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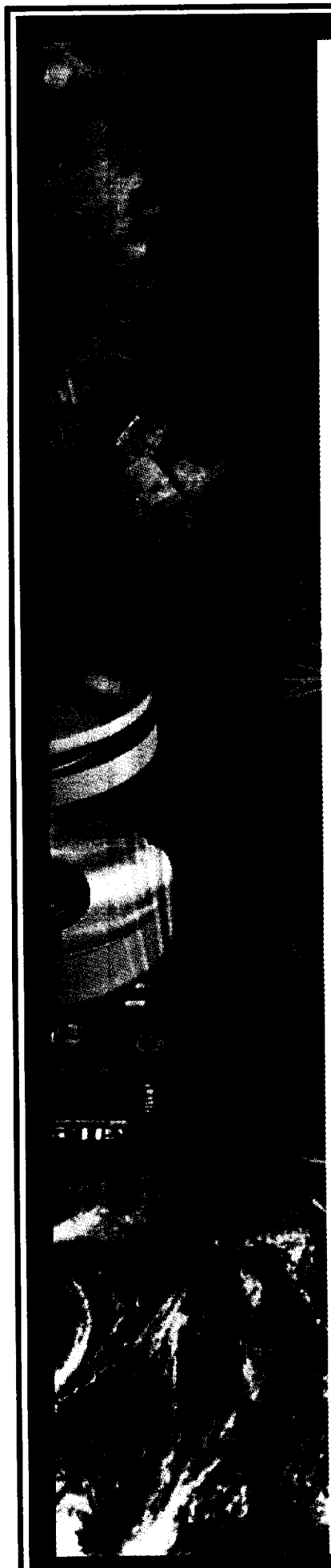

A STUDY OF BUSINESS INCUBATORS: MODELS, BEST PRACTICES, AND RECOMMENDATIONS FOR NASA AND FLORIDA

Prepared for

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Southern Technology Applications Center
One Progress Center, Box 24
Alachua, FL 32615
Phone (904) 462-3913

http://www.state.fl.us/stac/

NASA Southeast Regional Technology Transfer Center

A Study of Business Incubators: Models, Best Practices, and Recommendations for NASA and Florida

1.0 Executive Summary

This study was conducted to provide NASA-Kennedy Space Center with information and recommendations to support establishing one or more technology-based business incubators in Florida. The study involved assembling information about incubators: why they succeed, why they fail, how they are organized, and what services they provide. Consequently, this study focuses on widely-recognized "best practices," needed to establish successful technology-based business incubators. The findings are used to optimize the design and implementation of one or more technology-based business incubators to be established in Florida. Recommendations reflect both the essential characteristics of successful incubators and the optimal business demographics in Florida. Appendix A provides a fuller description of the objectives of the study.

Technology-based business incubators are an increasing catalyst of new business development across the US. Incubators focus on providing entrepreneurs and small start-up firms with a wide array of support services necessary to bring forth new products and processes based on technologies developed in the nation's federal and private laboratories and universities. Appendix B provides extensive discussion of findings relative to technology-based business incubators.

It is well known in business development circles that incubators in general provide start-up firms or entrepreneurs with the potential to leapfrog the so-called "valley of death," that period of time in the development of a business when the entrepreneur has no way to secure and to pay for engineering prototyping, production prototyping, market analysis, sales, and initial manufacturing operations.* During this time the entrepreneur is often forced to use personal investment sources until enough product sales either attract serious seed and venture capital investment or generate sufficient revenues and profits to pay for personnel, legal and financial expertise, equipment and facilities, and the myriad other elements of a technology-based business operation. The fact is, however, most entrepreneurs do not have sufficient personal financial resources to survive the "valley of death," and most fledgling technology-based firms fail at this stage of development.

* The phrase, "Valley of Death," is utilized by the National Institute of Standards and Technology (NIST) in their series of National Innovation Workshops to educate entrepreneurs about the realities of business development.

This is especially significant for Florida, since Florida is one of the top recipients of federal R&D funding and is noted for its high level of entrepreneurial activity. According to the *1995 Development Report Card for the States*, (pages 158-159) Florida ranked tenth in the US in "Entrepreneurial Energy," as measured by the number of new company start-ups as reported by the US Department of Labor. Another study ranks Florida seventh in the US in 1995 for receipt of $2.4 billion in federal R&D funding (3.5 percent of the total federal funding for R&D), most of which is from the Department of Defense ($1.75 billion) and NASA ($391 million) in support of aerospace-related technology development at federal laboratories and industry facilities (Teich and Carney 1997). Thus, the degree and extent of technology R&D is significant in Florida and a resource that should be extremely fertile for commercial development through the formation of new businesses, since industry received 65 percent, or $1.57 billion, of the state's total federal R&D obligations in 1995 (Teich and Carney 1997).

The need to take advantage of the existing entrepreneurial spirit and to tap into these technology resources in order to stimulate Florida's high technology manufacturing economy has been recognized by the state of Florida and by NASA-Kennedy Space Center (KSC) as well as by STAC, TRDA, institutions of higher education, local and county governments, and other organizations. Several initiatives illustrate this trend:

- Enterprise Florida was established as a public-private partnership to catalyze and strengthen Florida's high technology manufacturing economy through the establishment of six Innovation and Commercialization Corporations;

- Kennedy Space Center, in partnership with the Technological Research and Development Authority (TRDA), has established a technology-based incubator in Titusville, FL;

- New partnerships for technology-based business development are being established throughout Florida, such as the Gulf Coast Alliance for Technology Transfer which links federal laboratories, universities, a community college, and economic development councils to foster technology commercialization.

However, this support base must experience substantial growth before Florida can join the ranks of states with strong, vigorous economies based to a significant extent on technology-based manufacturing and its associated high skill, high wage jobs. For one thing, existing large manufacturing firms need an expanded base of high quality supplier firms in state from which to purchase needed components, sub-assemblies and services. In addition, a strong base of entrepreneurs able to commercially develop technology and innovations resulting from federal R&D provides both a significant return on the federal R&D

investment in Florida as well as a foundation for technology-based manufacturing and service growth that will attract increased R&D investment from government and private sources.

To this end, interest is growing regarding the role that technology-based incubators play in catalyzing, supporting, and strengthening technology commercialization by entrepreneurs and small start-up firms. The ever-present funding problem has generated a multitude of proactivists and stakeholders. Given the many concepts and approaches that have been employed to develop and operate incubators, it is necessary to determine the optimal direction for Florida.

Generally speaking, technology-based business incubators are designed to facilitate successful company formation and growth by reducing risks and shortening time to market for new products. According to a 1997 National Business Incubator Association study entitled, "Impact of Incubator Investments," approximately 87 percent of "graduate" firms remain in business, and 84 percent of "graduates" remain in the local community, adding jobs and contributing to economic growth, and returned an estimated $4.96 for every $1.00 of public operating subsidies.

Technology-based business incubators represent a diverse array of organizational forms, management structures, services provided to tenants, stakeholders, capital resources, and entry/exit criteria. ***There is no single optimum design that will guarantee a successful incubator.*** Rather, incubators are usually successful because they effectively identify and link with technological and organizational support organizations and capabilities, enforce consistent selection criteria for tenant companies, implement management practices, and design short- and long-term financing strategies that are consistent with objectives agreed upon and strongly supported by the stakeholders and partners. Other characteristics of successful technology-based business incubators include the following:

- They are generally not-for-profit corporations with direct access to capital, such as by creating "for-profit" subsidiaries to serve as the investment arm of the incubator;

- They have a facility that provides office and other space, business services, and access to laboratory and other technical resources needed for production prototyping, testing and analysis, and other product development tasks;

- Stakeholders agree on the objectives of the incubator, including short-term and long-term expectations about tenants' growth and maturation;

- Incubator managers are experienced in designing and delivering services that are tailored to the unique needs of client firms;

- They have designed long term financial support strategies that draw on locally available investment sources, client fees, and downstream equity or royalty returns;

- They exist within and utilize a substantial community infrastructure to facilitate access to the widest possible range of financial, management, marketing, technical, legal, and information resources needed for tenant training, networking, market analyses, regulatory compliance, and product development.

These findings illustrate the fact that successful technology-based business incubators are an integral part of communities that can provide a variety of financial, management, technology, legal, and training resources to meet the unique needs of tenant firms.

While business incubators have been in existence in one form or another for more than 25 years, involvement in technology-based incubators by the National Aeronautics and Space Administration (NASA) is relatively recent. Incubator facilities now exist in association with Ames Research Center, Lewis Research Center, Stennis Space Center, Marshall Space Flight Center, and Kennedy Space Center. Others may be established in the near future. Detailed descriptions are presented in Appendix C. These incubators are in early stages of implementation, however, and definitive lessons learned to apply to the Florida scenario are not yet fully available.

Despite this, the following recommendations are made to NASA-Kennedy Space Center to serve as guidelines in the establishment and operations of one or more not-for-profit incubators in Florida:

1. Any Florida incubator in which NASA is a partner should be governed by a top level agreement or series of agreements that defines the incubator program and the roles and responsibilities of the partners involved in the effort.

2. Incubators selected for sponsorship by NASA should include the following critical elements:

   - A facility "with walls," of at least 10,000 sq. ft., with growth to 40,000 to 50,000 sq. ft., to provide space to tenant firms at rates that are below commercial rates is preferable to an incubator without walls.

- Mission focused on supporting firms that are in the process of building companies around technology developed by NASA or other source.

- Incubator facility located in close proximity (within approximately a100-mile radius) to technology R&D resources, including NASA-KSC, other federal laboratories, universities, and industry R&D laboratories.

- Stable long-term funding strategy, to provide the incubator facility with access to needed capital.

- Incubator management that demonstrates a thorough understanding of the management, marketing, technical, R&D, financial, and myriad other needs of technology-based tenant firms.

- Well-defined and agreed upon stakeholder roles and responsibilities that incorporate NASA's interests in commercially developing technology for spin off and spin in purposes and other stakeholder interests in deriving long-term economic growth via equity positions in ultimately successful technology-based business graduates.

- Well developed entry and exit criteria that assist in selecting incubator tenants with good chances of success, with business plans that match the goals of the incubator, with technologies that are deemed to be commercially viable in the long term, and with excellent chances of graduation in 2 to 3 years.

- Thorough evaluation process for applicant screening to ensure that only the best available opportunities are considered for entry.

- Services for tenants that are tailored to meet company needs are mandatory and must be managed effectively to ensure graduation and subsequent company success.

- A well-developed and focused community support network is necessary for success of a given incubator.

- Access to an array of financial investment sources will determine whether or not the client company can successfully cross the "valley of death".

3. Priority locations for technology-based incubators include Orlando and Tampa Bay, followed by Miami, Ft. Lauderdale, Melbourne, Gainesville-Ocala, Boca Raton, and West Palm Beach. Other locations should be considered if they bring additional resources to the arrangement.

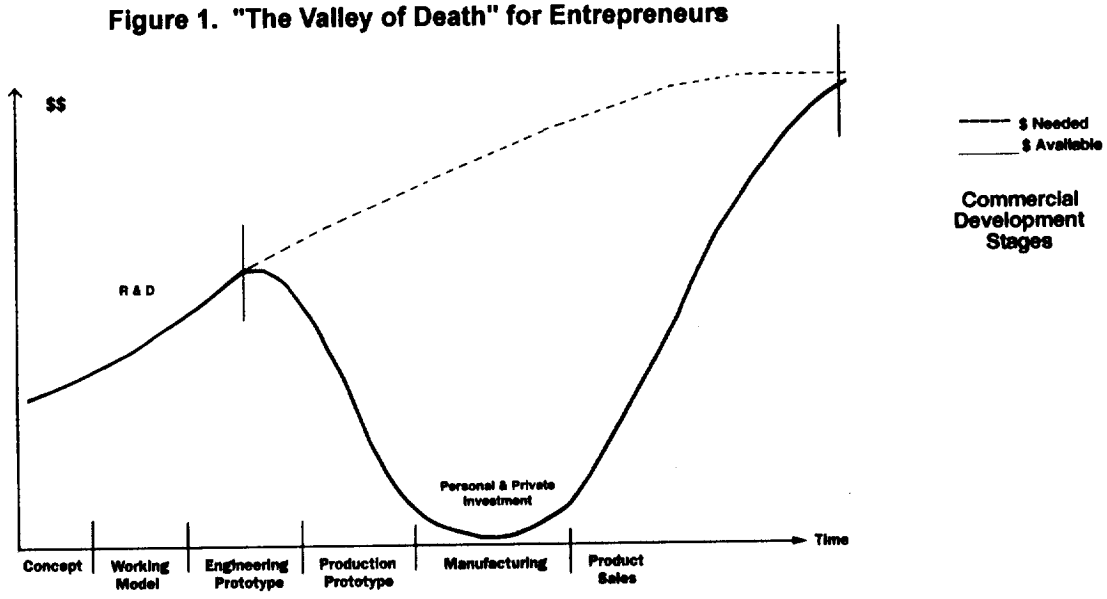
4. NASA's incubator funding policy of requiring a substantial cost sharing commitment from the non-NASA stakeholders should be maintained, and the total budget should reflect significantly larger allocations for strategic activities and client services, including investments and loans to tenants, than for operational expenses.

2.0 General Overview: Incubator Organizations and Programs

Business incubators are one of the most accepted economic development and growth strategies utilized in the US since the 1970s. Beginning with a few experimental programs, incubators are increasingly recognized as an important means for fostering the development of new businesses that can invigorate and expand local and regional economies. In fact, the successes of several incubators have generated a number of studies by economic development and business assistance professionals who seek to emulate those successes. Appendix B contains a fuller discussion of the literature on technology-based incubators, while Appendix C summarizes NASA's involvement with such incubators.

