

# Aerospace Resource Center

A yellow outline map of the state of Florida is positioned behind the text 'Aerospace Resource Center'.

## Needs Assessment Aerospace Industry Cluster

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Report Produced by  
Indigo Key, Inc.



## Foreword

The aerospace industry has played a major role in fueling Florida's past economic growth. Florida ranks third among the states for aerospace employment; the industry accounted for nearly 148,000 jobs and more than \$7B in wages in 2004. The key to Florida's maintaining—and enhancing—its competitive edge for economic development is focusing on the educational and training needs of occupations critical to the success of this high value industry cluster.

The Aerospace Resource Center (ARC) was launched in early 2006 as a Workforce Florida, Inc. initiative to serve as a focal point for all aviation and space education and training within the state. The ARC's mission is to craft relevant and timely curricula to address technological advances and industry innovations that change the skills required of aviation and space workers. The importance of talented workers to business success and growth places the ARC at the heart of the state's economic development plans for this key strategic industry.

Florida's past role in leading and executing this nation's efforts in aviation and space development is undeniable. However, a recently completed report, the Governor's Commission on the Future of Space and Aeronautics in Florida, portrays the aviation and space sectors in transition and poised to offer new employment opportunities and industry growth initiatives—ranging from the privatization of civil and military launch activities to space tourism and transportation.

With the ARC's focus on facilitating the development of an effective workforce for the aerospace industry, it is imperative to know the current as well as emerging needs of that industry. Towards that end, this report provides the results of an assessment of the aerospace industry and the education and training requirements of its current and future workforce.

This report reflects the efforts and inputs of several organizations. Ulrich Research designed a survey instrument that collected information on industry demographics, occupational and job needs, workforce education and training requirements, as well as retirement and hiring issues. Indigo Key analyzed the survey results and, integrating its database tools, economic development experience and statewide linkages to aerospace companies, produced the following analysis and report. Finally, the ARC leadership provided a brief, but important overview—one that takes initial steps to clarifying the existing, and often fuzzy, distinctions that arise in discussions and analysis of the aviation and space industries. This discussion offers a model for aligning the language of the industry with the ever increasing merge of aviation and space capabilities.

This report helps identify the workforce training needs of the aviation and space industries. It will provide the starting point for insuring that state-wide workforce development efforts are relevant, and targeted needs are industry-driven.

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## **AEROSPACE BANNER CENTER PROJECT OVERVIEW**

### **Purpose**

The Florida Aerospace Resource Center (ARC) is funded by a pioneering initiative of Workforce Florida, Inc. (WFI) and the Agency for Workforce Innovation (AWI). Accordingly, this collaborative will serve as a resource center for all aerospace education and training within the State of Florida. The program will focus on significant and emerging training requirements for aviation and space companies currently located in Florida, as well as those contemplating relocation to Florida. As Florida's first industry-driven Workforce Education BANNER Center (Business Assistance Now for New Economy Results), this collaborative effort represents the beginning of a statewide network designed to further solidify and strengthen partnerships among the business community, public and private education providers, and the public workforce system to coordinate in the collective pursuit of Florida's economic development goals.

The purpose of this effort will be to develop a statewide system of aerospace education and training resources to facilitate the development of a highly efficient and effective workforce, which will act as a catalyst for current as well as future aerospace industries located in Florida. This collaborative effort will look for synergies and commonalities in the aviation and space industries and apply best practices where necessary to enhance positive outcomes across the aviation and space communities.

### **Industry Definitions**

Each profession or industry typically has its own language or set of words that is commonly used by those in that particular field. For example, the distinct terms within the aviation and space industries each form a unique collection of "system vocabulary" where each word typically means one thing to all parties in verbal or written communication. However, this dynamic can break down when representatives of several industries collaborate on studies where disciplines interact. In these instances colleagues often employ words and terms they assume to have the same meanings by all participants—but often do not.

To illustrate--previous study analyses and reports [many referenced within this assessment] reveal a varied and inconsistent use of terms about what constitutes or represents the aviation and space industries. For example, the terms "space" and "aerospace" are often used interchangeably in a single body of work. Imprecise use of terms such as this can lead to confusion--does "aerospace" mean the same thing to someone in the space industry as it does to someone in the aviation industry? Differing opinions on what constitutes the "aviation industry" or the "space industry" can lead to uncertainty--and industry analysis that is imprecise and misleading. Consistent use of language is important--it provides precision and clarity about terms and the context they are used in.

In this particular assessment and within the context of the aviation and space industries' workforce development requirements, the following definitions will apply:

- The term “air” can be defined as a physical place: “*of, or pertaining to, earth’s envelope of atmosphere.*” As a corollary to this term, the term “aviation” shall be associated with the *design, manufacture, operation, training, and regulation of vehicles and systems primarily used in the earth’s atmosphere.*
- The term “space” is often defined as a physical place: “*that region beyond the earth’s atmosphere.*” Therefore, “space” shall be associated with the *design, manufacture, operation, training, and regulation of vehicles and systems primarily used in the region beyond the earth’s atmosphere.*
- The term “aerospace” is defined in Webster’s as being: “*of, or designating the earth’s atmosphere and the space beyond.*” The term “aerospace” shall be used by the ARC in conjunction with activities applicable to both the aviation and space industries, to include the *design, manufacture, operation, training, and regulation of vehicles and systems used throughout the earth’s atmosphere and beyond.* In short, the term “aerospace” shall represent an environmentally indivisible medium [air and space]. Whenever “aviation and space” are used in the industry context, “aerospace” will serve as a valid, unifying, and synonymous replacement for both of these terms.

Why are these particular clarifications important? Current “distinctions” separating aviation and space—platforms, environments, industry stovepipes—have dwindling usefulness as one looks to the future. One of the goals of the Aerospace Resource Center (ARC) is to facilitate the envisioned merging of aviation and space capabilities [e.g., horizontal launch of future space systems and the commercial application of transportation and tourism to space systems]. As we look ahead, past “distinctions” are blurring, and the term “aerospace” serves best not as simply a “place” but as a ***new way of thinking*** about the synergistic operation and support of aviation and space systems. This report embraces and communicates this unifying notion. In fact, this precept was the basis for the origination of the Aerospace Resource Center.

This report will address all the individual components of the aviation and space industry cluster—using this aviation, space, and aerospace framework.

## **REPORT OVERVIEW**

This report provides research and analysis on current as well as future workforce development needs of the aviation and space industries. The Executive Summary overviews the project, the purpose and design of the Florida Aerospace Industry Survey; and the report’s major Findings, Conclusions, and the Recommendations made by Indigo Key. The Findings, Conclusions, and Recommendations include insights of the ARC Advisory Council and Executive Board. Including their inputs provides added value by recognizing the “connectedness” among cited studies and places workforce development issues in a broader industry context.

The remainder of the report provides information and analysis on the number of current workers in the state of Florida in the aviation and space industries, geographic concentrations of aerospace industry within the state, and the impact of anticipated retirements on workforce planning and development. Finally, the report provides quantitative information on schools and vocational providers that serve the industry as well as a profile of the degree and certificate programs they offer.

## ***EXECUTIVE SUMMARY***

This report was commissioned by the Aerospace Resource Center (ARC) and performed by Indigo Key, Inc. The report presents fresh data gained from a broad cross-section of Florida's space and aviation community. Surveys were sent to nearly 1,500 Florida companies. The target database was gathered from listings provided by the Florida Aviation Aerospace Alliance (FAAA) and Indigo Key.

The purpose of the survey is to gather first-hand information on the aviation and space industries' five-year projected educational and workforce demands. It should be noted that the assessment is made during uncertain times. The shuttle-orbiter has short years remaining and impacts thousands of jobs. There are uncertainties about where the future of space is going but demands for Crew Exploration Vehicles (CEVs) and Very Light Jets (VLJs) are emerging. Florida companies are working to meet day-to-day business demands while they also seek to better understand the future.

To solicit the maximum response, ARC surveys were distributed under the names of three prominent figures in the industry:

- Mr. Marshall Heard, Chair of the Florida Aviation Aerospace Alliance.
- Mr. J. B. Renninger, Director of Aviation Center of Excellence, Florida Community College at Jacksonville.
- Dr. Al Koller, Executive Director of Brevard Community College Aerospace Program and Space TEC, Principal Investigator.

Surveys were distributed by fax, email and phone. Respondents were given the opportunity to fax their responses or complete surveys on-line. Surveys were designed so reviewers could qualify each respondent as to how relevant its products, services and employees were to the survey questions.

An exhaustive effort was made to secure participation. A total of 52 organizations participated in the survey, representing a response rate of 3.4%. Responses continue to arrive, but the numbers show that even with a major push, a large part of the community chose not to participate in this important assessment. Survey findings were complemented with telephone interviews with industry members and educational institutions.

The survey was designed to comply with the ARC "purpose" described above, and more specifically to assess the industry's workforce training, hiring and education needs. The survey was designed to qualify respondents according to the products and services they provide to the aviation and space sector and number of employees within specified professions. Below is a summary of the questions:

- The company's role in the aviation and space industry.
- The company's requirements for professional or technical certifications and licenses.

- The number of space and aviation personnel the company currently employs or is seeking to hire.
- How many of these positions the company currently employs.
- The academic requirements the company demands when filling its aviation and space positions.
- The perceived value of the skill-based curriculum taught by Florida's educational institutions.
- The major challenges companies experience in finding, recruiting and hiring qualified personnel.
- The percentage of the company's workforce that will retire within five years.
- Annual growth rate for space and aviation positions.
- Whether companies would participate as a "buyer" in a program that would link Florida buyers with Florida suppliers.
- The interest of respondents to serve on an advisory council or focus group to support Florida aviation and space.
- The respondent's interest in receiving a summary of this report.

The data gathered by this survey has been augmented by educational and economic impact data gained from other recent Florida-based studies and includes the Defense component. Where possible, previous reports are modeled or updated using 2006 impact analysis data. Calculations point to the state-wide effects of NASA's expenditures that ripple and multiply from the central Kennedy Space Center area.

Survey data was entered into Indigo Key's web-based solution where authorized users can conduct analysis using several tools including the ability to instantly search data by company, by question, by answer and to generate reports or to communicate with selected respondents.

The report suggests that the Aerospace Resource Center (ARC) and the Florida Aviation and Aerospace Alliance are important venues to establish a "community" within this highly independent industry sector. The hard work of transitioning to new space vehicles, building curricula, training the workforce, securing investment, retaining jobs and capturing Florida's share of the marketplace depends on a unified Florida community supporting a targeted academic initiative.

## ***FINDINGS***

What follows is a summary of this report's major findings: (Note: a detailed report of individual survey questions and answers is provided in the "Survey Analysis" section of this report).

- The majority of the respondents are involved in the business of aircraft manufacturing and maintenance. Additionally, a large segment of the responding companies provide training-related services to the industry.
- Aviation and space companies continue to hire; however, in most communities engineers and technical positions are difficult to fill. Specifically, Florida companies are struggling

to recruit engineers (aeronautical, astronautical, manufacturing and mechanical) and also electrical technicians. This assessment shows that employers expect a 5% growth demand for these positions and that up to 10% of their workforce is slated for retirement within five years. This data contrasts with current Florida Department of Education reports (see Choice Planner reports<sup>1</sup>) that predict a 3% growth demand exclusive of retirement. When the retirement factor is included in the calculation, Florida needs to replace up to 15% of its total aerospace engineering and technical workforce within the next five years.

- Over 80% of respondents (as high as 93% in some skill sets) indicated that the programs offered by Florida's educational institutions are important resources for their workforce needs.
- More than two-thirds of respondents seek at least a Bachelor's degree for engineer positions.
- A high school education is the threshold requirement for hiring technicians, machinists and operator positions.
- 81% of respondents indicated that ten-percent or less of their workforce is expected to retire within five years.
- The majority of respondents (57%) said they would participate as "buyers" in a program to link Florida buyers with Florida suppliers.
- A total of 30.5 % of respondents said they would be willing to serve on an industry advisory or focus group.
- Calibration and line technicians represented the largest anticipated growth areas for hiring during the next five years.
- 83.3% of respondents want to receive a summary of this report.

On July 27, 2006, the findings of the Indigo Key survey and assessment were presented to the members of the ARC Advisory Council at a meeting at the University of Central Florida Research Park. The purpose of the meeting was to gather insights and observations on the assessment from the Advisory Council and the ARC Executive Board. What follows are highlights of Council and Board members' comments and responses:

- Some respondents felt the survey was not germane to their business line. This is attributed to the fact that the survey sought to gather information from a wide range of aviation, space, and aerospace activities.
- There was concern expressed over low response rate, but the Council felt that the quality of the respondents coupled with the in-depth interviews provided a sufficient qualitative

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<sup>1</sup> <http://statsbls.gov/news.release/ocwage.tn.htm>

sample. Possible reasons cited for low response rate among aviation segment included the industry-wide focus on short-term daily business demands as it seeks to prepare for major changes. There is also a lack of an industry “community” that can collectively pursue opportunities, combine resources, rally around issues and respond to major challenges. Other reasons cited for lack of responses are the frequent requests for data and the reality that most companies have few resources to dedicate to a major survey.

