

## **Aerospace Technical Education** **A Vision of Future Partnerships for Educational Transformation**

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### Abstract

The recent emphasis on education and infrastructure development for aerospace activities by a number of states (e.g., Florida, Texas, Alabama), the National Aeronautics and Space Administration (NASA), and the Department of Defense (DOD) has resulted in initiatives in workforce training, curriculum development, educational technology, and the space related research initiatives by post-secondary institutions. The aerospace industry has responded with strong support and endorsement by advisory groups such as the Aerospace Technology Advisory Committee (ATAC) in Florida, and programs of study are now being offered to students who meet the basic requirements of prospective aerospace employees.

The Community Colleges for Innovative Technology Transfer (CCITT) – a 15 college consortium located adjacent to all the NASA Centers and several DOD facilities – has embarked upon the development of a national skills standards program that will educate the workforce of the future and use the lure of space-related activities to infuse new levels of interest in academic programs of all kinds.

The purpose of this paper is to describe existing and future programmatic needs for educational activities and the approaches being developed to utilize partnerships with business and industry, NASA and DOD facilities, educational institutions, and government organizations such as state spaceport authorities for aerospace program activities that will link K-12, community college, and university systems to sustain a qualified and technically competent workforce.

### The Case for Partnerships

Since at least the early 1980's, perhaps in conjunction with the management movements of Total Quality Management and Continuous Quality Improvement, partnerships have increasingly occupied strategic planning activities and deployment strategies of major organizations. Education has been a part of the partnering phenomenon from its earliest beginnings, with some of the most dramatic examples involving the donation of equipment, software, and the favorable pricing of systems by Apple Computer, Inc.

Business and education have been partners for a very long time. Educators rely on businesses for contributions to classroom technology, executives on loan, aides and internships, endowments, and a host of other important inputs that raise the capability levels of local schools, colleges, and universities well beyond what could be achieved independently by those institutions. At the same time, educational institutions teach the children and workers of successful leaders in industry, and every economic development

organization in this country will attest to the importance of quality education as a major factor in retaining local business talent and attracting new industry into any community.

Among educational partnerships, those practiced by community colleges are among the most creative for workforce development. Unlike most university programs that are targeted primarily toward research, community college programs are aimed at teaching skills and competencies required by business and industry to build the workforce of the future. State economic development agencies have seized upon this unique characteristic of community colleges to turn their entrepreneurial leadership into major educational programs specifically for this purpose.

Three citations will serve to illustrate the importance, nature, and growth of the trend toward deepening and broadening partnerships for education in this country.

- In 1996 the U.S. Department of Education published a document entitled: “*A Guide to Promising Practices in Educational Partnerships April 1996*”,<sup>1</sup> which indicates that:

“Over the last several years, educational partnerships have proliferated across the country. Some have developed in response to legislation. Others have become vehicles for fundamental educational reform. Still others have delivered services to students and faculty to improve education or student outcomes, whether or not schools are attempting systemic changes. Partners undertaking joint endeavors with schools also vary greatly. Partnership relationships are built among schools and social service agencies, cultural institutions, businesses, industries, and institutions of higher education...”

“An examination of case studies reveals the problems and successes typical of educational partnerships. From the studies we learn that:

1. Outside funding stimulates action;
2. Each participating organization is challenged to change policies and procedures to accommodate a new way of working with others;
3. Partnership approaches require adaptation to fit each community, school district, and school;
4. Organizational mavericks may be a source of creative and meaningful programs, but they need support to strengthen and improve the program;
5. A shared vision and deep commitment among partners can overcome weaknesses in program design and implementation;
6. Even with confusion about how the partnership structure relates to the program, the partnership itself can be institutionalized;
7. Leadership is critical in a complex partnership;
8. Leaders who reflect commitment to particular programs and processes may be more successful than leaders who see themselves as facilitators;
9. Identifying and solving problems, using adaptive planning, contributes to success;
10. Skilled and committed staff empowered to carry out partnership plans are an important element in project success;

11. A complex partnership can be strengthened by breaking it down into components;
12. University students are a valuable resource for classroom teachers, even if the students are not pre-service teachers;
13. Highly stressed large urban school districts pose extreme challenges to university-based partnerships;
14. When partnerships do not receive feedback regularly, their importance may dwindle;
15. Educational partnerships can be used to leverage additional funding for activities deemed important by the community; and
16. Educational partnerships can be used to garner support for school reform in a community.

“Many of the practices described in these pages are relevant to a variety of partnership types. The preponderance of school-to-work transition activities included as promising practices indicates both the popularity of partnerships aimed at smoothing such transitions and that practices focused on the transition were among the most likely to succeed within three years of implementation. Partnerships can include efforts to change roles and types of knowledge required of participants, but implementation is slower and requires greater resources to help those undertaking tasks fundamentally different from the familiar. Timelines and expectations in many of the more ambitious reform projects were outside the timeline of this study. However, over the long run, partnerships that aim to change various parts of a system simultaneously can contribute to sustained education reform.”

