Aerospace Industry

PIPELINE STUDY

Prepared for:

Workforce Florida, Inc.

by

Employ Florida Banner Center for Aviation & Space

Workforce florida, inc.

EMPLOY FLORIDA BANNER Center Aviation & Space

Aerospace Resource Center
Cecil Commerce Center
13450 Lake Fretwell Street
Jacksonville FL 32221
Phone (904) 997-2842

TABLE OF CONTENTS

EMPLOY FLORIDA BANNER Center
Aviation & Space

Preface

The aviation and space industries are extremely important to Florida's economic vitality. A January 2005 assessment by Workforce Florida, Inc. noted that "Florida's non-military aviation and aerospace industries comprised almost 1,600 companies, employed almost 90,000 people, and generated almost $50 billion in direct sales—the third largest segment of Florida's economy."

Economic growth requires robust industry--which requires a trained and available workforce. It follows, therefore, that the process for preparing and sustaining qualified workers within the workforce takes on a priority all its own.

On-going changes within the aerospace industries, however, are impacting workforce training and educational requirements. Three items draw immediate attention: (1) the convergence of technologies used in the design and development of airplanes and spacecraft, (2) broader skill set requirements for entry-level aerospace technicians, and (3) the aging workforce and loss of technical talent.

Employers need available, knowledgeable, and skilled workers who can keep up with the rapid pace of technological change. An aerospace "pipeline" exists to make this happen. A "pipeline" can be defined as a series of *entry* and *exit* points in a **process** that links *educational* resources and programs with existing *workforce* programs in ways that effectively and efficiently meet the needs of *business and industry*. As this report will show, not all elements of the aerospace pipeline are linked, i.e., they don't work together. Addressing this issue is the thesis of this report.

Partnerships and program alignments within the pipeline are critical to producing available workers with relevant knowledge and skills for industry. Models will be used to assess pipeline linkages and help reveal gaps within the process. This report will conclude with recommendations to investigate areas that address those pipeline weaknesses that hinder or prohibit the implementation of industry-supported strategies to confront critical workforce shortages.

Special thanks to the Aerospace Resource Center (ARC) staff who helped research and complete this report:

- Sam Fischer for his cogent analysis, composition, and graphical expertise
- Jennifer Thomas and Amber Harrell for their diligent fact-finding and research of relevant support materials as well as their overall contributions as growing experts in the aerospace pipeline and workforce development fields.

Mitch Kozak
Program Manager
Aerospace Resource Center of Florida

Purpose and Tasking

Analysis of industry workforce skills and recent student performance trends in science, technology, engineering, and mathematics disciplines reflects a disturbing gap between industry needs and required workforce availability and capabilities. A pipeline of workers is vital for the development and sustainability of the state's aerospace industry – an industry that is critical to Florida's economy.

The purpose of this study is to detail the components, process, and dynamics for generating a pipeline of skilled workers for the aerospace industry. This focus will present a three-fold perspective and analysis of the aviation and space industry business-workforce construct:

- Descriptive: What components currently make up the "aerospace pipeline"?
- Diagnostic: What gaps or shortcomings in capacity and capability exist?
- Prescriptive: Given current status and gaps, what requires action? What is necessary to make the current pipeline more comprehensive and responsive to industry's needs? What are the priorities today? And tomorrow?

This "pipeline study" will assist the ARC in its efforts to identify aerospace training requirements. In addition, it will help implement workforce solutions that address the concerns and plans for assessing, designing, and implementing a "connected" and mutually supportive aerospace industry pipeline. Potential action-items that may result from this study include:

(1) Generating a pipeline of skilled workers for that industry through recruitment, articulation of programs, and collaboration with organizations that serve job seekers;
(2) Developing articulation agreements to implement the 1+1 program and provide industry specific training beyond traditional institutional boundaries. This will entail brokering and providing training and education statewide, as funds will allow.
(3) Conducting aviation and space summer camps to promote developmental math and science skills – and associated aerospace careers – for elementary, middle- and high-school students;
(4) Working with magnet schools and technical centers to create articulation agreements that provide additional pathways for increasing the pipeline of skilled workers;
(5) Developing skills- and knowledge-based curricula which align with career pathways and workforce requirements of the aerospace industry; and
(6) Assisting workers in declining industry sectors in their transition to meaningful employment elsewhere in the aerospace industry or into other high-growth industries.

Processes aside, what's necessary to make this all happen are comprehensive business, education, and workforce development partnerships that create innovative and mutually reinforcing approaches to address the workforce needs of industry while also effectively helping workers find good jobs with good wages and promising career pathways in the aviation and space industries.[1]

Having just completed its initial 18 months of existence, the ARC will use the information and analysis from this report to (1) identify gaps, (2) uncover opportunities for "strengthening" the many pipeline connections or pathways, and (3) generate a roadmap for fully developing a robust pipeline of future aerospace workers.

[1] U.S. Department of Labor Employment & Training Administration; Aerospace: Local solutions with National Applications to Address Aerospace Industry Workforce Needs; www.doleta.gov, June 26, 2007

DESCRIPTIVE:

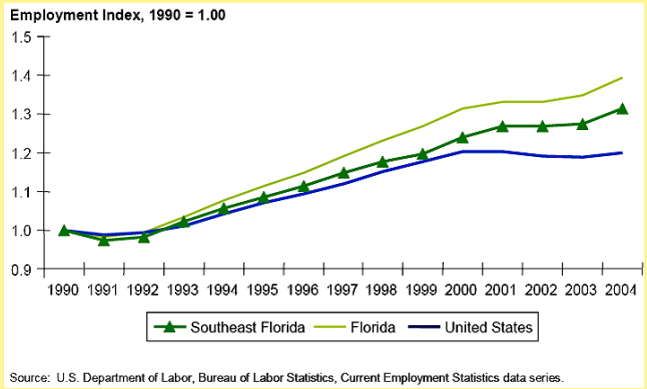
CURRENT COMPONENTS OF THE "AEROSPACE PIPELINE"

Aviation and Space Industry Scan

The Governor's Commission on the Future of Space and Aeronautics in Florida Report highlights the tremendous contribution the space, aeronautics, and aviation industries make to the Florida economy. Citing U.S. Department of Labor statistics:

- Florida ranks 3rd in the nation for employment in the aviation and aerospace industry;
- Employs nearly 148,000 Floridians in the industry, who
- Earn more than $7 billion in wages,
- With an average annual wage exceeding $51,000

Employment Growth - Florida vs U.S. *1990-2004*



The Aging Workforce— Stakeholders representing the aerospace industry express concern about the aging workforce. About 26 percent of aerospace workers will be eligible to retire by 2008. The average production worker is 53 years of age and the average engineer is 54 years of age. Participants want to establish an annually updated national database of skills/competency gaps focusing on training program money on 1 year and 5 year gaps (projected) identified by centers, companies and agencies and managed by them; establish the relevance of the aerospace industry in education and the workforce; and establish a phased retirement program.

America's Aerospace Industry: Identifying and Addressing Workforce Challenges

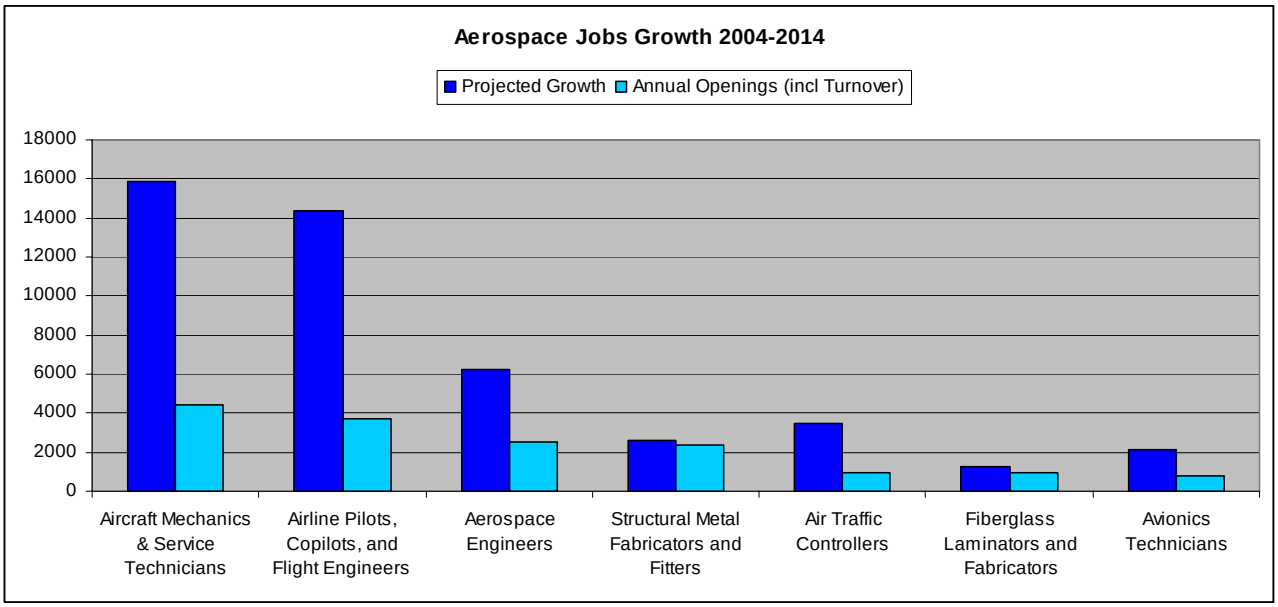
From space exploration and satellite communications to aircraft manufacturing and flight training, the spectrum of Florida's aviation and space industry is very broad. (eFlorida Market Brief, June 2007)

U.S. aerospace employment currently totals over one million professionals working in well-paying jobs. With approximately one quarter of all current aerospace workers reaching retirement age in the next few years, there will be many new high-wage career opportunities becoming available. Among the most prominent include:

