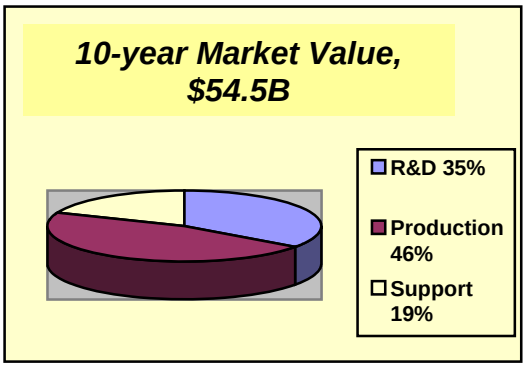
1) Re-emphasize math and science concurrent with aerospace related engineering and technical degrees. Possible consortium of aerospace and defense companies to enable sharing and joint outreach into the schools to engage students and interest them in the aerospace and defense industry
2) Emphasize manufacturing and production engineering needs
3) Adopt best practices for logistic and supply chain management including all manufacturing needs and stages
4) Create programs for cross training of MRO employees
5) Offer incentives or matching investment funds for industry representatives that modernize or re-design processes for competitive manufacturing
6) Work directly with workforce agencies and academia to ensure mechanisms in place to identify qualified workforce and support (non-engineer/mechanic) positions. Significant numbers of support personnel are not "degreed professionals" but transfers that have migrated into professional roles from the shop floor
7) Industries need to adopt competitive fulfillment and supply chain models to ensure Texas remains competitive and avoids offshore relocation of operations
   - Reduce operating costs - utilities, insurance, workers compensation, local & state taxes
   - Maintain a skilled available workforce
   - Recruit more tier 1, 2 and 3 suppliers to locate in Texas and make MRO and OEM supply chain more viable
8) Need to make aerospace and defense an attractive industry again through capturing students imagination and demonstrating a commitment to building careers in this industry
9) Support industry efforts to create a positive image and dispel past negative representation in order to attract bright science, math and technology students. Extend an outreach campaign, at least at the state university level, in collaboration with aerospace and defense industry participants.

Source: Mercer Consulting, Mike Higgins. Dallas, TX
KellyUSA, Bruce Miller. San Antonio, TX

III. Unmanned Aerial Vehicles (UAVs)

The UAV industry in Texas is promising to expand and advance not just in terms of military applications in aerospace and defense, but through the incorporation of technology that will promote other market opportunities for the public and private sectors. Products that incorporate guidance systems, autopilot solutions, precision control technology and real-time mission programming are part of the UAV market segment. Historically, UAV solutions have been used mostly in war zones. In fact, according to the U.S. Office of the Secretary of Defense, UAVs or drones have been part of military operations since 1917. It is likely that the Department of Defense (DoD) alone will spend $10 billion by 2010 on UAV and UAV-related technologies and will quadruple its use of UAVs in the field. As the awareness of market opportunities in UAV technology expands, so does the investment into the establishment of new companies and applications. Federal agencies such as the Department of Homeland Security's Border Patrol are pursuing the use of UAVs to meet their mandates for security and surveillance. In the private sector, energy, transportation/shipping, agriculture and environmental agencies are also interested in the utilization of UAVs.

The following chart highlights the UAV market value forecast over a 10-year period (2006-2015).



Source: US UAV Market Forecast 2006-2015, http://www.moireinc.com/MoireUAVMarketFeb2005.pdf)

States such as California, Maryland and Virginia currently own the greatest share of the UAV market. Currently, Texas has approximately a dozen UAV companies located throughout the state. As a state, Texas is ideally situated for border and Gulf of Mexico UAV-related activities. The state also has three spaceports and over three hundred general aviation airports that could serve as testing sites. There is market growth potential in the opportunities outlined below and Texas should aggressively pursue this market.

Market Growth Opportunities

1) Incorporate strategy to attract UAV companies to locate in Texas into the state's economic development plan.
2) Support current UAV companies in their growth and expansion strategies
3) Support private UAV companies to establish a center for testing and training
4) Work with military installations throughout the state to support their UAV efforts

5) Support Access Five, an industry-government project to create a system that would support UAVs in National Air Space (NAS)
6) Support higher education projects involved in UAV related matters
7) Foster state and congressional support
8) Become a national leader in implementing Department of Homeland Defense initiatives utilizing UAV technologies for border and port protection against terrorist threats
9) Provide support and assistance to UAV companies in working with the FAA to secure flight clearances on the three Texas spaceport facilities

Not simply about manufacturing vehicles, UAV additionally presents opportunities for Texas to play a major role in attracting research and development. Supporting the cluster also presents opportunities to recruit payload providers, support equipment, services such as training and MRO, flight services and integration.