- The “Building Bridges” Project hosted by the 21<sup>st</sup> Century Education Foundation describes partnering in their web pages found at <http://www.buildbridges.net/>,<sup>2</sup> that begins with this quotation:

*"If our schools succeed in producing graduates who can think and learn effectively in tomorrow's world, businesses will be among the first to benefit."*  
 Maryland Business Roundtable

“Though there are a great deal of community organizations and businesses willing to help teachers and students, many educators are not aware of exactly who is interested and how they wish to become involved with the educational process. And school staff is so pressed for time these days, that it is hard to find enough hours in the day to investigate, contact, and plan partnership activities with the business community. The Building Bridges Project seeks to alleviate the time consuming tasks of planning activities with businesses. And it provides helpful information and resources for insuring your partnership activity is a success...”

“Teachers are better prepared than ever before to teach, and educational technology has never been more sophisticated; but the rising expectations for educational services that prepare students to successfully cope in a highly complex society far exceed the human capacity for delivery, given one teacher per classroom. Consequently, the human and material resources that volunteers and partners are providing to enhance the learning opportunities of youth in America

are becoming increasingly vital to the well-being of the nation. Here are models of successful ways business and community leaders can get involved.”

Housed on this site are examples of partnerships and opportunities for linking business and education in new and creative ways designed to strengthen all the participants.

- Finally, the Converge Magazine web site for business and education partnerships offers a view from the other side of the table. Examples with “hot links” on the site with a primary focus on business include: “Some Notable National Business & Education Partnership Programs” from the February 1999 article: “Making Business Partnerships Work for You” as follows:<sup>3</sup>

“American Express Academies of Travel and Tourism Program,

<http://www.americanexpress.com/corp/philanthropy/att.shtml>

CISCO Networking Academies Program,

<http://www.cisco.com/edu/academies/index.html>

General Motors Education Programs,

<http://www.ict.org/>

For more information, Contact: EdVenture Partners, 510.653.8585, Institute of Computer Technology.”

### Hosting the Future

A nation’s success in any economic sector is directly related to the strength of its educational system, and the aerospace industry is no exception. To address the need for skilled technicians and to spur student interest and motivation to study, **Community Colleges for Innovative Technology Transfer (CCITT)** has prepared a proposal to establish **SpaceTEC**, a national aerospace science Technical Education Center of Excellence under the National Science Foundation’s Advanced Technical Education (ATE) Program.

There is wide interest in space activities, especially among young people, and the appeal of space can be used to stimulate interest in many subject areas. The *vision* of SpaceTEC is to be the focal point for technical education resources featuring aerospace, providing motivation for academic studies and professional development services for faculty, students, and aerospace employees. The *mission* of SpaceTEC is to create and implement an industry-driven, government-endorsed, technical education process for aerospace technicians that can be shared with other educational venues. The *goals* of SpaceTEC are to foster interest in science, mathematics, and technology education in the U.S., and to provide education for the technical workforce using a national alliance of representatives from business and industry, government, and academic institutions. The *strategy* is to formalize aerospace technician education nationally, establish a skills-based standards program that has industry-wide support, and infuse aerospace themes into other areas of study. *Methods* include regional and national advisory committees, national articulation among K-12 and post-secondary institutions, a national professional development organization, a formal certification process, innovative faculty development, resources for national dissemination, and coordinated curriculum development. Instructional materials with aerospace themes will be shared with non-aerospace disciplines such as English, Humanities, and the Fine Arts.

The **nine CCITT member colleges participating** in this initiative are affiliated with NASA centers or Department of Defense locations, and together they enroll over 400,000 students annually. United Space Alliance is an industry partner providing a Co-PI. CCITT colleges will lead one or more of the elements of the national program, and Brevard Community College will serve as the fiscal agent and Center manager. Figure 1 depicts a map of relationships found on the SpaceTEC web page at [www.spacetec.org](http://www.spacetec.org).<sup>4</sup>