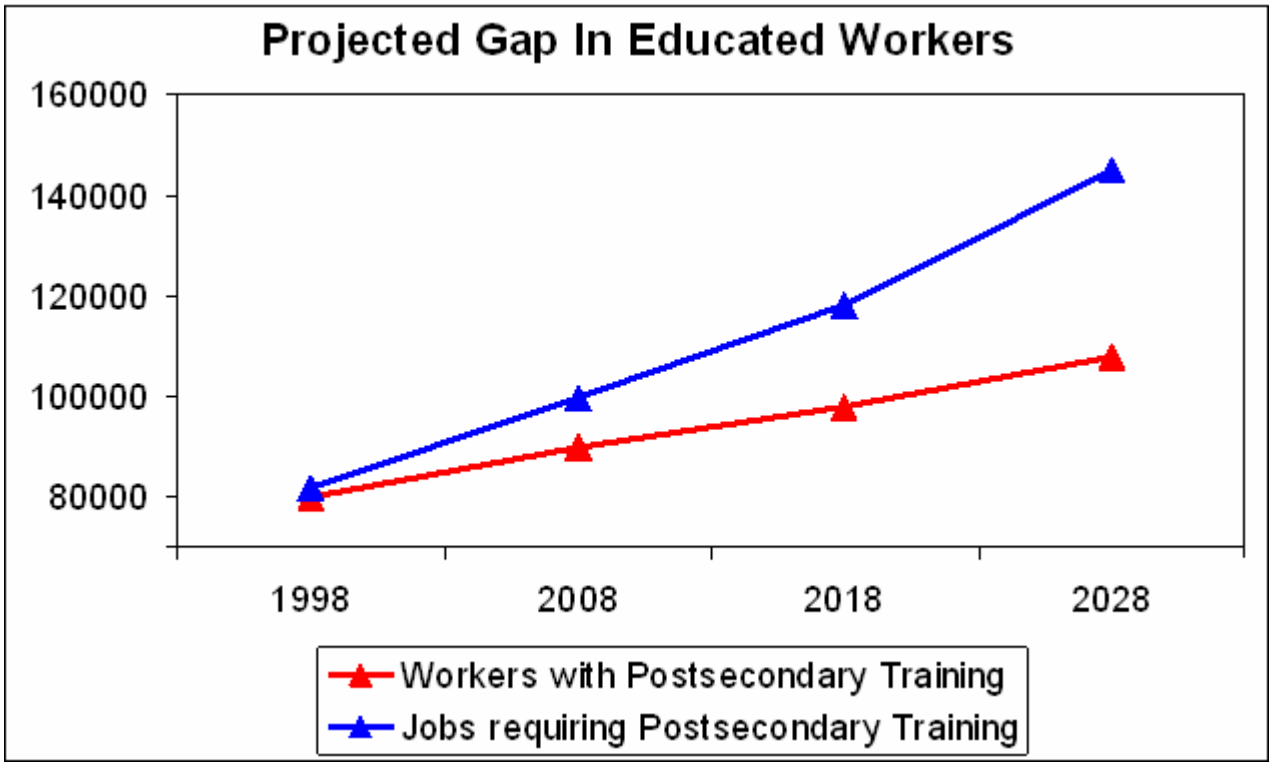
- industrial engineers;
- aircraft mechanics and service technicians;
- aerospace engineers;
- avionics technicians;
- aircraft and spacecraft structural, surface, and systems assemblers; and
- engine and other machine assemblers.

In addition to these aerospace specific occupations, there will be demand for business managers, administrative support specialists, machinists, and materials engineers.

In the coming years, aerospace industry growth spurred by business innovation and technological change will present critical shortages in qualified workers. Combining this dynamic with an aging workforce and the associated loss of technical talent will pose significant challenges to industry, training providers, and workforce agencies to provide well-trained, knowledgeable employees who can keep pace with the rapid technological developments of the aerospace industry.



Source: U.S. Bureau of Labor Statistics



Source: National Association of Manufacturers

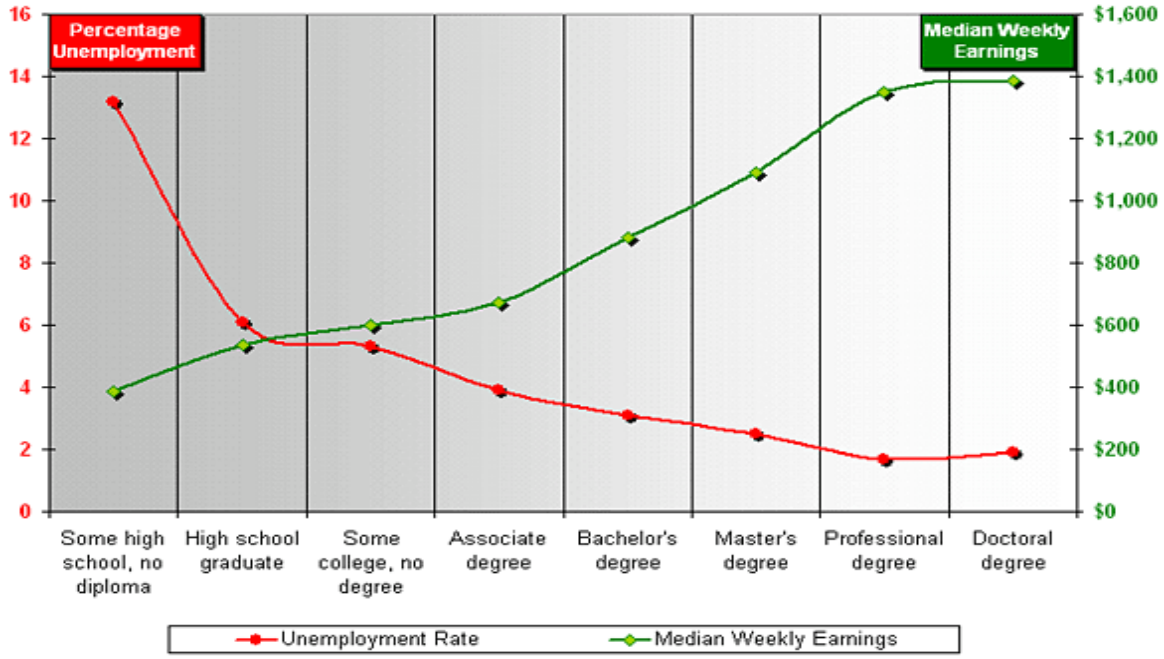
The table below shows the significant value that the aerospace sector and its related industry have in the State of Florida. The table lists many of the industry sectors, sub-sectors, their related North American Industry Classification System codes and the number of establishments in each code, average employment, and wages.

Florida's Aviation & Space Industry – Establishments, Employment, and Wages (2005)

Industry Sector & Sub-sector	NAICS Code	Companies	Annual Average Employment	Total Wages	Annual Average Wage
Search, detection, and navigation instruments	334511	71	9,660	$593,106,179	$61,399
Aircraft manufacturing	336411	50	2,748	$114,085,130	$41,512
Aircraft engine and engine parts mfg.	336412	51	3,835	$250,722,501	$65,385
Other aircraft parts and equipment	336413	53	3,101	$132,285,812	$42,661
Aviation Subtotal:		**225**	**19344**	**$1,090,199,622**	**$52,739**
Guided missile and space vehicle mfg.	336414 336415 336419	41	8,025	$652,181,945	$81,273
Satellite telecommunications	517410	101	662	$75,208,373	$113,665
Space research and technology	927110	14	2,080	$173,288,556	$83,308
Space Subtotal:		**156**	**10767**	**$900,678,874**	**$92,749**
Scheduled passenger air transportation	481111	191	26,338	$1,267,996,909	$48,144
Scheduled freight air transportation	481112	87	1,571	$60,932,126	$38,775
Nonscheduled air passenger chartering	481211	219	2,673	$134,639,723	$50,378
Nonscheduled air freight chartering	481212	43	556	$29,844,466	$53,653
Other nonscheduled air transportation	481219	35	133	$6,427,252	$48,477
Air traffic control	488111	37	2,331	$230,704,390	$98,994
Other airport operations	488119	173	9,544	$289,344,638	$30,319
Other support activities for air transport.	488190	469	7,183	$319,548,427	$44,488
Flight training	611512	148	2,491	$81,813,727	$32,843
Operations Subtotal:		**1,402**	**52,820**	**$2,421,251,658**	**$49,563**
Total Aerospace Industry		**1,783**	**82,931**	**$4,412,130,154**	**$58,455**

Source: Florida Agency for Workforce Innovation, Labor Market Statistics, Quarterly Census of Employment and Wages. (2005)

As the tables above suggest, the long-term employment outlook for the aerospace industry is strong, and access to high-wage jobs in the industry is linked to the education level of the worker. The graph below illustrates this notion by highlighting the increase in weekly pay that is associated with varying levels of higher education, along with a corresponding decrease in the rate of unemployment. In particular, take note of the **expanding** divergence between unemployment and earnings—the more education you get, the more you will earn!



Source: Bureau of Labor Statistics, 2004

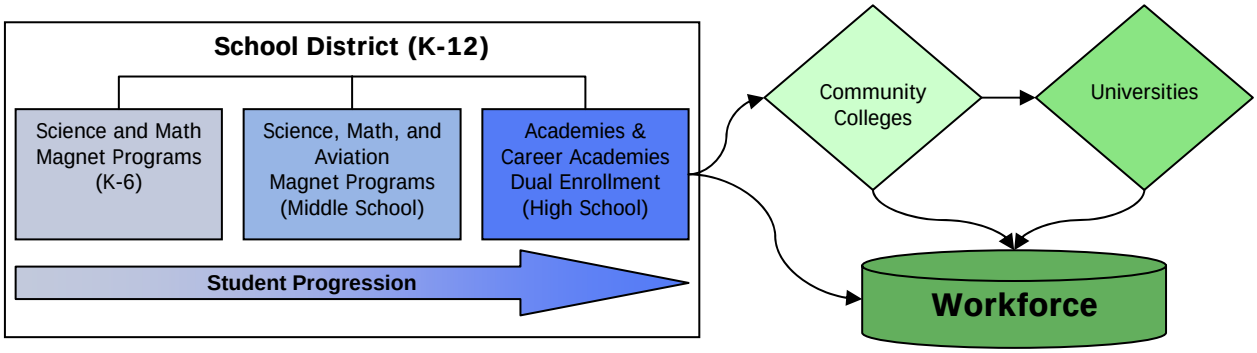
Much more information is available on the Career Voyages website – www.careervoyages.gov. The result of collaboration between the U.S. Department of Labor and the U.S. Department of Education, this website is a great source for information on high growth/high demand occupations and the skills and education needed to attain these jobs – both on a national – as well as state-level basis.

