

Championing The Aerospace Technical Workforce of the Future

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By Dr. Albert Koller

Thank you for the opportunity to participate on this important panel discussing the future of reusable launch vehicles for our aerospace industry. The focus of my talk today will be the nation's aerospace technician workforce and the transformation needed to meet the aerospace industry's requirements for the global aerospace marketplace of the 21st century.

Embracing the Present

Aerospace technicians manufacture, assemble, service, test, operate, and repair systems for both expendable and reusable space launch vehicles, payloads, related laboratories, and ground support equipment. They do the day-to-day hands-on work across a broad range of aerospace vehicles and systems. Since their numbers are large and their pay is lower than that of engineers, using them offers an opportunity to reduce costs and help reclaim our leadership in the world market.

In today's aerospace market, cost has become a major factor in determining which programs, vehicles, companies, and even which countries capture the greatest market share. Last year (2003), for example, the U.S. led the world in the number of space missions launched, capturing about 38% of the total (21 launches of 56 total). For the first time, China launched more missions (6) than Europe. In the commercial launch market, Europe (France), Russia, and the U.S. each captured about 27% of the total of 15 flights (4 each), and an emerging multinational group using the Zenit launch vehicle captured the remaining 20% (3 total). For Europe and the multinational group, all 7 of their launches were commercial. (Source: Futron, Inc.).

National economic leadership depends heavily on advanced technology. Aerospace -- including aviation and space-based research and development -- is a key segment that requires constant update and attention to both the new employees entering the workforce and the expertise of existing employees. Both aviation and space have relied in the past on graduates from military technical schools that either no longer exist or are producing far fewer graduates who enter the workplace. Aerospace technicians are NOT interchangeable with aviation technicians; they use some of the same skills but with different materials and applications. Without a pool of skilled technicians, the American aerospace industry cannot sustain its performance in a global market. Without new approaches to reduce the reliance of aerospace on large numbers of engineers and specialized technicians working in a single discipline, manpower costs will be prohibitive.

Understanding The Needs

Although difficult to forecast changes in today's dynamic environment, the Department of Labor estimates that technician jobs will grow 12% over the next 8-10 years. Our aerospace industry stakeholders (e.g., the National Aerospace Technology Advisory Committee – NATAC) are unanimous in their concerns for remaining competitive through a skilled technician workforce:

1. Educating students using commercial aerospace company resources is expensive and time consuming, making it difficult to maintain safety, quality, and global competitiveness.
2. Military technical schools -- the major source of technicians in the post-WWII era -- are closing, and those remaining open are graduating many fewer students into the workforce. The competition for these qualified technicians is very high.

3. Most high school graduates do not possess the requisite basic knowledge and fundamental work ethic required for success in aerospace endeavors. Recent studies show that an average of 41% of graduating high school seniors need remediation prior to entering college, with the greatest need in mathematics (Source: College Board; SAT).
4. As the aerospace industry matures, large numbers of senior technicians are reaching retirement age, taking with them a vast resource of knowledge, skills, and experience that cannot be easily duplicated. The Bureau of Labor Statistics estimates that 26-32% of aerospace employees will leave the workforce over the next six years.

It is important to note that there is a national industry-supported Automotive Service Excellence (ASE) certification required for mechanics working on cars, but there are presently no national skills standards for technicians working on spacecraft. Many individual task certifications are used in aerospace activities, but they are company-specific standards that are not easily articulated from one job or company to another. Except for the military, no one trains nationally.

As the aerospace industry has consolidated, work to integrate existing company curricula has posed extensive problems. The lack of national skills standards has impeded worker mobility and career development. When an aerospace technician changes jobs from one employer to another, he/she must begin again with training at all levels, from basic safety and quality to skill-based tests to qualify on that company's approach to systems or programs. This is costly to both the employee and the employer, adding substantially to the time required for technicians to attain recognized levels of proficiencies, and increasing labor expenses for aerospace.