Business incubators provide a way for entrepreneurs, and technology-based entrepreneurs especially, to leap over the "Valley of Death," as shown in Figure 1. The "Valley of Death" as utilized by the National Institutes of Standards on Technology and other experts, represents the period of time when there is little or no money available, other than the personal finances of the entrepreneur and her/his family and friends, for developing engineering and/or production prototypes, acquiring market analyses, and paying for other start-up costs. During these early start-up periods, seed or venture funding is not available, since risks are too high for seed and venture capitalists. Most seed and venture capital investors will not invest until the start-up firm has initial product sales that illustrate potentially high profits of the product and its derivatives in domestic and international markets.

Figure 1. "The Valley of Death" for Entrepreneurs



Consequently, incubators provide a lifeline to technology-based entrepreneurs by providing them with access to the engineering and production prototyping resources needed, by assisting with market analyses, legal considerations,

financial management, and other elements necessary to establish and grow a successful technology-based business. It is small wonder, then, that there is considerable interest in what makes some incubators more effective than others. Numerous studies have been conducted during the past two years to understand the "best practices" or develop a standardized model of the "ideal" incubator. The thinking is that a successful model can be emulated in different locations and contexts. A listing of the most recent studies is included in the reference section of this report for further study.

Several good resources in the literature on incubators provide information about the array of services and "best practices" of technology based incubators. Among these are the following recent publications:

- "Impact of Incubator Investments" (1997) prepared for the US Dept. of Commerce Economic Development Administration by a research team from the University of Michigan, Ohio University, National Business Incubation Association (NBIA), and the Southern Technology Council, and copyrighted by the NBIA,

- "The Art and Craft of Technology Business Incubation" (1997) by Tornatzky, Batts, McCrea, Lewis and Quittman,

- National Business Incubation Association's (NBIA) "A Comprehensive Guide to Business Incubation" (1996) edited by Sally Hayhow, and

- "Incubating New Enterprises: A Guide to Successful Practice" by Lichtenstein and Lyons (1996).

Review of the reference materials provides insight into the fact that incubators exhibit wide diversity in organization, services provided, entry and exit criteria, funding sources and myriad other organizational, managerial and financial details that combine for successful incubators. In fact, most experts agree that ***there is no single optimum design that will guarantee a successful incubator.*** Indeed, successful incubators come in a variety of forms, serve many different types of companies with differing types of needs, are capitalized and managed according to varying unique arrangements, and differ in definitions of "success."

Some of the information about what constitutes "success" focuses on the ability of the incubator to maintain itself over the long term so as to provide services to a constant stream of tenant firms. This perspective stresses the need for good incubator management skills, long-term financial goals, and sustained support by the community of organizational service providers, including financial, managerial, legal, educational, and others.

To others, "success" is defined by the accomplishments of the incubator "graduates." That is, a successful incubator is one that produces a constant stream of "graduates" that grow into large, stable employers and provide an expanded tax base for the community. This perspective, then, focuses on the types of services provided to tenant clients rather than on the structure of the incubator itself. Emphasis is given to the criteria used to select tenant firms for the incubator, the types of business plan development, management training, computer and product design, test and evaluation, market information, and similar services and facilities made available to the tenant firms. Firms that graduate and go on to become successful are a testament to the value of the incubator in terms of the services and assistance they received.

Tables 1 and 2 below, illustrate the different characteristics of success for incubators, according to the two orientations described above. Table 1 lists the "organizational"

Table 1. Organizational Elements Shared by Successful Business Incubators

- ⇒ Established Financial Goals for Long-term Viability
- ⇒ Agreed-Upon Roles for Stakeholders and Partner Organizations
- ⇒ Sustained, Proactive Support from the Community
- ⇒ Easy Access to a Variety of Business and Technology Product Development Capabilities

elements which appear to be shared among a wide variety of business incubators, while Table 2 focuses on the types of services offered most frequently in incubators that are considered to be successful. In reality, of course, these two sets of success criteria are linked closely together, since the ability to provide effective support services to tenant firms depends on the way the incubator is structured, financed and managed. It is useful here to separate them, however, to ensure that both sets of success criteria are understood in relation to each other.

Table 2. Service Elements Shared by Successful Technology-Based Business Incubators

- ⇒ Office Space and/or Access to Laboratory Facilities
- ⇒ Reasonable and Consistently Applied Process for Selection of Tenants
- ⇒ Secretarial, Receptionist, Photocopy, Connectivity and Related General Services
- ⇒ Networking Opportunities
- ⇒ Business Plan Development Assistance
- ⇒ Computer and Product Design Assistance
- ⇒ Assistance in Acquiring Investment Capital
- ⇒ Market Analysis and Related Information
- ⇒ Management Training
- ⇒ Legal/Regulatory Assistance
- ⇒ Other Services as Needed by the Tenant Firm

Ultimately, of course, incubator "success" is defined by the degree of success experienced by tenants after graduation. A high number of graduates that experience growth over the long term to provide jobs, economic impact on the community, and royalty or equity pay back to the incubator are evidence of real incubator success. Thus, successful business incubators are:

- Organized along sound management and financial principles, and
- Provide a wide array of needed services
- That meet the varied needs and solve the major problems of tenant firms,
- Which, in turn, graduate out of the facility and
- Grow into successful businesses that contribute to economic growth and expansion of the community, the region, and the US.

Appendix B provides a much fuller discussion of the findings of "best practices" of incubators as published in numerous studies. Appendix C lists the characteristics of the NASA-sponsored business incubators in the US.

3.0 Implications for NASA-Sponsored Incubators in Florida

Florida is poised to be a major player in domestic and international markets, and its high technology manufacturing base must be a major contributor. The development of an effective technology-based manufacturing sector that draws on the extensive R&D base of the universities and federal laboratories can be accelerated by continued development of an entrepreneurial support infrastructure. The addition of one or more technology-based business incubators in the state will enhance entrepreneurial support activities in a significant way.

This section expands the discussion of the elements shared by successful incubators to Florida. Specific adaptations must be made to the general model so that it conforms to and capitalizes on the unique business base and infrastructure support capabilities of a given locale. Consequently, the model described in the following paragraphs is a general one. Specific adaptations will depend on the available funding resources, partnership formations among stakeholders and sponsors, and incubator goals.

3.1 Critical Elements for Incubator Success In Florida

Florida has a need for technology-based business incubators to harness the entrepreneurial energy of the state and to utilize effectively the existing federal R&D base that stimulates innovation. NASA can play an important role in catalyzing the development of incubators that assist qualified firms to commercially develop innovations into viable products and processes that expand the state's economic base while providing NASA itself with a tangible downstream benefit: potential acquisition of high quality technology products needed for agency missions, including the international space station, space exploration, and shuttle programs.

Based on the information presented in Section 2 and on the information contained in the Appendices, incubators established in Florida should at the very least, have the following characteristics:

1. *A facility "with walls," of at least 10,000 sq. ft., with growth to 40,000 to 50,000 sq. ft., to provide space to tenant firms at rates that are below commercial rates is preferable to an incubator without walls.*

In Florida, by contrast, most incubators including the Enterprise Florida Innovation and Commercialization Corporations, are incubators without walls that provide different types of services to a variety of clients. The only major facilities in the state are the Florida-NASA Business Incubation Center located on the Titusville campus of Brevard Community College and the Sid Martin Biotechnology Development Center located in Alachua, FL and affiliated with the University of

Florida. This serious matter must be addressed in any future incubator-related activities.

2. Mission focused on supporting firms that are in the process of building companies around technology developed by NASA or other source.

The need for technology-based business incubators rather than mixed use incubators is an important consideration for Florida in order to take advantage of the sizable R&D base in the state. While there is a continuing need to build collaborative partnerships among communities to support business development generally, it appears that focusing on developing incubators that support technology commercialization should be a priority given the efforts already underway to strengthen the state's manufacturing base.

3. Incubator facility located in close proximity (within approximately a100-mile radius) to technology R&D resources, including NASA-KSC, other federal laboratories, universities, and industry R&D laboratories.

Several areas in Florida are characterized by relatively high densities of technology resources, including a high technology manufacturing base, a high technology business base, a high technology R&D base (including private and public laboratories), a university, a community college, and existing incubator programs. Appendix D contains information about the five primary regions in the state and the presence/absence of entrepreneurial support resources. It should be noted that we distinguish between a high technology manufacturing base and a high technology business base, since many corporations in high technology industries are represented in Florida but maintain their manufacturing operations elsewhere in the US.

Most experts in incubator organizations maintain that in order to provide the best mix of services to tenants, incubator facilities should be located in reasonably close proximity to federal laboratories, universities, and other industry resources. This enables entrepreneurs to have easy access to technical expertise and facilities in addition to frequent networking and management training opportunities. Similarly, investors also tend to invest in companies that are relatively close by.

4. Stable long-term funding strategy, to provide the incubator facility with access to needed capital.

Many incubators fail because they do not pay adequate attention to long-term financial planning. The best strategies utilize a mixture of funding sources, including several "anchor" funding sources, tenant company fees (including rents), and downstream financial returns from equity investments in the tenant

companies and/or royalties on products in the commercial marketplace. Local sources of investment and financing for the incubator and for tenant firms is a desirable strategy since it fosters greater commitment among local stakeholders and partners and can be used for cost matching from other state and federal funding sources.

5. *Incubator management that demonstrates a thorough understanding of the management, marketing, technical, R&D, financial, and myriad other needs of technology-based tenant firms.*

The literature suggests that incubator managers who are themselves experienced in starting companies have a more thorough understanding of the unique needs of start-up firms. They are thus in a position to diagnose tenant company needs and to design approaches to secure the appropriate services. In cases where incubator managers are primarily real estate experts or have expertise in other economic development related areas, the incubators tend to take different directions insofar as types of tenants selected and services provided.

6. *Well-defined and agreed upon stakeholder roles and responsibilities that incorporate NASA's interests in commercially developing technology for spin off and spin in purposes and other stakeholder interests in deriving long-term economic growth via equity positions in ultimately successful technology-based business graduates.*

Incubators serve the interests of a variety of stakeholders. Consequently, these interests must be clearly understood by all parties so that appropriate roles and responsibilities can be assigned relative to incubator financing, management, and operations. Conflicting roles or agendas on the part of partners and stakeholders can lead to difficulties in securing long-term financing, poor management, and operating procedures that do not meet the needs of the tenant companies. Any incubators established in Florida that utilize funding from NASA must be responsive to NASA's needs and purposes, along with local economic development agendas.

7. *Well developed entry and exit criteria that assist in selecting incubator tenants with good chances of success, with business plans that match the goals of the incubator, with technologies that are deemed to be commercially viable in the long term, and with excellent chances of graduation in 2 to 3 years.*

Technology-based incubators, by definition, must select firms that have a solid chance of succeeding in their efforts to commercialize a technology with significant market potential. Many entrepreneurs have excellent technologies, but if there is no commercial value it does not make sense to invest in commercial

development. Just because a technology is based on sound science, or incorporates engineering concepts in novel ways, or achieves a better performance specification is not enough to mandate that a business be formed around it. Rather, thorough applications research and market analyses must be conducted to determine if it makes sense to form a company in the first place. Once it is determined that there is commercial potential for the technology, then a business plan can be formulated for review by an incubator and used to determine whether the start-up is an appropriate candidate for tenancy in the facility.

8. *Thorough evaluation process for applicant screening to ensure that only the best available opportunities are considered for entry.*

In typical cases only about one in ten applications are actually accepted. The screening process must have an effective procedure for managing the rejections. Major public relations problems can result otherwise.

9. *Services for tenants that are tailored to meet company needs are mandatory and must be managed effectively to ensure graduation and subsequent company success.*

This includes the fundamental services that all tenants will require as well as access to specialized services that may be dependent on factors such as the technology area, e.g., biotechnology, manufacturing peculiarities, and hazardous materials handling, and certain market niches. Easy access to laboratories, technical expertise, legal assistance, test and evaluation facilities, business and technical networks, and financial investment sources are all fundamental to service provision by the incubator.

10. *A well-developed and focused community support network is necessary for success of a given incubator.*

This network is required to provide access to all the talents necessary around which a successful high technology company is built. Usually the business/management team is developed from this resource base as well as access to the needed banking and capital connections. This network also supports the continued viability of the incubator itself by contributing to operations and assisting the incubator to secure long-term funding.

11. *Access to an array of financial investment sources will determine whether or not the client company can successfully cross the "valley of death."*

The involvement of local angel networks and strong banking connections are the first critical element of any financial plan. These participants are the stepping stone to the next levels: venture and other investment vehicles. Many not-for-profit incubators have for-profit subsidiaries that handle financial investments in the tenant firms.

These eleven elements reflect findings in the literature on "best practices" as well as the information provided by experienced incubator professionals. They are the basis for development of successful incubator facilities that can nurture small start-up firms in Florida while ensuring their own continued viability over time. These categories provide a solid basis for evaluating requests or proposals for establishing incubators in Florida.

3.2 Potential Locations for Technology-Based Business Incubators

Florida provides numerous possible locations for technology-based business incubator facilities. Indeed, there are more locations than there are incubator facilities and funding sources. Consequently, decisions as to how many incubators and where should be driven by the defined mission goals of the incubator and by the level of commitment of the potential stakeholders in financial support for the incubator and services available for tenants.