The data above, in combination with the Aerospace Resource Center's own Needs Assessment (available at www.aerocenter.org), reinforce the importance of the Aerospace Industry to Florida's economic future. Additionally, it can be seen that not only does the industry require trained workers, but that the more training and education a worker has, the higher the salary commanded – and the greater the economic impact for the state. All of these points can be summed up in one thought: the importance of the aerospace industry to the state and the new technologies defining the industry's systems make it imperative that a productive and adaptive pipeline exists to provide industry with available, skilled, and trained workers.

Aerospace Industry "Pipeline" Model

A key ingredient to satisfying today's high skill-high wage workforce requirements is to develop a systemic process that creates reinforcing pathways which align educational and training "outcomes" with subsequent opportunities to sustain progress throughout the pipeline. Each step of the pathway is designed explicitly to prepare a participant for the next level of employment and/or education. (Jenkins, 2006) In other words, it is necessary within the pipeline to create a smooth "fit" between *exit* and *entry* points.

To understand the operation and dynamics of the aerospace pipeline, it is useful to be familiar with the components of this pipeline and the role or value each provides within the overall pipeline. The following diagram lays out a simple depiction of this pipeline – especially as it pertains to students.



The Aerospace Pipeline Model

As shown, the pipeline begins at the K-6 grade levels and flows through middle- and high-school completion. At this point, some students may exit the pipeline and proceed directly into the workforce. Others, however, may continue with their education by attending Community Colleges which act as a pivot point to gain a higher level entry into the workforce or entry into higher education at the University level.

In addition to purely education-oriented components, the pipeline is supported at various levels by numerous partners, such as the military, industry partners, and regional workforce boards.

To gain a more complete understanding of the pipeline as it exists today, the following chart (see pages 10 and 11) details the various components of the aerospace pipeline, their individual areas of influence, objectives, features and/or programs offered by each, as well as the pipeline outcomes they provide.

Education and the Labor Market

The 2030 projections show a widening gap between the labor market demand for postsecondary credentials and the forthcoming supply from Florida institutions.

Florida's Education Pipeline: A Further Exploration of Labor Market Demand - FLDOE

The areas of influence represent listings of the portions of the pipeline (i.e. the level of students and/or workers) that each component addresses. Note that there are several areas of overlap from one component to another and in some cases components may actually be competing to attract/service the same students or workers.

The objectives presented represent the broad training or workforce preparation goals of each component. The breadth of the targeted audiences served leads to a correspondingly broad approach to the preparation goals. At the lower-end, the accepted norm is that students are not likely to benefit from specialized instruction, so a broad, general education – possibly with some information about industry careers and skills – is provided. Higher up the educational continuum, specialized, highly technical training takes precedent in order to provide students or workers with the requisite job skills to gain entry to and grow with the industry.

The outcomes identified serve as the so-called "exit points" along the pipeline – enabling a student or worker to leave the pipeline having attained the specific job skills and/or general knowledge required to gain entry into the industry workforce.

Some of these outcomes are single ended – providing an exit that leads to workforce opportunities without a corresponding re-entry back into the pipeline. Others have existing and well-established connections from one component to another. Community colleges, for example, serve both as a ready receiver of students exiting from high schools as well as a provider of students entering 4-year colleges and universities.

The Current Aerospace *PIPELINE*

Components	Areas of Influence	Objectives	Representative Features/Programs	Outcomes
K-12	• Grades K – 6	• Technology/occupation awareness	• Hands-on projects • Computer games/simulations	• Use/Influence of technology • Occupation/industry awareness
	• Grades 7 – 9	• Develop Science, Technology, Engineering and Math (STEM) skills • Assess personal skill/interest fit with career interests • Develop education plans aligned to career interests • Evaluate workplace and work habits	• STEM courses w/labs and projects • Relevant computer games and simulations • Technology competitions • Career exploration via work site visits, guest speakers, modeling	• Build supporting educational foundation • Useful career Exploration
	• Grades 10 - 12	• Prepare and motivate for post-secondary education and training • Informed and proactive enrollment prior to high school graduation • Desire to pursue high skill/high wage jobs evidenced through part-time and summer jobs	• Advanced STEM courses • Concentrated labs and workshops • Dual enrollment high school / college credit programs • Career exposure: work site visits, guest speakers, job shadowing • Substantive internships during school and summer • Part-time and summer jobs	• Informed career decisions • Lifelong learning attitude • Academic – career alignment • Postsecondary educational achievement through dual enrollment (DE) and Advanced Placement (AP) accomplishment • Postsecondary Career Preparedness
Technical Schools	• High Schools • Post Secondary • Adult Learners • Career Changers • CHOICE Academy	• Provide students opportunities for attaining their educational goals • Provide an educated workforce that meets the demands of the economy • Be responsive to the education and training needs of industry and business • Provide quality technical training and customized industry training • Offer integrated educational avenue for students to move from high school through certificate, associate, and baccalaureate programs	• Network of schools providing both academic instruction and trade experience • Varied trade-oriented and technical skills programs due to: - projected employment demands for students enrolled in program - anticipated technological changes - availability of qualified instructors - competition from programs at other educational institutions - student interest in program • Tailored course offerings—some designed for secondary-level programs; others are limited to adult-level application	• Academic instruction with intensive occupation-specific training and apprenticeship credit - Secondary-level students receive a comprehensive high school education in conjunction with training in one of many available trades - Adults have access to full-time or part-time instruction in a similar number of trades • Skilled generalist • Trade specific skills • Industry certifications (partial / full) • Apprenticeship credit

Community Colleges	• Post Secondary Students • Career Changers • Adult Learners	• College entrance academic classes • Broadly defined career classes • Contextual, applied, integrated curriculum [academic and technical] • Project-based learning • College as well as career planning	• Open admissions policies with lower tuition than 4-yr colleges • Shorter continuing education programs to more lengthy Associate Degree programs • Technical program offerings, to include aerospace/composites • Workforce oriented programs for those wanting to upgrade skills or change occupation • Flexible course scheduling to accommodate working students • Workplace internships	• High skills workforce • 2-Year Associate Degree or Technical Certificate • Various articulation opportunities to further academic/career aspirations
Universities/4-Yr College	• Student Career Pathway • Adult Learners	• General academic program for those undecided on career • Establishes foundation for more advanced studies and professional level work	• Broad array of Bachelor's Degrees ranging from literature to sciences • Formal	• Professional degrees -- Aerospace engineers -- Pilots -- Mission specialists • Skills/knowledge upgrades -- Supervisory -- Management specialist
Military	• Entry Level Skills Training • Advanced Training	• Focused, specialized training • Often industry-trained	• Real-world applications • On-the-job training	• Hands-on job experience • Life cycle skills • Technical skills in demand by outside industry
Industry, Business, and Community	• K-20 Students • Entry and/or Incumbent Workers • Career Changers	• Collaborate and partner with stakeholders to address workforce training/educational needs • Attract and inspire K-20 students into aerospace industry • Retain talented and motivated individuals in workforce • Create and sustain robust economic development	• Steering committee members • Partners to government pipeline • Parental involvement and support • Speakers and role models • Field trips, job shadowing • Mentor programs • Workplace internships, community service • Articulations with post-secondary education	• Increased numbers of industry workers • Motivated workers • Workers with upgraded skills • Satisfied industry-based workforce needs • Strong communities with vibrant employment

Source: CAREER PATHWAYS: Aligning Public Resources to Support Individual and Regional Economic Advancement in the Knowledge Economy

Career Academies or Career Paths

The previous table shows the roles and outcomes of educational providers within the current structure of the Aerospace Pipeline. Another facet of the education portion of the pipeline, and one which has recently gained a foothold in Florida is the Career Academy concept for secondary education.

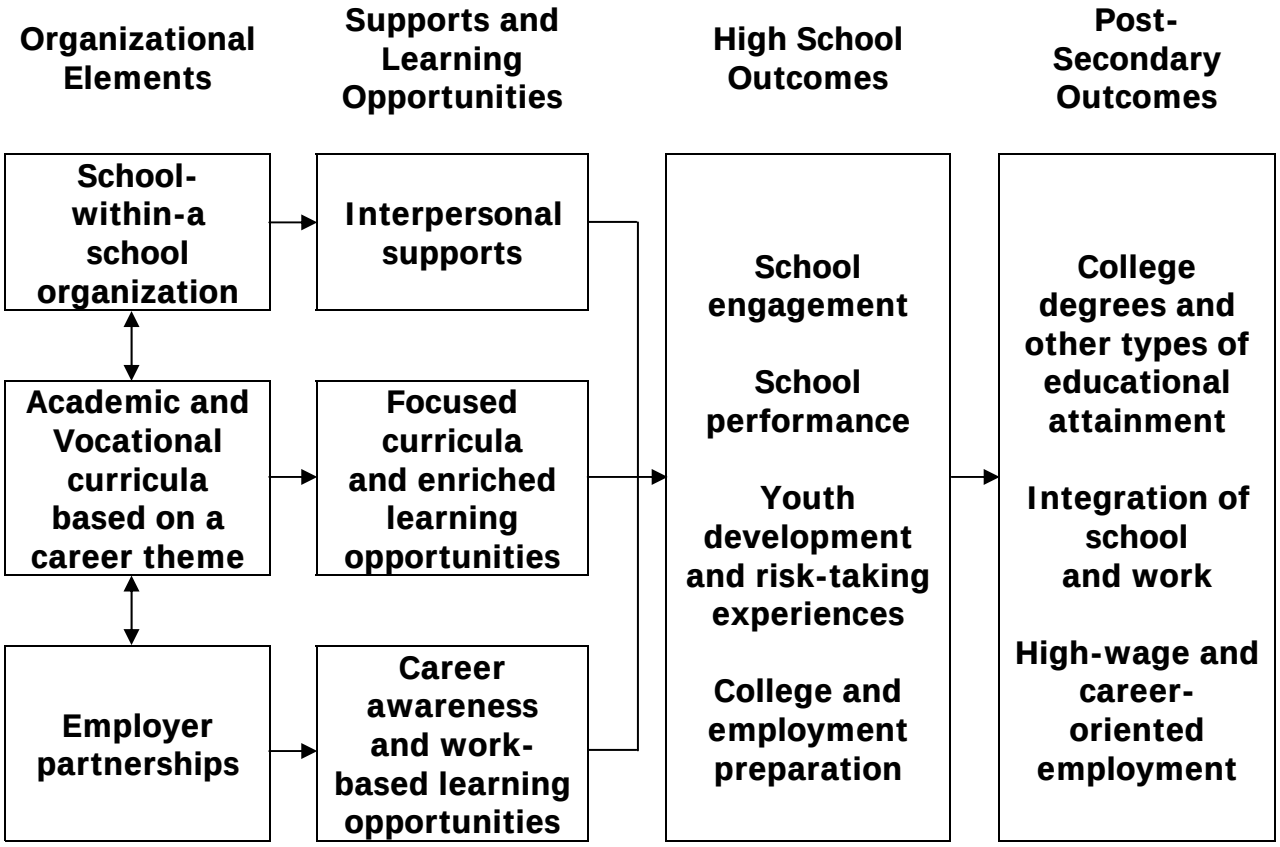
Career Academies were established over 30-years ago as a means of keeping at-risk high school students interested in learning and to prepare them for successful transition to postsecondary education or full-time employment. They are typically characterized by three basic features: a school-within-a-school organizational structure, curricula that combine academic and career or technical courses based on a career theme, and partnerships with local employers. The main goals of Academies are to prevent students from dropping out and to prepare them for college and careers" (Kemple, 2001). The term "career academy," which originally described a high school program was coined by Stern, Raby, and Dayton (1992) (Stern & Wing, 2004) and continues to evolve.