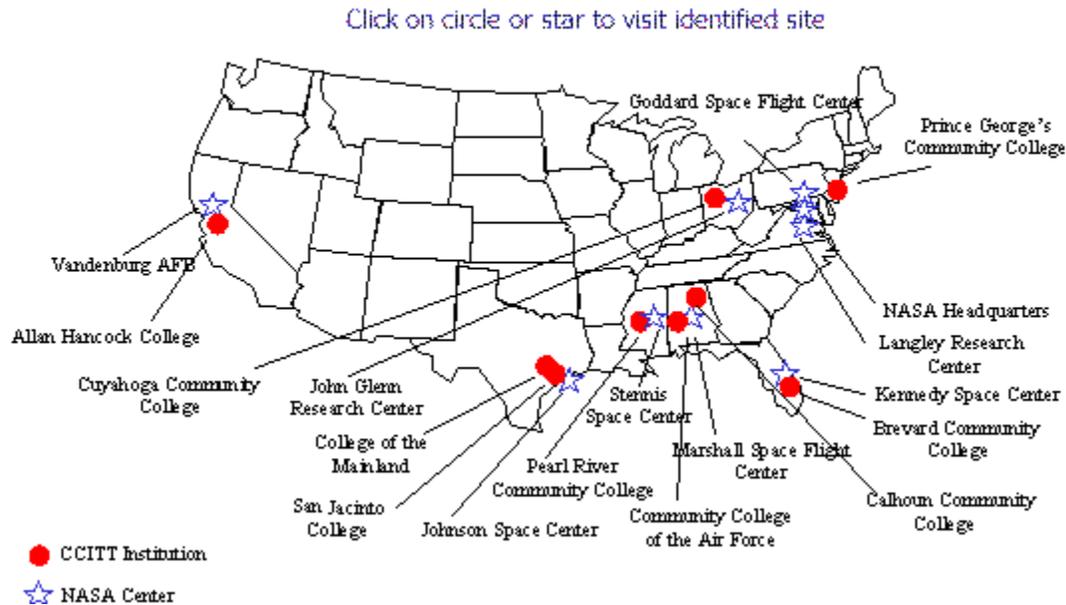


Figure 1. SpaceTEC Partnerships and Linkages

There are many benefits: Program **graduates** will receive nationally recognized competencies for employability. Participating **academic institutions** will receive funding for their roles, access to relevant curriculum, program articulation, faculty development, and recognition for industry-endorsed programs that satisfy critical workforce needs. **Business and industry** will be provided with a dependable source of well-educated entry-level technicians and a means of sustaining workforce development. **Government** will be provided an improved educational capability and qualified technicians for a key economic sector. **Educators** will have new space-related curricular themes to enrich their courses in many disciplines. **SpaceTEC** will serve as a national resource to strengthen our country's technical education base and motivate interest in academics.

The development of partnerships that significantly strengthen education options can be found at each of the CCITT colleges. At San Jacinto College's Aerospace Academy, for example, there are major alliances with aerospace organizations that include the Johnson Space Center and about 40 other groups. The same is true for Calhoun Community College and Brevard Community College. Table 1 illustrates relationships that have evolved to underpin the complex and rapidly changing aerospace world in which education plays a key role for both new and incumbent employees.

**Table 1. Aerospace Workforce & Major Partnering Organizations**

CCITT Institution	Aerospace Workforce	Partnering Organizations
Allan Hancock	10,667	<b>State and Federal Partners:</b> Vandenberg AFB, Cape Canaveral Air Force Station, Glenn Research Center, Johnson Space Center, Marshall Space Flight Center, Kennedy Space Center, Stennis Space Center, Spaceport Florida, Ohio Aerospace Institute, Florida Space Research Institute, California Space Agency.
Brevard	20,000	
Calhoun	16,000	
San Jacinto/Mainland	14,176	
Cuyahoga	11,000	
Pearl River	4,025	<b>Aerospace Industry Partners:</b> United Space Alliance, Boeing, Lockheed Martin, Johnson Controls, Harris Corp., Computer Sciences, Raytheon, SAIC, Wyle Laboratories, Sverdrup, Space Gateway Support, Indyne, Dynamac,
Prince George's	20,000	
Community College of the Air Force	*170,212 *(Counts Air Force enlisted personnel working in aerospace specialties)	
		Bionetics, Allied Signal Research, American Precision Products, Amtec Corporation, Coating Technology Applications, Campbell Engineering, Dynetics, Industrial Fabrication Company, Raytheon Systems, Summa Technology, TRW, ArgoTech, Parker Hannifin, BF Goodrich, Swagelok Company, Alcoa, PCC Airfoils, Polycraft Products, Astro Model, SIFCO Industries, ANALEX Corporation, Rockwell Aero., Bendix, Northrup Grumman, Waggoner Engineering, Earth Watch, Space Imaging, Johnson Engineering, Oceaneering Space Systems, Hernandez Engineering, Spacehab, Barrios Technologies, Cimarron Software Services, GB Tech, Inc., GHG Corp., Hamilton Sunstrand, Hernandez Engineering, Krug Life Sciences, MRI Computer Services, Pamco, MD Space Robotics, Muniz Engineering, Rothe Joint Venture, Enterprise Advisory Services, Washington Group, Inc.

**An Illustrative Example**

Brevard Community College's aerospace programs were founded in a strong partnership environment that grew out of a major meeting of local, state, and federal government, industrial, and educational groups in January of 2000 to examine the future of space activities in Florida. Called the Space Summit, this unprecedented one-day meeting brought together key leaders from stakeholder organizations that formed the basis for three major initiatives over the next 18 months. First, a joint planning group proposed funding from NASA and the State of Florida for a new life sciences laboratory facility on property at the Kennedy Space Center (KSC) to serve the International Space Station Program. Called the Space Experiment Research Processing Laboratory (SERPL, pronounced "sur'-pull"), this facility includes a state-of-the-art laboratory for life sciences work. It also caused the reshaping of KSC roadways and security gates to provide access for university researchers and space-related businesses for access to develop a new "commerce park" that would become the "ground floor" to the International Space Station for processing payloads and conducting sophisticated ground-based experiments. Florida funded more than 30 million dollars for this development in 2000 and 2001.

The second result was the formation of a new business/university group charged with creating strategic alliances and new opportunities for Florida colleges and universities to access a greater share of federal research funding for space-related work. Called the Florida Space Research Institute (FSRI), this unique organization was established as a private-public corporation with a former NASA astronaut/researcher serving as Executive Director. FSRI administers grants and is pursuing a major initiative in educational technology called the Advanced Learning Environment (ALE) that will utilize web-based information access, virtual reality, artificial intelligence, and simulation technology to revolutionize the ways in which subjects are taught and learned.