Appendix D contains extensive information collected on the Southeast, Southwest, Central, North, and Northwest regions of Florida. Each region is profiled to illustrate the range of entrepreneurial support organizations present such as universities, federal laboratories, other incubators, economic development groups, innovation networks, community colleges, and other resources. The information also summarizes the technology-based industry base in each region.

Table 3 is based on a summary of the information presented in Appendix D and lists 18 of the major cities in Florida, together with an indication of the extent of the high technology R&D base, the high technology business base and the high technology manufacturing base. The high technology business base reflects the presence of high technology firms that do not have manufacturing operations in the state. Examples of such high technology businesses are Allied Signal Aerospace, Microsoft, IBM, Sun Microsystems and Lucent in Southeast Florida. The high technology R&D base as used in the table indicates the presence of substantial technology sources, including NASA-Kennedy Space center, other federal laboratories, universities and industry with significant R&D capability.

Additionally, Table 3 indicates the presence or absence of significant levels of entrepreneurial support organizations, including other incubators, community colleges, including those that submitted concept papers in response to the TRDA

invitation as well as those that have a well defined and active presence in the community and region. When taken together, there are several cities that emerge as potential locations for incubators, based on the extent of the available resources and expressions of interest on the part of the community college concept papers. These include Orlando and Tampa Bay which have all six categories present in Table 3.

Table 3. Combined Entrepreneurial Support Resources for 18 Florida Cities

Location	Existing Incubator or ICC	High Tech R&D Base	High Tech Business Base	High Tech Mfg. Base	University	Comm College
1. Miami	–	X	X	X	X	X*
2. Ft. Lauderdale	–	X	X	X	X	X
3. Boca Raton	–	X	X	X	X	X
4. West Palm Beach	X	X	X	X	–	X
5. Ft. Pierce	–	–	–	–	–	X*
6. Melbourne	–	X	X	X	X	X*
7. Titusville	X	X	X	–	–	X
8. Orlando	X	X	X	X	X	X*
9. Tampa Bay	X	X	X	X	X	X*
10. Sarasota	–	–	X	–	–	X
11. Ft. Myers	–	–	–	–	X	X
12. Gainesville/Ocala	X	X	X	–	X	X
13. Daytona Beach	–	–	X	–	X	X
14. Jacksonville	X	–	X	–	X	X
15. Tallahassee	X	X	–	–	X	X*
16. Panama City	–	X	–	–	–	X*
17. Ft. Walton Beach	–	X	X	–	–	X*
18. Pensacola	–	X	X	–	X	X
19. Lakeland	–	X	X	X	–	X

*Denotes submission of a Concept Paper to TRDA.

A second "tier" of areas also emerges as areas with slightly less existing infrastructure, as noted in Table 3. These second tier areas include Miami, Ft. Lauderdale, Boca Raton, West Palm Beach, Melbourne, and Gainesville-Ocala. In each of these locations, five of the six categories in the table are present.

The remaining urban areas shown in Table 3 may merit an incubator facility, however, it may be more appropriate in such areas for community economic development groups to explore the feasibility of establishing general purpose or mixed use incubators rather than technology-based incubators. More general, mixed use facilities may be a more appropriate and effective stimulus attract and grow the type of solid business base that can subsequently support technology-based entrepreneurial activities.

4.0 RECOMMENDATIONS

Several recommendations emerge from the review of incubator success elements and Florida's regional entrepreneurial support infrastructures. These recommendations are offered as a guideline for decisions about incubator organization and location. The actual decisions should be made on the basis of a competitive process through which communities can provide much more detailed information about proposed incubator organizations and their financing avenues. For that reason, we suggest that NASA-Kennedy Space Center provide a competitive format through which a number of proposals are solicited according to well defined selection criteria.

Recommendation No. 1

Incubators in which NASA is a partner should be governed by a top level agreement or series of agreements that defines both the incubator program and the state- and/or regional-level organization(s) to be involved in the planning and implementation of program. Since it is likely that several incubator projects will be selected and that each one is likely to include a variety of stakeholders, the governing body should be organized to provide uniform management and consistent implementation throughout the program. For example, if the collaborative partnership is established by Enterprise Florida, Inc., TRDA and STAC to participate with NASA-Kennedy Space Center in developing a Florida Incubator Program, then representatives from the participating partners would form an Executive Committee tasked by NASA-Kennedy Space Center to oversee incubator establishment and operations.

Recommendation No. 2

Any incubator selected for sponsorship by NASA should include all the critical elements outlined in Sections 2.0 and 3.1 above.

Recommendation No. 3

Priority locations in Florida are represented by tiers one and two derived from Table 3 and discussed in Section 3.2. Locations selected from outside these two groups should bring additional resources to the arrangement.

Recommendation No. 4

NASA's incubator funding policy of requiring a substantial cost sharing commitment from the non-NASA stakeholders should remain in force. The annualized budget for the incubator should be demonstrated to be sufficient to perform both strategic and operational plans. History has shown that this budget should be approximately $1 million annually using funding derived from all stakeholders. Also, each incubator budget show both short- and long-term commitments including the point at which the proposed incubator can become self-sufficient. In addition to client services, a significant portion of the budget should be reserved for equity

investments and loans via a for-profit corporation mechanism. This will result in a smaller portion of the annual budget being committed to operational expenses, but in-kind support from one or more partner organizations can help defray these expenses.

APPENDIX A.

Background and Objectives of the Study

This study was generated by several converging trends and opportunities for the establishment of technology-based business incubators in Florida. Funded by the NASA-Kennedy Space Center, the study was envisioned as a means to identify potential models of incubators that could be established in appropriate locations in the state to capitalize on technology resources, expertise, financial and other business support capabilities, and the state's organizational infrastructure.

The Southern Technology Applications Center (STAC) was selected by KSC to conduct the study because of STAC's history of involvement with the range of business and technology development activities currently underway in Florida and nationally. STAC is a Regional Technology Transfer Center headquartered at the University of Florida's College of Engineering and hosted by five other state universities in Florida: the University of North Florida, the University of South Florida, the University of Central Florida, Florida Atlantic University and Florida International University.

The primary objective of this study is to help NASA-Kennedy Space Center define its role as a partner in technology-based incubators in Florida. To this end, information about technology-based incubators in general, NASA's involvement with incubators elsewhere in the US, and Florida's high technology business development efforts was collected and used to develop an optimum configuration for NASA-Kennedy Space Center's participation.

Overview of Technology-Based Incubators

In general, business incubators work to promote the growth and development of new enterprises by providing flexible space at affordable rates, a variety of supporting services, access to business and technical assistance, access to capital, as well as opportunities to develop networks of business associates for training, market development, and a variety of other benefits. An incubator's main goal is to produce successful graduates–businesses which eventually become self sufficient, financially sound, and create jobs.

There are two standard incubator organizational types: those with walls and those without walls. In the former case, incubators are housed in buildings of varying size and lease space to incubator "tenants," or those entrepreneurs and firms that have been accepted into the incubator to receive assistance. Some incubators rely on "anchor tenants" who supply some additional financial base to the incubator through rent payments and who also provide assistance to other tenants.

Incubators "without walls," on the other hand, do not provide space for firms. Instead, companies selected to receive assistance are referred to as "clients" rather than as "tenants." To avoid confusion, we use the term "client" to refer to any company receiving assistance from an incubator, and to "tenant" as a company or entrepreneur physically located in office space within an incubator facility.

Definition of Technology-based Incubators

Technology-based business incubators are generally considered to be a special class of business incubators. While incubators in general provide support and assistance to a wide variety of business types, including entrepreneurial start-ups in technology or service areas, ***technology-based incubators are organized primarily to assist entrepreneurs—often scientists and engineers—to transform new technology(ies) into products and processes for commercial markets.*** As such, the organization, types of services, needs of tenant firms, and business development and growth cycles are somewhat different than for non-technology based ventures, such as retail companies.

For example, in many cases the entrepreneurs in technology-based businesses are the technology developer(s) themselves. Most often these technically sophisticated scientists and engineers lack the expertise and experience needed to be successful business managers. While they have a thorough understanding of the scientific, engineering and other technical aspects of a particular technology, they do not have knowledge or experience in management, marketing, legal, accounting, and personnel. In fact, most technology based start-up ventures fail because of bad management and marketing, not because of bad

technology. They can benefit immensely from participation in a technology-based business incubator where they can have access to needed training, management support services, and other assistance needed to "learn the ropes" of business development and management.

Technology-based business incubators, generally but not always, provide opportunities for client firms to receive needed levels of sophisticated technical support, including

- Access to laboratory space,
- Access to computing and design engineering facilities,
- Access to prototyping facilities,
- Hazardous waste or other materials handling resources, and
- Other specialized assistance.

Consequently technology-based business incubators provide access to technology R&D support in addition to more commonly offered business development assistance activities.

Requirements for Successful Technology-based Incubators

I. Organization and Management Criteria

Finance and Capitalization of Incubators

Most incubators are operated as 501 (c) (3) not-for-profit organizations with funding derived from a number of sources. Experience indicates that incubators which set financial goals for themselves (beyond what financial supports are offered to client or tenant firms) are more likely to remain viable over the long term. To this end, most successful technology-based incubators are capitalized and financed through a variety of mechanisms, including one or more of the following:

- Stakeholder investments,
- Rents and other fees from tenant or client companies,
- Federal and state sources,
- Royalties from licenses, and
- Equity positions in tenant or client companies.

Particular financing formulas are based on the unique characteristics of each incubator the available resources, and the community environment in which it operates.

Most incubators utilize combinations of government funding, private matching investment, in-kind contributions, and client fees to ensure continued viability of the incubator itself. Additionally financial investments should be flexible enough through combinations of loans, grants, equity positions, etc., to provide short term and long term repayment options for clients ***that will maintain the incubator as well as benefit the company.***

Additionally, incubators that are linked to capital investment sources, such as pre-seed & seed funds, venture funds, and loan and other types of investment funds are more likely to have higher success rates in terms of graduating companies. This is especially true when the stakeholders and incubator management clearly understand and support the incubator's mission, such as focusing on start-ups, economic development, and/or cash repayments for services via royalty or equity positions in graduated firms.

Stakeholders and Roles

Strong, sustained commitment on the part of stakeholders are critical to the success of any incubator. Additionally, it is crucial that stakeholder roles be established and agreed upon early in the development and design of an incubator. Disagreement about roles, focus and benefits of involvement in an incubator among stakeholders can lead to lack of clear focus, poor selection of clients, and poor service delivery, and no financial stability, if managers must devote their time to stakeholder conflict resolution rather than the business of the incubator.

As an example of the importance of stakeholder buy-in, incubators that have been established to provide low-cost facilities have found that local real estate developers view them as competitors. In the developer's mind, an incubator that provides office and laboratory space at reduced rates is more attractive to a small company than the developer's own office space which rents at a higher price.

One solution to this dilemma is illustrated by the Boulder Technology Incubator which has an arrangement with the two private developers who actually own the facility. The developers allow clients to pay no rent and low prices for business/office services in the hopes that successful business graduates will relocate to nearby industrial parks owned by the developers where they will become rent-paying tenants (Tornatzky *et al*, 1996: 148).

Alternatively, incubators can charge a rental fee that is no more than 30 to 50 percent lower than existing commercial rates in a given area and maintain strict limits on the length of time (usually 3 to 5 years) for tenants to qualify for the lower

rates. Consistently meeting projected milestones, for example, can be used as justification for qualifying for lower rental rates until graduation.

With/Without Walls

As noted earlier, incubators are generally of two types. One type is that which provides a facility where company tenants rent space for offices, utilize laboratories and have access to conference rooms, general office support, and other resources. The second type does not have a facility, but operates "without walls" by providing consulting and networking services to client companies. The latter type of incubator generally relies on its network of supporting stakeholders and local facilities to provide client firms with essential services as needed by the particular client.

There is no clear-cut consensus on the superiority of one type of incubator over another. Instead, incubator organization, service mix, and types of client firms are designed from the standpoint of the presence/absence of a facility. Many incubators which have a facility, *i.e.*, "with walls," must ensure that "real estate" issues do not overcome the service focus. For example, when an incubator manager must devote the majority of his/her time to ensuring that leases are negotiated and maintained up-to-date, there is less time to devote to providing tenants with high quality and sufficient quantity of needed services and assistance.

There is also debate over the overall feasibility of the strategy of providing facility space, including office space and associated communications, postal, secretarial, and receptionist services at a below market rate. On one hand, emerging companies are cash poor and can benefit from subsidized rents and fees for service, particularly at early stages of development. On the other side are arguments that state that when risk (cost) is minimized to a great extent, the tenant firms become "comfortable" and therefore not as aggressive as they should or could be in pursuing their growth and development objectives. This can be resolved, however, by establishing a fixed term (3 to 5 year) lease "window," after which the tenant pays going rates for commercial office space.

II. Services Provided

Services provided to tenant or client companies largely depends on the goals of the program , the types of firms accepted into the incubation facility or program, and on the resources available from stakeholder organizations and the surrounding community. While entry/exit criteria formulations are discussed more fully in Section 3.2.3 below, it is important to note here that they play a strong part in defining the service mix available for tenants or clients.

Not all services are provided by all incubators. Rather, the collection of services provided reflects a synergistic melding of the available resources, types of clients

or tenants, and goals of the incubator itself. In general, however, most incubators provide services that allow their clients to access:

- Needed technology R&D resources, including laboratory space, prototype development capabilities, manufacturing resources, expertise and "know-how," and related supporting technical assistance;
- Business management resources and assistance;
- Financial resources, including low-cost rents and sources of investment capital;
- Marketing and sales assistance;
- Legal and regulatory expertise; and
- Business plan development training and expertise.