From 1993 to 2003, Manpower Demonstration Research Corporation (MDRC) conducted a longitudinal study of Career Academies. The study was funded by the U.S. Departments of Education and Labor and 17 private foundations and organizations. The evaluation included more than 1,700 Academy applications in the 8th or 9th grades and was both comprehensive and rigorous. Some of the findings included 1) career academies improved student engagement, and 2) academies increased the likelihood of potential drop out students to graduate, enroll in college, and become employed. The study also concluded that academies did not influence classroom instruction and standardized test scores were unchanged. However, initial analysis of CHOICE and existing career academies in Florida show a positive correlation between career curricula and FCAT results.

Components	Career Academies
Areas of Influence	• High Schools • CHOICE
Objectives	• Address workforce needs associated with state economic trends • Provide opportunities for industry certifications • Create avenues for students to pursue targeted careers • Link business and educational entities to meet regional needs
Representative Features/Programs	• Academy-only classes for 2-4 years • Team of teacher-managers • Limited, voluntary enrollment • Family-like atmosphere , administrator, and counselor support • Articulation agreements • Core course equivalencies relevant to technical areas of study • Partnerships w/local WFDBDs • Dual enrollments • Other courses and activities outside the academy
Outcomes	• High school diploma • College course credits • Basic competencies with industry certifications • Entry-level technical skills • Internship opportunities

Career Academies as Part of the Pipeline

In the MDRC study, a career model was presented:



Conceptual Model of the Career Academy Approach

Today, a typical Career Academy serves between 150 and 200 students in grades 9-12. The Career Academy concept is to create a small learning community that combines academic and technical curricula around a career theme. Partnerships with local employers provide Career Academy students with work-based learning experiences. The United States has more than 2,500 Career Academies. Career clusters identify pathways from secondary school to two-and four-year colleges, graduate school, as well as the workplace - students continue to learn traditional subjects while exploring career options and preparing for their future. Career clusters link what students learn in school with the knowledge and skills they need for success in college and careers.

(Delaware Dept of Ed)

Agriculture	Human Services
Arts	Information Technology
Business	Legal and Protective Services
Construction	Manufacturing
Education	Public Administration
Financial	Retail/Wholesale
Health Science	Scientific
Hospitality	Transportation **(covers Aerospace careers)**

The U.S. Department of Education (16 Clusters)

Locally, Career Academies in Florida can also follow the CHOICE model. CHOICE is a modification of the Career Academy concept that allows students to earn high school credit, college credit and industry certifications, all at the same time. CHOICE programs are rigorous enough to prepare students for college, while also providing the real skills desired by Florida employers. Coursework includes authentic learning tasks that cover hands-on, practical skills utilized in the real world.

As the CHOICE model, and in particular Aviation Academies, are replicated – with assistance from the Banner Center for Career Academies of Excellence and the ARC – aerospace pipeline development will achieve greater focus and prominence throughout the state of Florida.

Regional Workforce Development Boards

One critical component of the pipeline that exists in every region throughout the state is the Regional Workforce Development Board (RWDB). There are 24 RWDBs, each with its own area of responsibility and each with the ability to link local education providers with local industry. These boards, by serving their local area, have strong ties to the community and exist to not only promote workforce development, but to assist with economic development as well. These boards can play a number of important roles in the Aerospace pipeline.

> "WorkSource recognizes that the inter-connectedness of education and workforce development with economic development requires that effective partnerships be formed and managed to ensure the success of all involved. *Education fills the talent pipeline for the workforce*; a skilled and productive workforce is the foundation for economic development. Thus people and organizations involved in education, workforce development, and economic development have vested interests in partnering to create a comprehensive, seamless system which maximizes the benefits brought forth by limited public funding."
>
> First Coast Workforce Development Comprehensive Plan 2007-9

Workforce Boards – Roles in the Pipeline
• Aligns regional resources and partners
• Promotes Career Academies as a major priority
• Provides career resources at Workforce Centers
• Conducts workplace readiness training at the Career Centers
• Promotes Academy schools through Youth liaisons
• Assists in job placements, internships and post-high school counseling

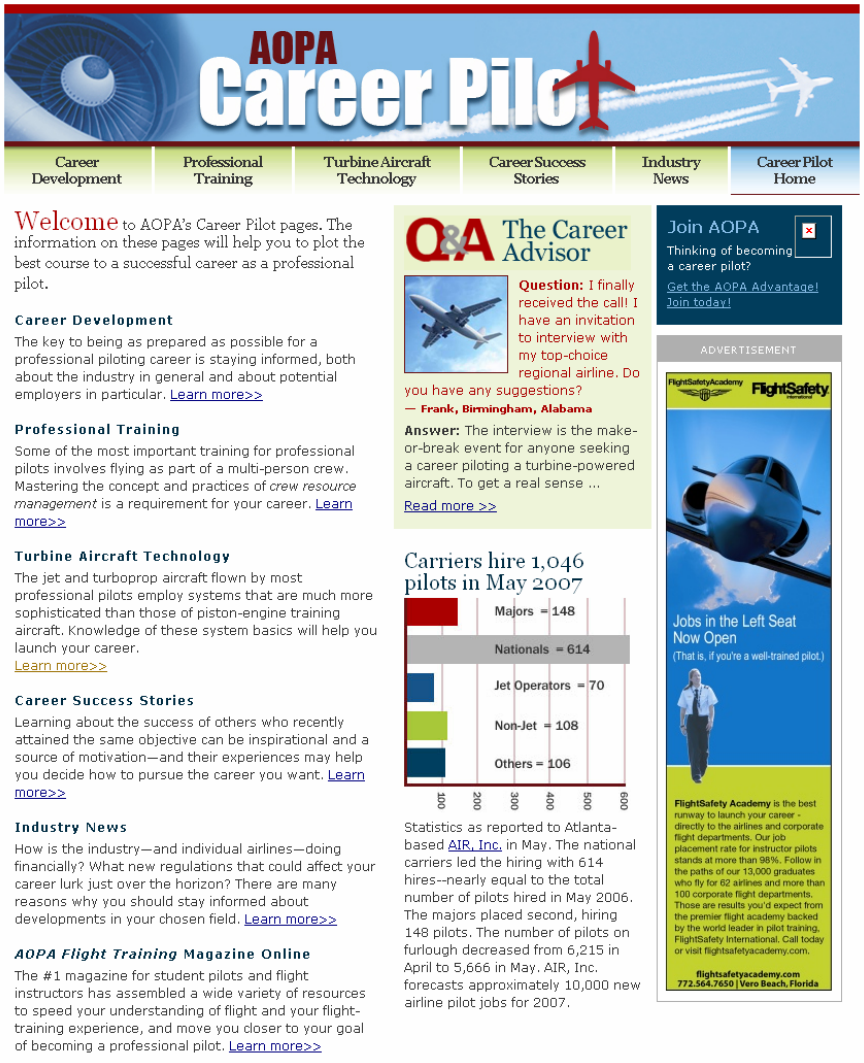
Through continuous contact with local industry the regional boards can track not only the current and latest workforce training needs, but also those trends that will affect the future workforce – both incumbent and new-hire. Tracking these needs provides each regional board with the necessary information to create and modify the list of "targeted occupations" for the board's services.

Additionally, through relationships with their local education providers – technical schools, community colleges, and universities – the regional boards are able to maintain first hand knowledge of the programs and courses being offered *and* being developed. In this way, they are able to direct both individuals as well as industry partners to relevant training when and where it is available.

Third Party Organizations

One final component of the aerospace pipeline is composed of those third party organizations whose role or mission involves the promotion of various components or sectors of the aerospace industry. These organizations are many and varied, and their level of involvement in pipeline development and/or throughput is equally varied. Many, however, as part of their core mission, are engaged in both active and passive marketing of the aviation and space industries.

By way of example, organizations such as NASA, with an overall budget of $16 billion, and the Aircraft Owners and Pilot's Association (AOPA) with 700,000 U.S. members, as well as regional organizations like the Technological Research & Development Authority (TRDA) with a staff of 12, all the way down to local chapters of the Experimental Aircraft Association (EAA) with a total annual budget of less than $2000, all have significant impact on the aerospace industry. Organizations such as these provide access to all manner of materials and programs which can impact the aerospace pipeline – from coloring books to airplane rides for kids, from summer camps to summer internships, from college scholarships to grants for launching experiments into space orbit.



In sum, all of these entities comprise the current state of the aerospace pipeline – building interests in the industry, creating a basis of knowledge and skills, training for specific job applications, and transitioning students into the workforce. This pipeline, while fixed in design, remains fluid in action – as industry needs evolve, student interests wax and wane, and educational programs are created or dissolved to maintain the relevance between workforce needs and pipeline throughput.