Last but not least, the third initiative came directly from the community college system in the form of a new aerospace technical training curriculum led by Brevard Community College and developed through a powerful partnership of industry, government, and academic institutions called the Aerospace Technology Advisory Committee (ATAC). What began as an initiative for local aerospace groups quickly became a statewide and then a national effort. It can be characterized by three major initiatives that engage organizations at the local, state, and national levels, with key linkages and joint activities for each as follows:

1. The “Aerospace Encounter” Seminar. This two-day course is offered in both credit and non-credit venues. Initially envisioned as a promotional tool to recruit secondary school students, this overview of the aerospace industry -- its history and operation -- has received high marks for interest and applicability to existing and future employees working in aerospace at Kennedy Space Center (KSC) and other sites, nationally and internationally. In discussions with local organizations, there are potential markets for tourists (including a potential “virtual reality” tour of KSC); international groups seeking to understand “how to do business” in the aerospace sector; upgrade training for upwardly mobile fast-track employees; familiarization training for “outside groups” such as educational institutions (faculty), economic development organizations, and government workers needing insight into the operations and structure of the industry; and annual refresher training in safety and security for a broad range of existing employees, to name a few. The organizational interfaces for this activity presently include:

- **Delaware North Park Services (DNPS)** -- the operations contractor for the KSC Visitor Complex. Linkages include rental of space for conferences and seminars at the Debus Conference Center, contract operations for tour busses with and without guides for KSC tours; catering for receptions and meetings; and training contracts for new DNPS employees including potential screening operations. This interface has potential for both income and expense (customer and provider) relationships. Contracts are active for tour buses and access to DNPS facilities, and talks are underway for DNPS access to Brevard’s aerospace laboratories during summer sessions when they are not fully utilized by the college. Web site: <http://www.kennedyspacecenter.com/>.
- **Florida Space Research Institute (FSRI)** -- a state-chartered group with Department of Education and Workforce Development funding for university research and workforce training. Linkages include sharing of curriculum development activities; transformation of traditional training materials to high-tech virtual reality and simulation/artificial intelligence modules; and joint-

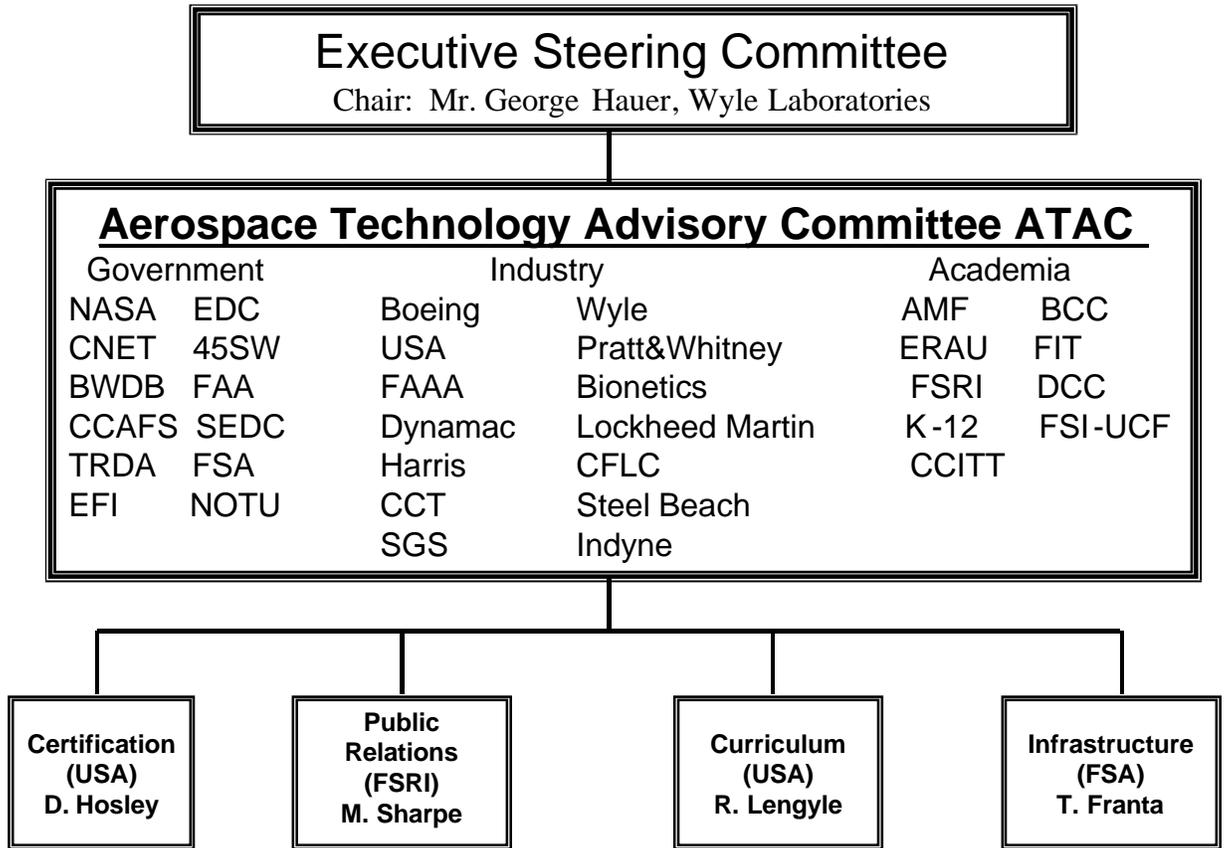
venture actions that combine assets of BCC and FSRI to accomplish goals of each in aerospace technology training systems. This interface has provided scholarship funding by grant from FSRI and has the potential for direct payment for specific training activities. Work is underway for the shared development of the “Aerospace Encounter” seminar for the conversion of a physical tour to a virtual tour, expanding significantly the marketability of that offering. Joint ventures are governed by a Memorandum of Understanding covering intellectual property rights, revenue sharing, and other specifics of this relationship. Web site: <http://integration.certification.net/fsri/main.htm>.

