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Transforming Technical Education

A National Partnership for Aerospace Education

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Recent changes in the aerospace industry have resulted in increased interest in educational initiatives by a number of states (e.g., Florida, Texas, Alabama), the National Aeronautics and Space Administration (NASA), the Department of Defense (DOD), and business organizations facing a challenging future. In response, 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 for aerospace technicians. This new program not only will educate the workforce of the future but also will use the lure of space-related activities to infuse new levels of interest in academic programs of all kinds.

Already the work by this group has resulted in initiatives in workforce training, curriculum development, educational technology, and 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 purpose of this paper is to describe the programmatic needs for educational activities for aerospace technical education. It will outline the approaches being developed to utilize partnerships that will link K-12, community college, and university

systems to sustain a qualified and technically competent workforce. To meet the growing need for a technically competent workforce, powerful alliances with business and industry, educational institutions, and government organizations such as state spaceport authorities for aerospace program activities have been formed. If successful, these activities can transform education with sustainable structures and flexible curricula that meet the needs of the ultimate stakeholders.

SpaceTEC Project

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)** proposes to establish **SpaceTEC**, a national aerospace science Technical Education Center of Excellence under the National Science Foundation's Advanced Technical Education Program.

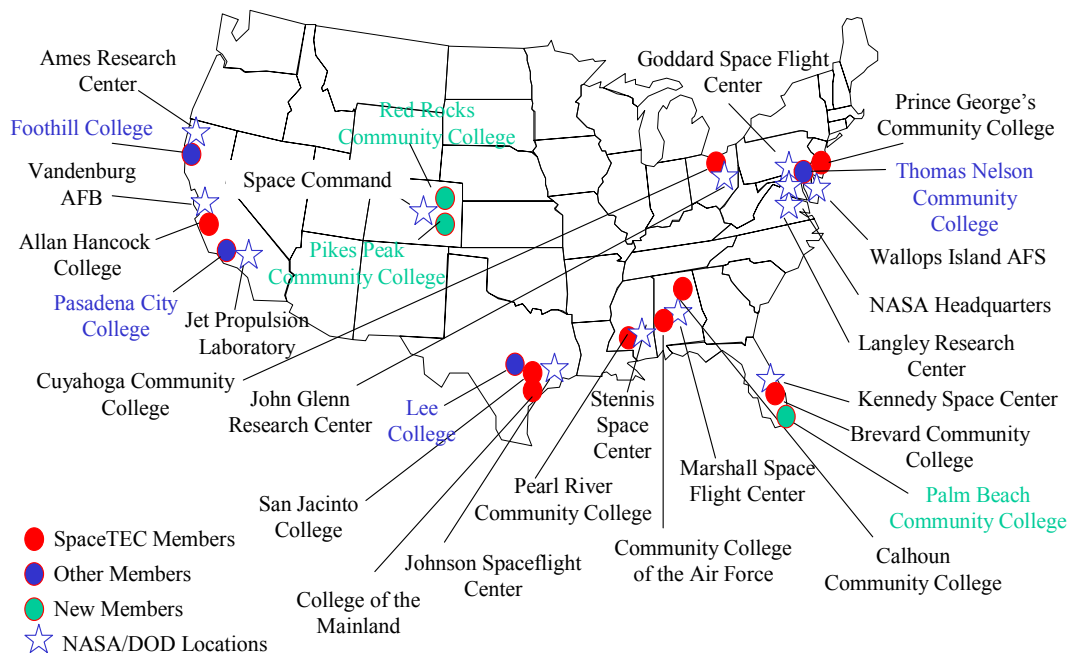
There is wide interest in space activities, especially among young people, and the appeal of space can be used to stimulate interest in many subject areas. The *vision* of SpaceTEC is to be the focal point for technical education resources featuring aerospace, providing motivation for academic studies 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.

The **nine CCITT member colleges participating** in this initiative are affiliated with a NASA center or Department of Defense location as depicted in Figure 1 below.