DIAGNOSTIC:

GAPS OR SHORTCOMINGS IDENTIFIED WITHIN THE "AEROSPACE PIPELINE"

Misalignments

An August 2006 study, CAREER PATHWAYS – Aligning Public Resources to Support Individual and Regional Economic Advancement in the Knowledge Economy, cites the fact that business and industry partnerships with educational and training providers that prepare youth and adults for employment are generally burdened by numerous misalignments among educational programs at different levels and between educational programs and the labor market.

Two findings of the report are centered on the career preparation and associated curricula provided by educational institutions.

First, the instruction provided at the secondary and postsecondary levels did not align well in relation to career education. It was found that few high school students get exposure to possible postsecondary pathways, and that many leave high school with little preparation and/or direction for pursuing careers or postsecondary education.

Second, while there is a demonstrated need for adult or basic skills programs (i.e., those that lead to a GED) and college remedial programs, neither can be considered to be too "developmental" in nature. Like the high school programs above, they focus on providing general training but have little if any concern for preparing students to continue to some form of postsecondary *technical* learning.

Other conclusions in this study point to the difficulties caused by inconsistent funding allocations and the lack of industry involvement and input on program development and delivery.

The normal model used to provide funding to educational providers is typically based on the enrollment and completion of students. This model can cause issues in both developing and sustaining technical programs which, given the rigorous demands of high-tech training, are challenged by high-cost requirements and hindered by low student completion rates. This is especially problematic when the availability of high-tech training is a direct driver of employer hiring requirements and the pursuit of economic development.

Additionally, an absence of strong, ongoing relationships with those employers that stand to benefit from aerospace training affects the pipeline in two ways. First, it limits needs identification which impacts the preparation of students for job entry and job advancement. Second, it limits course/training improvements stemming from new-hire performance evaluations and industry feedback. Regular and meaningful communications are a must in order to keep the pipeline responsive to changing industry needs and to maintain the efficacy of available training by seeking and responding to both industry and student feedback.

In summary, these issues impede educational and career advancement for students, and they lower the return on the public's investment in education and other services.

Disconnects

As will be discussed in the next section, there is no shortage in the number of groups, educational institutions, and organizations – public and private – trying to address the current and predicted shortages in the aerospace workforce. And the need doesn't stop at aviation and space, but continues on throughout high-tech industries and other science, technology, engineering and math (STEM) disciplines. What can be seen, however, is that many of these, while flourishing, are acting in isolation. In short, there are no continuing or "connecting" pathways. This illustrates what the Developing a 21st Century Workforce study refers to as "islands of success."

> "[These] examples are just a sampling of initiatives and activities that illustrate new ways of approaching the human capital challenges facing the aerospace industry. None of the examples could be applied on a universal basis, but many have features that could be more broadly diffused. In depth analysis of the strengths and weaknesses of these initiatives could offer fundamental factors upon which to base future actions. It is important to distill the elements that provide roadmaps for others to follow. However, absent coordinated action, these and many other success stories are at risk of being "islands of success."[2]

At the bottom end of the pipeline, for example, the Young Eagles program of the Experimental Aircraft Association aims to provide kids between 8 and 17 years old with a free flight in a light aircraft. For many, this will provide their first direct exposure with aviation and flying – and their enthusiasm and excitement following the flight can not be measured. However, at nearly every age level of participant, there is no clearly discernible next step. Students or their parents may seek information at school or from career counselors, only to find poor- or non-informed answers and outdated materials.

A similar example can be seen by examining aviation and space summer camps. Individually, these camps can provide students with excellent motivation while also providing learning examples in the real-world application of math and science skills. In many cases though, beyond having a base to build on for the next year's camp, there is little follow-up once the summer is over and these students return to their traditional classes.

These disconnects can also be found further down the pipeline, following high school graduation. The end of secondary education is a natural pipeline exit point where some students could (with suitable training, e.g. from a career academy) leave the pipeline and enter the workforce, while others proceed via qualified entry into technical programs, or two- and four-year colleges and universities.

Due to a lack of knowledge about particular programs, many students may choose not to attend advanced skills training and may be ill-prepared to proceed directly into the workforce. Depending on the courses available, even those students that graduate from an Aerospace Career Academy

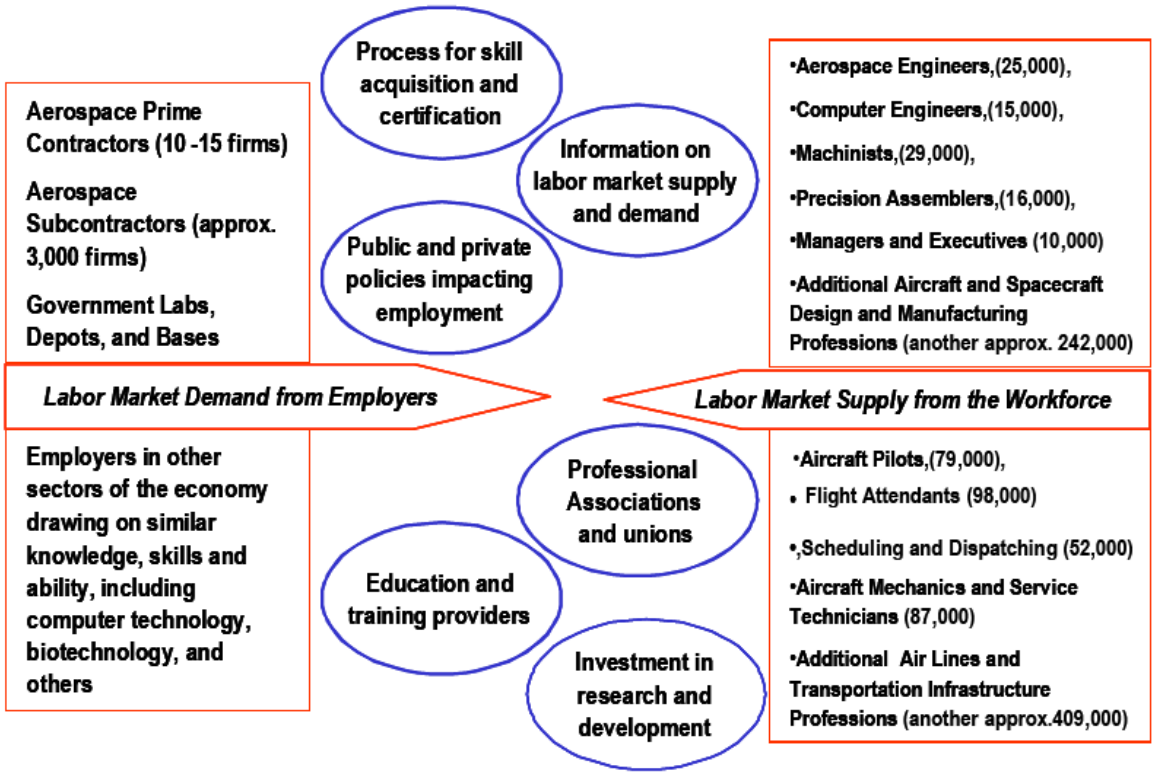
[2] MIT Labor Aerospace Research Agenda and Lean Aerospace Initiative, November 2001

may be poorly suited to seek direct entry into the workforce – depending on the alignment of the courses offered with regional or statewide workforce needs.

At the technical school and community college level, the picture brightens a bit, as a common state-wide course numbering system allows for fairly straightforward transfer of credits from one program to another, and from one institution to another. Furthermore, there is evidence that many of the courses, especially those with a technical base, are robust and provide adequate skills and training to meet many of the aerospace workforce's needs.

As for credit courses, many schools offer courses and programs aimed directly at the workforce – both entry-level and incumbent. These courses provide excellent value in that they train for specific skills required by industry in the region where they are needed. However, the limited and thinly spread marketing budget of most educational institutions limits the reach of these types of courses to "those in the know." To compound the matter, even less is known about such programs outside the immediate area served by the education provider. This not only generates unnecessary duplication of efforts, but can also limit the prosperity and value of individual programs and courses by limiting their reach throughout the state.

Much of the above can be summed up through the following chart from Developing a 21st Century Workforce[3] shows many of the various entities and forces affecting aerospace workforce development and the aerospace pipeline. Of note, there are no linkages between components – either from one step to the next or simply between components in general. While this particular chart is slightly dated, many of the same realities can be seen in workforce development and within the aerospace pipeline today.



[3] MIT Labor Aerospace Research Agenda and Lean Aerospace Initiative, November 2001

The result of these missed links is that the "pipeline" that does exist contains ill fitting and misaligned "joints and elbows." Many of the elements within the pipeline are working in stand-alone efforts that, while worthy in their own right, do not enable the critical parts of the pipeline to function purposefully and efficiently.

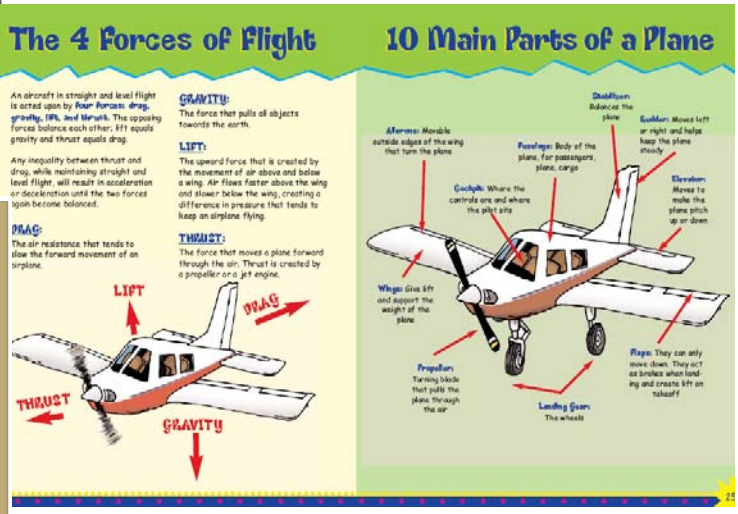
We Are Not Alone

In completing the research necessary for this study, one finding became overwhelmingly clear: the ARC is not blazing a new trail. Uncountable numbers of programs have gone before us. A few examples of existing programs were provided above to highlight pipeline disconnects – there are many, many more. This simple fact gives strong credence to the thought expressed in the MIT study – without cohesive and coordinated action, the overall objective to create relevant and useful alignments among components can not be achieved. The upside to this is the wealth of existing studies, programs, and available materials in place to help develop the aerospace pipeline and facilitate strategic "fit" among workforce, educational provider, and industry stakeholders.