- **Bethune-Cookman College (B-CC)** -- a historically black university in Daytona Beach, Florida, operating K-12 teacher resource activities and public educational outreach for NASA. A potential exists for partnering with Bethune-Cookman (B-CC) to utilize their NASA public relations link for tours and education-related materials for faculty development useful in the two-day seminar. There is the potential for cost-sharing by BCC for use of B-CC’s personnel to provide the tour guides when scale-up occurs. Web site: <http://www.cookman.edu/>.
- **Cape Canaveral Air Force Station (CCAFS)** -- where the majority of east coast launch activities take place. BCC has developed a strong link to the CCAFS for access to facilities such as historic Launch Complex 14 (John Glenn Mercury Project Launch), visits to the Air Force Museum at Complexes 26 and 56, and volunteer tour guides. Access is provided by the Air Force. Web site: <http://www.robsv.com/cape/map.html>.
- **The Astronauts Memorial Foundation (AMF)** -- where BCC currently leases 1000 sq. ft. of offices, 500 sq. ft. of classroom space, and 4000 sq. ft. of laboratory space. Our presence at AMF provides access to other tenants in the facility who are potential partners, including for example: Florida Space Research Institute; Florida Space Institute – an arm of University of Central Florida’s College of Engineering; NASA’s K-12 operations for educator training materials; and technology training for teachers by the AMF staff. Our presence at this site also provides no-cost access to Delaware North and the NASA Visitor Complex adjacent to our building location. Web site: <http://www.amfcse.org/>.
- **Steel Beach Productions, Inc.** -- This Jacksonville, Florida firm is under contract to FSRI for high- end graphics and creative development work. There is potential to perform BCC-specific work for marketing the “Aerospace Encounter” seminar. Web site: <http://www.steelbeach.com/>.

2. The Aerospace Technology AS and AAS Degree Curriculum. This work is funded through the State of Florida “Horizon Jobs” grant and is targeted to provide the course work for a complete AS and AAS degree program for training aerospace technicians for the Florida workforce. Developed in conjunction with strong industry input and direction, this initiative has already produced grants and in-kind support from The Boeing Company, United Space Alliance, and Wyle Laboratories for scholarships, mentors, student internships, equipment and surplus material donations, subject matter experts, executive services, and start-up seed money for initial program operations. BCC has received major commitments from representatives of the Aerospace Technology Advisory Committee (ATAC) -- the local advisory committee for aerospace technical education – to develop and sustain a training program with national potential. The interfaces for this effort include some that will be required for the national skills certification program described in the final section of this report.

The current organizations serving in this activity are shown in the following chart. In addition to the interfaces with the groups already discussed above, additional linkages exist as depicted below. BCC web site: <http://www.spaceportcenter.net>.

# Florida ATAC



- **NASA:** BCC has a network of contacts to assure NASA requirements are included in our curriculum, and NASA representatives serve on the ATAC to assure that our activities are fully understood and comply with NASA requirements. Visits have recently been completed with NASA representatives from KSC and Headquarters, and our initiatives have been well received. NASA funding may be possible in the future, but the amount and purpose remain uncertain at this time. Web sites at Headquarters: <http://www.nasa.gov/> and KSC: <http://www.ksc.nasa.gov/>.
- **Florida Space Institute (FSI):** This interface with UCF includes a special math refresher course for graduate engineers now being offered for the third time through our academic arm. FSI operates a consortium that includes BCC and is engaged in developing an on-site laboratory capability for payload processing to provide “hands-on” opportunities for engineering and technology students. BCC and UCF are developing articulation for the aerospace AS degree and the UCF Bachelor of Space Engineering Technology. Web site: <http://fsi.ucf.edu/>.
- **Florida Division of Community Colleges (DCC):** The DCC attends the ATAC meetings, advocates funding, and receives reports of accomplishments, plans, and