Actions and Accomplishments

To address the need for skilled technicians on a national level and to spur student interest and motivation to study math, science and technology, a national consortium of colleges known as the Community Colleges for Innovative Technology Transfer (CCITT) proposed, and the National Science Foundation funded **SpaceTEC**, a national aerospace Technical Education Center of Excellence under the NSF's Advanced Technological Education (ATE) Program. SpaceTEC is now in its 18th month of operation. The primary work of the SpaceTEC ATE Center can be divided into five categories:

1. Student recruitment and outreach
2. National technician education program
3. National skills assessments
4. Faculty professional development
5. Technician professional development

With more than 1000 students, 15,000 contacts, and a national infrastructure already to its credit, SpaceTEC has become the focal point for aerospace-related technical education resources, providing academic and professional development services for faculty, students, and aerospace employees nationally at the technician level. Over the past year SpaceTEC partners have made substantial progress in achieving most of the project's goals:

- Most early program graduates have been placed with major aerospace employers
- New grants have been won for technical programs at SpaceTEC member institutions
- A national technical education infrastructure is operational for the program (See chart)
- Institutions have added broad discipline areas to exploit aerospace skills/competencies
- Major curriculum improvements have been made to reflect industry-required skills
- An active launch site at CCAFS, Complex 47, has been dedicated to educational purposes

What began with 9 member colleges now includes 12 two-year institutions and a major university participating in this program in ten states nationwide. Each institution is affiliated with at least one NASA Center or Department of Defense location and a local advisory group. Presentation charts depicting SpaceTEC goals, achievements, and processes are appended to this report, and additional information can be found at: <http://www.spacetec.org/>.

The approaches taken by SpaceTEC to train future aerospace technicians reduce the costs and shift the responsibility for paying for basic education from aerospace employers to the students through the nation's post-secondary school systems. Aerospace companies are enthusiastic about the employability potential offered by incoming technicians holding two-year degrees. They now support a wide variety of actions that include:

- Staffing panels of experts for the curriculum development process
- Providing executive level personnel to local advisory committees
- Sharing existing curricular materials and task certification processes already in use
- Providing equipment on loan and contributing surplus tools and materials
- Contributing tuition for students and seed money for initial program offerings
- Arranging access to laboratories, workshops, assembly and test areas
- Assigning technical experts to serve as faculty and guest instructors to deliver the curriculum in partnering arrangements
- Providing mentors and hosting internships and cooperative students, and
- Hiring graduates and providing incentives for additional education

The benefits of SpaceTEC are now many:

- For employees who work or plan to work as aerospace technicians, the Center provides a single authoritative source for professional development activities, networking, training, certification examinations, job placement, and career development opportunities.
- For engineering students seeking hands-on technical experience, the Center promotes internships, refresher courses, and advanced instruction at partnering universities.
- For K-12 and community college faculty, the Center provides access to information, curriculum, workshops, and industry interfaces not available through any other source.
- For K-12 students, the Center provides inspiration and interest through space-related materials, recruitment activities, marketing promotions, and campus visits.
- For the aerospace companies and government agencies, the Center provides access to a pool of new qualified candidates who possess industry-endorsed competencies that make them work-ready and familiar with aerospace activities.
- For the academic institutions, the Center coordinates national skills standards that directly support the aerospace industry's training needs and employment initiatives.

Managing for the Future

I believe the timing is perfect for national workforce initiatives such as those outlined in this paper. Our young people need new opportunities, and our aerospace programs have evolved to the point that new initiatives are needed. The time has come to move beyond reliance only on top-level scientists, engineers, and astronauts for flight repairs befitting a technician. For example, if our international space station is to be truly viable, it must be staffed appropriately. That means we need to have technicians ready to fly when that opportunity is made available.

