

Voices of the Oklahoma

Aerospace Industry Leaders



Improving Oklahoma's Workforce
and
Ultimately Our Economy

Executive Summary with Recommendations

Skills Gap Analysis Report - 2010



Final Draft





Anautics, Inc.

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January 2011

THIS PROJECT WAS FUNDED BY A U. S. DEPARTMENT OF LABOR BRAC IMPLEMENTATION GRANT AND THE OKLAHOMA GOVERNOR'S COUNCIL FOR WORKFORCE AND ECONOMIC DEVELOPMENT. THE OPINIONS EXPRESSED AND ARGUMENTS EMPLOYED HEREIN DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OF THE U.S. DEPARTMENT OF LABOR NOR THE OKLAHOMA DEPARTMENT OF COMMERCE.

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TABLE OF CONTENTS

TABLE OF CONTENTS	ii
AUTHORS AND CREDITS.....	iii
REVIEWS OF THE EXECUTIVE SUMMARY AND THE FULL REPORT	iv
AEROSPACE SKILLS PANEL PARTICIPANTS	1
CENTRAL REGIONAL SKILLS PANEL	1
EASTERN REGIONAL SKILLS PANEL	2
FUTURE SKILLS PANEL.....	2
INTRODUCTION	3
MISSION OF THE PROJECT	3
METHODS OF COLLECTING DATA.....	4
OKLAHOMA AEROSPACE OVERVIEW	5
CURRENT ISSUES DISCUSSED IN THE SKILLS GAP ANALYSIS	5
EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE WORKFORCE NEEDS.....	6
EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE CORE JOB SKILLS.....	6
EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE WORKFORCE EMPLOYMENT	7
EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE EDUCATION NEEDS AND PROGRAMS	8
EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE RETIRING WORKFORCE.....	8
EXECUTIVE SUMMARY OF AEROSPACE BEST PRACTICES.....	9
EXECUTIVE SUMMARY OF RECOMMENDATIONS.....	9

AUTHORS AND CREDITS

ANAUTICS, INC.

Anautics is a woman-owned certified, HUBZone certified small business with 10 years experience providing innovative technology solutions and research and development efforts to industry and government organizations. Anautics has a proven record of accomplishment for implementing programs and projects across the United States and throughout Department of Defense. Our project base consists of efforts at Tinker AFB, Engineering Division, Oklahoma Department of Commerce/Oklahoma Aeronautics Commission, and Ft. Benning, GA. Anautics was chosen in 2007 and 2008 to present as a Showcase Company at the National SBIR Conference, We won the Journal Record Innovator of the Year in 2008 and the 2010 Tinker and the Primes Small Business Award. Anautics has conducted three Skills Gap Analysis Research efforts in the Oklahoma City Area.

RESEARCHERS

SANDY SCAFFETTA JOHNSON, PH.D. conducted research with adult learners for the Oklahoma City Public Schools and a Skills Gap Analysis Report Oklahoma Business and Education Coalition. She served on the Advisory Committee for Performance Pay for Teachers for the Oklahoma Speaker of the House and also conducted research on and testified before the Joint Oklahoma Legislative Education Committee regarding First Year Teacher Programs for State Representative Ann Coody. She has nine publications and has presented 25 research and professional development activities locally, statewide, nationally and internationally. While teaching in Anadarko High School, she was honored as the District Teacher of the Year and nominated for the Presidential Award for Excellence in Mathematics and Science Teaching. In business, she was one of 50 nominations across the State of Oklahoma for the Woman of the Year. She currently serves on the Board and the Executive Committee for the Oklahoma Commission for Teacher Preparation and on the Board for the Oklahoma Professional Educators. She is a member of the State Chamber of Commerce, the Greater Oklahoma City Chamber of Commerce, the Midwest City Chamber of Commerce, the OKC Rotary Club 29, and is an Honorary Commander for the 552d Air Wing Command at Tinker AFB.

BILLY D. GASTON, PH.D. has extensive technical skills that cover a broad spectrum ranging from software architecture to implementation. He provides expertise in process modeling, data modeling, architecture design, data structures, text mining, and record linkage algorithm research and design. His formal education background in Mathematics and Computer Science and his experience in education provide a breadth of knowledge and experience. Dr. Gaston has an extensive history in research, having written several publications and presented locally, statewide and nationally. Dr. Gaston worked a number of years at Tinker AFB in association with Oklahoma State University conducting research on weapon system health data and designing and implementing algorithms and applications to enhance and maintain aircraft maintenance and sustainment systems. Dr. Gaston is the Chief Technology Officer and Vice President at Anautics, Inc. where he brings a high level of expertise that supports the mission, initiatives and innovations.

REVIEWS OF THE EXECUTIVE SUMMARY AND THE FULL REPORT

Robert J. Conner, SES, President/CEO, Aerospace and Defense, LLC. Former Director of the Air Logistics Center, Tinker AFB.