- issues with our AS and AAS programs. BCC received recurring funding for year 2 of the Horizon Jobs grant in November of last year and expects to receive a third year funding allotment this summer following the completion of the spring legislative session. Web site: <http://www.dcc.firm.edu/>.
- **Dynamac:** This woman-owned company has strong ties to EPA and NSF, with significant educational commitments at KSC and elsewhere. In addition to opportunities for specialty workshops and internships for BCC's science students (academic linkage), Dynamac has agreed to serve as an external evaluator for any grant activity requiring that support. Because they employ the Center's largest number of graduate scientists in the life sciences, there are also opportunities to partner at the college's planetarium and for field operations in environmental management, as well as research with other groups working through Dynamac (e.g., Smithsonian Research Institute; Hubbs/Sea World Research Institute). Web site: <http://www.dynamac.com/>.
  - **Lockheed/Martin Company (LMCO):** As one of the "Big Three" launch contractors at CCAFS, Lockheed-Martin serves on the ATAC and offers the opportunity for major support to the national program for aerospace technicians. They have invited BCC to review their training processes to bid on education programs within BCC's capabilities. Web site at: <http://www.ast.lmco.com/index.shtml>.
  - **Space Gateway Support (SGS):** This company provides base operations support at KSC and CCAFS under a joint NASA/AF contract. Representatives from SGS and their subcontractors serve on the ATAC and have provided input to the AS curriculum development. SGS has been instrumental in making inputs to NASA for a training facility within the security area of KSC, as well as in the commerce park that will be a part of the Space Experiment Research Processing Laboratory (SERPL). Web site: <http://www.spacegatewaysupport.com/>.
  - **Embry-Riddle Aeronautical University (ERAU):** ERAU is a major educational player at KSC and CCAFS, providing Airframe and Powerplant mechanics for USA and others. A senior ERAU administrator serves on the ATAC, and we have developed a strong working relationship that will be extremely important for the success of a national skills certification program for aerospace technicians. The potential for articulation is good, and we expect to strengthen our working interface with ERAU in the future. There are no clear funding exchange opportunities for either college and no current agreements, but in the future it may be useful to jointly develop laboratory capabilities of mutual interest. Web site: <http://www.db.erau.edu/>.
  - **Brevard Workforce Development Board (BWDB):** This group has the interface for state funding through FSRI and is also a member of ATAC. They have encouraged development of joint working arrangements with access to the funding provided by the state for the ALE program. Dislocated and unemployed workers are funded through this group for training in career skills for new jobs. Web site: <http://www.bwdb.org/>.
  - **Community Colleges for Innovative Technology Transfer (CCITT):** Eight of the CCITT member colleges have joined BCC to pursue a National Science Foundation grant for a national center of excellence for aerospace technical education. A proposal submitted last October has achieved finalist status for an NSF award this spring. Members of the consortium working on the project and their NASA/DOD affiliations include Allan Hancock College (Vandenberg AFB,

California), San Jacinto College (Johnson Space Center, Texas), Calhoun Community College (Boeing Delta IV/Marshall Space Flight Center, Alabama), Prince George's Community College (Goddard Space Flight Center, MD, Langley Research Center, VA., and NASA Headquarters, Washington D.C.), Cuyahoga Community College (John Glenn Research Center, Ohio), Community College of the Air Force (Maxwell Air Force Base, Alabama), Pearl River Community College (Stennis Space Center, Mississippi), College of the Mainland (Johnson Space Center, Texas), and Brevard Community College (John F. Kennedy Space Center, Florida). Web sites at: <http://www.ccitt.info>. and <http://www.spacetec.org>.

- **United Space Alliance (USA):** USA is the largest Florida contractor for NASA Shuttle operations and one of the most active supporters of BCC's aerospace technical education initiatives. USA managers serve on the ATAC, and several senior USA technicians participated in the DACUM for the AS degree. A USA training manager chairs the ATAC Curriculum Subcommittee, and USA is in the process of making a formal commitment for funding part of BCC's aerospace program operation, student scholarships program, internship program, and providing access to senior staff, equipment, and laboratories. In addition to both financial and in-kind support for the technician training work, USA is interested in developing stronger relationships with BCC for in-house training, as well as the formal certification of USA trainers to strengthen the professional development capabilities of the company. Web site: <http://www.unitedspacealliance.com/>.
- **Technological Research and Development Authority (TRDA):** This State of Florida entity operates the Florida/NASA Business Incubation Center at BCC's Titusville campus and serves on the ATAC as a formal member. In addition to providing key linkages to organizations outside the space center, TRDA is a funding source for special activities (such as K-12 teacher training, for example) as well as a possible joint venture partner for future facilities, should BCC need to expand. Web site: <http://www.trda.org/>.
- **Florida Institute of Technology (FIT):** Florida Tech serves on the Board of Directors of FSRI and is represented on the ATAC for aircraft and space operations interests. FIT is primarily interested in university research and aviation, but there are opportunities for articulation of BCC graduates of the aerospace program and long term partnerships in curriculum development for courses of mutual interest. FIT's presence on the ATAC provides another strong linkage to upper division private colleges and a very valuable asset in initiating a national skills certification program. Web site: <http://www.fit.edu/>.
- **Economic Development Commission of Florida's Space Coast (EDC):** The EDC serves on the ATAC and is expected to become a more active participant as workforce development roles become more apparent and the national skills certification program begins to gain momentum. There are no current formal activities underway. Web site: <http://www.spacecoastedc.org/>.
- **Wyle Laboratories (Wyle):** This large and diverse organization is committed to developing a skilled technician workforce and provides executive leadership to chair the ATAC. Wyle Labs has provided significant financial and staff support to the BCC aerospace technician program, including videotape training programs for use in the areas of security and safety – two elements that may broaden the "Aerospace Encounter" seminar to KSC and CCAFS-wide use as a refresher training program for all employees. Web site: <http://www.wylelabs.com/>.