Access to Technology R&D Resources and Assistance

Some technology-based entrepreneurial firms have some unique requirements in relationship to other start-up ventures. The primary difference is in the need to access a variety of resources that relate to the technology being commercially developed. Many entrepreneurs have solid designs but need to have a working prototype to demonstrate proof-of-design-and-concept. Others may have a working prototype, but may need access to expertise and facilities to make needed refinements, such as utilizing a better alloy or material or modifying the design to simplify the assembly process. Still others require access to laboratory space and other sophisticated facilities.

In addition, many technology-based entrepreneurs choose to build companies around a technology acquired from a federal laboratory, university, or other developer. In this case, access to the "know-how" and related expertise that are often available among the scientists and engineers who developed the technology is extremely important. Much time and energy can be saved when the incubator can link the entrepreneur with the technology developer for technical discussions, development history, test results and other technical data that may not accompany patents and other printed materials. The NASA-supported incubators at Lewis Research Center and Ames Research Center are exemplary in this regard, with many programs and opportunities for incubator tenants to interact with field center scientists and engineers.

An example of the benefits of providing entrepreneurs with access to technical resources can be seen in the Greater Tampa Bay area of Florida. Under an innovative program, the State of Florida through Enterprise Florida and the US Department of Energy collaborated for two years through a Cooperative R&D Agreement to assist technology-based entrepreneurs to have access to state-of-the-art facilities available at the Lockheed Martin Specialty Components Plant in Pinellas County, a nuclear weapons manufacturing facility scheduled for closure. After preparation of the facility for private sector use, STAC was asked to review applications received from small technology-based companies interested in utilizing the equipment and facilities in the plant for prototyping, testing, and other product development activities. Those firms and entrepreneurs who qualified for the program were able to utilize the facility, the equipment, and the expertise of the scientists at no charge to themselves. State of Florida funds were used to pay for the costs of the equipment usage for the small firms, while Department of Energy funds were used to compensate employees at the plant for the time and effort expended on the company's behalf. The program was a success for the following reasons:

- The Department of Energy was able to convert unused, excess capacity into a productive activity that will ultimately generate economic returns to the US economy,

- The State of Florida was able to assist technology-based entrepreneurs to reach an important milestone in building their Florida-based companies, and

- The entrepreneurs were able to conduct needed prototyping, testing, and other technical activities that were essential to product development but too costly to do without state resource support.

While the departure of the Department of Energy from the facility led to the dissolution of the agreement and the program, local interests in the Tampa Bay area, led by the University of South Florida, have created the Manufacturing Technology and Education Center (MTEC) as a modified version of the program. Additionally, the University of South Florida College of Business created the Office for Corporate Development to continue to nurture entrepreneurial development in Southwest Florida region.

Access to Management Resources and Assistance

A major need of technology-based business entrepreneurs is access to business management concepts, knowledge, and expertise. Most technology entrepreneurs are excellent scientists and engineers who understand their technologies. They understand the workings of the component parts, the

technical specifications of the invention, the operating tolerances, and other performance related data.

What these entrepreneurs usually do *not* understand well is the art and craft of building a business based on a product or process developed from the technology. Establishing a business requires extensive knowledge about the technology's range of applications and their associated industry markets, development of organizational, product development, financial and strategic goals that can be woven into a business plan, personnel issues, negotiating a myriad details relative to all aspects of business and operations management. In short, many, if not most technology-based entrepreneurs have had few opportunities to acquire the knowledge and skills needed to design, implement and grow a business.

Consequently, a fundamental service provided by incubators to technology-based entrepreneurs is access to business management resources. Such resources may include training courses, seminars, professors and/or graduate students in local business colleges, other industry management experts, and the like. Depending on the needs of the start-up firm, the background and training of the entrepreneur, and the resources available locally, incubators often will "prescribe" activities and actions required for business development.

In some incubators, equity positions are taken by the incubator in exchange for direct input of management expertise. This is similar to equity positions taken by seed and venture capitalists who wish to minimize as much risk as possible by inserting proven management teams into a new business venture.

Access to Financial Resources and Assistance

Essentially, all entrepreneurs have a strong need for funding. Early on, financial resources are most often drawn from personal bank accounts, second mortgages, loans from friends and relatives, and in some cases, investment "angels." As these sources of revenue are utilized, other financing must be secured until sales in the marketplace generate sufficient income to pay salaries, rents and overhead, taxes, sales and promotions, legal fees, additional product development costs, and to repay initial investors.

Many incubators provide a range of financial resources, ranging from low-cost rents and free use of certain facilities, including photocopying, secretarial, and other office resources, to investment loans in exchange for some portion of equity in the firm. As an example, the North Florida Technology Innovation Corporation in Gainesville, a 501 (c) (3) not-for-profit organization, has formed a for-profit subsidiary that provides investment capital to client firms in return for an equity position in the firm. Many other incubators have similar arrangements with investment groups so that at the appropriate time, the tenant firms can make presentations to investor groups for investment.

Access to Marketing/Sales Resources and Assistance
Another well documented need of most technology-based entrepreneurs is for market research and analyses on which to base product development, sales and promotional efforts. Market research is a critical component of success, particularly in the early stages of product development. Market research suggests the most promising industrial applications and associated designs needed to make the final product an attractive purchase.

In many instances, the technology developers have a good understanding of major applications areas for the technology, since the technology was often developed in response to a particular need, or application, identified by their federal laboratory or a funding agency. However, the real benefit of the technology may, in fact, be realized in widely different markets. Early understanding of these potential applications can be factored into product design, including materials selection, that result in a product that performs to needed and established specifications and, most importantly, has a low manufacturing cost. Too often, market research is overlooked at the earliest stages of technology-based business development when it is perhaps the most valuable contributor of information about business development, product design, prototype development, manufacturing operations planning, and financial targeting.

Successful incubators provide substantial market research support to their client firms, although this support can take a variety of forms. In some cases, graduate students in MBA programs provide early market research information on an internship basis. The client receives a market study at low or no cost, while the graduate students receive valuable experience in working with a real company. In other cases, the incubator provides access to market expertise in universities, industry areas, and other sources through networking, training seminars that help the entrepreneurs learn how to conduct market studies, and other means.

Early market analyses can also lead to decisions about which markets to avoid, no matter how promising they look at the outset. For instance, a technology may be technically sound, but existing and competing products in the marketplace may be adequate to the needs of the buyers, be cheaper to produce, and be available at a lower price than that envisioned/needed by the new technology. In these cases, decisions can be made early in the development of the product as to avoiding these areas in favor of other market opportunities with their associated performance specifications, production costs, and product design.

Sales and promotion activities can be tailored to markets based on market information. Demonstrations of the product conducted at industry trade shows, advertising campaigns in trade publications, cold-calling, and sales calls can all be techniques used to promote and sell the product.

Access to Legal/Regulatory Resources and Assistance
Many entrepreneurs are unaware of the existing legal and regulatory rules that may govern both the product and the processes utilized to produce it. Tax laws, worker safety as mandated by state and federal agencies, hazardous waste disposal, local, county, and state permitting requirements, and a host of other legal and regulatory issues affect high technology start-up companies. In addition to providing high technology clients with access to legal and regulatory assistance, technology-based business incubators must themselves meet legal and regulatory requirements.

A number of business incubators have developed working arrangements with local attorneys to provide incubator clients with *pro bono* and/or low cost legal advice for a specified number of hours.

Access to Business Plan Development Expertise
Successful incubators usually provide much-needed assistance to client firms in preparation of business plans. Complete, well thought-out business plans are fundamental to obtaining needed investment capital, and the entrepreneur who does not have a business plan or who has a poorly crafted plan is unlikely to attract serious investment into a venture.

However, incubators differ as to the emphasis placed on business plan development with respect to their clients. Many incubators require a completed business plan prior to admission to an incubator.

Still other incubators regard business plan development as a key service provided to entrepreneurs and client firms. Such plans may be developed by the entrepreneur with assistance through incubator-sponsored training courses, seminars, and business graduate student internship programs, as in the North Florida Technology Enterprise Corporation in Jacksonville and the Office for Corporate Development at the University of South Florida College of Business in Tampa.

III. Entry/Exit Criteria

All incubators have established entry and exit criteria for client firms which are agreed upon by incubator management in partnership with stakeholder organizations. The following paragraphs describe the range of variation of entry and exit criteria utilized by many incubators.

Entry Criteria
Entry criteria are generally fairly strict in all successful incubators. Because "success" is defined as having a high number of "graduate" firms that continue to grow and prosper after leaving the incubator, it is incumbent to select client firms

that, when provided with assistance, have a high likelihood of maturing into strong businesses. Consequently, successful incubator organizations place an extremely high priority on selection criteria for entry.

Entry decisions are often dependent on the following considerations:

- Product or service that is consistent with the incubator's goals and operations;
- A well developed business plan;
- Service needs that fall within the capabilities of the incubator; and
- Willingness of applicants to do one or more of the following:

  –exchange some portion of equity in the firm for incubator services and support,
  –pay royalties to the incubator based on future profits, and/or
  –pay fees for services.

In many cases, access to an incubator is extremely competitive, with a very small number of companies accepted from a large pool of applicants. In fact, decisions as to whether or not an entrepreneur or small company will be accepted into an incubation facility are often based on the quality of the business plan itself. The North Florida Technology Innovation Corporation in Jacksonville requires a business plan as part of the admissions criteria as does the Florida-NASA Business Incubation Center in Titusville. On an innovative note, the LIFT program sponsored by NASA-Lewis Research Center in Cleveland provides business plan development assistance to entrepreneurs in a "pre-incubator" program so that a completed plan can be submitted as part of the entry requirements.

Other types of incubators accept a mix of firms, including large firms with new products under development, firms proposing to provide services that complement manufactured products, and so forth. Again, entry criteria reflect the goals of the incubator management, the pool of available resources in the community, a good match between the needs of the firm and the services available through the incubator, and the soundness of the potential client firm's business and product development concepts.

Pre-Incubator programs

One very innovative incubator concept is that established by the NASA-Lewis Incubator for Technology (LIFT). LIFT utilizes a "pre-incubator" program for prospective client firms that are in very early stage development and do not yet have a complete business plan. Rather than deny these firms entry into the

incubator, LIFT utilizes the capabilities of the Great Lakes Industrial Technology Center (GLITeC), one of NASA's six Regional Technology Transfer Centers (RTTCs) to provide market opportunity analyses of the technologies being considered for commercial development.

The LIFT Pre-Incubator program is designed to meet the needs of emerging companies and entrepreneurs desiring to commercially develop a NASA technology. The Pre-Incubator program provides space at the incubator facility, computer and data resources, and support activities that help the entrepreneur to develop key components of the business plan. GLITeC provides market information that aids in assessing the commercial potential of the technology/product. Other support facilitates the transition of the firm from the pre-incubator program to LIFT as full tenants.

The advantage of a "Pre-Incubator" program is that it allows for the insertion of critical information at very early stages of business and technology development. Decisions made at early stages with regard to the technical development and technology R&D needs often lead to commercially viable and competitive products downstream. Similarly, information relative to business development options can be integrated into business plan components to provide strategic directions early on that serve to position the firm early in industry markets that are potentially highly lucrative.

Exit/Graduation Criteria

Exit or "graduation" criteria are also important components in incubator operations, in that they provide goals and objectives toward which the client firms must work and a set of milestones to be achieved in an appropriate timeframe. Most firms remain in incubators for 2 to 5 years, although there is considerable variation in tenancy, depending on the complexities of the particular client firm's development requirements.

Decisions about when a client firm should exit the incubator are generally made in one of two ways. A common method is for the incubator management together with its industry advisors to decide when a particular firm will graduate, based on one or more presentations made by the client firm. The other method is more collaborative, involving mutually agreed upon criteria and a joint decision on the part of the incubator management and the firm's management.

In many cases, graduation from the incubator means a transition time whereby the client firms relocate to other office space but still have access to the networks of service providers and industry support elements that were developed while in the incubator facilities. As noted earlier, the Boulder Technology Incubator, for example, provides an easier transition to local research and industrial parks since the incubator owners are also the developers of those parks and can exercise some flexibility in the cost of space for the fledgling companies.

In some cases, companies do not make sufficient progress to meet major, specified milestones. In these instances, it may be necessary to "fail" the company from an incubator standpoint. That is, it may be necessary to relocate the firm outside of the incubator and to replace it with a new tenant with a higher potential for success. Such unfortunate circumstances can be minimized, however, if the incubator management works closely with the company from the beginning and provides sustained oversight and monitoring functions. Early detection and diagnosis of potential problem areas, such as market configuration, rising prices for needed materials or other similar change, can lead to remedial actions and strategic decisions that can work to the firm's and the incubator's advantage in the long term.

Additionally, project management protocols established for the tenant in collaboration with incubator management and advisors to track the firm's progress on a pre-determined basis can both assist the firm to meet important milestones for graduation and serve as an early warning if serious problems arise. In any case, should a company depart the incubator due to lack of success, both the incubator and the company may need to negotiate an appropriate division of resources to assist the incubator to recover costs associated with assisting the firm up to that point.

Lessons Learned About What Does Not Work

A number of elements can contribute to the failure of business incubators, including unrealistic expectations, lack of stakeholder support, poor management, and inadequate resource leveraging/finance. The following paragraphs describe each of these elements in more detail.