"Workforce needs are a key focus for industry in Oklahoma. Jobs are vacant in Oklahoma aerospace companies today because of a shortage of qualified candidates. As a state, we need to do a better job of equipping students for the work place. The solid recommendations in this report must be acted on. The skills panels have provided a great deal of good information and can provide the foundation for action to come. But, without resources, that won't happen. The challenge for the leaders of industry; workforce and economic development activities; and our educational system is to focus the resources needed to make it happen."

Reed Downey, Small Business Owner and President of the Board for KIPPS Schools in Oklahoma City.

This report clearly lays out the challenges Oklahoma faces in meeting the demands of the Aerospace Industry. The state of our education system is not new; it was developing and went unheeded even though the signs were there for well over 30 years. During those years industry had a great supply of well educated baby boomers as well as those who are now called the Greatest Generation..To turn the entire education system will take a major effort, but the demands of the industry are NOW. To fill the gap until the system can be restructured and rebuild, look to those schools such as KIPP and Harding Charter Prep and others that are already producing the kind of graduates who can succeed in the areas needed by the industry. Partner with them and help them expand rapidly to meet the needs of the industry. These schools are already centers of excellence, use them!

Col Edward Laverdure, Lt Col USAF (Ret), MA, Principal, Velocity Ventures in Longmont CO.

"This ground-breaking study by Anautics led by Dr. Johnson examines the current challenges in maintaining and developing the Oklahoma aerospace industry workforce and serves as a clarion call for our state's business leaders, educators, parents and students to engage now by taking the necessary actions to close critical gaps between expectations and performance at all levels in the system and create an inspiring vision of America's technological leadership in 21st century aerospace, astronautics, propulsion, and supporting sciences. It is a new operational environment and we must chart a course for aerospace advancement independent of Federal requirements -- carpe diem."

Tom O'Neill - President, Crossbow Consulting Inc

Former Deputy Director of the Oklahoma Aerospace Institute

"This report lays the foundation for a long-needed aerospace work force requirements and delivery system. That system brings industry, education and government together to deliver the work force the industry needs to ensure Oklahoma can compete in the global arena today and in the future."

Ben T. Robinson, Brig General, USAF, (Ret) - VP, Oklahoma School of Science and Mathematics

President/Owner, Sentry One LLC

In my over 8 years with the Oklahoma aerospace industry covering time as a consultant with a national company, the Executive Director of Boeing Aerospace Operations in Oklahoma, with the Oklahoma Aerospace Institute, with Oklahoma Career Technology Center and now as the President/Owner of an aerospace consulting LLC, I have never read a more comprehensive, data based, industry driven, actionable report. The amount of research and data supporting this report is eye opening. The fact that so much of this report was produced from interviews with industry leaders gives it unprecedented

credibility. The findings and recommendations are spot on. Right now we have many new leadership positions in the state such as our Governor, our Lt Governor, our Secretaries of Commerce, Education and Science and Technology and our Superintendent of Public Education. Each are stakeholders in this report and the aerospace industry. We must get behind this effort to keep it going and to provide the leadership and organization to make it worthwhile and enduring. Oklahoma has an opportunity to be an innovative, pace setter in building significant relationships among industry, education and Government. We want all to see that Oklahoma is open for aerospace business.

DRAFT

AEROSPACE SKILLS PANEL PARTICIPANTS

The following industry leaders, education provider leaders, government representatives and others participated at least once in our Skills Panel activities.

CENTRAL REGIONAL SKILLS PANEL

AEROSPACE INDUSTRY

AAR
Boeing
Chromalloy
Design Intelligence Inc
Defense Logistics Agency (DLA)
Frontier Electronic Systems Corp.
General Dynamics IT
Lear Siegler Services
LSI
Pratt & Whitney
Pro-Fab Inc
URS
Valco, Inc.

EDUCATION PROVIDERS

Autry Technology Center
Canadian Valley Technology Center
Francis Tuttle Technology Center
Gordon Cooper Technology Center
Metro Technology Center
Oklahoma Career Technology Systems
OSU - School of IE&M
Rose State College
SOSU
University of Oklahoma K-20 Center

GOVERNMENT

Central Oklahoma Workforce Investment Board
Federal Aviation Administration
North Central Workforce Investment Board
Oklahoma Bid Assistance Network
Oklahoma Center for the Advancement of Science and Technology
Oklahoma Department of Commerce
Oklahoma State Regents for Higher Education
OSU / Aging Sys Sustainment and Enabling Tech (ASSET)
OSU Center for Innovation and Economic Dev (CIED)
OSU Information Technology
Southwest Workforce Investment Board
Tinker AFB, OC – ALC
US Department of Labor/ETA/OA
Vance AFB