- Initially, zero responses were not included in the findings. The Committee felt that a zero response provided important information, and subsequently these responses were added into the report’s totals and comparisons.
- The Florida Aviation Aerospace Alliance (FAAA) has actively supported this assessment including providing a list of 3,500 companies for the outreach. FAAA felt there is a need to better understand how the lack of qualified workers and workers compensation issues impact the industry. It also felt there is value to understand how Florida’s relatively high number of small businesses will be affected by future industry demands.
- There is a need to predict industry needs out 10 years. Florida has several Fortune 500 companies with strategic planning staffs that need to be engaged in this activity. A possible mission for the ARC would be to coordinate this effort and convene a “preparing for the future” forum. A major obstacle has been the industry’s reluctances to enter into open dialog that includes discussion of competitive products.
- The question was raised as to whether the venue should include separate meetings for aviation and space. The consensus opinion was in favor of a single session that merged the issues.
- The survey showed that Florida’s engineering positions are hard to fill, but this may be a regional problem not shared by other states. The ARC should research other state programs and their workforce programs to identify patterns and possible solutions.
- The survey did not address the industry’s need for investment and capital, but it is widely believed that new investment strategies must be considered. ARC can assist the industry by better knowing the future of aerospace infrastructure investment that supports Florida’s manufacturing and service sectors.
- The educational establishment may need new tools for identifying which “skill sets” can facilitate employment within the industry as well as augment the current curriculum-based programs. ARC is positioned to be the center of the workforce development effort. ARC should consider forming cooperative alliances with Enterprise Florida and Space Florida to meet these objectives.
- The Recommendations put forth in this report need to be evaluated for “do-ability”. It is recommended that they be placed in three tiers: Tier 1 as the most valued, Tier 2 as important to do, and Tier 3 as nice to do if time and funds are not an issue.
- ARC should consider a contingency plan that addresses an immediate shut-down of the shuttle program resulting from a catastrophic event. This effort should not be limited to curriculum development but also include the broader needs of a displaced workforce.
- It is expected that \$2 to- \$3 billion will be spent on construction infrastructure as the U.S. transitions from the shuttle to the follow-on systems. Strategic planning needs to include ways to ensure that Florida corporations are well positioned to maximize exposure to these contracts.

## **CONCLUSIONS**

The survey shows that in the next five years Florida will need as many as 12,000 positions to fill its aviation, space and aerospace industry requirements. Responses to this survey indicate that a significant portion of current hiring is based primarily on an applicant's skill sets and not their academic degrees. Many respondents say they are not pursuing degreed applicants and are accepting high school or non-degreed labor expecting that they (the company) will provide employee training.

It is a known fact that Florida's aerospace industry will undergo major changes in the near future. The space shuttle will be eliminated and new space vehicles will be developed, launched and supported. This report shows that while change is bearing down on Florida, most of the aerospace industry (particularly small companies) continues under a status quo strategy. The survey shows little evidence of major workforce restructuring, training or other *change-related* activities. Aerospace businesses continue the hard work of maintaining competitiveness and appear less involved in major preparations for the future.

Respondents to this survey were mostly small companies (none of the respondents indicated they had more than 150 employees). The conclusion was that major companies are more likely to be active in their strategic planning given larger corporate budgets for consultants and planning staffs; however, they are not compelled to share their plans at this time. Smaller companies are continuing to fulfill their typical role as subcontractors in support of prime contractors.

There are thousands of companies and tens of thousands of employees that make up Florida's aerospace industry. For years these companies have sought to establish individual and unique market niches. Companies have purposely endeavored to distinguish (and separate) themselves in a highly competitive marketplace. The result is that Florida's aerospace industry is not a "community". This survey, as example, was endorsed and distributed under the name of Florida's most visible aviation and space leaders. The assessment went to fifteen hundred Florida aviation and space companies. Weeks were invested personally calling companies to encourage their participation. This major effort produced 52 responses. As seen from the findings and recommendations, the responses offer a valuable window into the industry, and the ARC and its partners are indebted to the respondents for their input and clarity.

One of the most pressing findings of this survey is the need for Florida's aerospace support agencies like the Aerospace Resource Center (ARC); Enterprise Florida, Inc. (EFI); Space Florida; Florida Aviation Aerospace Alliance (FAAA); and others to partner in building the Florida aerospace community. A common voice will be required if Florida is to share a unified vision and strategy for going forward. Florida is competing nationally for its share of the aviation and space market, and the competition is getting organized. As an example, the California Space Authority recently received \$18 million dollars to organize its industry. At present more than 84 California organizations are cooperating to form a state-wide "community". Getting competing companies to actively participate in a state-wide cooperation is not just a good idea--it will be critical if Florida is to maintain its role as an aviation and space leader.

In addition to the findings gained by this survey, this report provides the reader with background and contrasting information that has been gathered by other Florida aerospace reports. The FAAA 2003 Assessment and the University of West Florida Economic Impact Study indicate that space expenditures contribute to the revenues of many of Florida's non-space related enterprises. These findings confirm that bold, decisive action is justified to maintain Florida's substantial footprint in the space industry. The report details the significant potential for expansion in aviation and defense businesses. Discussion will point out the possible expansion of the aviation and space sectors from the utilization of the declining manufacturing sector.

Studies conducted by FSA and EFI conclude that the Florida aviation and space exploration programs are expected to continue as a major economic force in the state and other selected US markets. Aviation has been a large part of Florida's history, and with some stimulus this industry can be poised to grow exponentially. The aerospace segment of the Florida economy has great potential to provide a source of high tech, high wage occupations. Growth in the industry is dependent upon the State seizing the initiative and leading the effort to transform the Florida workplace from a service based economy to one based on high-end occupations. The challenge facing the educational establishment is to transition from business as usual to one that is proactive in promoting existing and new aviation technologies. The aerospace industry's high wage jobs are vital to the State's economic health.

There is a bright future for new space-related niche companies and the technologies that will lay the foundation for planned new Moon and Mars missions. The primary challenge is the Shuttle Transportation System (STS) that is nearing the end of its operational lifespan. The loss of this huge economic engine is expected to be a gradual, phased turndown, but contingencies need to also prepare for instant catastrophic shutdown. The State needs aggressive initiatives to anticipate this loss and innovative plans to transition to replacement industries. The design and support of a new vehicle will require the State to mobilize its industrial and educational capacity to provide overall support to the aviation and space community. The plan needs to include tools to capture contracts that are generated in Florida but go to non-Florida suppliers.

As of the time of this report, key decisions remain regarding the replacement vehicle for STS and associated delivery systems. There is some concern that the Kennedy Space Center (KSC) will no longer serve in its current vital role as a launch site, pre-launch processing center, logistics depot, and recovery/refurbishing center for the next generation of space delivery systems. Should this happen, the outcome will impact Florida negatively for several decades. For Florida, winning or losing this "economic space race" will be measured annually in the tens of billions of dollars. Leadership from the educational establishment, representing both public and private institutions, remains a primary success factor if Florida is to successfully increase its "market share" of the industry sector.

It is significant to note that the definition and resulting number of defense and aviation-related companies have been narrowly defined in the most recent studies. This report shows that definitions may have failed to recognize many companies who have a capability to support the aviation, space, and aerospace industry. These companies are an important asset as the state looks to capture the billions in sales and tax revenues that it is losing to other states.

President Bush's recently announced vision for U.S. space exploration is the primary driving force for future investment in this sector. Florida's previous industry investments, however, will not be a defining factor for securing the future. The Governor's Commission on the Future of Space and Aeronautics in Florida states clearly that formidable competitors are mobilizing to secure a place in the new space race. The University of West Florida study of *The Defense Industry Impact on the Economy of Florida* concluded that the defense industry represents a \$44 billion industry segment. Combining aviation (\$50 billion), space (\$5 billion) and aerospace (\$44 billion) produces a combined aerospace industry cluster value approaching \$100 billion. External competition and failure by the state to capitalize on and grow current aerospace businesses will jeopardize a major industry base within the state.

The Commission Report also concluded that despite growth in this area, Florida will continue to be a net importer of goods and services. Jobs in the economic aerospace cluster are being exported to other states. Many of these contracts (jobs) could be performed in Florida. Components in these supply chains are easily identifiable using tools such as Indigo Key and will allow economic developers to specifically target cluster suppliers.

Florida needs better tools to advance its key industry sectors. A historical review shows the state does not fare well when pursuing major industrial activity (EADS, BMW, Mercedes, etc.). The economic development community could benefit from tools that focus on cluster supply chains. The activities of FAAA, Space Florida, the Manufacturing Association of Florida (MAF), and the overall aerospace community should be combined with renewed emphasis on maximizing contracts for Florida supplier companies. In short, the synergy with manufacturing as a lead-in source for high skill workers should be exploited.

## **RECOMMENDATIONS**

The following recommendations were formulated by Indigo Key and flow from their survey results as well as report findings and conclusions.

**Tier 1.** These tasks are considered to be the **most important**. If these actions are pursued by the ARC, they will advance its mission and purpose (and satisfy the requirements of the grant).

1. Industry anticipates that it will replace or add up to 15% of *all* aerospace engineering and technical positions (within five years). The academic and post-secondary vocational provider communities need to prepare for this demand, which exceeds 12,000 workers. A possible goal of the ARC is to help the industry to form a state-wide aerospace community and to facilitate the work of helping to prepare Florida's aviation and space companies for significant change.
2. Survey responses indicated that *skill sets*, not curricula, represent primary hiring criteria for **aerospace** companies, particularly in non-engineering positions. One recommendation of this report is for the academic community to increase its efforts to identify the target "skill sets" required by the industry. The process of identifying industry skill sets should be accomplished in addition to the traditional "career path" approach, not in place of it<sup>2</sup>.
3. Military trained personnel may be an under-utilized resource for ramping up a technical workforce. The academic community should evaluate the potential of a curriculum to prepare and advance military trained personnel as candidates to help fill the industry's need for qualified employees. There is additional potential to coordinate or model initiatives after the Community Colleges of the Air Force and its vast educational network.
4. A total of 57% of respondents said they would be willing to participate as buyers in a buy-Florida program. This report concurs with several earlier recommendations that Florida invest in a program to capture contracts that originate in Florida, but are primarily fulfilled by out-of-state vendors. Presently, little or no attempt is made to link Florida ASA buyers with Florida suppliers. A modest program that captures 20% of Florida's exported contracts from this sector will produce 15,000 jobs, \$2.5 billion in economic vitality and \$50 million in new taxes for Florida.

**Tier 2.** These tasks are considered to be **important** but may be deferred to a later date.

5. Florida should conduct an inventory of potential locations for test, repair, refurbishment, operation, launch, landing, flight and recovery for aviation and space related ventures including commercial vehicles, defense, tourism, and any other sector whose activities relate to aerospace development and operation.

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<sup>2</sup> Anecdotal comments from George T. Baker Aviation School indicate that skill sets enable their students to receive employment offers prior to graduation. We recommend more targeted surveys and industry based focus groups to help determine the academic skill sets required.

6. Florida should conduct an inventory of companies related to the aviation and space sectors that are expected to have major changes in educational requirements due to *changing technologies*. An example in this area is the shifting emphasis from metal fabrication to use of composite materials. Following the inventory, the State should then advance programs that promote investment in the educational needs of these enterprises.
7. The academic community should continue its efforts to revise curricula that anticipate the loss of the STS and its related attendant mission elements. These plans should consider both phased turndown and catastrophic shutdown contingencies. Planning should anticipate transitioning existing personnel to other related aerospace technology areas. There needs to be better coordination between the needs of industry and the academic community. There should be a position, preferably housed at Space Florida, whose sole purpose is to keep evolving aerospace technology needs known to the academic community through the ARC.

**Tier 3.** These actions will enhance the goals and missions of the ARC, but not in a strategic manner.

8. The State of Florida (Enterprise Florida, Inc. and Space Florida) should actively support initiatives of the Aerospace Resource Center and the Florida Aviation Aerospace Alliance “to build a unique community of industry partners” as an important venue for the state to achieve its economic objectives.
9. The displaced manufacturing force may be a potential resource for aviation, space, and aerospace occupations. A model is Operation Paycheck, where Community Colleges rapidly responded to displaced workers following 9-11.

**DISCUSSION ON OUTLOOK AND GROWTH PATTERNS**

Career and job opportunities exist in the aviation, space, and aerospace industry sectors. Over 12,000 positions need to be filled in the next five years with most of the growth coming from retirements. There is little evidence that this report or previous reports are capturing the impacts of impending industry changes that will come with the Crew Exploration Vehicle (CEV), its attendant booster, and the introduction of the on-demand air taxi service as an outcome of the development of VLJs.

The following career choices were profiled as representative of aviation, space, and aerospace sector occupations (Table 1). These career fields are studied and reported by the Florida Department of Education as part of its Choice Planner data. Base employment data is provided by the US Department of Labor. It is important to note that Table 1 predicts only growth, not retirement replacement (unlike table 2 that estimates growth and retirement replacement). By using whole-number percentages as measurements, these reports do not account for the hundreds of positions that Florida anticipates will be added to the industry sector.