For example, there are numerous organizations geared towards promoting aviation and aerospace both as a hobby and as a career. Many of these have both national and local reach; the national arm provides financial and materiel support through scholarships, and educational and marketing materials, while the local arms can provide personal investment via site visits, speakers and mentors, or even labor assistance. A sampling of organizations can be found in Attachment D.

Below are just a few examples of the kinds of materials that can be obtained – in most cases at minimal cost to not cost.

AOPA's PATH to Aviation



Sources: AOPA's PATH website: www.aopa.org/path/, NASA JPL's Spaceplace website: spaceplace.jpl.nasa.gov/en/kids/, and NBAA's Aviation for Kids website: www.avkids.com/

Additionally, there are many programs in place to assist educators at all levels in creating materials to use in the classroom, for example, teaching math and science concepts by using aviation and space themes. Some of these materials come from likely sources, such as NASA, while others can be a bit surprising as evidenced by this excerpt from Chicago's O'Hare Airport website.

Source: O'Hare Airport's Kids Pages website - www.ohare.com/events/

There are many more examples of material that have already been created to excite youth of all ages, provide them with career examples, and help guide their education and pathway into the workforce. While the materials can not be completely repurposed and/or re-branded, their very existence can greatly reduce the time and manpower effort required to create the wealth of materials that are needed to adequately support the aerospace pipeline.

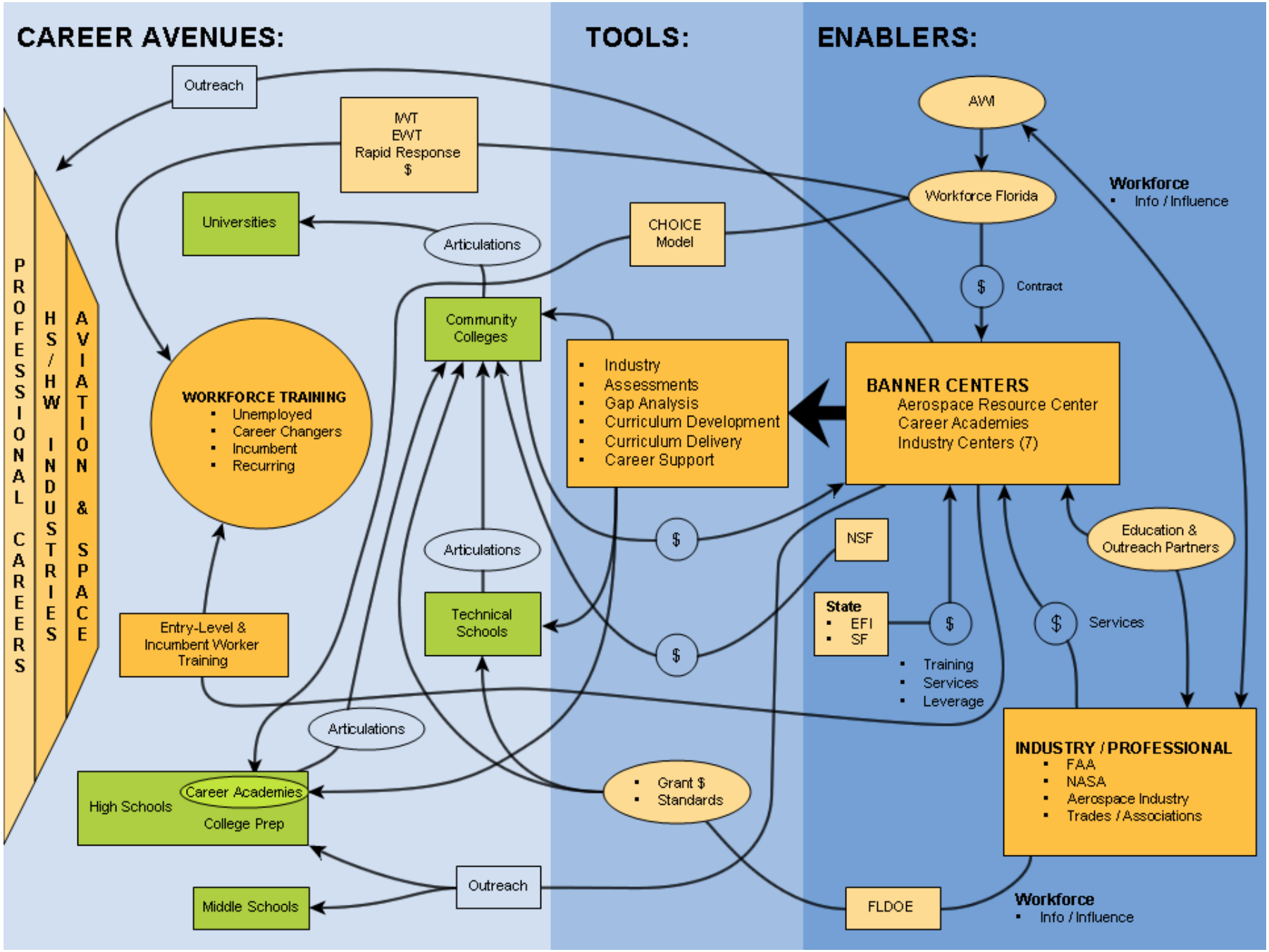
A Complex Pipeline

In summary, the aerospace pipeline is comprised of a vast array of components – industry, workforce agencies, education and training providers, trade associations, and supporting aerospace organizations. Each of these components adds to the pipeline – either through their own individual efforts or in combination and partnership with other components. The end result is a pipeline that provides a semblance of flow from beginning to end. As highlighted above, however, there are areas where the smooth flow from entering students to employed workers is restricted, redirected, or cut off altogether.

To provide an example of the complexity involved, the following chart seeks to illustrate one vision of the aerospace pipeline. Many, though not all, of the major components are displayed and are grouped according to their roles in developing the workforce via the pipeline. Connections and model flows can be followed using the arrows and lines connecting the components.

What can be readily seen is the vast number of required connections between components and the complexity involved in making those connections. If any single linkage or connection is broken, then the pipeline becomes less effective; for example, high schools need to articulate to community colleges; industry needs to provide input to workforce agencies and those agencies must be able to listen to that input and respond accordingly.

While the pipeline may continue to work without some of these components or connections, the output will fall short of what is optimal. Only through the involvement of the appropriate components and the smooth connections and flows from one to another can the aerospace pipeline reach its full capacity.


CAREER AVENUES:
TOOLS:
ENABLERS:
PROFESSIONAL CAREERS
HS / HW INDUSTRIES
AVIATION & SPACE
Outreach
IWT
EWT
Rapid Response
$
Universities
Articulations
CHOICE Model
AVM
Workforce Florida
Workforce
Info / Influence
$
Contract
Community Colleges
WORKFORCE TRAINING
Unemployed
Career Changers
Incumbent
Recurring
Industry
Assessments
Gap Analysis
Curriculum Development
Curriculum Delivery
Career Support
BANNER CENTERS
Aerospace Resource Center
Career Academies
Industry Centers (7)
Articulations
$
NSF
Education & Outreach Partners
Technical Schools
State
EFI
SF
$
$
Services
Entry-Level & Incumbent Worker Training
Training
Services
Leverage
Articulations
INDUSTRY / PROFESSIONAL
FAA
NASA
Aerospace Industry
Trades / Associations
High Schools
Career Academies
College Prep
Grant $
Standards
Outreach
Middle Schools
FLDOE
Workforce
Info / Influence

PRESCRIPTIVE:

REQUIRED ACTIONS, PIPELINE IMPROVEMENTS, AND PRIORITIES

Recommendations

"Many studies have been conducted on effective practices and educational reform, but efforts to improve education should be guided by evidence of what has worked in the past. And current efforts should continue to collect evidence to inform the future" (Stern & Wing, 2004, p5). This translates to an examination of best practices in the field and adoption of those models most effective.

The research and findings presented in this study suggest numerous areas where action can be taken to strengthen the aerospace pipeline. These actions involve both short- and long-term goals involving not only the ARC and components within the aerospace pipeline, but transferring across industries to other Banner Centers and their workforce pipelines as well.

The ARC, even in its first year, has taken steps to address some of the pipeline issues identified in this study. Moving forward into year 2 and beyond, several "areas of possible action" can be derived from this study, as well as other pipeline studies preceding it.

- Communication and public education efforts should be heightened to help parents, students, industry, and community leaders to see why science, technology, engineering, and mathematics education are important to the aerospace industry as well as to international leadership (Business Roundtable, 2005).

- Work to continue the development of new Career Academies and expand the offerings available at existing academies. Stern, Dayton, Lenz, and Tidyman (2001) have identified key career components of pipelines that include academies. Examples of these components include:
    - Minimum of two grade levels (11-12), preferably three (10-12) or four (9-12), are included;
    - Minimum of two academic classes/ year (three or four optional) are included;
    - One career/technical class is included/year; and
    - A written course sequence exists.

By way of example - FCCJ, in collaboration with the Jacksonville Chamber of Commerce and Duval County Public Schools, has already begun working to develop a written, four-year plan for aerospace academies on the First Coast. Draft examples of the course layout and progression are shown below.

POS: **AVIATION**

Workforce Certificate: Aircraft Airframe Mechanics (5712)

District Major: Aerospace and Aviation Integrated ()

9th GRADE	10th GRADE	11th GRADE	12th GRADE	FRESHMAN @ FCCJ	SOPHOMORE @ FCCJ
Algebra I	Geometry	Algebra II	4th Year Math or College Algebra	**FALL TERM** Air Maintenance Technology General I	**FALL TERM** Air Maintenance Technology Airframe 3
English I	English II	English III	English IV or English Comp I	Air Maintenance Technology General 2	
Keystone	World History	American History	American Govt./ Economics	**SPRING TERM** Air Maintenance Technology General 3	**SPRING TERM** Air Maintenance Technology Airframe 4
Science	Science	Science	Science	Air Maintenance Technology General 4	
Foreign Language 1	Foreign Language 2				
Aerospace 1 Aerospace 1 8600580	Aerospace 2, 3 Aerospace 2, 3 8600660 8601780	Aviation Maintenance Technology General I (AMTG I/ 8715110)	Aviation Maintenance Technology General 3 (AMTG 3/8715130)	**SUMMER TERM** Air Maintenance Technology Airframe I	
	Advanced Applications in Technology 8601900	Aviation Maintenance Technology General 2 (AMTG 2/8715120)	Aviation Maintenance Technology General 4 8715140 OCP A	Air Maintenance Technology Airframe 2	

DE (dual enrollment) - Opportunity to take college courses and earn free college credit at the high school or college campus for those students who qualify. Courses listed in blue under freshman and sophomore years only need to be taken if not taken in the 11th or 12th grade as dual enrollment.