OTHER

CYR Consulting Inc
GDH Consulting
Greater OKC Chamber of Commerce

EASTERN REGIONAL SKILLS PANEL

AEROSPACE INDUSTRY

American Airlines
Cherokee Nation Industries
Cinch Connectors
Da-Pro Rubber, Inc.
Diehl Aero-Nautical Co
Executive AirShare
First Wave
Flight Safety International
Hill Industries
L-3 Aeromet
Lucas Finishing
Lufthansa Technik
Malone's CNC Machining, Inc.
Mint Turbines
Nordam Group
Precision Machine
Raytheon
Spirit AeroSystems, Inc.
Tulsair Beechcraft

GOVERNMENT

Eastern Workforce Investment Board
Indian Nation COG
McAlester Army Ammunition Plant
OBAN
Oklahoma Aeronautics Commission
Oklahoma Center for the Advancement of
Science and Technology
Oklahoma Department of Commerce
Oklahoma Manufacturing Alliance
Tulsa Workforce Investment Board
Education Providers
Central Technology
OK Dept Career and Tech Education
OSU Center for Innovation and Economic Dev
OSU Information Technology
Tulsa Technology Center

OTHER

Horizon Business Concepts
Liberty Partners
Managing Creativity
Tulsa Metro Chamber of Commerce
Workforce Solutions

FUTURE SKILLS PANEL

AAR
Acorn Growth Companies
American Airlines
Ardmore Development Authority
ARINC
BizJet International
Capital Aviation
Design Intelligence Incorporated, LLC
Enviro Systems
Flight Safety International

General Aviation Modifications (GAMI)
Lufthansa Technik
FAA/Mike Monroney Aeronautical Center
Oklahoma Aeronautics Commission
Oklahoma Aerospace Alliance
Oklahoma Aerospace Institute
Oklahoma Department of Commerce
Spirit AeroSystems, Inc.
The Boeing Company
Tinker AFB, OC – ALC
University Multispectral Lab

INTRODUCTION

MISSION OF THE PROJECT

This Project was funded by a U. S. Department of Labor BRAC Implementation Grant and the Oklahoma Governor's Council for Workforce and Economic Development. In March 2010, Anautics was awarded a portion of the grant to conduct an aerospace Skills Gap Analysis study, to establish and facilitate three aerospace skills panels for the purpose of understanding the state of Oklahoma's aerospace industry workforce pipeline today, and to develop a process to collect, revise, and update data relative to the state's Aerospace industry and skills gap research information. In order to understand the workforce pipeline, it was necessary for the results of the study to reveal answers to the following questions: how well does the pipeline function, how can the pipeline immediately be improved, and what long-term innovations can be implemented to maintain and grow the aerospace industry in Oklahoma. Throughout this study, the workforce "pipeline" terminology is used. This "pipeline" is defined as the pathway in education that eventually leads to employment in the aerospace industry at any entry-level position. This includes but is not limited to touch labor, information technology, engineering, program and business managers, and other aerospace related occupations.

This study features an industry led systematic examination of recruitment, employment, retention, and retirement within the aerospace workforce with emphasis on its present and future state. It is a vocal, documented instrument of the Oklahoma aerospace industry, providing insights into the aerospace industry in Oklahoma on four primary challenges facing the state. Those challenges are:

- the aging of the aerospace workforce,
- the stability of space-related programs,
- the skills required for major programs, and
- the status of the pipeline for future workers.

Of these four challenges, this report addresses all challenges listed above with the exception of space-related programs. This report also serves to capture the issues surrounding these ongoing challenges from Oklahoma aerospace leaders and highlights the needed urgency to address these issues for the sake of the Oklahoma aerospace industry and economy. Research indicates Oklahoma will struggle to train and retain its highly skilled workforce in the near future if decisive actions are not taken. The Skills Gap Analysis, the Skills Panels, and the Aerospace Workforce Website further the actions recommended in the "Strategic Plan for the Growth of Oklahoma's Aerospace Industry" completed in 2009.

There were three major objectives of the Aerospace Workforce Project.

- A. Provide staff support for facilitation and staff support for the three skills panels

1. Processes used to build and maintain the Panels
 2. Statistics on Panel participation
 3. Continued support of the Panels
 4. Training for the WIB Directors
- B. Delivery of a comprehensive aerospace Skills Gap Analysis Report
1. Methods of collecting data
 2. Review of data collected thus far
 3. Review of activities for future panel meetings
- C. Continuing Process to Update and Revise the Workforce Requirements Information within the Skills Gap Analysis Report

This study is intended to represent voices of the Oklahoma aerospace industry.

It is also intended to help increase worker productivity, increase the number of entry-level workers who eventually will need minimal on-the-job training, provide access to adequate numbers of qualified workers, increase the number of workers who have the necessary basic skills, increase worker morale, and increase worker loyalty to their RSP participants. This study should provide a decision-making instrument for the stakeholders in the Oklahoma Aerospace Industry.