*Table 1*

Career	Description/Outlook (2004-2014)/Growth
Aerospace Engineering and Operations Technician	<p><u>Description</u> 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.</p> <p><u>Growth:</u> Stable. Growth in Florida estimated at 0%; U.S. employment change estimated at +1.5%.</p> <p><u>Outlook:</u> 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.</p>
Aerospace Engineer	<p><u>Description</u> Performs a variety of engineering tasks in designing, constructing, and testing aircraft, missiles, and spacecraft.</p> <p><u>Growth:</u> Decreasing job opportunities in Florida and nation-wide. Jobs are going to off shore companies and new graduates are decreasing.</p> <p><u>Outlook:</u> 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</p>

	workforce ages and retires.
Air Traffic Controller	<p><u>Description:</u> 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.</p> <p><u>Growth:</u> Stable in Florida. U.S. Growth +14.3% and 1% in Florida.</p> <p><u>Outlook:</u> Increasing air traffic will require more controllers. Automation and Federal budgets will limit growth.</p>
Avionics Technician	<p><u>Description:</u> Lays out, installs, tests, repairs, and maintains electrical systems in aircraft.</p> <p><u>Growth:</u> Estimated to increase by 0% in Florida and +9.1% nationally.</p> <p><u>Outlook:</u> Mechanics who keep abreast of changing technology in electronics and composite materials will be in greatest demand.</p>
Aircraft Engine Mechanic	<p><u>Description:</u> Repairs and maintains the operating condition of aircraft and helicopter engines.</p> <p><u>Growth:</u> In Florida 0% and estimated +13.4% increase nationally.</p> <p><u>Outlook:</u> Most jobs will be replacement. Competition from other fields is creating favorable hiring climate.</p>
Aircraft Mechanic	<p><u>Description:</u> Inspects, tests, repairs, maintains, and services aircraft.</p> <p><u>Growth:</u> Estimated increase in Florida is 0% and 11% nationally.</p> <p><u>Outlook:</u> Most jobs will be replacement. Some mechanics will leave for work in related fields such as auto mechanics.</p>

<p>Aircraft Pilot</p>	<p><u>Description:</u>                  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.</p> <p><u>Growth:</u>                  0% increase in Florida and +17.2 nationally.</p> <p><u>Outlook:</u>                  Jobseekers with the most FAA licenses will have a distinct advantage as competition for these jobs increases.</p>
<p>Precision Aircraft Systems Assembler</p>	<p><u>Description:</u>                  Lays out, assembles, installs, and tests aircraft systems, such as armament, environmental control, plumbing and hydraulics.</p> <p><u>Growth:</u>                  No growth in Florida and +7.8% nationally.</p> <p><u>Outlook:</u>                  Automation contributing to the decline.</p>

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 aerospace industry 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 (see Table 2 on page 17 for detailed growth projections).

These tables do not predict the impact of Florida aerospace job opportunities stemming from new technology and business innovations. For example the expanded use of unmanned aerial vehicles (UAVs), which are already widely used for military reconnaissance, can lead to expanded growth for air cargo operations. Near space operations, e.g., sub-orbital flight experiences at altitudes in the vicinity of 300,000 feet have the potential to provide employment and economic growth for Florida businesses. Also, commercial space applications will grow as the government allows the commercial use of federal facilities and as other spaceports are established. There are also ongoing negotiations with the Air Force to use the Eastern Test Range and its extensive tracking ability for commercial launches. Finally, there is a fledgling emergence of a space tourism industry.

Additionally, the potential for growth in the aviation sector is significant. DayJet, for example, plans on a large fleet of VLJ—very light jets. The program will be focused on no-frills and cost effective service and will utilize 100% automated planning and scheduling technologies. It will capture the technology evolution of the past decade employing highly efficient engines, innovative manufacturing techniques and integrated avionics. At DayJet there is concern that aircraft manufacturing and flight simulator training will go to other states. Florida, however, has

the opportunity to capture significant related opportunities such as aircraft maintenance. As already stated, the fleet will be large and that will require additional aircrew and maintenance personnel. Inaugural DayJet air taxi operations are scheduled to begin in November in Florida. If the traditional model is followed, significant amounts of related work will be done out of state.

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

*Table 2*

Career Field	Employed	Retirement	Growth	Total
Pilot	3,684	485	110	595
Air Traffic Controller	1,963	245	125	370
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
Precision Aircraft Systems Assembler	2,628	355	80	435
Avionics Technician	1,444	170	60	230
	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 aerospace industry. (See Recommendations).

## THE AEROSPACE CLUSTER

The table below shows the significant value that the aviation and space industries have upon the State of Florida. The table lists many of the industry occupations, their related NAICS codes, and the number of establishments in each code, average employment and wages.

### Florida's Aviation and Space Industry

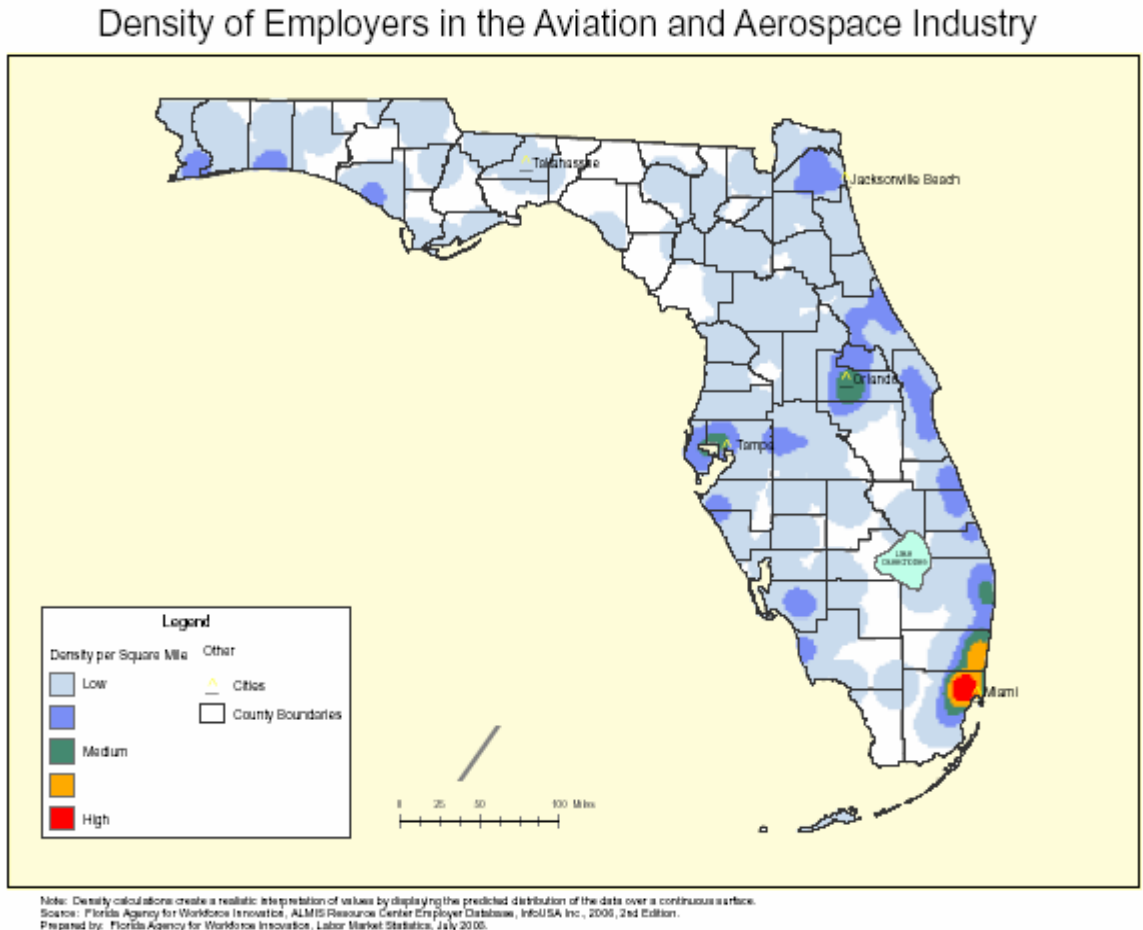
#### Florida's Aviation and Space Industry Establishments, Employment, and Wages (2005)

Industry	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
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
<b>Space Subtotal:</b>		<b>381</b>	<b>30,111</b>	<b>\$1,990,878,496</b>	<b>\$ 69,886</b>
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
<b>Aviation Subtotal:</b>		<b>1,402</b>	<b>52,820</b>	<b>\$2,421,251,658</b>	<b>\$ 49,563</b>
<b>Total Aerospace Industry</b>		<b>1,783</b>	<b>82,931</b>	<b>\$4,412,130,154</b>	<b>\$53,204</b>

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

### Density of Employers in the Aviation and Space Industry

Florida’s aviation and space industries cluster has heavy concentrations on the I-4 and I-95 corridors, but the industry is dispersed statewide. Note the cluster map below shows the industry concentrations in the major population centers and around our military installations. The industry cluster is complimented by educational establishments. The educational partners have been responsive to industry by locating facilities on or near the major aerospace centers. Examples are the FCCJ campus at Cecil Commerce Center and educational facilities on all military bases. The cluster, based on Agency for Workforce Innovation, Bureau of Labor Market Statistics 2005 data, is based on information that narrowly defines aerospace companies. In reality, many manufacturing companies contribute to the industry as a small part of their overall operations. Many other companies have the skills and technologies that serve the industry as contractors and suppliers. More work needs to be done to identify these companies, who are candidates to capture some of the \$7 billion in ASA contracts that Florida exports each year.

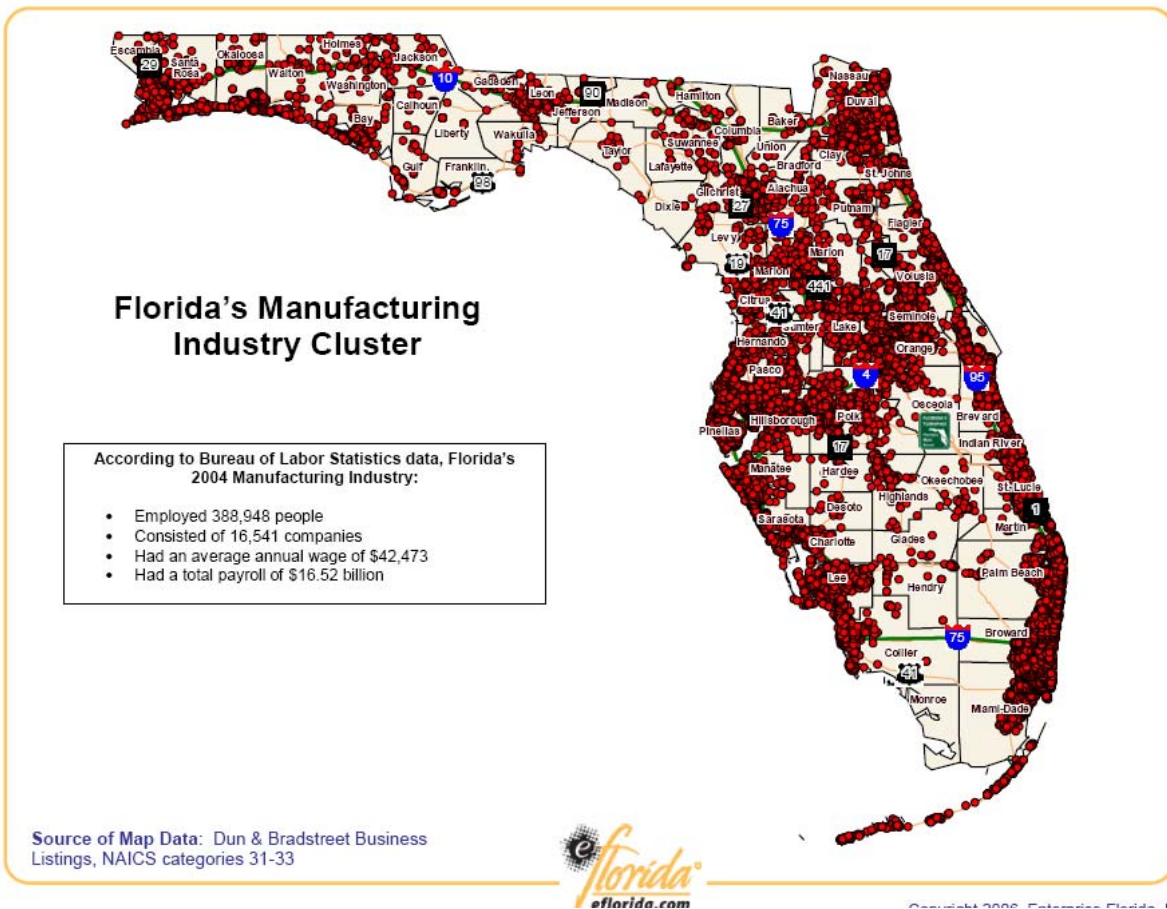


For full diagram see “AeroSpaceErs.pdf” attachment in the Attachments section.

### Florida's Manufacturing Cluster

Below is a map showing the distribution of Florida manufacturing companies. The manufacturing sector is comprised of several key cluster groups including aviation, space, bio-tech, high-tech, software and Internet technology. There has been little effort made to cross over suppliers from one cluster to another, but the potential is huge for Florida. The Florida manufacturing sector has seen a steady decline in jobs but still numbers about 400,000 workers with average salaries above \$42,000 per year. A cluster map of manufacturing jobs is shown below.

### Manufacturing Cluster Map



If one overlaid the cluster map of the aviation and space industries over the manufacturing cluster above, it would show a strong correlation. In addition to manufacturing, the military complex (not shown in the cluster) is renowned for its high quality training. Ex-military members with aerospace skills are a potential resource for Florida workforce development. Veterans should be aggressively targeted as potential high tech capable employees. The ARC should investigate what efforts are required to translate military skills to recognizable civilian degrees and certificates. This would preclude veterans from having to unnecessarily return to the classroom for certification.