- **CNET:** This is a new interface with the Navy, specifically with the distance learning arm based in Washington D.C. that is initiating actions on an \$800M program to provide advanced online educational opportunities to all shipboard navy personnel anywhere in the world. CNET provides a liaison member to ATAC. Web site: <http://www.cnet.navy.mil/>.
- **The Boeing Company:** The Boeing operation includes Delta 2 and 4 activities, as well as support to the International Space Station under contract to NASA. Boeing provides strong support to ATAC and endorses a national skills certification program. Boeing provided the first \$15,000 grant to the BCC aerospace technician program in 2000 and is committed to provide the full range of support for the national skills standards program. Key Boeing technicians served on the DACUM and attended development meetings for the “Aerospace Encounter” seminar. The company has pledged tuition sponsorships, internships, hiring of graduates, executive-on-loan arrangements, and access to Boeing equipment and facilities. Web site: <http://www.boeing.com/flash.html>.
- **United States Air Force (45SW):** BCC has developed strong relationships with both the 45<sup>th</sup> Space Wing at Patrick AFB and the Cape Canaveral Air Force Station to support development of all three elements of the aerospace program. Both groups serve on the ATAC and have attended the “Aerospace Encounter” seminar. It is likely that PAFB will send key staff to the “Aerospace Encounter” seminar on a regular basis, and support for the NSF grant proposal is an important element in this partnership. Space Command global web site: [http://directory.google.com/Top/Regional/North\\_America/United\\_States/Government/Military/Air\\_Force/AF\\_Space\\_Command\\_-\\_AFSPC/](http://directory.google.com/Top/Regional/North_America/United_States/Government/Military/Air_Force/AF_Space_Command_-_AFSPC/).
- **Florida Aviation and Aerospace Alliance (FAAA):** The FAAA is a lobbying group representing a broad spectrum of aerospace organizations throughout Florida, with special emphasis on small aviation businesses. The Executive Director of FAAA serves on the ATAC, and BCC is a member of FAAA. There are no formal agreements at this time, but FAAA may become an important part of the national skills standards program, interfacing with the FAA when appropriate. Web site: <http://www.faaa.org/>.
- **Spacecoast Economic Development Commission (SEDC):** The SEDC is the economic development arm for North Brevard funded by the City of Titusville and local businesses for activities in the northern part of the county. The SEDC president serves on the ATAC and represents business interests of the community beyond the boundaries of KSC and CCAFS in much the same way that the EDC Chair serves the needs of the county at large. Although there are no formal agreements with the SEDC currently, in the past they have provided support for ribbon cuttings, receptions, and similar PR activities that may be very important to our initiatives in the near future. The SEDC has very strong relationships with NASA, TRDA, and BCC at the Business Incubator and is a strong advocate of aerospace development activities, with special emphasis on education and infrastructure development. Web site: <http://www.globalgateway.org/>.
- **Bionetics:** This company, based in Hampton, Virginia, provides payload support and biomedical laboratory operations at the Kennedy Space Center. The Bionetics Project Manager serves on the ATAC and is also Chairman of the Board of FSRI. This provides a strong linkage that can serve as a catalyst for joint operations across organizational boundaries. Bionetics has pledged to support BCC efforts in the AS and national skills certification programs and

- provided formal endorsements for both of these initiatives. In addition, Bionetics has skills in the procurement and grant development areas that may become useful to the overall consortium. Web site: <http://www.bionetics.com/>.
- **Florida Space Authority (FSA):** The Florida Space Authority (formerly Spaceport Florida Authority) serves as a formal member of the ATAC and chairs the Public Relations Subcommittee. As one of the primary State of Florida representatives to NASA and the Air Force, FSA provides a key link for the BCC aerospace program sponsorship. BCC has developed a strong relationship with FSA in several areas, and work is underway to qualify an active launch pad for educational uses. Web site: <http://www.floridaspaceauthority.com/>.
  - **Brevard Public Schools (BPS)** The Brevard County Area IV Superintendent has formally joined ATAC and serves in an advisory capacity for the county K-12 system. This provides a seamless link between K-12 and BCC's AS program, permitting access to dual-enrollment, recruitment opportunities for technician workforce screening, and promotional work as far down into the K-12 system as deemed appropriate. Work is underway to develop a special version of the "Aerospace Encounter" seminar for K-12 educators. There are no agreements beyond the current BCC/School Board articulation agreement for this activity. Web site: <http://www.brevard.k12.fl.us/>.
  - **Federal Aviation Administration (FAA):** The BCC Aerospace Program staff visited the FAA Associate Administrator for Commercial Space Transportation last spring and the FAA has formally joined the ATAC and attends meetings of that group. This interface is crucial to developing national support of the AS degree and the national skills certification program. There are grant monies available through FAA for educational activities, and there may be interest on the part of FAA personnel for the "Aerospace Encounter" seminar, especially if information about licensing and permitting of commercial space vehicles is included and targeted for their employees. Web site: <http://www.faa.gov/>.
  - **Harris Corporation (Harris):** As a major employer of technical personnel, Harris represents a key player not currently participating in our technician training program. Web site at: <http://www.harris.com/>.
  - **Central Florida Labor Council (CFLC):** This broad-based labor council represents a first-attempt at bringing organized labor into formal relationship with ATAC. Web site: <http://www.aflcio.org/unionand/statefed.htm>.
  - **Naval Ordnance Test Unit (NOTU):** This Navy group at Port Canaveral is an important link to naval launch operations, not only at Port Canaveral, but worldwide. An invitation to attend and join ATAC has been sent, and telephonic confirmation has been achieved. NOTU will be an active and important linkage to sea-based activities that will probably require specialized training not found in other operations. Web site: <http://www.otsu-2.navy.mil/links.html>.
  - **Pratt&Whitney:** Based in West Palm Beach, this major rocket engine manufacturer is an important addition to ATAC, broadening the base of ATAC operations geographically within the state and operationally to include major manufacturing and design activities. Pratt&Whitney is an important element both in broadening the AS degree and in strengthening the national skills certification program. Web site at: <http://www.pratt-whitney.com/>.
  - **Enterprise Florida, Inc. (EFI):** This State-chartered economic development group provides major economic incentives for Florida businesses expanding their workforce or bringing new jobs to the state. Their presence on the ATAC assures

industry leaders that their interests are being addressed and their access for state support of selected high-value programs enhanced through this partnership. Web site at: <http://www.eflorida.com/>.