METHODS OF COLLECTING DATA

Several methods were used for collecting data throughout the study. Primary research was collected and analyzed from:

- Regional Skills Panels Focus Group Questions
- Future Skills Panel Personal Interviews
- Future Skills Panel Focus Group Questions
- Online Supplemental Surveys for Panel Participants
- Online Questionnaires for non-Panel Aerospace Companies
- Focus Questions for Government Service Supervisors of Engineers and Touch Labor
- Other personal interviews

Secondary research was gathered from a summary of relevant existing research and literature. Current skills, knowledge, and abilities of the aerospace workforce were also identified throughout the study. A literature review is provided in each section highlighting existing research relevant to the section topic. Prioritization and importance of the processes involving recruiting, hiring, and retaining/retention were investigated and analyzed as well.

A final Joint Skills Panel meeting was held in January 2011 where participants from both the Central and Eastern panels reviewed sections of the Skills Gap Report that includes responses of

the panels to validate the findings. The response was overwhelmingly supportive of the report and of the findings.

NOTE OF CAUTION

The results of this study are based in part on the Regional Skills Panels (RSP) which included the voices of at least 33 industry representatives, 24 aerospace-related government representatives, 15 aerospace-related education and training providers, 8 other aerospace-related companies that comprised the Regional Skills Panels. Additionally, 20 senior executive leaders participated in the study that comprised the Future Skills Panel. Online surveys consisted of distributing two surveys to over 350 aerospace companies or entities with only a less than 10% return.

OKLAHOMA AEROSPACE OVERVIEW

Over the past several years, Oklahoma's estimated \$12.4 billion aerospace industry has been established as a dominant economic catalyst for the state's economy. Research consistently gives the aerospace industry credit for providing Oklahomans with over 72,000 jobs, which have wages above the state average, and approximately 145,000 total jobs directly, indirectly and induced. The average wage is recorded at \$55,000, almost double the state average. Manufacturing, Repair and/or Overhaul (MRO), Original Equipment Manufacturer (OEM) and air transportation are three primary sectors of aerospace impacting Oklahoma. Other subsectors are supply chain management, engineering and modifications, manufacturing, emerging technologies such as unmanned aerial systems/vehicles, and Fixed Base Operators (FBOs). This Skills Gap Analysis will identify gaps that exist between the industry needs and core job skills, education programs, employment processes, and retiring workforce.

Because of its strong MRO presence, Oklahoma's aerospace workforce consists of a large number of jobs at the technician, trade, and engineering levels. The aerospace workforce encompasses all aspects of the government and commercial industries that include manufacturing, MRO, parts suppliers, research and education providers. To facilitate the large number of aerospace activities performed across Oklahoma, the industry strives to continue to build a credentialed workforce with specific licensures and certifications.

CURRENT ISSUES DISCUSSED IN THE SKILLS GAP ANALYSIS

- Oklahoma Aerospace Workforce Needs
- Oklahoma Aerospace Core Job Skills
- Oklahoma Aerospace Workforce Employment
- Oklahoma Aerospace Education Needs and Programs
- Oklahoma Aerospace Retiring Workforce

➤ Aerospace Workforce Best Practices

EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE WORKFORCE NEEDS

The findings for the Oklahoma Aerospace Workforce Needs begin with an employer perspective of qualifications of high school graduates who apply for jobs in the aerospace industry. It was determined that, in general, these young people are not workforce ready. Many have little to no background in the Science, Technology, Engineering, Mathematics (STEM) curricula, nor have they mastered basic mathematics and reading skills. There exists a direct correlation between the percent of applicants who are qualified for entry-level aerospace jobs and the American College Test (ACT) Profile Report for Oklahoma college-ready graduates. This suggests that many of the underlined issues find their source in Oklahoma's K-12 education system.

Industry workforce readiness demands higher academic expectations and more rigorous coursework in the STEM courses. There is a need for new hires to be able to communicate verbally and clearly in writing. They should also possess the ability to work in a team environment. As indicated in this report, many entry-level aerospace employees lack soft skills such as good work ethic, punctual attendance to work, reliability, time management, and appropriate dress. Although some aerospace entry-level employees possess documentation for necessary aerospace certification or educational requirements, in practice many do not have depth of knowledge in order to perform an aerospace job unsupervised. Additionally, some aerospace employees will not be able to qualify for a security clearance because of poor choices in the past such as drug usage, drug abuse and domestic violence. While many applicants may pass the technical requirements for a position, they cannot pass readiness exams such as drug tests.

Recruitment and retention of the aerospace workforce are the lifeblood of the aerospace industry in order to prepare for a potential retiring workforce. As revealed in this report, recruitment and retention of the aerospace workforce presents challenges for the commercial industries because of the Obama administration's current policies that have led to an upsurge in Government hiring, (e.g. in-sourcing) at the expense of contractors. Moratoriums have been placed on state tax incentives even though these incentives are critical for encouragement and growth of high tech aerospace jobs in Oklahoma. Another issue found was industry's challenges in recruiting potential aerospace employees to Oklahoma because of a lack of knowledge and appreciation for the state's qualities. To address our future workforce supply needs, we need to market Oklahoma better as a great place to live and raise a family and to promote aerospace as an important economic industry in Oklahoma.

EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE CORE JOB SKILLS

From the needs assessment, the following issues were discussed at length during the Regional and Future Skills Panels. The aerospace industry, as a whole, needs to establish core job skills standards and certifications so there is consistency in job descriptions and job requirements. Subsets of the licensure for Airframe and Powerplant may be acceptable licensures that would promote more precise skill sets

and less training time. Currently the FAA's A&P License is the only industry-accepted certificate. There clearly exists a need for additional "subsets" of certification. There also exists a need for better training in regulations of agencies such as: Federal Aviation Administration, European Aviation Safety Agency (EASA), Civil Aviation Administration of China (CAAC), and regulations such as: the International Traffic in Arms Regulation (ITAR), and Export Administration Regulations (EAR). In addition, networking capabilities among aerospace companies may alleviate the need for high impact/low number type of employees in medium to small companies. Currently in Oklahoma, there is need for more up-to-date training for specialized positions such as Metallurgical and Optical Engineers. Currently, employers are forced to hire out of state to find workforce qualified to fill these positions.

Scientists and engineers need to continue the research and development that is central to the economic growth of our country. Technologically proficient workers are needed who are capable of dealing with the demands of a science based, high technology workforce. More training for specialized skills needs to be developed. These skills account for about 70% of the employment needs. In-house programs need to be presented in order to upgrade mid-level managers to find individuals who can "learn and grow." Additionally, the education of voters and citizens is critical so they can make intelligent decisions about public policy and understand the world around them.

EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE WORKFORCE EMPLOYMENT

Discussions concerning workforce employment flushed out many gaps such as the need within the aerospace industry to obtain well-defined descriptions of what the phrase "fully qualified employee" dictates as far as workforce job skills and responsibilities. The need for training in soft skills, which was discussed at almost every skills panel meeting, translates that lack of responsibility, lack of respect, and lack of high expectations that appear to be the rule rather than the exception in the public school experience. This may be a cultural issue; however, it is everyone's problem when it affects the job market and the economic development of Oklahoma. As a result of this study, the following gaps were identified between the aerospace industry expectations in applicant/entry-year employee performance and the reality of applicant/entry-year employee performance.

The following are gaps between the aerospace industry workforce job opportunities and capabilities, and the career training mechanisms that exist in the public schools:

- Significant gaps exist between the entry-level training needed and training provided by education institutions;
- A gap exists between the aerospace industry workforce job opportunities and capabilities and the career training mechanisms that exist in the public schools;
- A gap exists involving communications between the aerospace industry skill sets requirements and the training provided by education institutions; and
- A gap exists between aerospace industry training, job shortages and surpluses and programs available in education institutions. Better alignment of programs with labor shortages would shorten the work-ready timeline and possibly save companies some of their in-service training.

EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE EDUCATION NEEDS AND PROGRAMS

According to a National Task Force on Public Education 108 in 2005 out of 50 states and the District of Columbia, Oklahoma public schools ranked:

- 40th on 4th grade reading proficiency tests
- 43rd on 4th grade mathematics proficiency tests
- 32nd on 8th grade reading proficiency tests
- 42nd on 8th grade mathematics proficiency tests

Because of the low performance indicators of Oklahoma education, discussions in the Skills Panels proposed that the Oklahoma aerospace industry needs to develop effective youth mentoring programs through partnerships with industry and schools. Additionally, there is a need to develop more partnerships between industry and education; provide peer mentoring for teachers to help with student achievement; financially support the needs of the education communities; and to specifically allocate more funding for math and science specialists. There is also a necessary to encourage integration of the curriculum across various content areas and to model our education programs after other countries that have had academic success, utilizing those concepts that would work well in our education system.

Educators and administrators alike need to support the Oklahoma Aerospace Summit Education and Training Day; support extension of days in school year and other measures that improve educational rigor; help teachers better understand real world aerospace applications within current curriculum; provide opportunities over the summer for teachers to “shadow” industry members; provide summer academies for teachers, students, and counselors; and provide and promote internships for teachers in the summer; and to educate teachers in the importance of the STEM curriculum, both near-term and long-term. Furthermore, schools need to encourage a more hands-on, interactive, project-based approach to learning and encourage and initiate aerospace-related career and science fairs; and there is a need to discourage teaching to the state mandated tests. The participants also discussed a need to market the aerospace industry as a viable, exciting, and rewarding career that has many different levels of job categories and applications of science and mathematics.