Unrealistic Expectations

Unrealistic expectations in terms of both time in which results will be felt and the types of results that will occur are a major cause of incubator failure. In particular, the timeframe in which stakeholders and others anticipate success may turn out to be much longer than expected, leading to frustration and even withdrawal of needed financial support. In most cases, a tenure of 3 to 5 years in an incubator is desirable and sufficient for a successful graduate. It may still take another 2 to 3 years or longer for the firm to realize substantial growth and profitability such that the early incubator investments in the form of equity or royalties begin to pay off. Stakeholders that are unwilling to wait that length of time for a return on their investments may decide to withdraw their support of the incubator.

Additionally, expectations about the types of impacts an incubator may have on a community can be a major cause of dissatisfaction among various stakeholders. Government officials, for example, are often concerned about impacts with respect to job creation and economic growth. Economic development professionals are often more concerned about industry recruitment. Real estate developers may anticipate quick returns in the form of leases and building construction as companies graduate from the incubator.

Together, differing and perhaps even contradictory vested interests in incubator outcomes and impacts as well as the timeframes in which the outcomes are anticipated can lead to stakeholder dissatisfaction, frustration, and ultimately to withdrawal of support. Consequently, it is essential for incubator programs to define clearly at the outset the goals and focus of the incubator, anticipated outcomes and timeframes.

Stakeholder Support
Withdrawal of stakeholder support for any number of reasons, including perceptions that the incubator is not producing desired outcomes in an appropriate timeframe can cause some stakeholders, particularly investors, to withdraw support. If an incubator program is dependent on outside funding, as many are for a number of years, this can be catastrophic. The fact is, however, that most incubators are dependent on some public subsidies, according to the 1997 EDA-sponsored *Impacts of Incubator Investments* study. Indeed, that study found that for every public $1.00 invested, there was a return of almost $4.96 in the form of tax revenues.

Similarly, situations where stakeholders compete with one another to shape the focus and activities of an incubator can also lead to failure, particularly when stakeholder goals are contradictory to one another. As an example, an incubator started and initially funded by NASA at the Johnson Space Center did not satisfy its primary stakeholder (NASA) leading to the withdrawal of funding. The incubator is in the process of being restructured as a private sector venture with a new set of stakeholders and sponsors.

Poor Incubator Management
Management is critical to incubator success. A good manager with a broad outlook, positive attitude, solid knowledge and experience with business development, and a flair for diplomacy can mean the difference between success and failure. According to Raymond Smilor, "incubators have failed because the manager misjudges clients or has difficulty choosing ones that will fit and have a chance at success." (1996: 10) Further, unsuccessful incubator managers are often individuals who are more experienced in general economic development, rather than in building companies. That is, these individuals are often excellent in terms of recruitment and marketing–central activities of many economic development activities–but have little understanding of the types of supports and assistance required for moving a technology from prototype to large scale production for example.

Poor incubator management can also result in situations where competing interests of stakeholders generate sets of contradictory goals and objectives to be met by management. Strategic and programmatic activities that satisfy one set of stakeholders may alienate other sets. Consequently, incubator managers must be skilled at understanding stakeholder interests, negotiating compromises

where differences threaten incubator operations, and translating those interests into a well conceived, effectively managed enterprise.

Resource Leveraging

Incubators, like most organizations, require time to grow and to solidify a stable financial position. According to Smilor (1996: 11), "the Austin Technology Incubator in Texas looked for funding for three years out. Its city council committed to $50,000 a year for each of three years. The chamber of commerce put in $25,000 a year for each of the three years. The incubator raised $50,000 a year from private sources. In addition to that, private companies–such as accounting, law, and marketing firms–made three-year commitments of in-kind support amounting to about $100,000 a year. Resources are thus leveraged and, as a bonus, a lot of people gain a stake in the incubator's success." Additionally, many incubators are now taking equity positions in the tenant companies, leading to a long-term financial pay-back for services and at least a stable, though oftentimes not large, income stream from graduates.

Failure to leverage resources leads to over-dependence on limited sources of funding. Should a funding source withdraw for any reason, the incubator will generally fail. Thus, it is essential to combine public and private sponsorship to engage all resource bases in long-term support of an incubator.

APPENDIX C.

NASA Incubators

In the past few years, several of NASA's Field Centers have begun to work with local communities as partners in technology-based business incubator programs. Some of these projects have been successful, while others have yet to find the particular combination of resources and organization that will generate successful business development.

Table C-1 on the following pages provides summary information on the various NASA incubators in existence or planned for the near future. In almost all cases, emphasis is placed on the development of technology-based businesses, preferably businesses created around one or more NASA-developed technologies, but there is wide variation in organization and management as well as in client company selection criteria. A trend for most of the incubator facilities sponsored by NASA is for location close to a NASA field center and other technology sources as well as to technical support resources, including laboratory facilities at universities, for prototyping and R&D testing.

Table C-1. NASA-sponsored Technology-based Business Incubators

Name	Date	Management & Organization	Screening Process	Services Provided	#Cos.
Ames Technology Commercial -ization Center (ATCC)	1993	ATCC created as a NASA experiment in commercial-izing its technologies. Companies must have a clear connection to NASA technologies. Originally, ATCC was co-managed by Ames and the U of Texas-Austin. This has shifted to a private group of established investors which has up to $60 million in investment capital to match with the NASA investment.	Goal is to build companies around Ames technologies. Reviews of business plans or technology-business idea conducted by incubator mgmt and outside boards. Participation reviewed monthly. Mgmt determines when tenants are successful and should graduate. Entrepreneurs can originate from outside or within NASA-Ames.	Access to business expertise in marketing, sales, high tech mgmt & operations, financing, patents and corporate law; low cost office space, high quality executive services, access to NASA & university research libraries & facilities. Assistance in transferring NASA technology. Also assist companies outside the incubator in solving technology problems.	4 Grads
Lewis Incubator for Technology (LIFT)	1997	Funded by NASA 3-year cooperative agreement grant from LeRC at $1,109,800, and by Ohio Dept. of Development at $125,000 for 1996-97. Annual operating revenues @ approx. $500,000. LIFT managed by Enterprise Development, Inc. (EDI) which also manages the Edison Technology Incubator and is supported by GLITeC in the areas of in-reach and pre-incubator support for potential LIFT tenants. Located at BP-America facility in Warrensville, OH facility, and staffed by an Executive Director, Technology Director, Incubator Coordinator, Business Develop-ment Mgr., and an Advisory Board.	Companies must have the potential to transfer and commercialize NASA technology. Emphasis placed on identifying high potential NASA technologies and matching them with qualified and interested entrepreneurs. Sound business concept with commercially focused technology as a foundation reviewed for acceptance. Assistance on business plan development provided in Pre-Incubator program.	Two phases: Pre-Incubator stage and actual tenancy in LIFT. Pre-incubator stage provides space at LIFT and focuses on developing key components of the business plan, including Market Opportunity Assessment. As tenants, ventures receive services at no cost or at competitive rates. Lewis Commercial Technology Office facilitates linkages with lab "Know-How" and other resources in NASA.	2
Florida-NASA Business Incubation Center	1996	Located in Titusville, FL, the incubator facility provides 10,000 sq. ft. of offices. Can accommodate 15-20 firms. Managed via joint partnership between NASA KSC, Brevard Community	Screening criteria include filling out a descriptive questionnaire regarding the business, product under development, incubator facilities needed, other assistance needed (clerical, legal, marketing, financial, technical, etc.).	Tenants have access to listings of NASA technology available for commercial-ization, common areas, conference rooms, office equipment, Internet, and Broward CC facilities. Other services are available on a competitive	1 Grad

APPENDIX C continued.

		College, and Technological R&D Authority (TRDA). FNBIC managed by an Executive Director.		rate basis. Off-site firms can access incubator facilities for a fee and are eligible to attend and participate in a variety of programs and educational workshops.	
JSC Enterprise Center	1993	Originally managed by the Univ. of Texas (IC2) before becoming an independent, nonprofit organization. NASA originally funded the incubator but has decreased funding levels. Incubator is currently being reorganized.	TBD	TBD	TBD
SSC-Mississippi Enterprise for Technology	1994	Independently governed, nonprofit, 501(c)(3). Located at Stennis Space Center, the incubator is a "virtual organization" that links three major statewide programs to support entrepreneurs and boost the state's economy. NASA and the state Dept. of Economic & Community Development are the principle co-funders of the facility. Indirect cost recovery as well as rents and fees paid by clients augment the funding base and operations. Mgmt structure includes a Chief Admini- strative Officer assisted by a Financial Director and a Technical Director.	Screened on three different scoring areas: business experience of the entrepreneur/applicant, feasibility of the product (not the technology), and market viability and entry barriers.	Provides critical business, administrative, marketing and technical assistance to tenant clients in addition to joint venture opportunities, training and access to state and federal technology. Provides links to 2 other programs, also managed by the MSET: the Mississippi Technology Extension Partnership and the Technology Commercial-ization Program. The latter focuses on commercializing NASA technologies.	4 Grads
Huntsville, AL Business Technology Developme nt Center, Inc.	1997	Partners include NASA, Alabama A&M Univ, AL Dept. of Economic & Community Affairs, Calhoun Comm. College, City of Huntsville, Drake State Technical College, TVA, U of Alabama in Huntsville. Other sponsors include the Huntsville Chamber of Commerce and the Small Business Development Center. Located in a 30,000 sq. ft. facility near MSFC, UAH, and Cummings Research Park.	Application process requires detailed pre-application questionnaire and business plan. Clients must be a proprietary business based on one or more techno-logy(ies) and be in early stage, prototype stage, or developmental stage. Incubator goal is a mix: 25% early stage, 40 % prototype stage, 35% developmental stage.	Services include office space, telephone, receptionist, clerical, postal, computer services, financial mgmt, peer-group interaction, mentoring with experienced business persons, resource access, and referrals to reduced-rate professional service providers.	0

APPENDIX D.

Florida's Economic Development Initiatives

Florida is one of the top recipients of federal R&D funding. According to a study by Teich and Carney (1997), Florida ranked seventh in the US in 1995 for receipt of federal R&D funding, most of which is from the Department of Defense and NASA in support of aerospace-related technology development at federal laboratories and industry facilities.

Three Florida universities are ranked in the top one hundred universities receiving federal R&D funding dollars. In 1995, the University of Florida ranked 44th, the University of Miami ranked 46th, and Florida State University ranked 92nd. While these universities received a significant portion of their funding from USDA, National Institutes of Health, and the National Science Foundation, the Department of Defense and NASA are also represented as funding sources. Thus, the degree and extent of technology R&D is significant in Florida and a resource that should be extremely fertile for commercial development through the formation of new businesses.

The need to tap into these technology resources is strong if Florida is to expand and strengthen its high technology economy and join the ranks of states with strong, vigorous economies based to a significant extent on advanced technology-based manufacturing and its associated high skill, high wage jobs.

However, even with the positive steps taken in Florida to date, it is necessary to understand that Florida has not been truly aggressive in exploiting its high technology potential. Given the overall population and solid R&D base, success should be measured against the performance of states such as California, Texas, New York, and Massachusetts. The emergence of Enterprise Florida, Inc., as the state's major economic development organization is the first viable thrust Florida has made to establish itself as a high technology leader. There are numerous opportunities that can be developed from this foundation.

Due to the substantial proliferation of successful incubators throughout the country, this vehicle is being given a chance to make a meaningful contribution. Two specific areas of economic growth that could include incubators are readily identified as follows:

- Existing large manufacturing firms need an expanded base of high quality high technology supplier firms locally from which to purchase needed components, sub-assemblies and services, and

- A strong base of entrepreneurs able to commercially develop technology and innovations resulting from federal R&D provides both a significant return on the federal R&D investment in Florida as well as a foundation for technology-based manufacturing growth that will attract further R&D investment from government and private sources.

The following sections outline both Florida's statewide activities and initiatives as well as profiles regional initiatives as a way of establishing the organizational and economic context for incubator development.

Statewide Organizations and Initiatives

Florida has a number of technology-based support organizations and networks that provide statewide access for entrepreneurs and small companies. These organizations have differing but complementary missions that can contribute to the success of business development initiatives. A brief summary of these statewide resources follows.

Enterprise Florida

Enterprise Florida, Inc. is a not-for-profit, government-private partnership designed to lead Florida's economic development. Headquartered in Orlando, Enterprise Florida, Inc. is governed by a Board of Directors chaired by the Governor who appoints individuals from the private and academic sector. Enterprise Florida, Inc. has assumed many of the responsibilities and programs of the Florida Department of Commerce in addition to creating additional capabilities focused on growing a viable high technology, high wage manufacturing sector. Enterprise Florida, Inc., manages four strategic business units:

- Technology Development–works to create high technology, high wage jobs, primarily in the manufacturing sector by helping Florida's small and medium-sized manufacturers and by encouraging entrepreneurship and the commercialization of new technologies;

- Capital Development–helps develop appropriate forms of capital to finance business growth;

- Workforce Development–charged by government to design the state's workforce development strategy utilizing one-stop career centers, school-to-work, welfare-to-work, and high skills/high wage jobs programs; and

- International Trade and Economic Development–conducts economic and trade development functions for the State of Florida and promotes the state as a global business center.

Within the Technology Development area, several significant programs are in place that directly affect any consideration of establishing technology-based business incubators in the state. These programs include the following:

Innovation and Commercialization Corporations (ICCs)–Enterprise Florida currently coordinates the activities of six independent not-for-profit ICCs in Florida. The ICCs provide an array of services to entrepreneurs, including incubator services. The ICCs' incubators function as incubators "without walls" and provide management, marketing, network, financial and business plan development services to qualified client firms. Each ICC responds to its economic and community environment in a different manner, so that ICCs vary in terms of types of clients and types of services offered. Table D-0 illustrates the major organizational, clients types, and services provided by the ICCs.