Our space program provides tremendous inspiration for our young people to be more involved in math, science, engineering, and technology. Programs like those of the Challenger Centers, the Astronauts Memorial Foundation, and the NSF/ATE Centers of Excellence provide opportunities

to take advantage of the desires of our young people to participate in something big, important, and exciting enough to make a permanent difference in their lives. If we can capitalize on the “mystique” of space, we can inspire a new generation of Americans in the same way our own imaginations were captured when Americans reached out to the moon in the 1960’s. With our ATAC committees and our government and industry partners, we are working hard to make this effort successful. I hope you will join us in making the national aerospace skills standards a reality.

To secure and maintain a skilled technician workforce for the aerospace industry in the future, the following actions are recommended:

1. Endorse the approach to adopt industry-driven national skills standards for aerospace technicians and help implement them contractually.
2. Develop support for a national certification program based on the two-year Associates Degree as the minimum entry requirement. Encouragement by NASA, DOD, NSF, and FAA for such a program is essential to achieving robust industry participation.
3. Integrate the national aerospace skills standards with a career ladder system that is linked to education and workforce development programs, with options for additional programs of study. Without a system that generates effective career paths and a visionary plan that is compelling, it will be difficult or impossible to inspire students to attempt rigorous academic preparation in math, science, engineering, and technology, or to entice them to work in an industry where it is perceived that their potential is likely to go unrealized.
4. Use the national technical education infrastructure (NATAC, ATEA, NAAT) to develop a national strategic emphasis on space exploration and assist in the transfer of knowledge from experienced senior aerospace technicians, engineers and scientists.

Without a blueprint like this for our future aerospace workforce, America will not be able to capitalize on the investments made in the past. It is up to those of us in the aerospace industry to maintain the health of this important economic sector and to support the development of a skilled workforce at levels sufficient to guarantee our leadership in aerospace on a global basis. If we fail to do this, we threaten our own future with the loss of technological leadership on a global scale. In fact, if we do not maintain the lead in commercial space initiatives, we will find ourselves reacting to work by others who are more aggressive. Under those circumstances, it is unlikely that we will ever reach our full potential.

The initiatives begun by SpaceTEC and its partners deserve and need the support of government, industry, and academic groups nationwide. As the national skills assessment program is implemented this coming year, please consider what role you could play in making this program the focal point for aerospace technical education in America.



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Professional Experience:

Dr. Koller is Executive Director of Brevard Community College's aerospace programs at the Spaceport Center and Principal Investigator for SpaceTEC®, the National Science Foundation's Center of Excellence for Aerospace Technical Education. He is Executive Director of the Aerospace Technology Advisory Committee, Inc. and Executive Director of Community Colleges for Innovative Technology Transfer (CCITT), a national consortium of community colleges working with the NASA centers and several DOD sites. At BCC over the past 12 years he has served as Associate Vice President for International Education; Dean of Institutional Advancement; Campus President and Dean of Instruction for the Titusville campus, and as Executive Director of the Community Colleges for International Development, Inc. (CCID) – a consortium of 90 colleges working in international education. Dr. Koller is president of e3 Company, a private consulting firm, and was a NASA engineer and program manager at the Kennedy Space Center (KSC) for more than 30 years. He has taught at several universities, consults for private and public organizations, and is nationally published in the technical and management fields, as well as international education. Dr. Koller holds a formal certification by the Institute of Certified Professional Managers, James Madison University.

Dr. Koller's affiliations include the Florida Association of Community Colleges (FACC); the American Association of Community Colleges (AACC); the Community Colleges for Innovative Technology Transfer (CCITT); the Aerospace Technology Advisory Committee, Inc. (ATAC), the Florida Space Business Roundtable; the National Space Club Florida Committee (NSCFL, Vice Chair); the American Technical Education Association (ATEA); the Titusville Sunrise Rotary Club; and the Titusville Area Chamber of Commerce, where he served as the Chairman of the Board for 2000. Dr. Koller is the Founding Chair of the Brevard Nature Alliance, Inc. and the founder of the Business Education Support Board, Inc.