EXECUTIVE SUMMARY OF OKLAHOMA AEROSPACE RETIRING WORKFORCE

It is predicted that 2011 will be a peak year in employment in Oklahoma and then employment numbers will begin to start tapering off partially as a result of the projected retiring workforce. Thus, there is a critical need for Oklahoma aerospace companies to immediately begin preparing for this projected loss and replacement. When the retiring workforce issue was addressed with Skills Panel participants, many areas of concern were discovered and/or validated. The aerospace companies and the industry need to prepare for the exodus of the Baby Boomer aerospace workforce and become more proactive in sponsoring retirement workshops to inform the retirees about their benefits. In addition, industry

needs to increase awareness in the public of the employment opportunities that exist in aerospace and to provide assistance to the workforce to help understand how one can traverse from one industry occupation to another. Mechanisms need to be in place to capture the knowledge that will be lost once the retirement group is actually retired in order to retain the knowledge and make task transitions smooth for remaining employees. Finally, aerospace businesses need assistance in finding ways to network in order to support their workforce requirements across industries.

EXECUTIVE SUMMARY OF AEROSPACE BEST PRACTICES

To address effects of the economic pressures, states across the United States are creating new employment strategies and initiatives that:

- Continue to assess the current workforce pool and incoming workforce needs;
- Continue labor studies to identify workforce areas of need;
- Develop recruitment, retention, and training strategies;
- Recruit workers from non-aerospace industries;
- Provide workers with infrastructure, social services, quality of life (to retain them);
- Train and educate local workforce by providing more specific technical classes;
- Work with education providers to establish appropriate STEM curricula for P-20;
- Establish partnerships with key institutions to coordinate a workforce response;
- Respond to the unique needs of military and federal civilian spouses and their families;
- Streamline licensing transfer processes; and
- Offer training, educational access, and tuition assistance, particularly for veterans who may have served in areas parallel to job categories in aerospace.

EXECUTIVE SUMMARY OF RECOMMENDATIONS

Aerospace industries must address the challenge that it is not the responsibility of the Government to keep the aerospace industry going. It is the responsibility of the industry. Innovation and research drive this as expressed by Burt Rutan in a presentation titled Rutan Sees the Future of Space, February 2006, Monterey California, at an Inspiration and Innovation for the New Space Race meeting. He stated, “You don't have innovation cycles if the government develops and the government uses it. You know, a good example, of course, is the DARPA net. Computers were used for artillery first, then IRS. However, when we got it, now you have all the level of activity, all the benefit from it. Private sector has to do it.” According to Rutan, “We're entering a second generation of no progress in terms of human flight in space. In fact, we've regressed. We stand a very big chance of losing our ability to inspire our youth to go out and continue this very important thing that we as a species have always done. We need to inspire them, because they need to lead us and help us survive in the future.” While this illustration specifically addresses space-related programs, it also directly applies to the aerospace industry. The excitement and fulfillment of aviation and aerospace efforts should be

marketed in our schools and across industries to encourage the brightest and best young people to consider a career in aerospace.

The time to take action is now. According to a new study published by the Atlantic in December 2010, *Your Child Left Behind*, old excuses such as teachers' salaries and classroom sizes, and diversity of the population cannot be used any longer to account for the low achieving performances of young people educated in our schools. This study compared our best students, those who had at least one parent with a college degree, affluent and white to the accomplishments of foreign students who took the PISA (Programme for International Student Assessment). US young people used in this comparison are not generally subject to language barriers or racial discrimination. As a result of the study findings, "these relatively privileged students do not compete favorably with average students in other well-off countries. On the percentage basis, New York state has fewer high performers among white kids than Poland has among kids overall. In Illinois, the percentage of kids with a college-educated parent who are highly skilled at math is lower than the percentage of such kids among all students in Iceland, France, Estonia, and Sweden." Oklahoma ranks well below both of these states. According to an Organisation for Economic Co-operation and Development (OECD) 2010 *Strong Performers and Successful Reformers in Education, Lessons from PISA for the United States*, there is a significant cost to the international achievement gap. Researchers used an economic model to relate cognitive skills as measured in PISA and other international tests to economic growth. Even small improvements translate to large Gross Domestic Product (GDP) gains. For example, raising our average PISA scores by 25 points over the next 20 years could translate to a gain of USD 41 trillion for the US present value of future improvements in GDP. Bringing all US students to a baseline level of proficiency for the OECD, could imply GDP increases for the US of USD 72 trillion. As the reader will find in this document and the Skills Gap Analysis Report, aerospace employers need work-ready, college-ready entry year employees, and the industry leaders are ready to get involved in the education system for the advancement of the industry.

During the research study, the participants were asked after attending five skills panel activities to brainstorm what is needed from the industry to move forward now to take action to improve the aerospace workforce in Oklahoma. Many of these recommendations for action are included in this section of recommendations and in the Year 2 proposal.

1: PROVIDE RECOMMENDATIONS TO HELP INDUSTRY BETTER IDENTIFY ITS ACTUAL NEEDS.