The workforce can be enhanced by private and public institutions that offer skill-specific curricula. Certificate programs are offered in aviation/space studies. Candidates can enter the system at any level from middle school through high school and college and complete a certificate, a license, or a degree that will qualify them for employment in the aviation/space industry. Articulation agreements exist throughout the Florida educational system that allow for a seamless pathway (FLACCC Report) to a career in the aviation, space, and aerospace sectors.<sup>3</sup> (See listing of academic and vocational provider offerings starting at page 45.)

Previous studies have examined Enterprise Florida, Inc (EFI) data from *Florida's Aviation and Aerospace Industry Companies, Employment, and Wages, 2004*. EFI data differs from NASA studies because it extends the reach beyond NASA-only expenditures to include the 300 companies that make up the strategic aerospace sector. The EFI report lists the total sector as having 29,100 employees with an average annual income of \$63,000. The data below is updated to include 2006 impact calculations. The following table (EFI's 2004 report) shows the overall aerospace economic impact of \$4.8 billion, including \$97 million in taxes and \$986 million in capital income.

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<sup>3</sup> Some barriers remain to certification programs. The cost of an aviation mechanic's tool kit may be approximately \$1,100. The barrier for minority students remains a lack of exposure to the career field (SAFE Report).

## **AEROSPACE INDUSTRY ECONOMIC IMPACT**

The economic impact of the aerospace industry to the Florida economy has been established at approximately \$100 billion. Significant amounts of these dollars for aerospace are concentrated in the Brevard County area. The discussion of the aviation and space segments is intended to show the potential for these sectors to expand using the available, existing infrastructure.

### **Florida Aviation and Space Sector**

This information is added to emphasize the impact of aviation and space businesses on the Florida economy.

**Enterprise Florida, Inc (EFI) data from Florida's Aviation and Space Sector  
300 Companies including 29,100 Employees  
(Updated using 2006 IMPLAN data)**

<b>Gross Economic Output <sup>4</sup></b>			
Industry	Direct Impact	Indirect and Induced Impact	Total Impact
Aviation and Space Sectors	\$3,411,490,000	\$1,431,489,197	\$4,842,979,197
Total:	<b>\$3,411,490,000</b>	<b>\$1,431,489,197</b>	<b>\$4,842,979,197</b>

<b>Gross County Product <sup>5</sup></b>		
Industry	Total Impact	
Aviation and Space Sectors	\$3,022,803,327	
Total:	<b>\$3,022,803,327</b>	

<b>Total Labor Income <sup>6</sup></b>		
Industry	Total Impact	
Aviation and Space Sectors	\$1,939,650,523	
Total:	<b>\$1,939,650,523</b>	

<b>Total Employment <sup>7</sup></b>		
Industry	Total Impact	
Aviation and Space Sectors	29,105	
Total:	<b>29,105</b>	

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<sup>4</sup> Gross Economic Output is the aggregated market value of goods and services produced by firms and government enterprises in the county's economy. It is essentially equal to the revenue collected by businesses (including indirect taxes) within the county.

<sup>5</sup> Gross County Product is the total value added created by the production of goods and services in the local economy. It is analogous to the concept of Gross Domestic Product at the national level. It represents the sum of labor compensation, capital type income (profits, interests and rents), and indirect business taxes (which are mainly sales taxes, but also include property taxes and government mandated fees).

<sup>6</sup> Labor Income is the compensation to employees and self-employed proprietors including both wages and indirect payments such as retirement benefits, health insurance and other similar fringe benefits.

<sup>7</sup> Employment is the number of jobs generated within the county, and includes: full-time and part-time positions, salary workers, and sole proprietors.

<b>Capital Income <sup>8</sup></b>		
<b>Industry</b>		<b>Total Impact</b>
Aviation and Space Sectors		\$986,059,944
	<b>Total:</b>	<b>\$986,059,944</b>

<b>Indirect Business Tax <sup>9</sup></b>		
<b>Industry</b>		<b>Total Impact</b>
Aviation and Space Sectors		\$97,092,858
	<b>Total:</b>	<b>\$97,092,858</b>

**Brevard County Space Sector (Shuttle Operations)**

Brevard County will one day lose the space shuttle and its related job and tax benefits. The loss will come either by way of a phased turndown or via an instant cessation resulting from a catastrophic shutdown of the STS program. Even if a follow-on vehicle were ultimately sited in KSC, there is a threat that without an industry-led planning initiative, the program’s momentum, labor and infrastructure would be lost before a replacement program was instituted.

There are an estimated 8,000 jobs in Florida directly supporting shuttle operations--with most of these located in Brevard County. This table shows the annual impact that the shuttle orbiter and related companies have on the Brevard County area. The data shows that the 8,000 shuttle-related jobs in Brevard County and the surrounding market produce \$1.33 billion in annual economic impact including \$26.9 million in State taxes and \$271 million in capital income.

(Updated using 2006 IMPLAN data)

<b>Gross Economic Output</b>			
<b>Industry</b>	<b>Direct Impact</b>	<b>Indirect and Induced Impact</b>	<b>Total Impact</b>
Shuttle and Related Industry Sectors	\$937,870,000	\$393,537,947.70	\$1,331,407,947.70
	<b>Total:</b>	<b>\$937,870,000</b>	<b>\$1,331,407,947.70</b>

<b>Gross County Product</b>		
<b>Industry</b>		<b>Total Impact</b>
Shuttle and Related Industry Sectors		\$831,014,177.60
	<b>Total:</b>	<b>\$831,014,177.60</b>

<sup>8</sup> Capital Income is the sum of all property type income (such as business profits, interest income and rental income) generated within the County.

<sup>9</sup> Indirect Business: Taxes and fees that are not based in the businesses’ income. For the most part they represent sales taxes levied by the state and the county, but also include property taxes levied against businesses as well as fees imposed by federal, state and local governments.

<b>Total Labor Income</b>		
<b>Industry</b>		<b>Total Impact</b>
Shuttle and Related Industry Sectors		\$533,239,152.65
	Total:	<b>\$533,239,152.65</b>

<b>Total Employment</b>		
<b>Industry</b>		<b>Total Impact</b>
Shuttle and Related Industry Sectors		8,001.45
	Total:	<b>8,001.45</b>

<b>Capital Income</b>		
<b>Industry</b>		<b>Total Impact</b>
Shuttle and Related Industry Sectors		\$271,082,735.17
	Total:	<b>\$271,082,735.17</b>

<b>Indirect Business Tax</b>		
<b>Industry</b>		<b>Total Impact</b>
Shuttle and Related Industry Sectors		\$26,692,289.78
	Total:	<b>\$26,692,289.78</b>

Previous NASA and EFI studies show that Brevard County has approximately 14,500 employees in the space business. These employees are directly impacted by economic conditions and industry trends. The 2004 NASA economic impact report on the State of Florida included the following background statements (This 2004 report contains the most recent accounting on this information):

- A. In FY 2004 the Kennedy Space Center (KSC) and NASA injected \$1.5 billion into the Florida economy.
- B. The KSC and other NASA centers awarded 821 contracts in Florida. 92% of this money was concentrated at KSC. It should be noted that KSC purchasing offices often purchase for other centers. As an example, KSC purchases liquid nitrogen for all centers.
- C. Total direct spending was \$72 million in the Florida counties of Brevard, Flagler, Lake, Orange, Osceola, Seminole and Volusia.
- D. Workers at KSC received a total of \$871 million in take-home earnings.

The table below is derived from the 2004 NASA report. Specifically, this module calculates a benefit to Florida using the on-site space industries work force of 14,500 employees mostly in the Brevard County market with an average salary of \$60,675 annually. The results (below) are updated to current 2006 dollars using IMPLAN data. NASA's annual impact to Brevard County and the surrounding market is \$1.699 billion of direct and \$2.4 billion in total impact including \$48.3 million in annual tax benefit for Florida.

### Brevard County 14,500 Employees

<b>Gross Economic Output</b>			
<b>Industry</b>	<b>Direct Impact</b>	<b>Indirect and Induced Impact</b>	<b>Total Impact</b>
Space and Related Industry Sectors	\$1,699,880,000	\$713,283,596	\$2,413,163,596
Total:	<b>\$1,699,880,000</b>	<b>\$713,283,596</b>	<b>\$2,413,163,596</b>

<b>Gross County Product</b>		
<b>Industry</b>		<b>Total Impact</b>
Space and Related Industry Sectors		\$1,506,204,890
Total:		<b>\$1,506,204,890</b>

<b>Total Labor Income</b>		
<b>Industry</b>		<b>Total Impact</b>
Space and Related Industry Sectors		\$966,490,633.89
Total:		<b>\$966,490,633.89</b>

<b>Total Employment</b>		
<b>Industry</b>		<b>Total Impact</b>
Space and Related Industry Sectors		14,502.54
Total:		<b>14,502.54</b>

<b>Capital Income</b>		
<b>Industry</b>		<b>Total Impact</b>
1) Space and Related Industry Sectors		\$491,334,747.74
Total:		<b>\$491,334,747.74</b>

<b>Indirect Business Tax</b>		
<b>Industry</b>		<b>Total Impact</b>
1) Space and Related Industry Sectors		\$48,379,508.41
Total:		<b>\$48,379,508.41</b>

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## **SURVEY ANALYSIS**

### **Telephone analysis**

As mentioned in the Executive Summary, the survey was sent to approximately 1,500 companies across Florida. Past research efforts have shown that telephone interviews frequently reveal anecdotal and/or additional information that is helpful to understanding the data. The interviews established that there are regional differences in the workforce environment for hiring A&P mechanics: Lake City has an excess capacity while Miami is having difficulty locating qualified candidates. Also significant is that most employment is done directly between institutions and the employers. Employers feel they have to create a good contact network for finding qualified candidates. The surveys showed that there is little use of the public employment system (Employ Florida). Companies indicated that they also use Internet resources like AvJobs.com and Monster.com as major sources for aviation jobs.

### **Telephone interviews**

**Placement Officer, George T. Baker Aviation High School, Miami.** Enrollment remains substantially down as a result of 9-11. Enrollment is under capacity, and 100% of the students are placed at graduation. The students are all hired locally, and most are not willing to relocate. There continues to be many unmet ASA hiring demands. The staff is aware of the Occupational Outlook (OO) that predicts a flat requirement for Florida employment and finds that the data is completely the opposite of their experience. The business of maintenance, repair and overhaul (MRO) left south Florida following 9-11 but is now returning and creating jobs. Students at Baker are frequently hired before graduation as demand for graduates is very strong.

**Placement Officer, Private Aviation Academy, St Petersburg.** The academy teaches composite material processing and admits that a major concern is keeping up with changing technologies. They feel that the aviation industry needs to do a better job of communicating with academic institutions. Another major problem is finding students. The academy aggressively recruits students from local schools and also out of area. The last class graduated 36 people. A total of seventeen companies attended the job placement open house seeking to fill vacant positions. The local companies are recruiting heavily for avionics specialists, aircraft helpers and airframe-power plant mechanics (A&P). The introduction of regional airlines that are developing personalized air transportation systems are creating yet another demand for scarce labor. DayJet, for example, is locating its maintenance facility in Gainesville. It also seems that industry is seeking out ex-military to fill positions where it can. St. Petersburg College accepts 56 academic credit hours from the Aviation Academy which helps students achieve a quick completion of the Associate in Science and a pathway to a bachelors of Science in Aviation Maintenance Management.

**Recruiter, TIMCO Co, Lake City.** He states he has difficulty in hiring sheet metal and structural mechanics and is searching nationwide. On the other hand, he has no difficulty in finding airframe-power plant mechanics in his area. This information points to regional differences in hiring patterns. His A&P requirements are met by an older workforce that looks for quality of life rather than the congestion in nearby Jacksonville. TIMCO at one time had an

agreement with the Lake City Community College; the requirements have been filled and the program ended.

**Manager, Galaxy Aviation, St. Augustine.** The manager states that they are not actively hiring but are always looking for qualified personnel, particularly in avionics and general maintenance. He is concerned that new technology is arriving faster than industry can keep pace with. He also states that the arrival of the Very Light Jet (VLJ) will be complicated by the lack of experienced pilots. Today's pilot with relatively low flying time operating in a high pressure atmosphere will be severely challenged to meet the demands of this operating environment. The company has an internship program with Embry Riddle Aeronautical University that he finds is an excellent source of employees. He is a member of the Advisory Board for the aviation program at St. Johns Community College [accuracy note: SJRCC has no aviation program]. He also states the AvJobs.com and Monster.com are the primary sources for finding qualified personnel.