With a strong forecasted growth, Texas should promote the adoption of UAV research, manufacturing of product and market expansion in terms of attracting companies, suppliers and vendors to support the growth. The Aerospace and Defense Cluster Team strongly recommends the building of opportunities in the UAV market space. UAV opportunities should be incorporated into the state's economic development plan as a target market. In conclusion Texas can play a part in manufacturing, surveillance, training and testing for the UAV business.

Sources

Document prepared by the Economic Development and Tourism division's Office of Aerospace and Aviation.

http://www.acq.osd.mil/usd/uav_roadmap.pdf Department of Defense Roadmap for Developing and Employing UAV's and UCAV's (Unmanned Combat Aerial Vehicles) over the next 25 years (2002-2027).

www.moireinc.com/MoireUAVMarketFeb2005.pdf U.S. UAV Market Forecast 2006 – 2015.

IV. Space Industry – Our Role in a New Era of Space Exploration

A. Window of Opportunity

There exists today, a finite window of opportunity for the state of Texas to launch its space industry on a path of growth toward diverse economic impact and relevance. This opportunity is defined by the nation's new Vision for Space Exploration combined with the unique capabilities and expertise of the Johnson Space Center and supporting space industry. The timeframe is defined by the terms of a visionary Texan in the White House and a new NASA Administrator who is both committed to the vision and to drawing on the traditional roles and strengths of the NASA Field Centers to achieve it.

The Vision for Space Exploration provides a roadmap for extending sustained human operations and research on distant planetary bodies – the Moon, Mars and beyond. This significant step takes human space flight from short-term sorties intended to demonstrate and evolve our capability to explore, to the establishment of complex research and habitation settlements to support long-term operations.

B. Innovation, New Technology and Partnership

The mission, capabilities and expertise of the Johnson Space Center, and its supporting space industry, position Texas to play a significant role in the development of spacecraft, systems, technologies, methodologies and missions to carry out the vision. However, the highly specialized nature of the mission of the space community has tended to isolate it somewhat from other key industries across the state. To successfully meet the objectives of the vision, this must change.

This new era of human space exploration calls for a broad range of industry expertise, technology and resources to address new challenges in the areas of energy, life support, medical research, transportation, robotics, communication and education. Combined with the unique core competencies of the current space industry, the state of Texas offers the experience, infrastructure and expertise to address these challenges and, in the process, develop a highly diversified, highly integrated new space development industry for the future.

Texas is uniquely positioned to seize this opportunity. The state can establish itself as the incubator for a new space development industry that focuses on the application and development of human productivity, ingenuity and capabilities in space. This emerging industry has potentially broad economic roots in the state of Texas based on the broad spectrum of expertise and resources that are required to research, develop, test, plan and execute human activities in space.

C. Action Plan

The state of Texas must adopt and aggressively pursue a strategy to:

1) Ensure full support and funding for the Vision for Space Exploration
2) Firmly establish the Johnson Space Center as the lead NASA field center for all human space operations (spacecraft, systems, technologies, missions and methodologies)

3) Create a business environment that encourages the growth of a highly diversified space development industry through legislation, communication, education and collaboration among the key industries in the state
4) Provide state-level leadership for the development of policies, resources, institutions and opportunity for the space development industry in Texas – a state-funded and chartered Space Commission

Sources:
Jeffrey Carr, United Space Alliance
Michelle Brekke, NASA/JS executive on loan to the Houston Technology Center
Marie Dalton, Executive Vice President, San Jacinto Community College Aerospace Academy
Harry Erwin, NASA/JSC executive on loan to the Bay Area Houston Economic Partnership
Bob Mitchell, Bay Area Economic Development Partnership
Dudley VanNess, CenterPoint Energy

V. Homeland Security Market Assessment and Business Opportunities in Texas

A. Homeland Security Industry Trends

September 11, 2001 brought homeland security to the forefront of the public's attention. The commitment at a government level to secure the borders across the U.S. has created the emergence of a homeland security marketplace. Opportunities to develop more advanced technologies and create a workforce of specialists fall in four critical areas:

1) Emergency Preparedness and Response
2) Protection of Critical Infrastructure and Major Information Networks
3) Border Control, Transportation Security
4) Chemical, Nuclear and Biological Response

A focus on homeland security strategic planning is touching all regions of Texas. The rapidly changing landscape creates opportunities for Texas' business to access new funding sources and gain the technology expertise needed to overcome internal and external threats on America. Texas has won and will continue to win defense contracts and grants for innovation and product development. This will have a high impact on the creation of an advanced workforce, ability to attract and retain quality companies and the validation to invest in critical infrastructure.