- Create a Governor-appointed position where the appointee will coordinate all state resources used to support attraction and growth of the aerospace industry. This person should be agreed upon by Common Education, Higher Education and CareerTech and be able to build collaborative efforts among the education providers, be accountable to the governor, be responsive to industry customers to oversee all the workforce issues related to aerospace business attraction projects for the benefit of the growth of the Oklahoma economy and the

improvement of the quality of living in Oklahoma.

- Develop standard job descriptions, certifications, licensures to aid industry in better defining their existing workforce;
- Identify or establish an approved aerospace working group to include both industry and education providers that will serve as a formal platform to communicate actual needs across the industry;
- Provide Oklahoma industry ongoing access to the Aerospace Workforce Center website to report workforce information so that the state/industry will have a better picture of their workforce pipeline;
- Continue current Skills Panels, transforming them into working groups with action items to specifically address solutions for gaps revealed in this report;
- Investigate and encourage large company to small company mentoring programs to build and grow relationships and allow mentoring companies to help others identify weaknesses and provide them with guidance to meet their immediate needs using proven processes; and
- Enhance methods, tools, and techniques to ensure aerospace companies have access to information and training for workforce forecasting to assist them in identifying and addressing future needs.

2: PROVIDE ASSISTANCE FOR EDUCATIONAL STANDARDS FOR EDUCATIONAL FACILITIES AND EDUCATION CURRICULUM.

- Establish a standard communication platform between industry working groups and education working groups to ensure that providers are aware of what industry expects from incoming employees, primarily at the entry-level;
- Identify a collection of industry experts to better define their core job skills standards so that the education providers could better plan their program curricula to fit those standards; and
- Investigate partnerships between education providers and industry that would aid in providing up-to-date equipment to education facilities for workforce training.

3: PROVIDE RECOMMENDATIONS TO SHORTEN THE TIMELINE FROM WHEN AN EMPLOYER IDENTIFIES AN EMPLOYMENT NEED TO WHEN THAT EMPLOYER HAS A PRODUCTIVE WORKER.

- Create collaborations between industry and P-20 systems to establish internships, co-ops, tours, fairs;
- Identify introductory aerospace courses most needed by entry-level personnel and establish widespread curriculum among education providers (basic instruction in: Introduction to Soft skills, general manufacturing, familiarization with jets, six sigma, lean, ITAR, FAA regulations, aerospace standards);
- Leverage company scholarships for teachers and students to attend education entities or company sponsored summer academy;
- Establish programs to place industry personnel in schools to ensure students are aware of aerospace industry opportunities and requirements so students know what is expected upon entering an aerospace career field;
- Highlight companies with successful employee mentoring programs;
- Establish core job skills standards and certifications to ensure consistency in job descriptions and job requirements enabling employers to know exactly what skill set they are hiring;
- Establish stable, consistent communications with education providers on aerospace workforce job category labor shortages and surpluses; and

- Better align programs with labor shortages in order to shorten the work-ready timeline and possibly save companies some of their in-service training.

4: PROVIDE RECOMMENDATIONS TO IMPROVE WORKER AGILITY (ABILITY TO MOVE FROM ONE AREA OR INDUSTRY TO ANOTHER) AND PROVIDE SUGGESTIONS FOR DEVELOPING A CROSS-INDUSTRY TRAINING CURRICULUM WHICH WOULD PROVIDE AEROSPACE WORKERS WITH GREATER AGILITY AND CAPABILITY WITHIN THE OVERALL WORKFORCE.

- Develop a working group which would determine what requirements are necessary to “improve” worker agility;
- Work with Tinker AFB and our other military installations to determine best practices they use to “broaden career paths” of employees and determine what is applicable to the industry;
- Develop additional certifications, standardized skill sets that would go across industries; this would involve utilizing working groups from: health care, energy, manufacturing, aerospace, agriculture, logistics, etc.;
- Develop a consortium of cross-industry personnel so each can better understand the functions of the other; and
- Encourage investigations of application of skills in the cross-industry meetings.

5: PROVIDE RECOMMENDATIONS ON HOW OKLAHOMA TRAINING AND EDUCATION ORGANIZATIONS CAN ASSIST INCUMBENT WORKERS WITH EMPLOYEE GROWTH AND DEVELOPMENT.

- Develop collaboration platform for industry officials and research college/universities to research solutions to existing industry problems, provide workers with access to research and emerging technology;
- Define and develop cross-industry training curriculum in order to accomplish tasks in Recommendation 4;
- Spearhead incentive programs to train or re-train existing workers;
- Provide better awareness of Workforce Investment Boards (WIBs) to industry and process to leverage their resources;
- Encourage participation in the MRO university;
- Establish methods to educate WIBs on industry area needs;
- Incorporate programs other states (e.g. Washington and Arizona) utilize to provide reimbursement for expenses used for eligible training;
- Coordinate efforts to speak to parent groups to help them understand why children need to prepare for the STEM curriculum as early as the elementary grades; and
- Coordinate job fairs for youth.