CCITT/Agency Locations

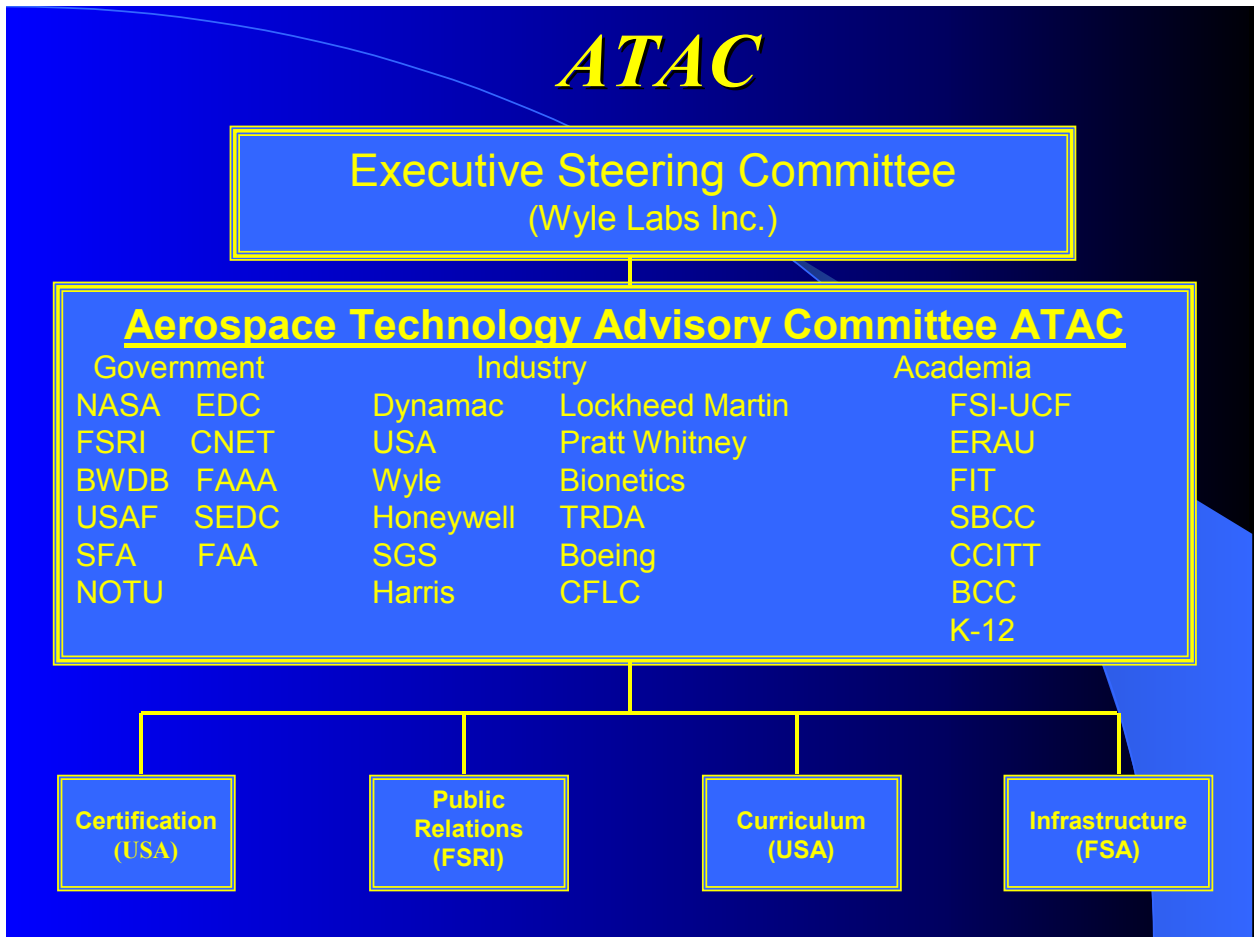


Together they enroll over 400,000 students annually. United Space Alliance is an industry partner providing a Co-PI. CCITT colleges will lead one or more of the

elements of the national program, and Brevard Community College will serve as the fiscal agent and Center manager.

For an initiative such as this to be successful requires strong local support from a variety of organizations, the most important of which are the commercial ventures that will hire graduates to support their technical workforce needs. In the case of SpaceTEC, several advisory committees at the localities in which each college operates provide this support. To provide some idea of the complexity and power of such an arrangement, the Florida ATAC is shown in Figure 2. It comprises about 40 groups spanning the entire spectrum of participation.

Figure 2. Florida Aerospace Technology Advisory Committee, 2002.



ATAC members have provided seed money for program start-up, scholarships for students, mentors, teachers, curriculum, executive assistance such as the ATAC leadership, co-op and intern support (pending), access to laboratories and equipment, surplus equipment and tools either free or at very low cost, and evaluative support to assure the effectiveness of the curriculum and the suitability of graduates.

As many as 11 individual curricula have already been developed for local use, but none are presently articulated or formally aligned. Work is already underway to remedy this shortcoming and to utilize the model provided by the local advisory committees to form a national committee to assist in national integration of standards, courses, skills, and competencies that are jointly recognized and approved for work ready, beginning level technicians. While no two-year curriculum can provide all of the specific skills needed for the complex jobs required by aerospace contractors, there is a core of common skills that can be taught in that timeframe. Building these courses into a two-year associate degree program offers the opportunity to recruit a substantially larger candidate labor pool that is educated through the existing community college system, with the costs of basic education borne by the individuals and their sponsors. Site and company specific training will be required and, appropriately, will be funded by the employing agency, with defined career paths that encourage long term commitments by both the employer and the employee through professional development programs that build upon the Associate Degree, including credit and non-credit continuing education, as well as work towards the baccalaureate and beyond. A typical curriculum, recently approved for use by all Florida post-secondary institutions, is shown in Figure 3.