Gold Seal Vocational Award Pathway: Opportunity to Qualify for College Tuition

Major: Aviation Airframe and Powerplant Mechanic (Courses listed in blue above the major are college course curriculum matches that can be taken as dual enrollment.)

Dr. Steven R. Wallace, President
Florida Community College at Jacksonville

Dr. Joseph Wise, Superintendent
Duval County Public Schools

POS: **AVIATION**

A.S./A.A.S. Degree: Aviation Operations (2253)

District Major: NO DISTRICT PROGRAM EQUIVALENT

9th GRADE	10th GRADE	11th GRADE	12th GRADE	FRESHMAN @ FCCJ	SOPHOMORE @ FCCJ
Algebra I	Geometry	Algebra II	4th Year Math or College Algebra	**FALL TERM** English Comp I	**FALL TERM** Social Sciences
English I	English II	English III	English IV or English Comp I	Humanities	Aviation Safety
Keystone	World History	American History	American Govt./ Economics	History of Air Transportation	Air Cargo Operations
Science	Science	Science	Science	Aviation Management	Human Resources Mgmt.
Foreign Language 1	Foreign Language 2			Professional Elective	Professional Elective
				SPRING TERM College Algebra	**SPRING TERM** Principles of Airport Mgmt.
				Writing About Non-Fiction	Intro to Business
				Federal Air Regulations	Intro to Computer Concepts
(Major)	(Major)	(Major)	(Major)	Aviation Weather	Aviation Internship
				SUMMER TERM Professional Elective	Professional Elective

DE (dual enrollment) - Opportunity to take college courses and earn free college credit at the high school or college campus for those students who qualify. Courses listed in blue under freshman and sophomore years only need to be taken if not taken in the 11th or 12th grade as dual enrollment.

Major: No District Program Equivalent

Dr. Steven R. Wallace, President
Florida Community College at Jacksonville

Dr. Joseph Wise, Superintendent
Duval County Public Schools

Additionally, the following table presents a number of avenues to explore as the ARC moves into Year 2 and beyond. Some of the identified tasks are already included in Year 2 plans – such as developing flyers and DVDs marketing aerospace careers, while others represent areas requiring further research into needs, capabilities and benefits to the pipeline, prior to proceeding with actions.

POTENTIAL ARC PIPELINE ACTIVITIES	Phase I	Phase II	Phase III	On-going
Goal / Objective				
Activities / Deliverables				
Set up project infrastructure for *ARC Pipeline Project*				
Hire manager and curriculum coordinator				
Plan and set meetings for curriculum development, alignment, and articulations				
Develop website as a information, registration and curriculum portal				
Conduct meeting to identify resources available, gaps in resources/information, and development of needed products				
Form focus groups as needed for project development				
Develop Modules/ALT/Curriculum for 5 aerospace topics; tie to K-12 curriculum standards.				
Project team members, teachers, and faculty work with Aerospace Consultant to translate aerospace theory into applied learning.				
Develop marketing materials				
K-12 participation in STEM careers, aerospace curriculum, and skills				
Staff				
Prepare and set-up summer camp necessities and activities through advertising, registration, staff training, field trip coordination, transportation arrangements, etc.				
Develop and provide fliers to school districts throughout the state on field trip site availability and opportunities, summer camp programs, and careers in aerospace industries				
Teachers				
Attend summer camps at local/regional venues				
Partner with school systems to connect classroom mathematics and science courses to real life learning, job requirements, and applied course content knowledge				
Increase Professional Development opportunities and programs at Aviation Centers and industry/business sites				
Students				
Attend summer camps at local/regional venues				
Parents				
Participate in Aviation Summer Camp as both volunteers and learners				
Participate in programs (such as Open House evenings), which will be conducted to educate parents of secondary school students on the job opportunities in the various fields of aviation. Not only will the merits of the job that is high skill/high pay be emphasized, but also the merits/importance of STEM skill development				

POTENTIAL ARC PIPELINE ACTIVITIES	Phase I	Phase II	Phase III	On-going
Goal / Objective				
Activities / Deliverables				
Marketing				
Develop in-school awareness of the aviation field in middle school students as a viable career choice. Awareness can be attained by high impact video, career materials, lectures and/or field trips				
Planning for teachers and students: job shadowing, field trips to college campus, and site visits to industry/business				
Evaluation				
Assess, test and make adjustments to curriculum and materials.				
K-12 Implementation into the classroom				
Align school program, course offerings, and articulation for school year via *ARC Pipeline Project* with school system Applied Technology staff, administrators, and teachers.				
Work with school systems to offer high level mathematics and science courses as well as increase the number of students successfully enrolling in those courses.				
Create an awareness of high skill career fields, which will enhance motivation to complete high school to compete for all high wage jobs.				
Increase student choice among rigorous high school programs or accelerations to postsecondary education.				
Increase the number of students participating in dual enrollment or continuing into postsecondary technical programs directly from high school				
Post-secondary education implementation				
Provide expanded summer camp programs throughout the state				
Provide college courses, curriculum, and certification/degree programs				
Provide a framework that includes courses of instruction that are transferable and articulated to specific institutions of higher learning, where students will be more readily accepting of continued instruction in a particular field of study in post secondary education or college.				
Provide industry training and certification				

Summary

The Aerospace industry is a key part of Florida's economy, and to maintain and grow it needs a source – a pipeline – of skilled, trained workers. While such a pipeline exists and current needs are being met through education providers and workforce agencies around the state, future workforce needs dictate that the pipeline process must be not only be solidified, but dramatically grown to keep pace.

The Aerospace Resource Center, through this pipeline study, has identified areas where the current pipeline can be strengthened and expanded. However, the exact mechanism for providing that strength and growth needs to be further refined.

By working with the its key partners, continuing to survey the industry, and creating curriculum for statewide dissemination, the ARC can address some of the identified pipeline issues. Upcoming efforts in Year 2 and beyond will focus on working with students, career counselors, parents, and other interested parties to identify the best methods for closing pipeline gaps and creating the needed entry and exit points along the pipeline to fully serve all levels of the industry and workforce.

APPENDICES

Resource Listing	Attachment
• Current Florida Aviation-Space Programs in K-20	A
• Occupation Outlooks & Projections for Growth and Retirements	B
• Aviation and Space Summer Camps in Florida	C
• Organizations and Associations Promoting Aerospace Careers, Training & Education	D

Attachment A - Current Florida Aviation-Space Programs in K-20

Community Colleges offering Aviation and Aerospace Programs by Degrees

Aviation Maintenance Management Technology
- Broward Community College
- Florida Community College at Jacksonville
- Miami-Dade Community College
- Palm Beach Community College

Aviation Operations or Administration
- Broward Community College
- Florida Community College at Jacksonville
- Miami-Dade Community College
- Palm Beach Community College
- St. Petersburg College

Aerospace Technology
- Brevard Community College

Professional Pilot Technology
- Broward Community College
- Central Florida Community College
- Florida Community College at Jacksonville
- Indian River Community College
- Miami-Dade Community College
- Palm Beach Community College

Florida Universities & 4-year Colleges with Aerospace/Aviation programs

Embry-Riddle Aeronautical University, Daytona Beach **(**Florida locations include: Ft Walton Beach, Panama City, Tallahassee, Jacksonville, Orlando, Tampa and Miami)

Master's Degrees
- Aeronautics
- Aerospace Engineering MSAE/MAE
- Aerospace Engineering (thesis required) or
- Aerospace Engineering (a non-thesis program)
- Business Administration in Aviation MBA/A
- Space Science

Bachelor's Degrees
- Aeronautical Science
- Aeronautical Systems Maintenance
- Aeronautics
- Aerospace Engineering
- Aeronautics Track
- Astronautics Track
- Propulsion Track

- Accelerated five-year program – bachelors and master's degrees.
- Aerospace Studies
- Air Traffic Management
- Applied Meteorology
- Aviation Management
- Business Administration in Aviation

Everglades University Boca Raton and Sarasota Florida

Graduates of the online degree programs earn the same course credits and degrees as those students who complete equivalent courses and programs on campus. For more information regarding online education, please visit the Online Education web site at www.evergladesuniversity.org

Masters Degree

- Aviation Science

Bachelor's Degree

- Aviation Management
- Professional Aviation
- Aviation Technology

Online Graduate programs

- Master's Degree in Aviation Science

Online Undergraduate programs

- BS Degree - Major: Professional Aviation
- BS Degree - Major: Aviation Management
- BS Degree - Major: Aviation Technology

Florida Institute of Technology, Melbourne Florida

Master's Degrees

- Aerodynamics and Fluid Aerodynamics
- Aerospace Structures and Materials
- Combustion and Propulsion

Bachelor's Degrees

- Aeronautical Science
- Aeronautical Science with Flight Training
- Astronomy
- Astrophysics
- Aviation Computer Science
- Aviation Management
- Aviation Management with Flight Training
- Aviation Meteorology
- Aviation Meteorology with Flight Training
- Engineering, Aerospace
- Science Education, Earth/Space Sciences
- Space Sciences

Doctor of Philosophy Degrees

- Aerodynamics and Fluid Aerodynamics
- Aerospace Structures and Materials
- Combustion and Propulsion

Florida Memorial College, Miami Florida

Bachelor's Degrees
- Aeronautical Science
- Airway Science
- Computer Science (Concentration in Aviation)

Lynn University, Boca Raton Florida

Master's Degree
- Business Administration- Aviation Management

Bachelor's degree
- Business Administration- Aviation Management (flight and non flight option)

Flight Training
- Professional Pilot Training Program through Aero Service Facility

University of Central Florida, Orlando Florida

Masters Degree
- Aerospace Engineering
- Space Systems Design and Engineering Track
- Thermo fluid Aerodynamic Systems Design and Engineering Track