- **Command and Control Technologies (CCT):** CCT is a leading small business organization providing space launch communication and control systems for spaceport activities in several states. Web site: <http://www.cctcorp.com/>.
- **Indyne Corporation (Indyne):** This group provides engineering management and consulting services for space launch, safety and quality assurance tasks. They serve on the ATAC to provide inputs from specialized disciplines requiring specific curricula for effective workforce training and development. Web site: <http://www.idinc.com/>.

3. **National Aerospace Technician Skills Certification Process.** This project includes commitments by the entire ATAC to transition the aerospace technician training program to a national level, providing an industry-driven program of skills and competencies that is accepted within the aerospace industry as the recognized minimum standard for “work ready” technicians in aerospace. The impetus for this work came from the industry representatives on the ATAC, and application has been made through the Community College for Innovative Technology Transfer (CCITT) for a National Science Foundation Grant under the Advanced Technological Education Program to provide funding for a National Center of Excellence in Aerospace Technical Education. The Center, based at BCC and operating at eight locations in conjunction with a national consortium of community colleges, would underpin the national certification process. The key deliverables for this program include: curriculum development and standardization; center administration; faculty development; management of web sites; publication of newsletters; hosting national conferences and workshops; managing databases: (member directory, job postings, best practices, hiring needs); conducting recruitment and marketing; developing a national industry alliance ( e.g., an expanded ATAC); promoting distance learning options; developing articulation agreements; generating criteria and operating a national skills certification system; hosting a national professional association and implementing a national certification program for aerospace technicians.

In addition to the many organizations listed in sections 1 and 2, this initiative requires expansion to the national level and the inclusion of several other groups:

- **The National Skills Standards Board (NSSB):** This government-chartered and -funded organization oversees the designation of national skills standards for workers in technical/vocational occupations. BCC staff visited the national offices of the NSSB and obtained early copies of draft application materials for a newly designated “specialty” certification category that appears to suit the aerospace technician occupation. The accomplishments of the ATAC to date, including its make-up and the conduct of the DACUMs for the aerospace technician degree program fit the NSSB criteria perfectly. A letter of intent has been sent, setting in motion another major step toward developing a national skills certification program that is formally recognized by all major players. Web site: <http://www.nssb.org/>.
- **National Science Foundation (NSF):** NSF provides expertise and grant funding for workforce technical education as part under NSF’s Advanced Technological Education Program . A proposal submitted in to NSF in October 2001 has

qualified CCITT as a finalist for an award as a national center of excellence for aerospace technical education. A site visit was conducted in January 2002, and final assessments are in work for this award. Web sites: <http://www.nsf.gov/> and <http://www.ehr.nsf.gov/EHR/DUE/programs/ate/>.

### Observations and Conclusions

Powerful forces are at work transforming the relationships among government, business, and educational institutions. The nature of that transformation is vividly described in a landmark book by Stan Davis and Jim Bodkin called “The Monster Under the Bed.”<sup>5</sup> Given the strong industry support and the encouragement of government and educator counterparts, Community Colleges for Innovative Technology Transfer’s Aerospace Technology Education initiative represents a new kind of partnership where academic credentials co-exist with competency-based education designed to satisfy workplace needs as defined by the businesses hiring the graduates. In the best sense of the word, the industry “owns” the curriculum, and the colleges provide the means by which day-to-day tasks are modeled and taught within an academic framework that is cost effective for the employers and stimulating for the potential employees who will find career paths defined in advance in a field where this has never been true before.

With significant support by the colleges, their stakeholders, and their state governing bodies, this program is moving forward to accomplish the kinds of initiatives outlined in this report. A formal paper will be delivered at the upcoming 39<sup>th</sup> Space Congress outlining the structure and status of these initiatives. At the local level, CCITT colleges will continue to strengthen relationships among their existing advisory committee members, inviting participation by new members as the program continues to grow in size and scope.

The interfaces outlined in this report are expected to continue to develop in depth and importance throughout the conduct of this program. The transformation of traditional curricula, delivery systems, teachers, and educational technology is welcomed with great anticipation for the next generation of new ideas and the challenges to anyone who makes the noble educational commitment to “pass it on”.

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To view current program status, please access the reports updated on a periodic basis at the CCITT web site: [www.spacetec.org](http://www.spacetec.org); BCC’s work at: <http://www.spaceportcenter.org>; and CCITT’s national consortium at: <http://www.ccitt.info>.

### Biographical

Dr. Koller holds a B.A. in Math/Physics, an M.S. in Systems Management, and a Doctorate in Business Administration. For more than 30 years he was an engineer and program manager for NASA at Kennedy Space Center; has taught for five universities; is president of e3 Company, a private consulting firm; and has worked at BCC for ten years.

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End Notes/Bibliography

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