Manufacturing Extension Partnership(MEP)–The NIST-sponsored MEP program operated by Enterprise Florida consists of four Manufacturing Technology Centers (MTCs), each serving a region of the state: South Florida, Central Florida, the Sun Coast (Southwest Florida) and the Panhandle (Northwest Florida). MTCs provide technical assistance to existing firms through locally situated field agents in an effort to assist in modernization, product enhancements and overall operations strengthening. The MEP program thus provides Florida manufacturers with a simple, effective means to acquire needed technical problem-solving expertise.

Working with the Capital Development division of Enterprise Florida, Inc., these two programs are well equipped to draw on the seed and venture funds as well as other capital products to provide qualified entrepreneurs with access to local capital investment sources.

Southern Technology Applications Center (STAC)
STAC is a statewide technology transfer and management organization headquartered at the University of Florida and hosted by five other universities in the State University System of Florida. STAC works with numerous federal, state, local, service providers in addition to the industry and academic sectors to enhance "grow your own" technology-based businesses. Providing a range of technology transfer and management, information, and networking assistance to manufacturing and other technology-based business firms, STAC works to transfer and commercialize advanced technologies developed by NASA, other federal laboratories and universities.

STAC operates the NASA Regional Technology Transfer Center program for the Southeastern US. In this capacity, STAC and its affiliates in eight other southeastern states provide industry with local access to the technology resources and "know-how" available from NASA and other federal laboratories. In many cases this involves the identification of entrepreneurs with an interest in acquiring a NASA-developed technology for the purpose of commercially developing it. Consequently, providing these entrepreneurs with access to technology-based incubator facilities is a critical element in supporting NASA technology commercialization. Additionally, STAC and its RTTC affiliates work with NASA scientists and engineers in assessing the commercial feasibility of technologies, identifying potential private sector partners for commercial development, and providing follow-on assistance as needed in the interests of technology commercialization.

STAC also operates a University Center Program sponsored by the Economic Development Administration (EDA) which focuses on assisting in the transfer and commercialization of university-developed technology. Other programs and projects reflect STAC's interest in and experience with technology development and commercialization, including participation in the Gulf Coast Alliance for Technology Transfer (GCATT) and numerous funded technology-market assessment projects for federal laboratories and industry firms. Finally, STAC professional staff have served on Advisory Boards to several incubators over the past 20 years.

Technological R&D Authority

Technological R&D Authority (TRDA) was founded in 1987 by the Florida Legislature and works to promote education, space research and economic development. Funding comes from the Florida Department of Education, Challenger license-plate sales, and NASA-Kennedy Space Center. TRDA works closely with Kennedy Space Center to link Florida manufacturers and high technology firms with the expertise and resources available at KSC. Additionally, TRDA manages the Florida-NASA Business Incubation Center in Titusville, FL at the Brevard Community College campus. The organization and management of that incubator was described more fully in Table 4.1.

TRDA has worked over the past several years to stimulate high technology R&D in Florida and to develop productive partnerships between Enterprise Florida, NASA-Kennedy Space Center, STAC, and other organizations. TRDA has facilitated several partnership development activities, including the establishment of the NASA Minority Entrepreneurial Partnership Program in Florida, involving Edward Waters College, Bethune Cookman College, Florida International University and Florida Memorial College to help stimulate high technology businesses.

In other activities, TRDA committed significant funding to the Southeast Display Center to construct a $1.8 million clean-room facility in Palm Bay, a facility that is

likely to become a center for excellence in flat panel display technology leading to numerous commercial and military applications. The Southeast Display Center is a consortium composed of Brevard Community College, Brevard Teaching and Research Laboratories, Florida Education and Research Foundation, Florida Institute of Technology, Accudyne Corporation, the University of Florida, Florida Atlantic University, the University of South Florida, the Space Coast, the Space Coast Economic Development Council, and the City of Palm Bay.

Additionally, TRDA funded scientific programs targeting K-12 teachers and students that provided nearly 4,500 teacher in-service training hours and reached over 150,000 students in 42 of Florida's 67 counties.

Finally, TRDA has been actively involved in helping NASA-KSC commercialize NASA technologies by working to develop partnerships between KSC, Florida's universities, colleges and companies. These partnerships work to bring KSC technologies out of the lab and into the commercial marketplace.

State University System

The State University System (SUS) of Florida comprises ten universities, of which several have developed outstanding research capabilities in science and engineering. These include the University of Florida, Florida State University, the University of South Florida, the University of Central Florida, and Florida Atlantic University. Two SUS universities, the University of Florida (UF) and Florida State University (FSU) are in the top 100 universities nationally receiving federal R&D funds. UF ranks 44th and FSU ranks 92nd in federal R&D funding. The remaining universities are actively building science and engineering capabilities.

Six of the SUS universities are strong partners and supporters of technology-based incubators sponsored by Enterprise Florida, Inc. These include the following:

- University of Florida, which provides significant in-kind matching contributions to the North Florida Technology Enterprise Corporation (NFTIC);
- University of South Florida College of Business, which manages the Office for Corporate Development, a re-organized version of the former Enterprise Development Corporation of Tampa Bay;
- University of Central Florida which provides significant in-kind cost matching to the Central Florida Innovation Corporation (CFIC);
- Florida Atlantic University is a partner of the Enterprise Development Corporation

- University of North Florida participates on the Board of Directors for the Enterprise North Florida Corporation and leases office space to the ICC for a satellite office;

- Florida State University, which provides post-graduate student assistance teams in technical, administrative, marketing, information and finance areas for clients of the Florida North Shore Technology Center.

The involvement and support of the universities provides the Innovation and Commercialization Corporations sponsored incubators with access to a variety of technologies, facilities, and expertise of faculty and graduate students that can benefit client companies.

Community College System
Florida is fortunate to have a network of 28 community colleges that provide both technical/career development and college parallel course offerings that contribute to the quality of life in the local areas. Many have significant capability to support employee training and are major resources for the industrial communities in their areas.

In early 1997, all of the community colleges were invited to submit concept papers as indications of interest in possibly co-sponsoring an incubator in partnership with TRDA. The concept papers included each community college's ideas about suitable incubator types, level of commitment, proposed structure and operations, and a preliminary estimate of cost and cost sharing required.

Ten community colleges submitted concept papers to TRDA in April, 1997. These community colleges are:

- Chipola Community College
- Gulf Coast Community College
- Hillsborough Community College
- Indian River Community College
- Miami-Dade Community College
- Okaloosa-Walton Community college

- Pasco-Hernando Community College
- St. Petersburg Junior College
- Tallahassee Community College
- Valencia Community College

The community college system in Florida contributes substantially to training and workforce development, including providing management training opportunities for nontraditional students. Such students include business entrepreneurs who desire to acquire needed skills in management, marketing, business plan development and financial development as part of owning, starting, improving and growing their businesses. Consequently, the community colleges provide excellent opportunities for incubator tenants to capitalize on existing courses and training resources.

Many community colleges have facilities and space available for housing incubator centers "with walls." Brevard Community College, for example, converted the old cafeteria building at its Titusville campus for use as the Florida-NASA Business Incubator Center. Other facilities are planned or are already available at several community colleges.

Regional and Local Resources

In addition to the statewide coverage of the organizations just noted, regional activities and initiatives are underway to promote economic growth through incubator programs and small business assistance. Enterprise Florida ICCs, manufacturing technology centers, county economic development councils, the Small Business Development Centers, together with local and county government, community colleges, universities and private sector groups are forging ahead in developing leveraged networks to encourage economic growth.

Several regional areas have been defined in Florida as the result of a natural clustering of technology-based organizations and activities. These regions contain varying numbers of government, university and private sector groups that actively are working to promote economic growth by encouraging the development of small high technology business. Drawing on the significant technology resource base of industry, federal laboratories and universities, high technology business entrepreneurs have a wealth of opportunity for developing businesses that span an entire range of industries.

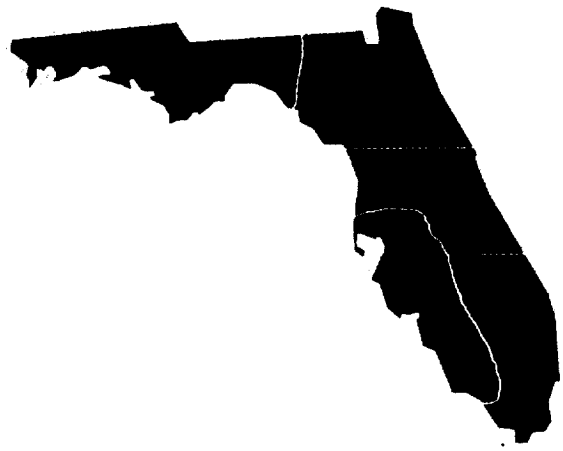
Figure D-0 shows the distribution of technology-industry foci across five regions in Florida. These regions reflect natural clusterings of business and industry as well as the distribution of several organizational resources, such as Enterprise Florida, Inc., Innovation and Commercialization Corporations, Small Business

Development Centers, Venture Forums, technology R&D and prototyping facilities, and technical expertise. The following sections describe each of the five regions more completely. In addition, a listing of available technology-business development resources is provided in table format.

Figure D-0. Florida'sTechnology-Based Industries

State of Florida

Engineering, accounting, research, management	12948
Business services	5746
Communications	3766
Industrial & commercial machinery & co	2568
Electronic, electrical equip & components, except co	1453
Chemicals & allied products	1289
Measuring/analyzing/control instruments; photo/medical/optics	1189
Rubber & misc plastic products	1077
Fabricated metal products, except machinery	956
Stone, clay, glass, & concrete products	519
Misc manufacturing industries	496
Transportation equip	427
Primary metal industries	45
Petroleum refining & related industries	28
	32,507



Southeast Florida

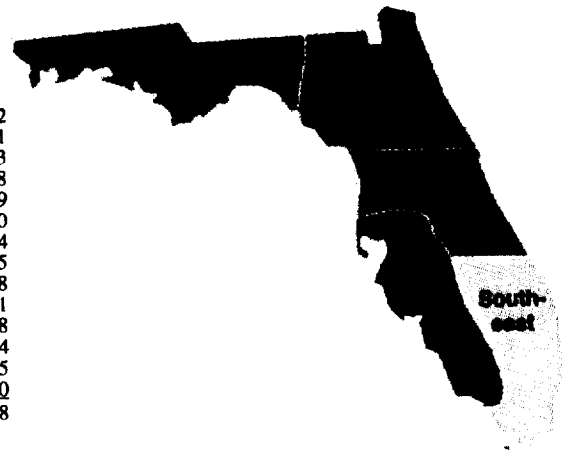
Southeast Florida, including the metropolitan areas of Miami, Ft. Lauderdale, Boca Raton, and West Palm Beach, represents a significant high technology resource base. Large firms, including Motorola, Pratt & Whitney, Sensormatics, Inc., and others anchor much of the high technology manufacturing in the area, while other firms, including Lucent, IBM, and Sun Microsystems provide a solid high technology business base.

Figure D-1 shows the distribution of business/technology areas in southeast Florida. As noted in the figure, the dominant technology-business areas are in R&D consulting areas, business services, communications, industrial and commercial machinery, electronic, electrical equipment and components, measuring/analyzing/control instruments, chemicals and allied products, and fabricated metal products. Several other SIC codes are represented in this technologically rich and dynamic region of the state. Southeast Florida technology-based industries, including R&D, high technology business, and high technology manufacturing totals almost 12,000 firms.

Figure D-1. Southeast Florida

Southeast Florida

Engineering, accounting, research, management	5062
Business services	2121
Communications	1363
Industrial & commercial machinery & co	858
Electronic, electrical equip & components, except co	519
Measuring/analyzing/control instruments; photo/medical/optics	450
Chemicals & allied products	364
Fabricated metal products, except machinery	355
Rubber & misc plastic products	298
Misc manufacturing industries	171
Stone, clay, glass, & concrete products	158
Transportation equip	144
Primary metal industries	15
Petroleum refining & related industries	10
	11888



Additionally, many of these firms have borne the brunt of defense industry downsizing during the past 4 years, resulting in a substantial number of extremely talented engineering professionals and others who may be good technology based business entrepreneurs. This pool of expertise, then, can be considered a significant resource, in that it is a pool of potential entrepreneurs.

Table D-1 on the following pages provides a listing of technology-based business development resources in the region. The listing reflects principal services provided and some descriptive information about industries served, types of company clients and funding sources. Every attempt has been made to ensure that the listing as complete as possible.

Major industry association support groups in include the American Electronic Association and the South Florida Manufacturers Association. In addition, Florida Venture Forum and Gold Coast Venture Capital Club both provide avenues for investment funding for small start-up companies. Incubator assistance for small firms is provided by the Enterprise Development Corporation–an Enterprise Florida, Inc., affiliated ICC–and the Palm Beach County Incubator, Inc., and Entrepreneurial Institute.

Additional support is provided by an array of assistance groups, including the South Florida Manufacturing Technology Center, which is part of the Enterprise Florida, Inc., MEP program, the Southern Technology Applications Center, the Small Business Development Center, and several other groups.

Another key organization in the area is the University of Miami, a private university with a substantial federally funded R&D base. In fact, the University of Miami ranks 46th nationally in the amount of federal R&D funding it receives, largely from the National Institutes of Health and the National Science Foundation. For a number of years, the Center for Health Technology provided

incubator services to numerous technology start-ups, mostly in the biomedical and biotechnology areas. Unfortunately, that incubator is no longer in existence, owing to difficulties in long-term funding stability.