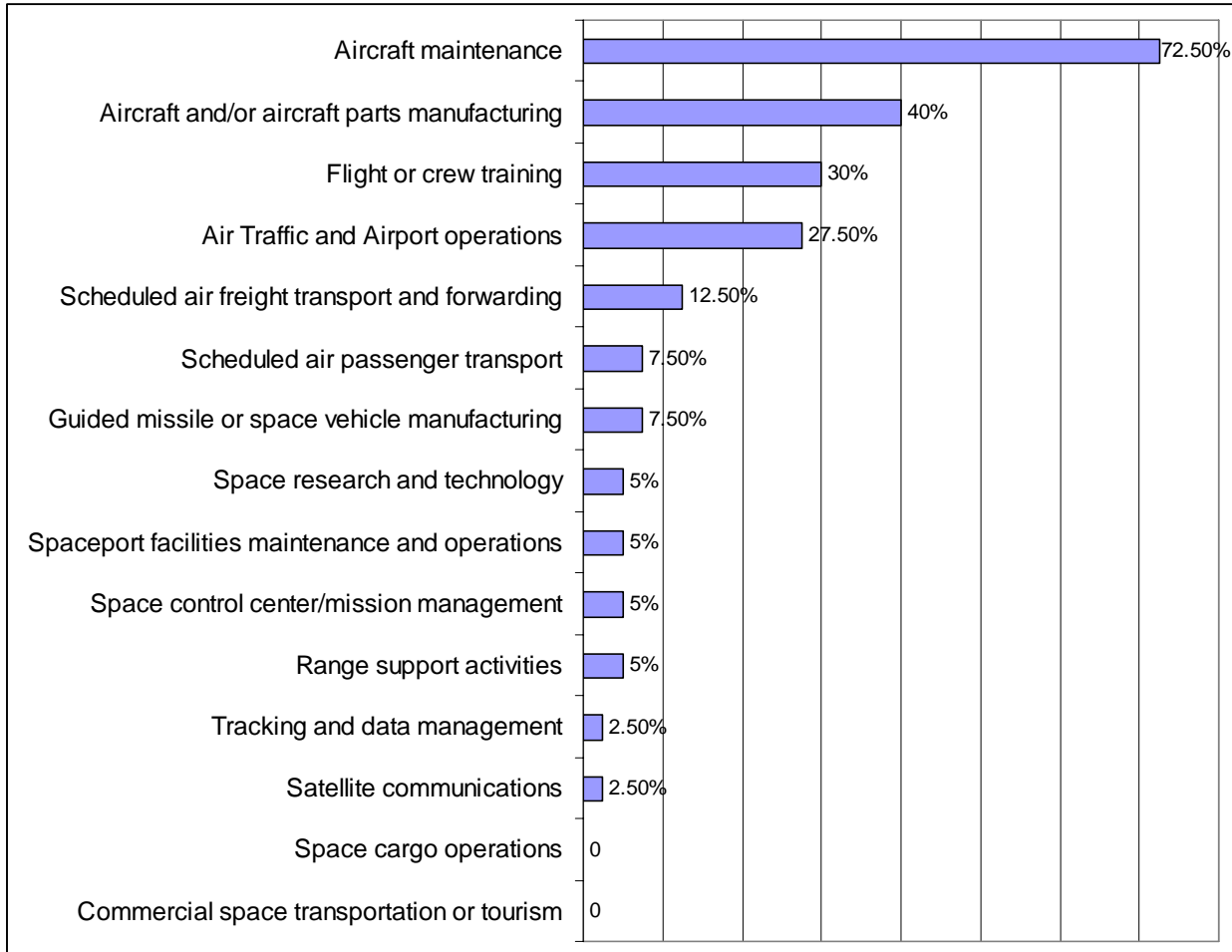
**Manager, Aerospace Integration Corp (AIC), Crestview.** The aviation CHOICE program of Okaloosa county schools has proven successful. Several graduates are now full time employees at AIC. However, the program will not satisfy the needs of a large scale industry expansion. Aerospace Integration Corporation specializes in high-end technical modifications. They have a continuing need for electrical and mechanical engineers. They recruit nationwide through newspapers and employ a professional search firm to assist. They have a steady supply of technician positions that are filled by separating/retiring military members. The average per capita income in Okaloosa county is \$25,000 and the average at AIC is \$52,000. AIC has established a cooperative student program with the University of West Florida in an attempt to build its engineering hiring pool.

**Survey Data Analysis**

The following tables list the questions asked in the ARC survey and the percent responses received from Florida companies. Percentages are used to protect the individual responses and identity of unique Florida companies.

**“Categories that apply to your organization's role in the aviation and aerospace industry.”**

The business climate in Florida appears to be “hands on” activity associated with commercial aviation.

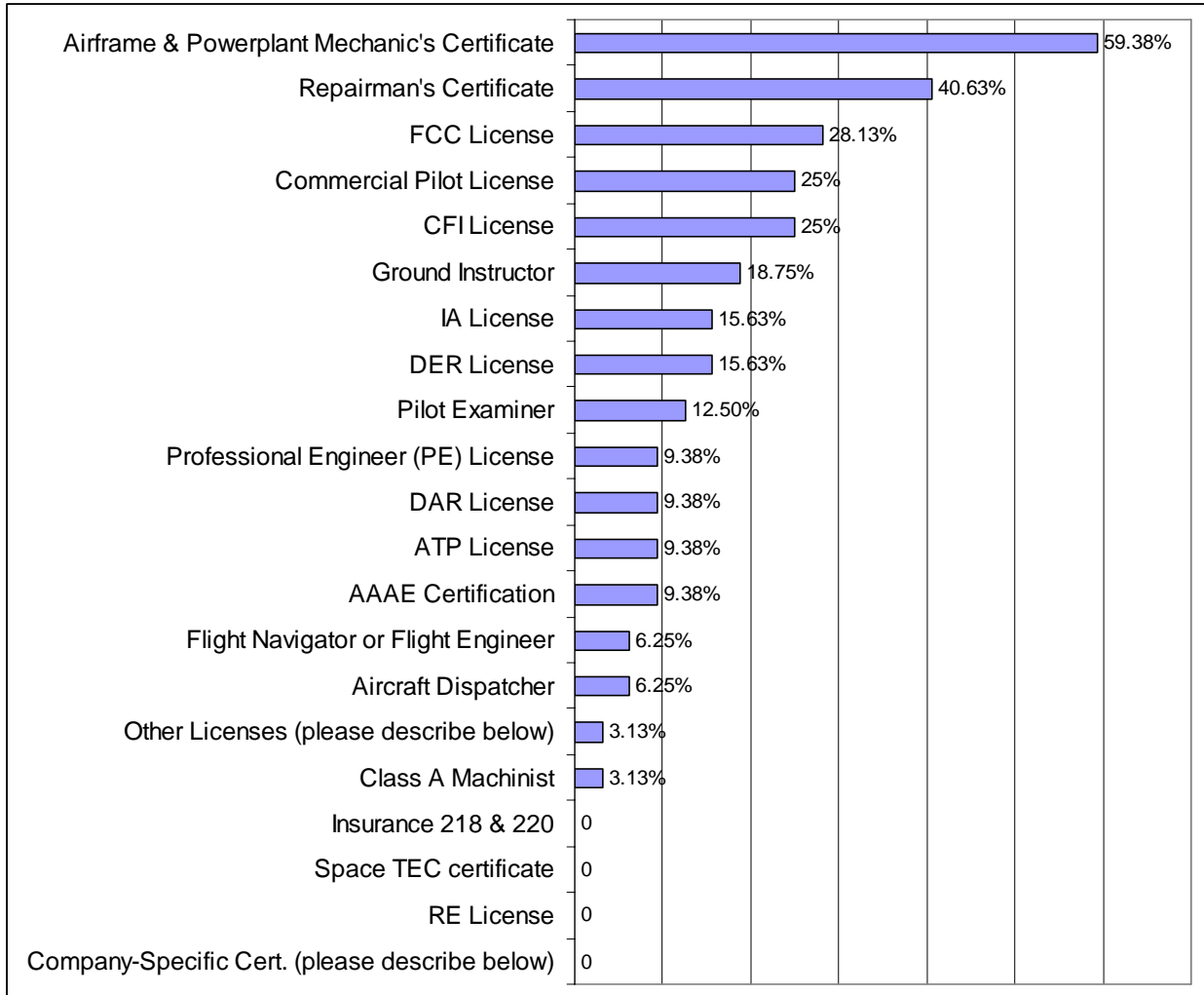


**“Other roles in the aviation and aerospace industry that were written into the survey response:”**

1. Part 147 AMT school
2. FAA Part 145 Repair Station
3. Hydraulic components and landing gear
4. Design and manufacture of airplane interior components
5. EXPORT - AIRCRAFT PARTS
6. I am a one person munitions consulting company.
7. Air Charter Service and Flight School
8. Military Radar or Satellite Communications Manufacturing
9. We represent general aviation businesses
10. Chamber of Commerce - Econ Dev Organization
11. Calibration Services
12. Design and manufacture prototypes and finished equipment
13. Sales and rent of ground support equipment
14. Air Cargo Agency - Live Animals Only, ATI IATA/CNSC Endorsed and appointed
15. Tire business only
16. Aerospace & Military Testing Facility
17. FBO
18. Composite material research
19. Airdrop platform manufacture
20. We provide shuttle fuel
21. Scale model manufacturer
22. Engineering services relating to gas turbine engines

**“Which professional or technical certificates or licenses listed below are required of your workforce?”**

Virtually all occupations associated with aviation aerospace require some type of credentialed certification.

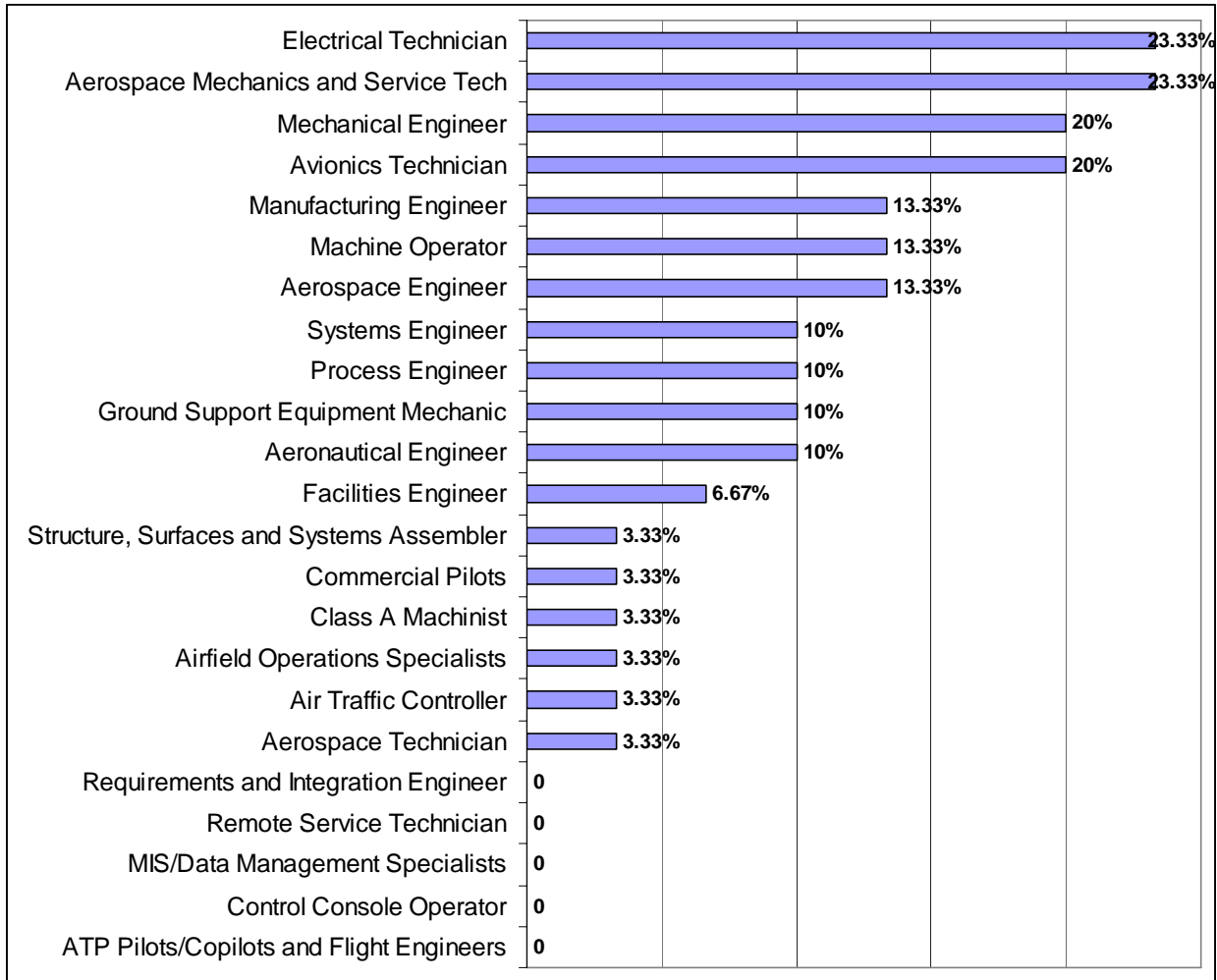


**“Other Licenses You Require:”**

1. Florida Teaching Certificate
2. FAA Part 145 Repair Station Certificate
3. FAA-DMIR, Level II and III x-ray, FPI, Visual, UT
4. County Occupational Licenses
5. ISO 17025 Accreditation
6. NDT Level II for MP & DPI
7. No license required, real experience on the units we overhaul
8. Line tech
9. CDL, Hazmat
10. Master Rigger
11. Cirrus Transition
12. Airport Police Officers