6: NEAR-TERM AND LONG-TERM WORKFORCE OPPORTUNITIES AND SOLUTIONS.

- Near Term
 - Begin a campaign in the public schools to educate young people on the aspects of the aerospace industry with a focus on middle school because of early intervention for STEM;
 - Determine Best Practices in University programs to recruit engineering majors;
 - Determine how to recruit more women and minorities into the aerospace programs;
 - Develop a program to alleviate the causes of early voluntary attrition; and
 - Build up the Aerospace Summit to facilitate more networking within and across industries.
- Long Term
 - Work at the state government levels to build rigor in middle school and high school curricula that includes the STEM curriculum;

- Develop programs for state-wide internship programs for teacher/counselor during the summer months with aerospace industries;
- Include K-12 administrators and counselors as part of working/focus groups;
- Develop standards for work-ready/college ready requirements; and
- Work closer with Common and Higher Education counselors and Colleges of Education.

7: PROVIDE RECOMMENDATIONS REGARDING A LONG-TERM STRUCTURE FOR AEROSPACE WORKFORCE.

- Develop certifications and/or licenses which might support or augment the existing A & P certification;
- Begin standardization of job categories/job titles/job descriptions;
- Develop career paths for ex-military (veterans) for quick insertion into the aerospace industry;
- Develop methods for aerospace industry representatives to network, share business capabilities and share work loads;
- Develop long term relationships with the Education sector through Summer Academies for teachers, principals, and counselors; and
- Develop academic aerospace-related camps for children during off-school days.

8: PROVIDE RECOMMENDATIONS REGARDING HOW TO COMMUNICATE WITHIN WORKFORCE WIBs, PANELS, THE INDUSTRY, THE CAREERTECH SYSTEM, COMMUNITY COLLEGES, UNIVERSITIES, INDUSTRY TRAINING OPERATIONS, THE MILITARY, ETC.

- Develop quarterly newsletters that highlights activities from entities;
- Establish working group with representatives from each organization to identify ways to leverage existing resources to aid shared training, equipment use and/or facility usage;
- Leverage established relationships to eliminate duplication of effort among agencies and establish a complete inventory analysis of what programs/activities/entities have been established in Oklahoma to ensure they are being adequately marketed and utilized by their intended audience; and
- Develop regular meetings with existing panel members, provide joint meetings annually.

9: IDENTIFY NEEDS THAT COULD BE MET WITH EXISTING ENTITIES, E.G. OAC AND ITS PROGRAMS OKLAHOMA AEROSPACE INSTITUTE (OAI) AND CENTER FOR AEROSPACE SUPPLIER QUALITY (CASQ) AS DIFFERENT FROM SUPPLIERS.

- Lead new certification efforts;
- Lead collaboration among the common state aerospace entities and industry organizations so that working groups can strategize as to how to best connect and network with aerospace companies in Oklahoma;
- Continue developing industry-led functionalities for the Aerospace Workforce Center website.

10: RECOMMENDATIONS FOR PREPARING FOR THE EXODUS OF A RETIRING WORKFORCE.

- Begin to develop ways to keep retiring workforce on staff a few hours a week for mentoring/training or to send to the classroom;
- Begin to educate our youth now on the type of jobs that are involved in the aerospace industry;
- Work with industry to investigate current processes that provide more on-the-job training where a young person can shadow a mentor (pre-retirement);
- Investigate Best Practices of Oklahoma aerospace companies as they plan and prepare for transitions as a result of a retiring workforce.

11. RECOMMENDATIONS TO CONTINUE THE WORKFORCE DATABASE TO CAPTURE THE AEROSPACE WORKFORCE DATA.

- Continue development of the website with guidance from industry;
- Continue to train Human Resources to input data into the database at least quarterly to gain information on the current workforce by job category, the number of people “on the bench,” the number of employees expected to retire in the next three years, the estimated forecast in hiring during the next quarter, the estimates on cost of training;
- Develop training manuals for the aerospace companies as they learn to navigate the aerospace workforce database; and
- Continue developing networking capabilities among aerospace companies in Oklahoma.

ACKNOWLEDGEMENTS

Aeronautics would like to acknowledge and thank each of our aerospace industries, education providers, government and other representatives who participated faithfully in the Skills Panel meetings and provided time away for the workplace in order to assist in documentation of the industry voice. Without the participation, openness in discussions, and valuable input, this report would not have been possible. Thanks to the U.S. Department of Labor, the Oklahoma Department of Commerce, the Oklahoma Aeronautics Commission, for their guidance and their contributions to the funding of this project. Thank you to Veritas Consulting for the program management, input, guidance, and assistance provided in this project. Finally, thank you to all of our reviewers listed on page v of the full report. Your comments, suggestions, and support enabled us to fine-tune the document for publication.

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