Bachelor's Degree
- Aerospace Engineering

University of Florida, Gainesville Florida

Bachelor's Degree
- Aerospace Engineering

Combined Bachelor's/Master's Degree (3/2)
- Aerospace Engineering

Doctor of Philosophy Degree
- Aerospace Engineering

University of Miami, Miami Florida

Bachelor's Degree
- Aerospace Engineering

Middle and High Schools that offer Aerospace Technology Programs

Broward County
- Charles W. Flanagan High School

Citrus County
- Lecanto High School

Miami-Dade County
- Lawton Chiles Middle School
- Thomas Jefferson Middle School
- Felix Varela Senior High School
- Booker T. Washington Senior High School
- George T. Baker Aviation Academy

Duval County
- Samuel W. Wolfson High School
- Frank H. Peterson Academies
- Highlands Middle School

Escambia County
- Northview High School

Glades County
- Moore Have Jr./Sr. High School

Highlands County
Lake Placid Senior High School

Hillsborough County
- Leto Senior High School

Middleton High School
- Robinson Senior High School

Okaloosa County
- **CHOICE** Aviation Academy

Palm Beach County
- Wellington High School

Volusia County
- Seabreeze Senior High School

Attachment B - Occupation Outlooks & Projections for Growth and Retirements

Career	Description/Outlook (2004-2014)/Growth
Aerospace Engineering and Operations Technician	Description Operates, installs, calibrates, and maintains integrated computer/communications systems consoles, simulators, and other data acquisition, test, and measurement instruments and equipment to launch, track, position, and evaluate air and space vehicles. Growth: Stable. Growth in Florida estimated at 0%; U.S. employment change estimated at +1.5%. Outlook: Opportunities are best for persons with an associate's degree. As technology becomes more sophisticated, employers will look for technicians skilled in new technology and require minimal job training.
Aerospace Engineer	Description Performs a variety of engineering tasks in designing, constructing, and testing aircraft, missiles, and spacecraft. Growth: Decreasing job opportunities in Florida and nation-wide. Jobs are going to off shore companies and new graduates are decreasing. Outlook: In Florida 0%; nationally -5.2%. Foreign competition and the slowdown in air travel have effected this occupation. The sharp decline in degree production may pose a problem as the existing workforce ages and retires.
Air Traffic Controller	Description: Authorizes, regulates, and controls air traffic within the vicinity of an airport and between control centers and airports to ensure the safety of passengers and crew. Growth: Stable in Florida. U.S. Growth +14.3% and 1% in Florida. Outlook: Increasing air traffic will require more controllers. Automation and Federal budgets will limit growth.

Avionics Technician	Description: Lays out, installs, tests, repairs, and maintains electrical systems in aircraft. Growth: Estimated to increase by 0% in Florida and +9.1% nationally. Outlook: Mechanics who keep abreast of changing technology in electronics and composite materials will be in greatest demand.
Aircraft Engine Mechanic	Description: Repairs and maintains the operating condition of aircraft and helicopter engines. Growth: In Florida 0% and estimated +13.4% increase nationally. Outlook: Most jobs will be replacement. Competition from other fields is creating favorable hiring climate.
Aircraft Mechanic	Description: Inspects, tests, repairs, maintains, and services aircraft. Growth: Estimated increase in Florida is 0% and 11% nationally. Outlook: Most jobs will be replacement. Some mechanics will leave for work in related fields such as auto mechanics.
Aircraft Pilot	Description: Flies airplanes and helicopters to carry out a wide variety of tasks, such as transporting passengers and cargo, dusting crops, spreading seed for reforestation, testing aircraft, tracking criminals, monitoring traffic, and rescuing and evacuating injured persons. Includes commercial, military, flight engineer, and navigator. Growth: 0% increase in Florida and +17.2 nationally. Outlook: Jobseekers with the most FAA licenses will have a distinct advantage as competition for these jobs increases.

Precision Aircraft Systems Assembler	Description: Lays out, assembles, installs, and tests aircraft systems, such as armament, environmental control, plumbing and hydraulics. Growth: No growth in Florida and +7.8% nationally. Outlook: Automation contributing to the decline.

In reality, growth is anticipated in each of the Outlook sections described above -- even those that predict zero growth. The zero growth relates to percentage points. The aviation and space sector is Florida's third largest economic sector, and growth of less than one percent may translate into hundreds or thousands of jobs over a five year period

The data tables below represent five-year projections that have been prepared by the Florida Department of Education and include estimates for growth and retirement replacement. It is interesting that the data gathered by the ARC survey closely match the findings of the DOE study. Both estimates approximate an annual 3% labor increase which includes industry growth and retirement replacement. In total, the industry needs to add and replace about 12,000 high wage jobs by 2014. If Florida does not capture its share of the growth opportunity described in the new technologies above, it will lag behind the national averages in the rate of growth within those occupational categories.

5 Year Projected Employment Demand Including Predictions for Growth and Retirement

Career Field	Employed	Retirement	Growth	Total
Aero Engineering & Operations Tech	2,009	210	70	280
Aerospace Engineer	4,642	565	150	715
Aircraft Engine/Aircraft Mechanic	15,586	1,810	680	2,490
Air Traffic Controller	1,963	245	125	370
Avionics Technician	1,444	170	60	230
Pilot	3,684	485	110	595
Precision Aircraft Systems Assembler	2,628	355	80	435
	31,956	3,840	1,275	5,115

A sudden cessation of the current Shuttle program could present adverse factors. At present, there are no known workforce initiatives that **address** the effects of premature massive retirements in the space industry.

Attachment C - Aviation and Space Summer Camps in Florida

Florida Community College at Jacksonville

2-week long, day-only camps, teaching math & science using aviation and space.

- Aviation
  - Mach 1 – Grades 6-9
  - Mach 2 – Grades 8-10
  - Mach 3 – Grades 10-12
- Space
  - Space Camp
  - Advanced Space Camp

Sun-n-Fun / Florida Air Museum

1-week long, day-only and residential camps designed to capture the imagination of children and interest them in aerospace science.

- Destination Aviation
  - Ages 11-12
  - Ages 13-14
  - Ages 15-18
- Space Camps
  - Space Camp 1 – Ages 7-8
  - Space Camp 2 – Ages 9-10

Embry-Riddle

3-week long, residential camps designed to introduce the technology of today to the aviators and astronauts of tomorrow. Can give college credit.

- Aerospace I
  - Ages 15-18
- Aerospace II
  - Ages 16-18
- Aviation Discovery for Women
  - Ages 15-18

Kennedy Space Center –Visitor Center

1-week long, day-only camps providing Shuttle Mission simulations, tours, and exploration challenges.

- Space Camp
  - Ages 8-14

Attachment D
Organizations and Associations Promoting Aerospace Careers, Training, and Education

AeroScholars – Online Aviation High School
www.aeroscholars.org

Aircraft Owners and Pilots Association (AOPA)
www.aopa.org

ALLSTAR – Aeronautics Learning Laboratory for Science, Technology and Research
www.allstar.fiu.edu

Aviation Museum of Kentucky
www.ket.org/trips/aviation/

BuildAPlane
www.buildaplane.org

Careers in Aviation
www.careersinaviation.org

The Challenger Center
www.challenger.org

Civil Air Patrol (CAP)
www.cap.gov

Experimental Aircraft Association (EAA)
www.eaa.org

Federal Aviation Association (FAA)
www.faa.gov

The K-8 Aeronautics Internet Textbook
wings.avkids.com

National Coalition for Aviation Education
www.aviationeducation.org

The Thomas Wathen Foundation
www.flabob.org/home2.html

Women in Aviation Resource Center
www.women-in-aviation.com

BIBLIOGRAPHY

Cutcher-Gershenfeld, et. al. (2001). *Developing a 21st Century Aerospace Workforce.* Massachusetts Institute of Technology. November 2001

First Coast Workforce Development Board. (2007). *Connecting Workers to Jobs: The WorkSource Comprehensive Plan 2007-2009.* Retrieved Aug 9, 2007 from www.WorkSourcefl.com

Florida Department of Education. (2005). *Florida's Education Pipeline: A Further Exploration of Labor Market Demand.* Retrieved June 26, 2007 from www.fldoe.org

Kemple, J. (2001). *Career Academies: Impacts on Students' Initial Transitions to Post-Secondary Education and Employment.* Manpower Demonstration Research Corporation, MDRC®. December 2001.

Kemple, J. and Snipes, J. (2000). *Career Academies Impacts on Students' Engagement and Performance in High School* Manpower Demonstration Research Corporation, MDRC®. March 2000.

Jenkins, D. (2006). *CAREER PATHWAYS: Aligning Public Resources to Support Individual and Regional Economic Advancement in the Knowledge Economy*, White Paper funding provided by the Joyce Foundation, August 2006, pages 9-10. Retrieved from website: http://www.financeproject.org/irc/win/tools.asp

Skandera, Hanna. (2007) *Florida's Education Pipeline: A Further Exploration of Labor Market Demand*. Retrieved from www.fldoe.org/OSI/meeting_2005_10_17/pdf/ComparisonPresentation.pdf

Stern, D., Raby, M., and Dayton, C. (1992). Career Academies: Partnerships for Reconstructing American High Schools San Francisco: Jossey-Bass.

Stern, D., Dayton, C, Lenz, R., and Tidyman, S. (2001). *Implementing Career Academies Schoolwide -- Four Case Studies*. Career Academy Support Network, CASN. University of California Berkeley: Johns Hopkins University and the Office of Educational Research and Improvement, U.S. Department of Education (ED-99-R-0024).

Stern, D. and Wing, J. (2004). *Is There Solid Evidence of Positive Effects for High Schools Students?* Career Academy Support Network, CASN. University of California Berkeley. January 15, 2004.

U.S. Department of Labor Employment & Training Administration. (2005). *America's Aerospace Industry: Identifying and Addressing Workforce Challenges.* Retrieved June 26, 2007 from www.doleta.gov

U.S. Department of Labor Employment & Training Administration. (2007). *Aerospace: Local solutions with National Applications to Address Aerospace Industry workforce Needs*. Retrieved June 26, 2007 from www.doleta.gov

U.S. Department of Labor Employment & Training Administration. (2007). *High Growth Industry Profile*; retrieved from www.doleta.gov/BRG/pdf/Aerospace.pdf