**“Which positions in your organization do you have the hardest time finding qualified applicants?”**

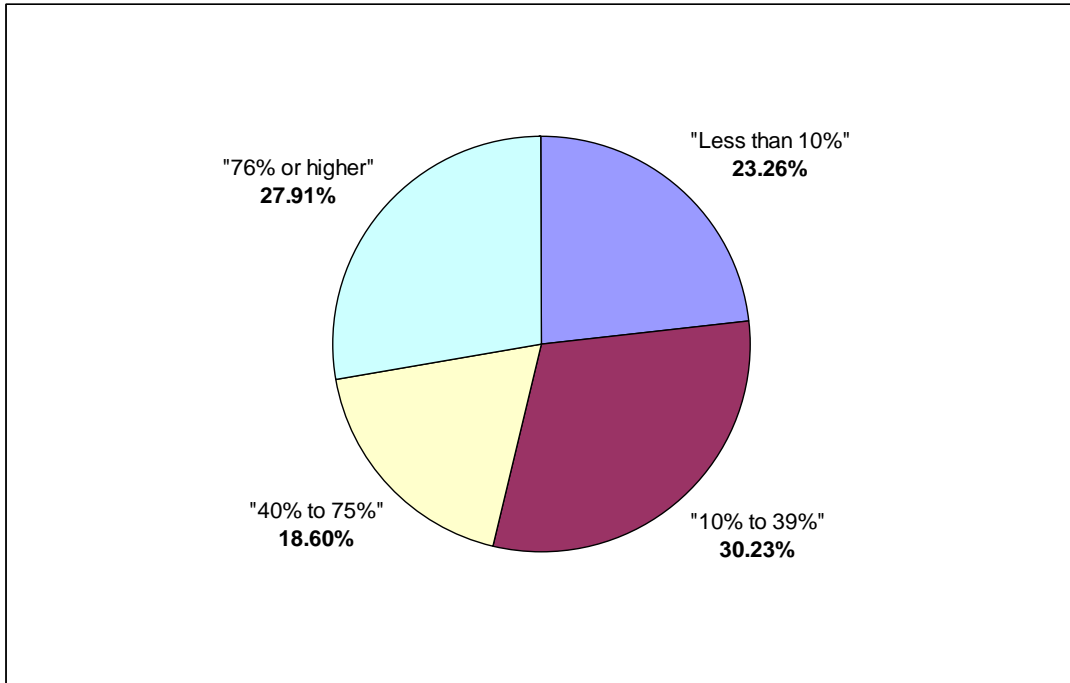
The survey and anecdotal information indicates engineers are difficult to recruit and with advances in technology, such as seen with new avionics in the Very Light Jets, will be harder to recruit in the future.



**“Other Positions Found Hard to Fill:”**

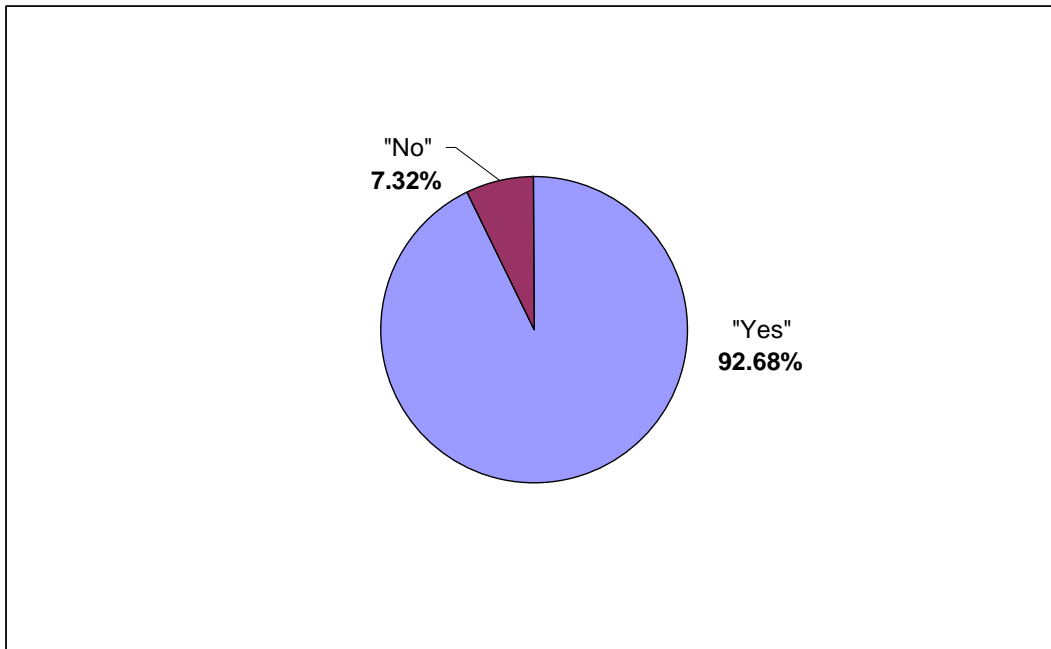
1. AMT Technician Instructors
2. Master model maker
3. Guidance, navigation, autopilot engineers
4. Heat treating of metals technicians
5. Software engineers
6. Winding technicians
7. Shipping
8. Sewing machine operators
9. Quality Assurance, NDT
10. Electro-mechanical CAD draftsmen and injection molding designers
11. Product definition personal (mechanical drafters)
12. Hydraulic technicians, landing gear technician
13. Inspector, quality engineer, Non-destructive inspection Level II and level III
14. Aircraft Mechanics and Flight Instructors
15. Calibration Tech
16. CFI
17. Electronics Tech
18. Front Desk Manager
19. Light Aircraft A+P with experience
20. Test Engineer, Test Technician
21. Line Fuel Tech, Customer service Rep
22. Electrical Engineer, Optical Engineer, Qualifications Test Engineer, Designer, Team center Admin
23. Civil Environmental, Chemical, P.E
24. Airport Police Officers

**About what percentage of your workforce is in technical positions such as those listed above?**



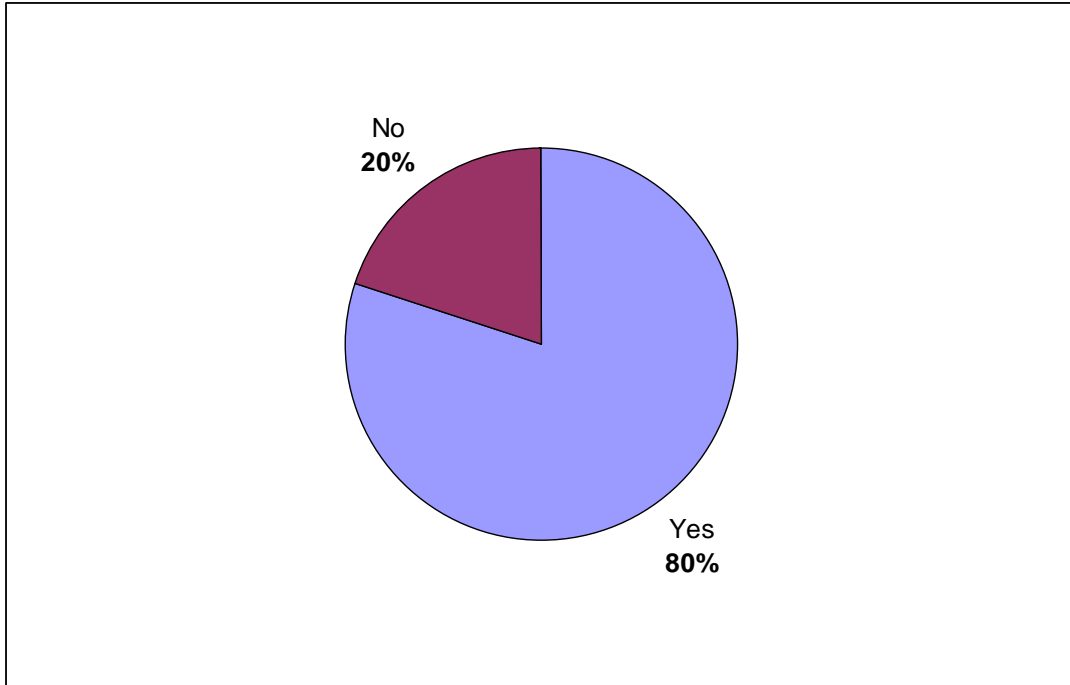
**Are "Workplace Fundamentals" skills taught by Florida's educational institutions important for your organization?**

Overwhelmingly, respondents emphasize the value of soft skills.



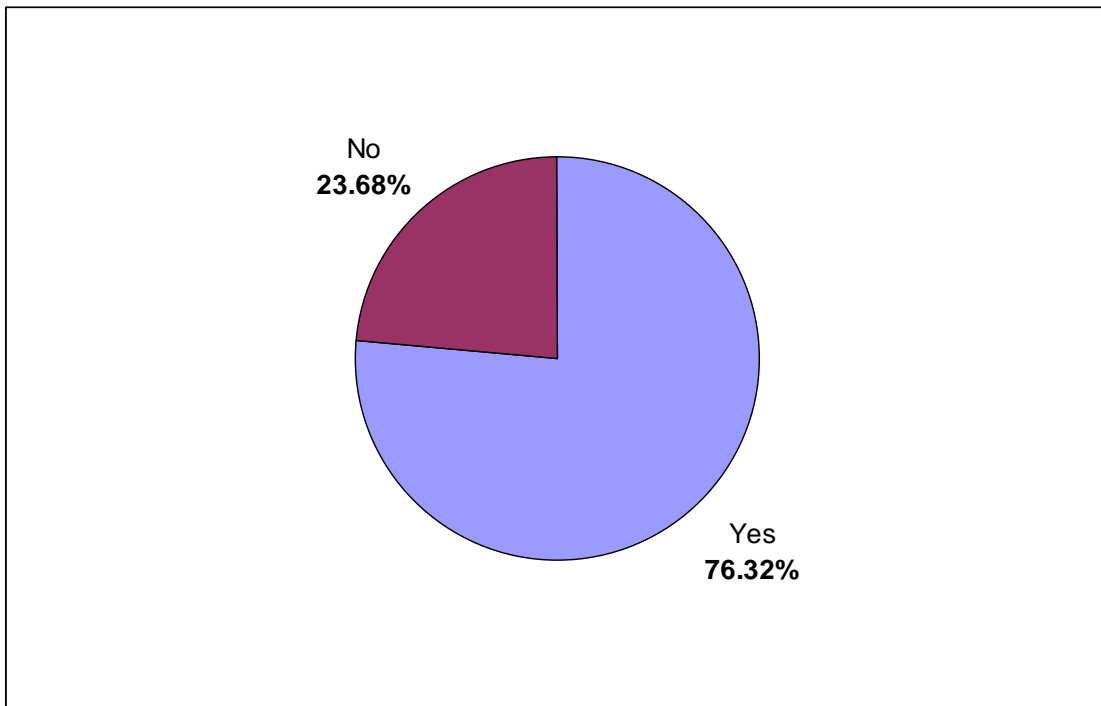
**Are "Aerospace Safety" skills taught by Florida's educational institutions important for your organization?**

Safety is a fundamental issue when operating around engines, heat generating equipment and corrosive materials.



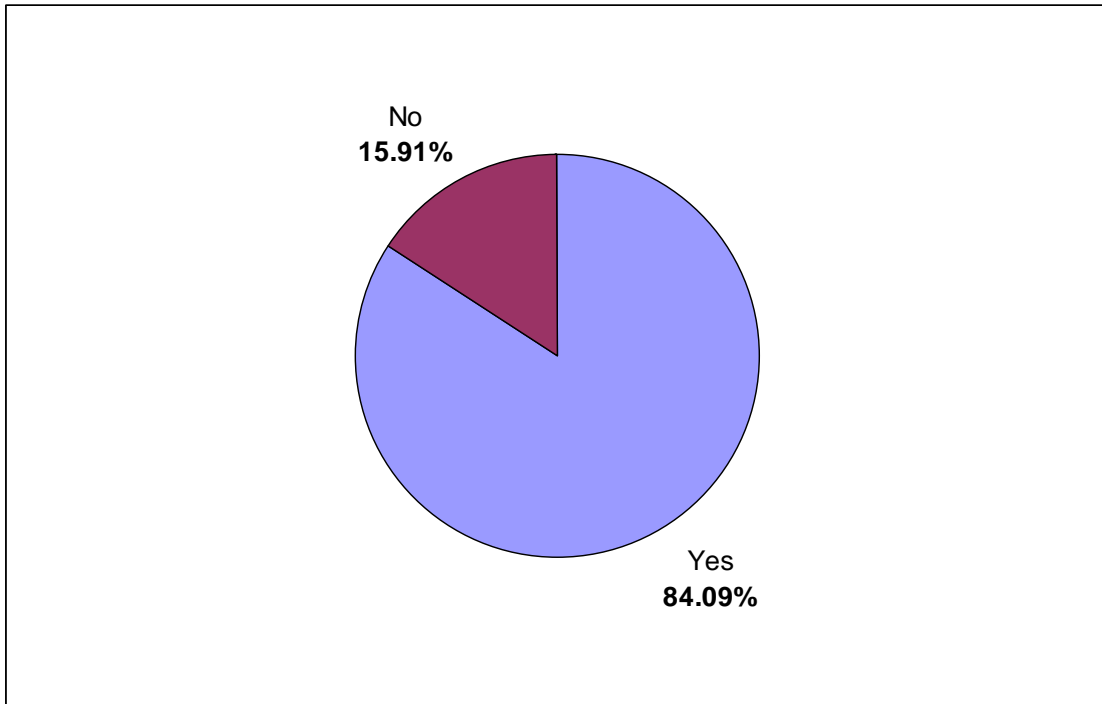
**Are "Basic Electricity" skills taught by Florida's educational institutions important for your organization?**

This appears to be a basic requirement for all related aerospace occupations.