B. Technology and Key Market Opportunities for Homeland Security in Texas

Texas has a history of producing quality products in aviation, security and defense. Materials, hardware, tracking applications, vaccine and diagnostic science, aircraft fleets and ammunition have been designed and produced in Texas for decades. Some of the technologies that are and will continue to produce market opportunities include:

- Detection and Sensor Network Systems for Weapons of Mass Destruction (WMD), bombs, foreign substances
- Database Analysis and data mining for pattern and data recognition
- Critical Infrastructure design and construction. Includes telecommunications, information technologies (IT), physical barriers and technologies to protect buildings, inventory, government fleets

- Secure Identification and Recognition Technologies include biometric technologies (finger, optic, physical), behavioral characteristic technologies (profiling, voice, gestures)
- Advanced Material Sciences for developing better, smaller and cheaper WMD sensors, aircraft technology and human applications
- Medical and Biosciences to ensure the best pre and post hazardous event management

In 2004, Governor Rick Perry announced that 544 Texas jurisdictions would receive $54 million dollars in First Responder Equipment Grants from the Office of Domestic Preparedness (ODP). Jurisdictions are awarded grant funds based on proposals outlining needs and vulnerabilities. Texas HB 9, 78th Legislature, gives Governor Rick Perry the authority to oversee homeland security grants and fund proposals, administer emergency and security programs and provided the strategy to establish an advisory group, Critical Infrastructure Protection Council. Also included in the bill are protection guidelines Texas' 254 counties, critical infrastructure, emergency response plans, vulnerability assessments, information technology assets and a resource of Texas' primary expertise in homeland security.

C. Near-term Projects

1) Design of educational programs and core curriculum to produce a trained workforce to address current and future homeland security skill needs.
2) Create a resource bank to identify major agencies, companies and academic programs
3) Create a sub-committee of the Aerospace and Defense Cluster team to outline opportunities

D. Long-term Projects

1) Target companies with technologies and assets to support market segment objectives Examples include: information security, medical science, sensors
2) Identify companies and or labs where technology is being commercialized
3) Establishment of a Texas Homeland Security Center of Innovation.

E. Recommendations for the State of Texas

1) Educate regional economic development leaders about homeland security activities and agencies. Communicate the need for regional planning and compatible technologies in case of an emergency
2) Forecast workforce skills in the state economic development strategic plan
3) Foster entrepreneurial efforts for technology innovation and commercialization
4) Aid Texas-based companies with letters of recommendation, matching funds, tax incentives for purchases of equipment and workforce training
5) Fund and market procurement conferences, leadership networks and data resource banks of federal agency activity for Texas business development

Sources:
Governor's Cluster Committee for Aerospace & Defense, 2005
Texas Homeland Security Alliance, 2005.
Texas State Technical College (TSTC), 2004.
Department of Public Safety, Governor's Division of Emergency Management, State Coordinator, Jack Colley.

Department of Homeland Security. www.dhs.gov
Office of the Governor, Office of Homeland Security www.governor.state.tx.us

8.5 - Summary and Next Steps

In summary, the Aerospace and Defense Cluster has an opportunity to grow and be a recognized global competitor. This objective will take the dedication of all parties – government, industry, associations, non-profits and academia to determine what is the best allocation of state resources, what cluster strengths should be leveraged for economic prosperity and the execution of a statewide economic development plan. This assessment has focused on core issues to address strengths, weaknesses, opportunities and threats within the Aerospace and Defense Cluster. The interests of the regions have been brought to the attention of state and industry leaders. The execution phase of the cluster initiative should incorporate a commitment to strengthening the business climate, demonstrating commitment to commercialization strategies, allocating resources to growing the next generation workforce and driving investment into new technologies and companies.

9 – Cluster Team Acknowledgements

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Richard Stevenson	Lockheed Martin Aeronautics
Leland Williams	The Boeing Company

Prepared for the State of Texas by the Office of the Governor, the Texas Workforce Commission and the Texas Workforce Investment Council, in coordination with New Economy Strategies, LLC.

[1] New Economy Strategies LLC. Texas Workforce Commission

[2] New Economy Strategies LLC. Governor's Cluster Aerospace and Defense Executive Team

[3] Labor Market and Career Information of the Texas Workforce Commission

[4] New Economy Strategies LLC. Texas Workforce Commission

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