Florida Atlantic University, Florida International University, Miami-Dade Community College, and Broward Community College, among other academic institutions, provide sources of technology and business assistance in a wide variety of areas. Strong linkages exist between these institutions and the entrepreneurial support organizations noted above.

Table D-1 - Southeast Florida Entrepreneurial Support Organizations

	Industries Served				*Clients Served*					*Funding Sources*			
Organizations	Manu-facturers	Retail	Service	Techno-logy	Existing business owners	Manu-facturing cos.	Mid-sized cos.	Potential business owners	Start-up cos.	From future earnings	Nominal fees	Some free services	State/ Federal grants
American Electronic Assoc.	X			X	X	X	X		X		X	X	
Assoc. for Corporate Growth	X	X	X	X	X	X	X					X	
Bus. & Econ. Dev. Revital. Corp.		X	X		X		X	X	X	X		X	
Enterprise Development Corp.	X		X	X	X	X	X	X	X	X	X		X
FL Atlantic Univ. Research Corp.	X	X	X	X	X	X	X	X	X		X		
Florida Atlantic R&D Authority	X	X	X	X	X	X	X	X	X				
Florida Venture Forum	X	X	X	X	X	X	X		X				
Gold Coast Venture Capital Club	X	X	X	X	X	X	X	X	X			X	
PBC Incubator, Inc. & Entrepreneurial Inst.	X	X	X	X	X	X		X	X		X	X	
Small Business Devel. Center	X	X	X	X	X	X	X	X	X		X	X	X
South Florida Manufacturers Assoc.	X			X	X	X	X						
S Florida Manufacturing Tech. Center	X			X	X	X	X			X	X	X	X
Southern Tech Applications Center	X		X	X	X	X	X	X	X		X	X	X

Table D-1 continued - Southeast Florida Entrepreneurial Support Organizations

Organizations	Assistance Provided															
	Business consulting	Company growth	Defense transition	Edu. & training	Access to funding source	Govt. contracting	Incubator facilities	Intl. trade	Manufacturing process	Patent searches	Product devel.	Quality systems devel.	Sales & marketing	Space & land	Tech transfer	HR & workforce devel.
American Electronic Assoc.	X			X	X			X	X			X	X			X
Assoc. for Corporate Growth	X	X			X											
Bus. & Econ. Dev. Revital. Corp.				X	X		X	X								X
Enterprise Development Corp.	X	X			X						X				X	
FL Atlantic Univ. Research Corp.															X	
Florida Atlantic R&D Authority							X							X		
Florida Venture Forum	X			X	X											
Gold Coast Venture Capital Club	X	X		X	X											
PBC Incubator, Inc. & Entrepreneurial Inst.	X	X		X		X		X					X			
Small Business Devel. Center	X	X	X	X	X	X		X					X			
S Florida Manufacturers Assoc.				X								X				X
S FL Manufacturing Tech. Ctr.	X	X	X	X				X	X		X	X	X			X
Southern Tech. Applications Ctr.	X		X		X	X			X	X	X		X		X	

Southwest Florida

Southwest Florida, including the greater Tampa Bay area, St. Petersburg, Sarasota, Fort Myers and Naples, is vigorously pursuing economic growth through technology business development. The region is characterized by a diverse technology/industry base as shown in Figure D-2. As in Southeast Florida, there are substantially more companies that provide engineering, accounting, research and management services (almost 3,100), followed by companies that provide general business services (1,474). Industrial and commercial machinery, communications, electronic, electrical equipment and components, measuring/analyzing/control instruments, photo/medical/optics, and chemicals and allied products are all significant components of the broad technology business and manufacturing base in the region.

Figure D-2. Southwest Florida Industry

Southwest Florida	
Engineering, accounting, research, management	3085
Business services	1474
Industrial & commercial machinery & co	777
Communications	69
Electronic, electrical equip & components, except co	359
Measuring/analyzing/control instruments; photo/medical/optics	355
Rubber & misc plastic products	274
Chemicals & allied products	268
Fabricated metal products, except machinery	248
Misc manufacturing industries	144
Stone, clay, glass, & concrete products	137
Transportation equip	92
Primary metal industries	16
Petroleum refining & related industries	4
	7928

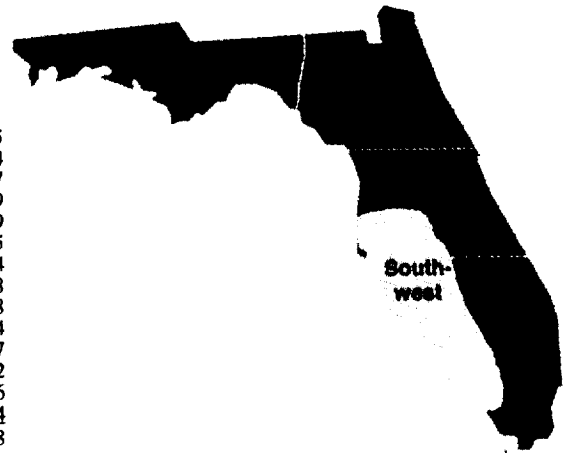


Table D-2 lists entrepreneurial support organizations in the region, compiled from several provide entrepreneurs and start-up businesses with needed assistance and services. Of particular interest to the present study is the fact that many of these service providers focus on sales and marketing activities, education and training, general business consulting and management assistance. Others provide access to funding sources, such as the Enterprise Florida, Inc., affiliated Office for Corporate Development and Suncoast Manufacturing Technology Center.

The Office for Corporate Development provides incubator services to a number of clients and is currently finalizing its relationship with Enterprise Florida, Inc., as an incubator "without walls." Table D-0 provided descriptive information about this incubator organization. Part of the University of South Florida's College of Business Administration, the Office for Corporate Development is teaming with numerous other university groups, including the Small Business Development Center, the Southern Technology Applications Center USF Office, the Manufacturing Training and Education Center, the Suncoast Manufacturing

Technology Center, the Suncoast Venture Forum, and St. Petersburg Junior College to develop synergistic ties that can benefit the development and growth of high technology manufacturing in the region.

Other service providers in the region include several economic development councils, Hillsborough Community College, planning councils, and private sector development groups, including several chambers of commerce, the Tampa Downtown Partnership and the Westshore Alliance.

Table D-2 - Southwest Florida Entrepreneurial Support Organizations

	Industries Served				Clients Served					Funding Sources			
Organizations	Manu-facturers	Retail	Service	Techno-logy	Existing business owners	Manu-facturing cos.	Mid-sized cos.	Potential business owners	Start-up cos.	From future earnings	Nominal fees	Some free services	State/ Federal grants
Bay Area Manufacturers Association	X		X	X	X	X	X		X		X		
Florida State Economic Services	X	X	X	X	X	X	X	X	X				X
Greater Pinellas Park Chamber of Commerce	X	X	X	X	X	X	X	X	X				X
Hillsborough County Commerce Dept.	X	X	X	X	X	X	X	X	X				X
Manufacturing, Training & Education Ctr.	X				X	X	X		X	X	X		
Office for Corporate Development	X	X	X	X	X	X	X		X	X	X		
Pinellas Community Reuse Org.	X			X	X	X							
Small Business Development Center	X	X	X	X	X	X	X	X	X		X	X	
South Tampa Chamber of Commerce	X	X	X	X	X	X	X	X	X				X
Southern Tech Applications Center	X		X	X	X	X	X	X	X	X	X	X	
St. Petersburg Area Chamber of Commerce	X	X	X	X	X	X	X	X	X				X
St. Petersburg/Clearwater Econ. Devel. Council	X	X	X	X	X	X	X	X	X				X
Suncoast Manufacturing Tech. Center	X		X			X			X		X	X	
Suncoast Venture Forum	X	X	X	X	X	X	X	X	X		X		
Tampa Bay Economic Devel. Corp.	X	X	X	X	X	X	X	X	X				X
Tampa Bay Regional Planning Council	X	X	X	X	X	X	X	X	X				X
Tampa Downtown Partnership	X	X	X	X	X	X	X	X					X
Tampa Port Authority	X	X			X	X	X	X	X		X		X
U of South Florida Technology Deployment Center	X			X	X	X	X		X	X			X
Westshore Alliance	X	X	X		X	X	X	X	X				X

Table D-2 continued - Southwest Florida Entrepreneurial Support Organizations

Organizations	Assistance Provided															
	Business consulting	Company growth	Defense transition	Edu. & training	Access to funding source	Govt. contracting	Incubator facilities	Intl. trade	Manufacturing process	Patent searches	Product devel.	Quality systems devel.	Sales & marketing	Space & land	Tech transfer	Management Assist
Bay Area Manufacturers Assoc.	X			X				X					X			
Florida State Economic Services				X												
Greater Pinellas Park Chamber of Commerce													X			
Hillsborough County Commerce Dept.													X			
Manufacturing, Training & Education Center	X	X		X	X				X		X				X	X
Office for Corp. Development	X	X			X								X		X	X
Pinellas Community Reuse Org.			X													
Small Business Devel. Center	X	X	X	X	X	X		X					X			X
South Tampa Chamber of Commerce													X			
Southern Tech Applications Ctr.	X		X		X	X			X	X	X		X		X	X
St. Petersburg Area Chamber of Commerce													X			
St. Petersburg/Clearwater Econ. Devel. Council		X	X	X	X		X	X	X					X		
Suncoast Manufacturing Tech. Center	X	X		X	X				X				X		X	X
Suncoast Venture Forum	X	X			X								X			X
Tampa Bay Econ. Devel. Corp.							X									X
Tampa Bay Reg. Planning Coun.														X		
Tampa Downtown Partnership				X										X		
Tampa Port Authority								X						X		
U of South Florida Technology Deployment Center			X		X				X		X				X	
Westshore Alliance	X			X									X	X		

Central Florida

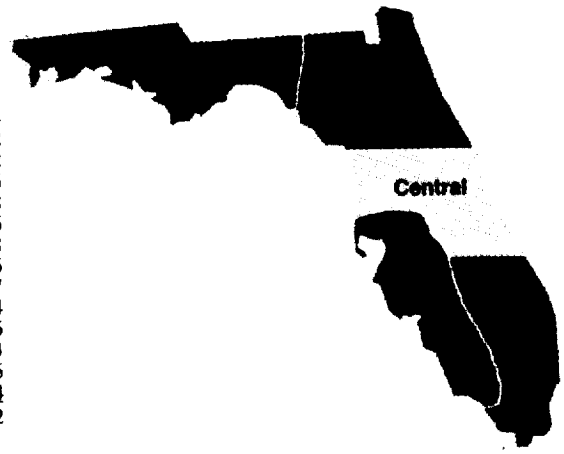
Centered around the Orlando-Titusville-Melbourne corridor, Central Florida is a very proactive business development region of the state. Home to the headquarters offices of Enterprise Florida, Inc., Technological R&D Authority, and the NASA-Kennedy Space Center, the region also comprises strong technology/industry areas in lasers and electro-optics and training and simulation.

Figure D-3 illustrates the diversity of technology areas represented by industry firms in the region. Again, the vast majority of firms in the region provide an array of engineering, accounting, research, management and business services, followed by firms in the communications industry, industrial and commercial machinery

Figure D-3. Central Florida

Central Florida

Engineering, accounting, research, management	2584
Business services	1132
Communications	922
Industrial & commercial machinery & co	506
Chemicals & allied products	488
Rubber & misc plastic products	406
Electronic, electrical equip & components, except co	378
Measuring/analyzing/control instruments; photo/medical/optics	216
Fabricated metal products, except machinery	177
Stone, clay, glass, & concrete products	174
Misc manufacturing industries	116
Transportation equip	103
Primary metal industries	6
Petroleum refining & related industries	4
	7212



companies, chemicals and allied products, rubber and miscellaneous plastic products, electronic, electrical equipment and components, and measuring/analyzing/control instruments, photo/medical/optics, and fabricated metal products. The diversity of these technology-based industries reflects the solid high technology business and manufacturing base that many groups in the region are assisting to expand.

Table D-3 on the following page lists key service provider organizations that are involved in entrepreneurial support activities. Of these, the Central Florida Innovation Corporation (CFIC) and Central Florida Manufacturing Technology Center (CFMTC) are affiliated with Enterprise Florida, Inc. CFIC operates the business incubator while the CFMTC provides technical assistance to manufacturers through a network of field agents.

Organizations with services that are directly associated with the needs of entrepreneurs and advanced technology start-ups include CFIC, the Small Business Development Center, the Southern Technology Applications Center, and TRDA which manages the Florida-NASA Business Incubation Center located on the campus of Brevard Community College in Titusville. Additionally, other organizations, including the University of Central Florida, Valencia Community College, and Indian River Community College provide an array of information and assistance to small manufacturing firms and start-ups as appropriate.

This region's high technology manufacturing and business sectors are partial reflections of the driving force of NASA-Kennedy Space Center and other defense-related activities. Serious downsizing has affected the regional economy, and a number of efforts in the past few years focused on helping defense-dependent manufacturing firms to convert to commercial markets. Enterprise Florida, Inc., the Southern Technology Applications Center, and many other groups have worked to help firms diversify into non-military markets by providing opportunities for product re-design, production prototyping, and market analyses. These efforts helped many firms to make the transition, and today the high technology business and manufacturing base reflects a strong diversity.