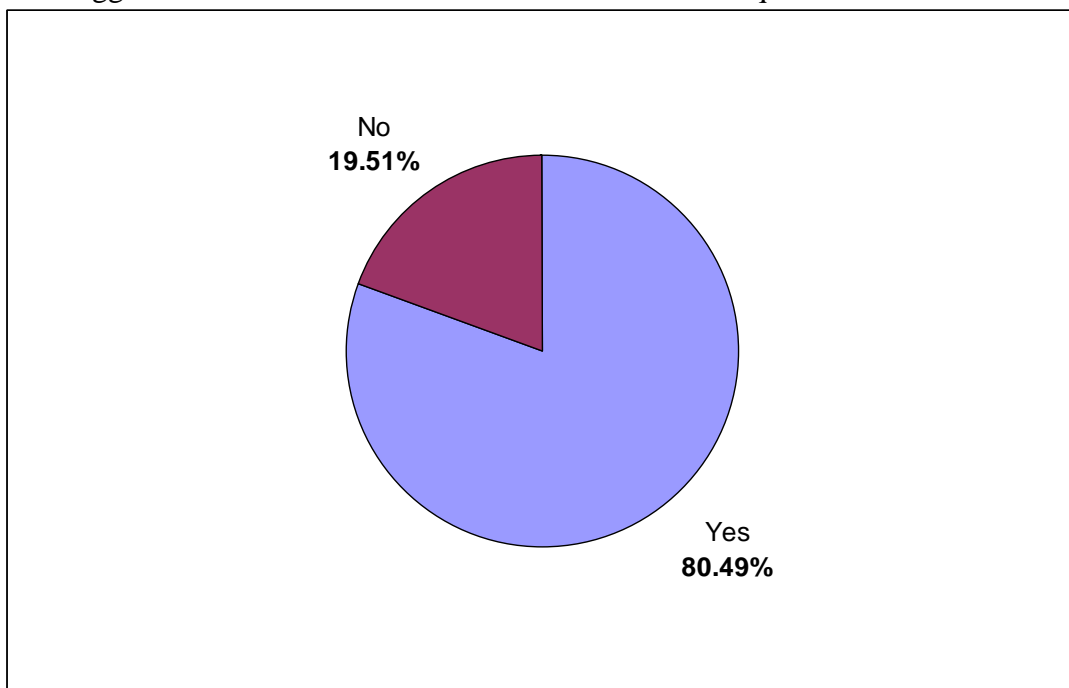
**Are "Applied Mechanics" skills taught by Florida's educational institutions important for your organization?**

Once again, this appears to be a core requirement and should be a part of any general aviation and space curriculum.



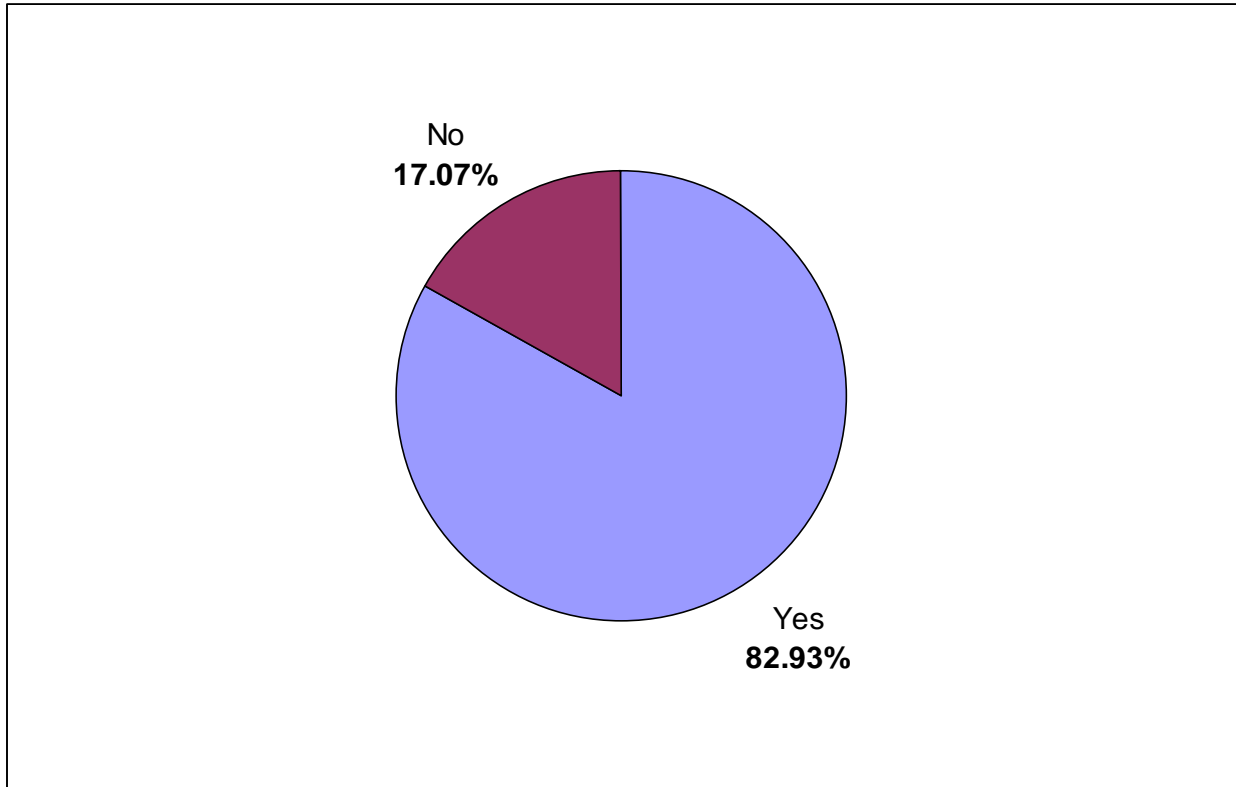
**Are "Materials and Processes" skills taught by Florida's educational institutions important for your organization?**

This result suggests another candidate for the core educational requirement.



**Are "Tests and Measurements" skills taught by Florida's educational institutions important for your organization?**

This is found to be another core-required part of the curriculum.

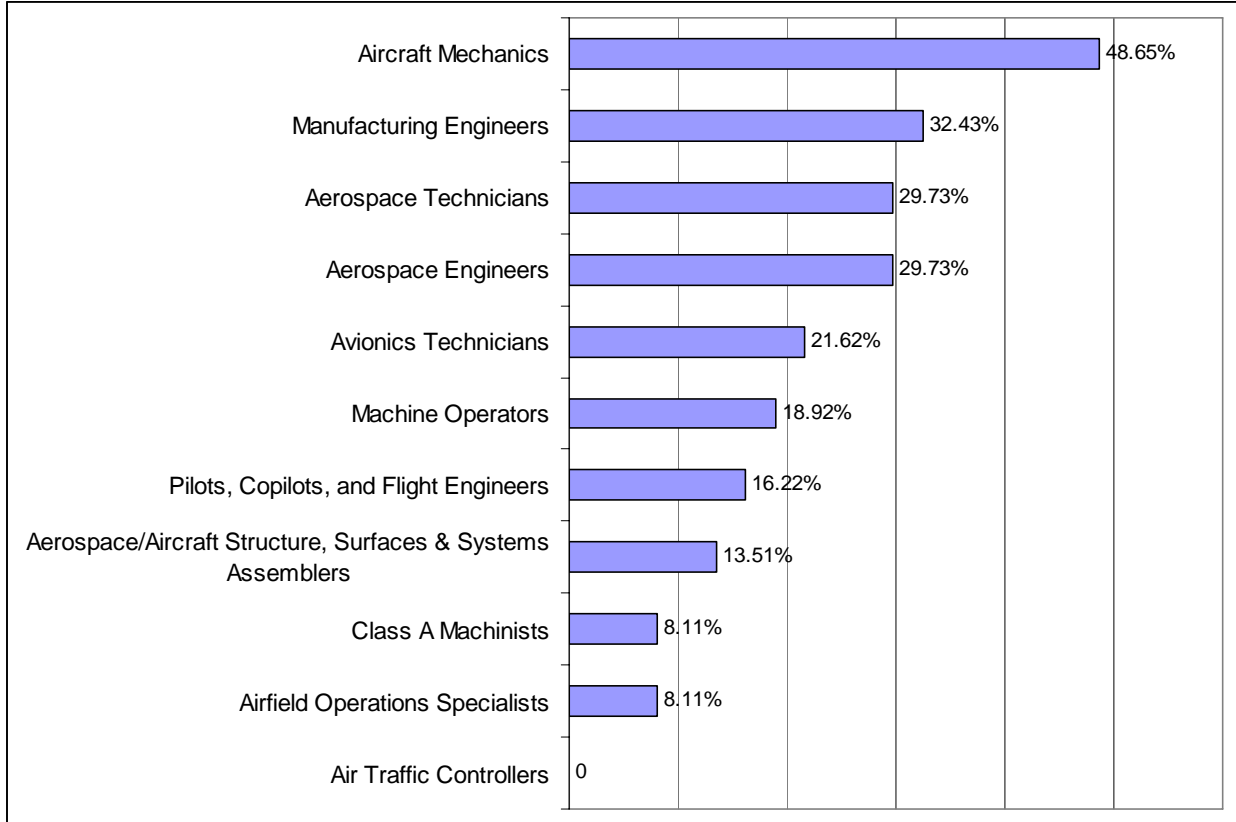


**What other industry-specific technical skills are important to your organization?**

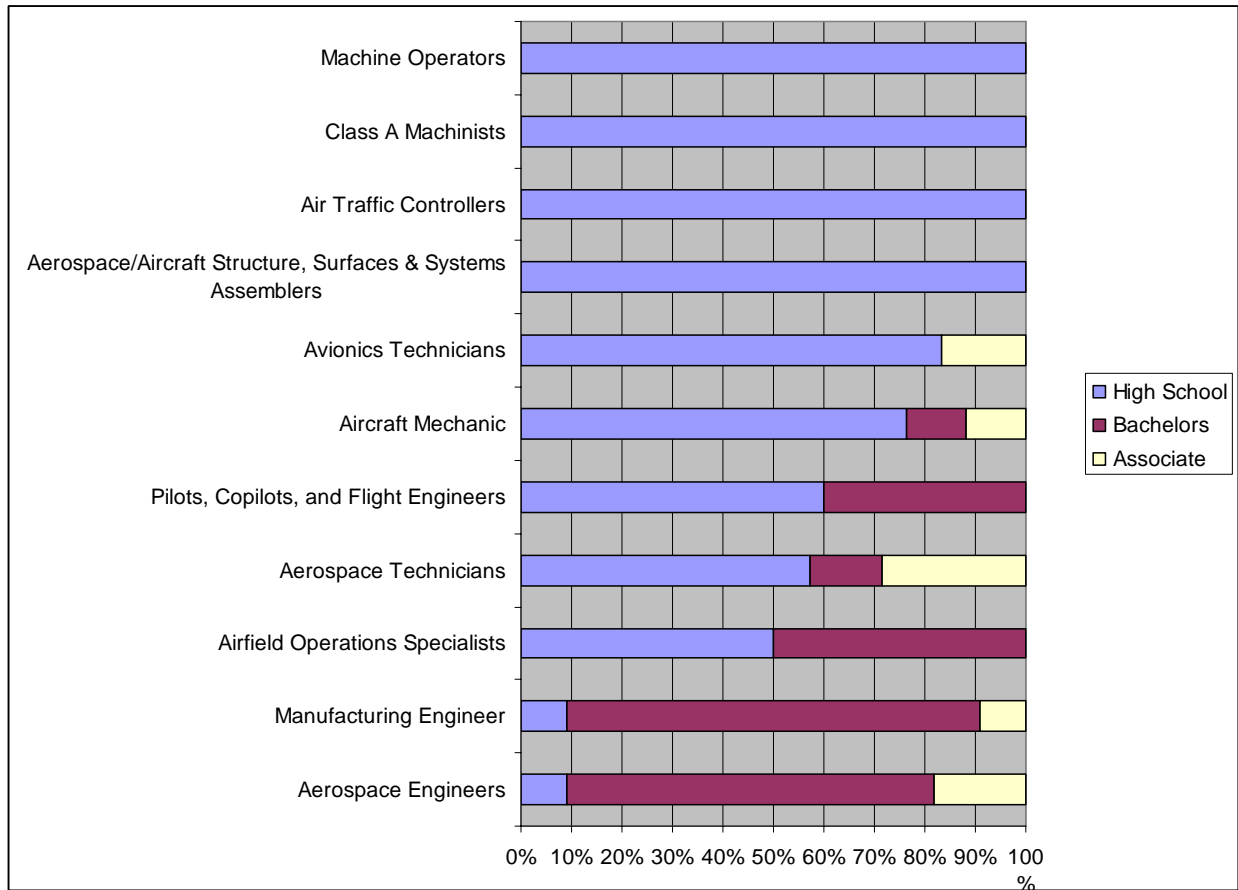
1. Aero thermal stress, dynamics, digital and analog electronics
2. Software and computer engineering
3. Aero dynamics heat transfer (thermal sciences)
4. Non-destructive inspection, quality systems
5. Systems and troubleshooting
6. Metrology
7. A desire to learn
8. Knowledge of hydraulic & pneumatic circuits and theory
9. Fuel handling
10. Avionic, Electronics
11. Business

**Do You Hire These? Check all that apply:**

There is a demand for engineers and highly qualified technicians. This indicates a potential career path from technician through engineer.