Figure 3. Aerospace AAS DEGREE (AS Degree Requirements * Shown in Brackets)

<p>1st Semester English ENC 1101 – 3 crs. Intro to Aerospace Workplace - 3 crs. Technical Math MTB 1321 – 3 crs. (Algebra, MAC 1105)* Physical Science PSC 134I – 3 crs. Computer Applications CGS 2100– 3 crs. Evolution of the Aerospace Industry AFR 1250 – 1 cr. Total: 16 crs.</p>	<p>2nd Semester Basic Electricity/Electronics – 4 crs. Applied Mechanics – 3 crs. Aerospace Systems I – 4 crs. Materials and Processes I – 3 crs. Safety and Quality – 3 crs. (Speech, SPC 2600)* Total: 17 crs.</p>
<p>Summer A Internship – 3 crs. Total : 3 crs (Humanities/Cultural Arts Elective – 3 crs)*</p>	<p>Internship – 3 crs (Social Science Elective – 3 crs.)* Summer B Total : 3 crs</p>
<p>3rd Semester Structural Fabrication I – 3 crs. Electronic Fabrication and Optics – 3 crs. Aerospace Systems II – 4 crs. Technical Writing – 3 crs. Materials and Processes II – 3 crs. Total: 16 crs.</p>	<p>4th Semester Structural Fabrication II – 3 crs. Technical Task Analysis – 4 crs. Fluid systems – 4 crs. Tests and Measurements – 4 crs. Total: 15 crs. Program Total: 70 credits</p>

One of the hallmarks of good partnerships is that each organization shares in mutual benefit from the programs supported. In this case, the benefits are many and varied.

- 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 for 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.

Although the final approvals have not yet been received (February 2002), there are many accomplishments and several key initiatives underway to transform education for aerospace technicians. The listing in Figure 4 provides a summary to illustrate the many powerful project elements that will take this approach and its partners to a new level of cooperation for educational purposes, to the benefit of all concerned.

Accomplishments/Plans

- Quality DACUM, Sept. 11, 2001
- Horizon Jobs Second Year Funding, Oct. 9
- AS/AAS Curriculum to State Oct 9; Approved Nov. 9
- NSF Grant Proposal, Oct. 18
- Mentoring Initiated, Oct. 24, 2001
- TTC Groundbreaking Oct. 30; Completion in April 2002
- Manufacturing DACUM, Dec. 4-5
- Second Semester Classes, Jan. 7, 2002
- NSF Field Visit Jan. 28, 2002 -- SpaceTEC
- 45th SW/FSA Agreement for Pad 47, SMPF access

As a parting note, it is important to remember that the lure of space is a powerful incentive that increases the interest of people of all ages to learn more and become more closely involved with science and technology. One of the primary areas of work under

this partnership is the K-12 system, where great strides are expected in the infusion of space-related themes into curricula in all disciplines. English and Humanities stand to gain just as much or more than math and science from exposure to space-related materials. Space art is spectacular, and existing programs in subjects like English where examples, readings, and writings relate directly to aerospace topics have been shown to generate enormous interest and commitment beyond that usually existing in traditional courses. This, along with adaptations such as the development of an Advanced Learning Environment such as that envisioned by NASA and the Florida Space Research Institute, promise great new options for learning, both in traditional settings and through web-based distance learning. Using sophisticated technology and inputs by subject matter experts, ALE is combining the power of simulation, artificial intelligence, and virtual reality to form an entirely new approach that promises to reshape education in the future.

Questions or requests for additional information should be directed to the authors at BCC-A, Building M6-306, Kennedy Space Center, Florida 32899. Contact may also be made by telephone at 321.449.5060, or by email at: kollera@brevard.cc.fl.us.

To view current program status, please access the reports updated on a periodic basis at the BCC web site: <http://www.spaceportcenter.org>. For additional information on CCITT, surf to www.spacetec.org.

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 Brevard Community College for 10 years.

Dr. Steffen holds B.S. and M.S. degrees in Mechanical Engineering, an M.S. in Industrial Administration, and a Doctorate in Business Administration. His employment history includes both aircraft and aerospace assignments in industry; executive level assignments in construction and economic development both domestically and abroad; research and teaching assignments at the university level; and teaching and administration at Palm Beach Community College, Florida for 15 years.