Table D-3 - Central Florida Entrepreneurial Support Organizations

Served	Industries				Clients Served					Funding Sources			
Organizations	Manu-facturers	Retail	Service	Techno-logy	Existing business owners	Manu-facturing cos.	Mid-sized cos.	Potential business owners	Start-up cos.	From future earnings	Nominal fees	Some free services	State/ Federal grants
Brevard County Econ. Devel. Commission.	X	X	X	X	X	X	X						
Central Florida Innovation Corporation	X		X	X	X			X	X	X	X	X	X
Central FL Manufacturing Tech. Ctr.	X			X	X	X	X		X		X	X	
Enterprise Florida	X	X	X	X	X	X	X	X	X		X	X	X
Florida Electro-Optics Industry Assoc.	X			X	X	X	X				X		
Florida Optics & Laser Association	X		X	X	X	X	X						
Greater Orlando Chamber of Commerce	X	X	X	X	X	X	X	X	X		X	X	
Institute for Simulation & Training	X		X	X	X	X	X	X					X
Natl. Minority Supplier Devel. Council of Florida, Inc.	X					X	X						
Small Business Devel. Center	X	X	X	X	X	X	X	X	X		X	X	
Southern Tech Applications Center	X	X	X	X	X	X	X	X	X	X	X	X	
Training & Simulation Tech. Consortium	X		X	X	X	X	X		X		X	X	X
University of Central Florida Technology Assistance Program	X			X	X	X	X	X					X

Table D-3 continued - Central Florida Entrepreneurial Support Organizations

Organizations	Assistance Provided															
	Business consulting	Company growth	Defense transition	Edu. & training	Access to funding source	Govt. contracting	Incubator facilities	Intl. trade	Manufacturing process	Patent searches	Product devel.	Quality systems devel.	Sales & marketing	Space & land	Tech transfer	Management assist.
Brevard County Econ. Devel. Commission.	X	X	X	X	X			X					X			
Central Florida Innovation Corp.	X	X		X	X					X	X		X		X	
Central FL Manufacturing Tech. Ctr.	X	X	X	X	X			X	X		X	X	X			X
Enterprise Florida																
FL Electro-Optics Indus. Assoc.				X				X					X			
Florida Optics & Laser Assoc.																
Greater Orlando Chamber of Commerce				X												
Inst. for Simulation & Training				X											X	
Natl. Minority Supplier Devel. Council of FL, Inc.			X	X		X										
Small Business Devel. Center	X	X	X	X	X	X		X	X	X			X			
Southern Tech. Applications Ctr.	X		X		X	X			X	X	X		X		X	
Technology Innovation Center																
Training & Simulation Tech. Consortium			X			X									X	
University of Central Florida Technology Assistance Program	X			X												

North Florida

North Florida includes the cities of Jacksonville, Gainesville, Ocala, Daytona Beach, and Lake City. Of all of the regions in the state, it is perhaps the most rural. Jacksonville, the largest urban area, is home to the University of North Florida and Florida Community College at Jacksonville. Gainesville is home to the University of Florida, while Daytona Beach is the location for Stetson University, Embry-Riddle Aeronautical University, and the Florida Institute of Technology. Manufacturing activities are most concentrated in the Jacksonville and Ocala areas, with some light manufacturing and high technology R&D found in Gainesville, Lake City and elsewhere. The region is unique in that there are no substantial "pockets" of concentrated technology-based business and manufacturing companies, such as that in the Orlando-Titusville-Melbourne area, the Tampa-St. Petersburg area, or the West Palm Beach-Ft. Lauderdale-Miami area. Despite this, the University of Florida is a major technology resource for the state, particularly in the areas of biotechnology, engineering, and the health sciences.

Figure D-4 illustrates that, like the other regions in the state, engineering, accounting, research, management, and business services dominate the industry technology areas in North Florida. Communications, industrial and commercial machinery, chemicals and allied products, electronic, electrical equipment and components, and fabricated metal products are primary industry technology areas.

Figure D-4. North Florida

North Florida	
Engineering, accounting, research, management	1389
Business services	599
Communications	431
Industrial & commercial machinery & co	294
Chemicals & allied products	148
Electronic, electrical equip & components, except co	127
Fabricated metal products, except machinery	125
Measuring/analyzing/control instruments; photo/medical/optics	115
Rubber & misc plastic products	81
Transportation equip	62
Misc manufacturing industries	50
Stone, clay, glass, & concrete products	35
Primary metal industries	4
Petroleum refining & related industries	3
	3463

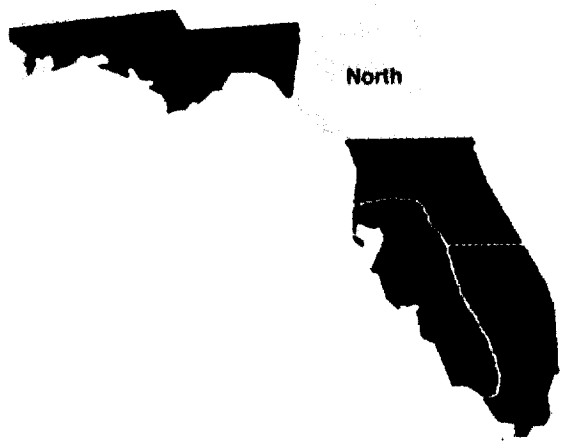


Table D-4 lists active entrepreneurial support organizations. Three business incubators, two sponsored by Enterprise Florida, Inc., are found in the region. These are the Enterprise North Florida Corporation in Jacksonville and the North Florida Technology Innovation Center in Gainesville. Both operate as incubators

"without walls" and provide various services to client firms. The third incubator, the Sid Martin Biotechnology Development Institute, is managed by the University of Florida as an incubator "with walls." Currently the Biotechnology Institute hosts 13 start-up firms in the biotechnology area, with one company close to graduation in the coming year.

Additionally the North Florida Venture Capital Forum comprises investors who receive presentations from incubator client firms (and others) for investment consideration. Other support organizations include the University of Florida, the University of North Florida, the Gainesville Area Innovation Network, Small Business Development Centers, and several chambers of commerce. The Southern Technology Applications Center is headquartered at the University of Florida.

Table D-4 - North Florida Entrepreneurial Support Organizations

	Industries Served				Clients Served					Funding Sources			
Organizations	Manu-facturers	Retail	Service	Techno-logy	Existing business owners	Manu-facturing cos.	Mid-sized cos.	Potential business owners	Start-up cos.	From future earnings	Nominal fees	Some free services	State/ Federal grants
Enterprise North Florida Corp.	X			X	X	X		X	X	X	X		X
First Coast Manufacturers Association	X			X	X	X	X		X		X		
Florida Community College Urban Resource Center	X	X	X	X	X	X	X				X		
Gainesville Area Innovation Network	X	X	X	X	X	X	X	X	X		X		
Jacksonville Chamber of Commerce	X	X	X	X	X	X	X	X	X		X	X	
Jacksonville Econ. Devel. Commission	X	X	X	X	X	X	X						
North Florida Tech. Innovation Corp.	X			X	X	X			X	X	X	X	X
North Florida Venture Capital Forum	X	X	X	X	X	X	X		X		X		
Sid Martin Biotechnology Institute	X			X	X				X	X	X		X
Small Business Devel. Center	X	X	X	X	X	X	X	X	X		X	X	
Southern Tech Applications Center	X		X	X	X	X	X	X	X	X	X	X	X

Table D-4 continued - North Florida Entrepreneurial Support Organizations

Organizations	Assistance Provided															
	Business consulting	Company growth	Defense transition	Edu. & training	Access to funding source	Govt. contracting	Incubator facilities	Intl. trade	Manufacturing process	Patent searches	Product devel.	Quality systems devel.	Sales & marketing	Space & land	Tech transfer	Management assist.
Enterprise North Florida Corp.	X	X		X	X				X		X		X		X	
First Coast Manufacturers Assoc.		X							X							
FL Community College Urban Resource Center		X		X												X
Gainesville Area Innovation Network				X	X											
Jacksonville Chamber of Commerce	X	X		X		X		X						X		
Jacksonville Econ. Devel. Commission	X	X			X			X								
North FL Tech. Innovation Corp	X	X		X	X		X		X		X		X		X	X
North Florida Venture Capital Forum		X			X											
Sid Martin Biotechnology Inst.	X	X		X	X		X		X		X		X		X	X
Small Business Devel. Center	X	X	X	X	X	X		X		X			X			
Southern Tech. Applications Ctr.	X		X		X	X			X	X	X		X		X	

Northwest Florida

The Florida panhandle is provides many opportunities for technology-based entrepreneurs, especially through accessing the extensive technology resources of the numerous federal laboratories and universities in the region. A significant development in the past several years in northwest Florida was the establishment of the Gulf Coast Alliance for Technology Transfer (GCATT), a consortium of nine federal laboratories, two SUS universities, and one community college to promote technology business development in the area. GCATT works to facilitate technology transfer and to augment the technology transfer offices of the federal laboratories. Additionally, GCATT is linked with economic development councils in order to capitalize on regional economic development aspects of technology transfer.

Figure D-5 shows that the majority of firms represent engineering, accounting, research, management and business services. However, there is also a strong industry technology base in electronic, electrical equipment and components in addition to industrial and commercial machinery. Less well represented are the industry technology areas of measuring/analyzing/control instruments, photo/medical/optics, fabricated metal products, and chemicals and allied products.

Figure D-5. Northwest Florida

Northwest Florida

Engineering, accounting, research, management	828
Business services	420
Communications	355
Industrial & commercial machinery & co	133
Electronic, electrical equip & components, except co	70
Measuring/analyzing/control instruments; photo/medical/optics	53
Fabricated metal products, except machinery	51
Transportation equip	26
Chemicals & allied products	21
Rubber & misc plastic products	18
Misc manufacturing industries	15
Stone, clay, glass, & concrete products	15
Petroleum refining & related industries	7
Primary metal industries	4
	2016

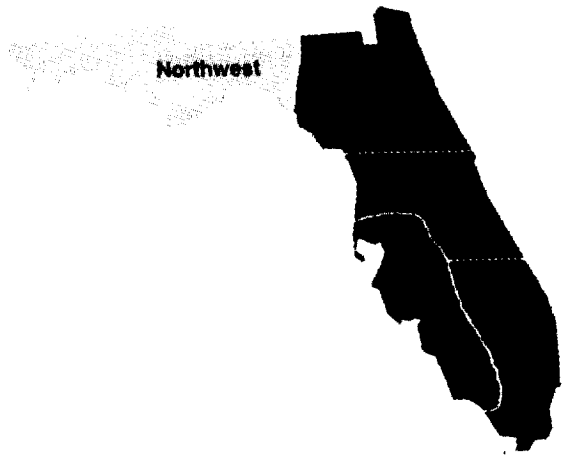


Table D-5 lists entrepreneurial support resources and organizations in the region. Perhaps most significant of these, in addition to GCATT, are the High Magnetic Field Laboratory operated by Florida State University, the Florida North Shore Technology Center which serves as an Enterprise Florida, Inc. incubator "without walls," and the Manufacturing Technology Center located at Okaloosa-Walton Community College.

Additional resource organizations include the University of West Florida, several chambers of commerce, Tallahassee Community College, Chipola Community College, and others.

Table D-5 - Northwest Florida Entrepreneurial Support Organizations

Organizations Served	Industries				Clients Served					Funding Sources			
	Manu-facturers	Retail	Service	Techno-logy	Existing business owners	Manu-facturing cos.	Mid-sized cos.	Potential business owners	Start-up cos.	From future earnings	Nominal fees	Some free services	State/ Federal grants
Air Force Armstrong Labs - Environics Directorate	X			X	X	X	X			X	X		
Air Force Development Test Center	X			X		X	X			X			
Air Force Wright Labs Air Base Technology Branch						X				X	X		
Air Force Wright Labs Armament Directorate						X				X	X		
Florida North Shore Technology Center	X		X	X		X		X	X	X	X	X	X
Gulf Coast Alliance for T2 (GCATT)	X		X	X	X	X	X		X	X	X		X
High Magnetic Field Lab - FSU	X			X		X	X			X	X		X
Navy Aeromedical Research Lab						X				X	X		
Navy Coastal Systems Station						X				X	X		
North Florida Econ. Devel. Coalition	X	X	X	X	X	X	X	X	X				
North Florida Manufacturing Tech. Ctr.	X			X	X	X	X				X		X
Small Business Development Center	X	X	X	X				X	X			X	

Table D-5 continued - Northwest Florida Entrepreneurial Support Organizations

Organizations	Assistance Provided															
	Business consulting	Company growth	Defense transition	Edu. & training	Access to funding source	Govt. contracting	Incubator facilities	Intl. trade	Manufacturing process	Patent searches	Product devel.	Quality systems devel.	Sales & marketing	Space & land	Tech transfer	Management assist.
Air Force Armstrong Labs - Environics Directorate			X			X					X				X	
Air Force Devel. Test Center			X			X					X				X	
Air Force Wright Labs Air Base Technology Branch			X			X					X				X	
Air Force Wright Labs Armament Directorate			X			X					X				X	
FL North Shore Tech. Center	X	X		X	X		X									X
Gulf Coast Alliance for T2 (GCATT)						X			X	X	X	X			X	
High Magnetic Field Lab - FSU						X			X		X				X	
Navy Aeromedical Research Lab			X			X					X				X	
Navy Coastal Systems Station			X			X					X				X	
N Florida Econ. Devel. Coalition				X									X	X		
N FL Manufacturing Tech. Ctr.	X			X					X							X
Small Bus. Development Center	X	X			X						X					X

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