**Level of Education Required for "Aerospace Engineers"**



If the title of the occupation is engineer, then a Bachelors degree is the general requirement. Other skill levels require an Associates degree or high school.

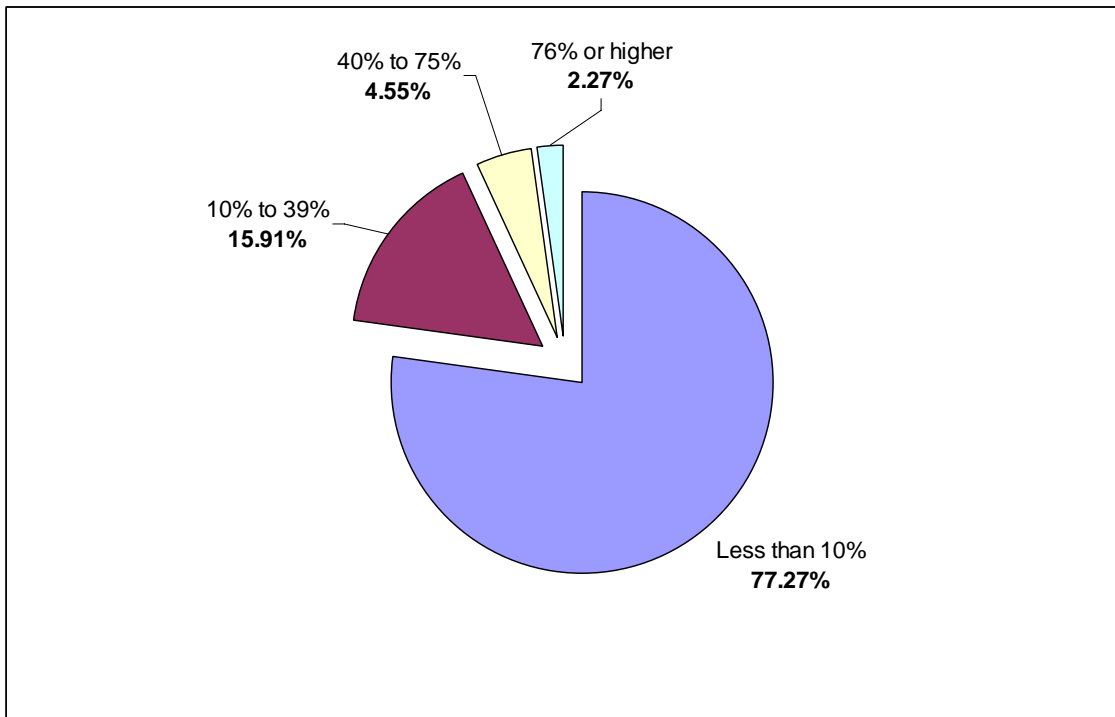
A bachelor’s degree is not required for pilot; however, the degree is a discriminating item and most commercial and all military pilots have a degree.

**What do you think is the biggest challenge your organization faces in finding, recruiting, and hiring qualified employees for your positions in the aviation and aerospace industry?**

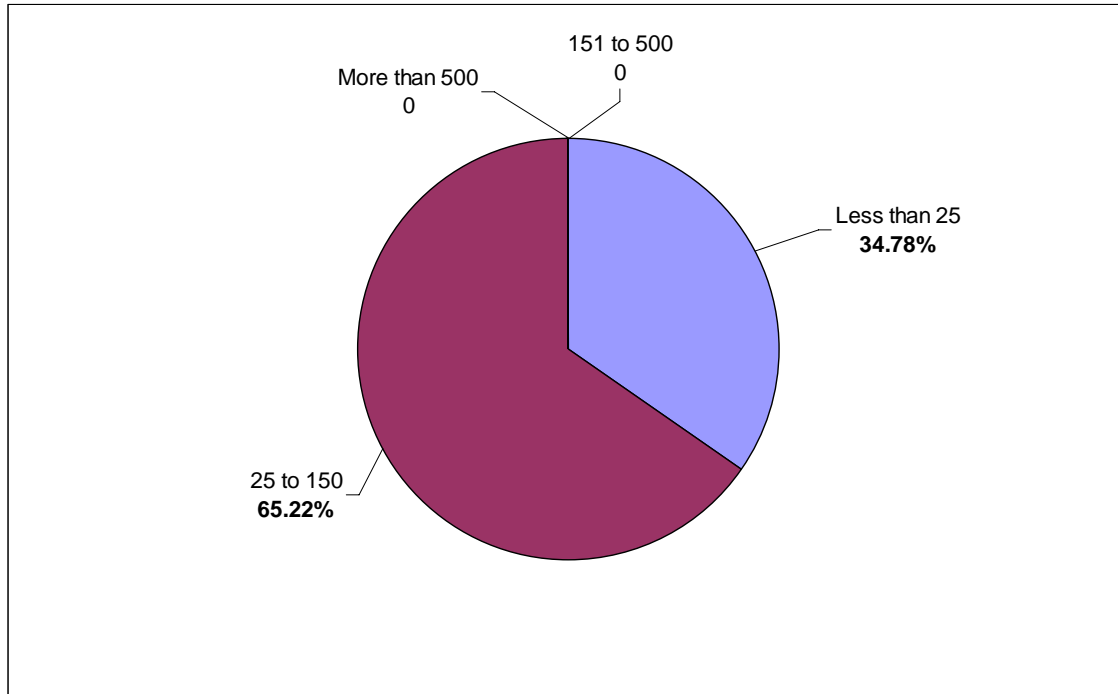
1. Entry level wages are below other skilled trades.
2. Ability to afford wages
3. Available qualified candidates
4. Finding engineers experienced in missiles and DOD type systems
5. Finding high tech software and computer engineers; technicians are not the future of central Florida's aerospace industry
6. Lack of available people
7. Keeping up with the training in new technologies
8. Qualified labor force
9. Salary competition
10. Cannot find qualified electro-mechanical design engineers
11. Finding gas turbine engineering experience
12. Lack of a 4 year university offering these courses within a close proximity to the population.
13. Current salary wages versus the cost of living in the West Palm Beach area
14. Basic education, specific training in calibration, metrology
15. Offering appropriate compensation package - especially as it relates to health insurance and retirement issues.
16. Pay - competing with other industries that pay more
17. Limited number of qualified job candidates and poor work ethics
18. Attracting qualified workforce at reasonable costs
19. First is to get people to come over for an interview. Second is to find candidates with real experience in GSE.
20. Locating trained personnel and cost
21. Their level of intelligence, brightness and curiosity along with their willingness to be a life long learner
22. Core Values (Honesty and trustworthy and responsible and common sense skills)
23. Finding well rounded people with practical work experience
24. Finding good quality workers in the 15 dollar an hour range with current housing cost is a problem in South Florida
25. Number of engineer and techs graduating from U.S. schools. Escalating patents for U.S. tech jobs
26. Lack of tech training for the entry level requirements
27. Qualification and experience
28. It's a specialized industry with only a small amount of carry-over skills from other industries
29. The pay rate for professionals paid by private industry
30. Being able to compete with civilian pay rates

**What percentage of your technical workforce do you expect to retire within the next five years?**

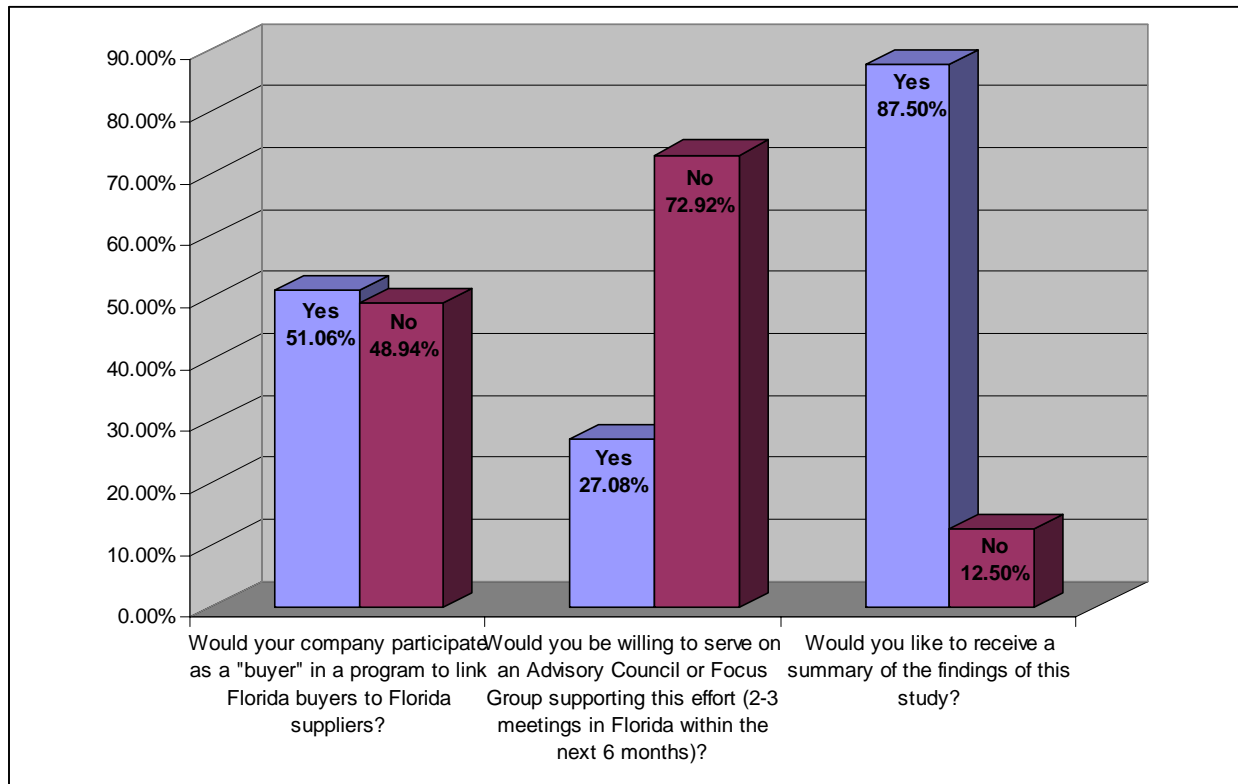
The study shows that retirement, in the ASA sector, may be a major issue during the next five years. Respondents to the ARC survey indicated that three out of four companies will retire up to 10 percent of their ASA workforce within five years. Additionally, 16 percent of respondents will replace between 10 and 39 percent of their ASA employees. It's estimated that the ASA sector and its related support companies total over 79,000 Florida jobs. Between now and 2011 replacing a retiring workforce will require thousands of newly qualified ASA employees.



**Into which of the following ranges does the number of employees at your location fall?**  
 We're interested in the number of employees at your particular location, not the total number of employees in your organization.



**Would your company participate as a "buyer" in a program to link Florida buyers to Florida suppliers?**



**Annual growth rate for Aerospace based industries, over the next 5 years:**

[Statistics drawn from question 6 of the survey]

Class A Machinists	-5%
Avionics Technicians	1.8%.
Pilots, Copilots, and Flight Engineers	3.8%.
Aerospace Technicians	4.4%
Aerospace Engineers	5.8%
Manufacturing Engineers	5.9%
Aerospace/Aircraft Structure, Surfaces & Systems Assemblers	6.3%
Machine Operators	8.3%
Aircraft Mechanics	10.3%
Airfield Operations Specialists	No Data
Air Traffic Controller	No Data

**Education level for write-in job Descriptions:**

[Statistics below drawn from “other major occupations organizations require” responses to survey question #6 of the survey]

Level of Education Required for "GNC Engineers" (Other #1)	Bachelor's Degree
Level of Education Required for "Software Engineers" (Other #1)	Bachelor's Degree
Level of Education Required for "Electrical Design" (Other #1)	Bachelor's Degree
Level of Education Required for "Mechanical Engr" (Other #1)	Bachelor's Degree
Level of Education Required for "Facilities Engr" (Other #1)	Bachelor's Degree
Level of Education Required for "Professors" (Other #1)	Master Degree or PhD
Level of Education Required for "Level II or III" (Other #1)	High School
Level of Education Required for "Calibration Tech" (Other #1)	High School
Level of Education Required for "Line Tech" (Other #1)	High School

## **ATTACHMENTS**

### **Sample Survey**



"Sample  
ARCSurvey.pdf"

The following is a sample of the survey which was sent to Air Dayiti. The survey was faxed, e-mailed and made available online to companies through out Florida.

### **Career and Description**

The following is a summary of academic institutions and their curriculums that support the aviation and aerospace communities:



Career and  
Descriptions.pdf

The Career and Descriptions attachment describes the career listed below

### **Raw Survey Data**

The following are the unrefined results of the survey data.



ArcSurveyData.pdf

Rollup of raw survey data

### **AeroSpaceErs.pdf**



AeroSpaceErs.pdf

Density of Employers in the Aviation and Space Industry

## **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](http://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